CHAPTER 2

THE PROJECT MANAGEMENT AND INFORMATION TECHNOLOGY CONTEXT

LEARNING OBJECTIVES

After reading this chapter, you will be able to:

- Describe the systems view of project management and how it applies to information technology projects
- Understand organizations, including the four frames, organizational structures, and organizational culture
- Explain why stakeholder management and top management commitment are critical for a project's success
- Understand the concept of a project phase and the project life cycle and distinguish between project development and product development
- Discuss the unique attributes and diverse nature of information technology projects
- Describe recent trends affecting IT project management, including globalization, outsourcing, and virtual teams

OPENING CASE

Tom Walters recently accepted a new position at his college as the Director of Information Technology. Tom had been a respected faculty member at the college for the past 15 years. The college—a small, private institution in the Southwest—offered a variety of programs in the liberal arts and professional areas. Enrollment included 1,500 full-time traditional students and about 1,000 working-adult students attending evening programs. Many instructors supplemented their courses with information on the Internet and course Web sites, but they did not offer any distance-learning programs. The college's niche was serving students in that region who liked the setting of a small liberal arts college.

Like other institutions of higher learning, the use of information technology at the college had grown tremendously in the past 10 years. There were a few classrooms on campus with computers for the instructors and students, and a few more with just instructor stations and projection systems. Tom knew that several colleges throughout the country required that all students lease laptops and that these colleges incorporated technology components into most courses. This idea fascinated him. He and two other members of the Information Technology department visited a local college that had required all students to lease laptops for the past three years, and they were very impressed with what they saw and heard. Tom and his staff developed plans to start requiring students to lease laptops at their college the next year.

Tom sent an e-mail to all faculty and staff in September, which briefly described this and other plans. He did not get much response, however, until the February faculty meeting when, as he described some of the details of his plan, the chairs of the History, English, Philosophy, and Economics departments all voiced their opposition to the idea. They eloquently stated that the college was not a technical training school, and they thought the idea was ludicrous. Members of the Computer Science department voiced their concern that almost all of their students already had state-of-the art laptops and would not want to pay a mandatory fee to lease less-powerful ones. The director of the adult education program expressed her concern that many adult-education students would balk at an increase in fees. Tom was in shock to hear his colleagues' responses, especially after he and his staff had spent a lot of time planning details of how to implement laptops at their campus. Now what should he do?

Many of the theories and concepts of project management are not difficult to understand. What *is* difficult is implementing them in various environments. Project managers must consider many different issues when managing projects. Just as each project is unique, so is its environment. This chapter discusses some of the components involved in understanding the project environment, such as using a systems approach, understanding organizations, managing stakeholders, matching product life cycles to the project environment, understanding the context of information technology projects, and reviewing recent trends affecting IT project management.

A SYSTEMS VIEW OF PROJECT MANAGEMENT

Even though projects are temporary and intended to provide a unique product or service, you cannot run projects in isolation. If project managers lead projects in isolation, it is unlikely that those projects will ever truly serve the needs of the organization. Therefore, projects must operate in a broad organizational environment, and project managers need

to consider projects within the greater organizational context. To handle complex situations effectively, project managers need to take a holistic view of a project and understand how it relates to the larger organization. **Systems thinking** describes this holistic view of carrying out projects within the context of the organization.

What Is a Systems Approach?

The term **systems approach** emerged in the 1950s to describe a holistic and analytical approach to solving complex problems that includes using a systems philosophy, systems analysis, and systems management. A **systems philosophy** is an overall model for thinking about things as systems. **Systems** are sets of interacting components working within an environment to fulfill some purpose. For example, the human body is a system composed of many subsystems—the nervous system, the skeletal system, the circulatory system, the digestive system, and so on. **Systems analysis** is a problem-solving approach that requires defining the scope of the system, dividing it into its components, and then identifying and evaluating its problems, opportunities, constraints, and needs. Once this is completed, the systems analyst then examines alternative solutions for improving the current situation, identifies an optimum, or at least satisfactory, solution or action plan, and examines that plan against the entire system. **Systems management** addresses the business, technological, and organizational issues associated with creating, maintaining, and making changes to a system.

Using a systems approach is critical to successful project management. Top management and project managers must follow a systems philosophy to understand how projects relate to the whole organization. They must use systems analysis to address needs with a problem-solving approach. They must use systems management to identify key business, technological, and organizational issues related to each project in order to identify and satisfy key stakeholders and do what is best for the entire organization.

In the opening case, when Tom Walters planned the laptop project, he did not use a systems approach. Members of his IT department did all of the planning. Even though Tom sent an e-mail describing the laptop project to all faculty and staff, he did not address many of the organizational issues involved in such a complex project. Most faculty and staff are very busy at the beginning of fall term and many may not have read the entire message. Others may have been too busy to communicate their concerns to the Information Technology department. Tom was unaware of the effects the laptop project would have on other parts of the college. He did not clearly define the business, technological, and organizational issues associated with the project. Tom and the Information Technology department began work on the laptop project in isolation. If they had taken a systems approach, considering other dimensions of the project, and involving key stakeholders, they could have identified and addressed many of the issues raised at the February faculty meeting *before* the meeting.

The Three-Sphere Model for Systems Management

Many business and information technology students understand the concepts of systems and performing a systems analysis. However, they often gloss over the topic of systems management. The simple idea of addressing the three spheres of systems management—business, organization, and technology—can have a huge impact on selecting and managing projects successfully.

Figure 2-1 provides a sample of some of the business, organizational, and technological issues that could be factors in the laptop project. In this case, technological issues, though

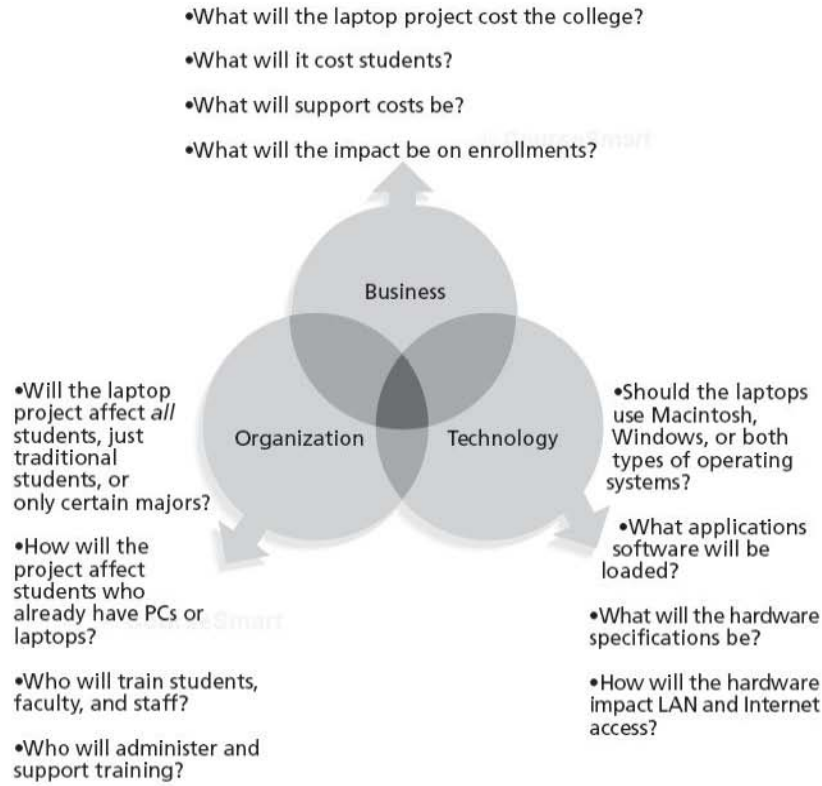

FIGURE 2-1 Three-sphere model for systems management

not simple by any means, are probably the least difficult to identify and resolve. However, projects must address issues in all three spheres of the systems management model. Although it is easier to focus on the immediate and sometimes narrow concerns of a particular project, project managers and other staff must keep in mind the effects of any project on the interests and needs of the entire system or organization.

Many information technology professionals become captivated with the technology and day-to-day problem solving involved in working with information systems. They tend to become frustrated with many of the "people problems" or politics involved in most organizations. In addition, many information technology professionals ignore important business issues—such as, "Does it make financial sense to pursue this new technology?" or, "Should the company develop this software in-house or purchase it off-the-shelf?" Using a more holistic approach helps project managers integrate business and organizational issues into their planning. It also helps them look at projects as a series of interrelated phases. When you integrate business and organizational issues into project management planning and look at projects as a series of interrelated phases, you do a better job of ensuring project success.

The systems approach requires that project managers always view their projects in the context of the larger organization. Organizational issues are often the most difficult part of working on and managing projects. For example, many people believe that most projects fail because of company politics. Project managers often do not spend enough time identifying all the stakeholders involved in projects, especially the people opposed to the projects. In fact, the latest edition of the *PMBOK® Guide* added a new initiating process under project communications management called "identify stakeholders." (See Chapter 10 for more information.) Project managers also often do not spend enough time considering the political context of a project or the culture of the organization. To improve the success rate of information technology projects, it is important for project managers to develop a better understanding of people as well as organizations.

The Four Frames of Organizations

Organizations can be viewed as having four different frames: structural, human resources, political, and symbolic:[1]

- The **structural frame** deals with how the organization is structured (usually depicted in an organizational chart) and focuses on different groups' roles and responsibilities in order to meet the goals and policies set by top management. This frame is very rational and focuses on coordination and control. For example, within the structural frame, a key information technology issue is whether a company should centralize the information technology personnel in one department or decentralize across several departments. You will learn more about organizational structures in the next section.
- The **human resources (HR) frame** focuses on producing harmony between the needs of the organization and the needs of the people. It recognizes that there are often mismatches between the needs of the organization and the needs of individuals and groups and works to resolve any potential problems. For example, many projects might be more efficient for the organization if personnel worked 80 or more hours a week for several months. This work schedule would probably conflict with the personal lives of those people. Important issues in information technology related to the human resources frame are the shortage of skilled information technology workers within the organization and unrealistic schedules imposed on many projects.
- The **political frame** addresses organizational and personal politics. **Politics** in organizations take the form of competition among groups or individuals for power and leadership. The political frame assumes that organizations are coalitions composed of varied individuals and interest groups. Often, important decisions need to be made based on the allocation of scarce resources. Competition for scarce resources makes conflict a central issue in organizations, and power improves the ability to obtain scarce resources. Project managers must pay attention to politics and power if they are to be effective. It is important to know who opposes your projects as well as who supports them. Important issues in information technology related to the political frame are the power shifts from central functions to operating units or from functional managers to project managers.

- The **symbolic frame** focuses on symbols and meanings. What is most important about any event in an organization is not what actually happened, but what it means. Was it a good sign that the CEO came to a kickoff meeting for a project, or was it a threat? The symbolic frame also relates to the company's culture. How do people dress? How many hours do they work? How do they run meetings? Many information technology projects are international and include stakeholders from various cultures. Understanding those cultures is also a crucial part of the symbolic frame.

WHAT WENT WRONG?

Several large organizations have installed or tried to install enterprise resource planning (ERP) systems to integrate business functions such as ordering, inventory, delivery, accounting, and human resource management. They understand the potential benefits of an ERP system and can analyze its various technical issues, but many companies do not realize how important the organizational issues are to ERP implementations.

For example, in early 2001, Sobey's, Canada's second largest grocery store chain with 1,400 stores, abandoned its two-year, $90 million investment in an ERP system. The system was developed by SAP, the largest enterprise software company and the third-largest software supplier. Unfortunately, the system did not work properly due to several organizational challenges. People in different parts of the company had different terms for various items, and it was difficult to make the necessary decisions for the ERP system. Also, no one wanted to take the time required to get the new system to work because they had their daily work to do. Every department has to work together to implement an ERP system, and it is often difficult to get departments to communicate their needs. As Dalhousie University Associate Professor Sunny Marche states, "The problem of building an integrated system that can accommodate different people is a very serious challenge. You can't divorce technology from the sociocultural issues. They have an equal role." Sobey's ERP system shut down for five days and employees were scrambling to stock potentially empty shelves in several stores for weeks. The system failure cost Sobey's more than $90 million and caused shareholders to take an 82-cent after-tax hit per share.[2]

Project managers must learn to work within all four organizational frames to function well in organizations. Chapter 9, Project Human Resource Management, and Chapter 10, Project Communications Management, further develop some of the organizational issues. The following sections on organizational structures, organizational culture, stakeholder management, and the need for top management commitment provide additional information related to the structural and political frames.

Organizational Structures

Many discussions of organizations focus on organizational structure. Three general classifications of organizational structures are functional, project, and matrix. Most companies today involve all three structures somewhere in the organization, but one is usually most common. Figure 2-2 portrays these three organizational structures. A **functional organizational structure** is the hierarchy most people think of when picturing an organizational

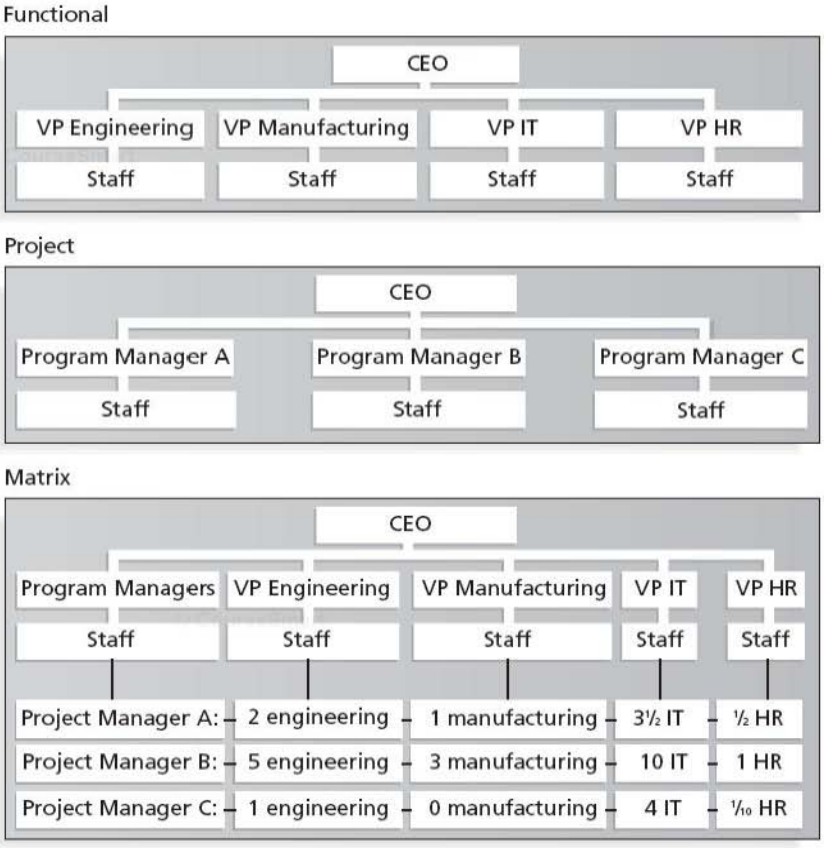

FIGURE 2-2 Functional, project, and matrix organizational structures

chart. Functional managers or vice presidents in specialties such as engineering, manufacturing, information technology, and human resources report to the chief executive officer (CEO). Their staffs have specialized skills in their respective disciplines. For example, most colleges and universities have very strong functional organizations. Only faculty in the business department teach business courses; faculty in the history department teach history; faculty in the art department teach art, and so on.

A **project organizational structure** also has a hierarchical structure, but instead of functional managers or vice presidents reporting to the CEO, program managers report to the CEO. Their staffs have a variety of skills needed to complete the projects within their programs. An organization that uses this structure earns their revenue primarily from performing projects for other groups under contract. For example, many defense, architectural, engineering, and consulting companies use a project organizational structure. These companies often hire people specifically to work on particular projects.

A **matrix organizational structure** represents the middle ground between functional and project structures. Personnel often report to both a functional manager and one or more project managers. For example, information technology personnel at many companies often split their time between two or more projects, but they report to their manager in the information technology department. Project managers in matrix organizations have staff from various functional areas working on their projects, as shown in Figure 2-2. Matrix organizational structures can be strong, weak, or balanced, based on the amount of control exerted by the project managers.

Table 2-1 summarizes how organizational structures influence projects and project managers, based on information from several versions of the *PMBOK® Guide*. Project managers have the most authority in a pure project organizational structure and the least amount of authority in a pure functional organizational structure. It is important that project managers understand the current organizational structure under which they are working. For example, if someone in a functional organization is asked to lead a project that requires strong support from several different functional areas, he or she should ask for top management sponsorship. This sponsor should solicit support from all relevant functional managers to ensure that they cooperate on the project and that qualified people are

TABLE 2-1 Organizational structure influences on projects

Project Characteristics	Organizational Structure Type				
	Functional	Matrix			Project
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project manager's authority	Little or none	Limited	Low to Moderate	Moderate to High	High to almost total
Percent of organization's personnel assigned full-time to project work	Virtually none	0–25%	15–60%	50–95%	85–100%
Who controls the project budget	Functional manager	Functional manager	Mixed	Project manager	Project manager
Project manager's role	Part-time	Part-time	Full-time	Full-time	Full-time
Common title for project manager's role	Project Coordinator/ Project Leader	Project Coordinator/ Project Leader	Project Manager/ Project Officer	Project Manager / Program Manager	Project Manager/ Program Manager
Project management administrative staff	Part-time	Part-time	Part-time	Full-time	Full-time

available to work as needed. The project manager might also ask for a separate budget to pay for project-related trips, meetings, and training or to provide financial incentives to the people supporting the project.

Even though project managers have the most authority in the project organizational structure, this type of organization is often inefficient for the company as a whole. Assigning staff full-time to the project often creates underutilization and/or misallocation of staff resources. For example, if a technical writer is assigned full-time to a project, but there is no work for him or her on a particular day, the organization is wasting money by paying that person a full-time wage. Project organizations may also miss economies of scale available through the pooling of requests for materials with other projects.

Disadvantages such as these illustrate the benefit of using a systems approach to managing projects. For example, the project manager might suggest hiring an independent contractor to do the technical writing work instead of using a full-time employee. This approach would save the organization money while still meeting the needs of the project. When project managers use a systems approach, they are better able to make decisions that address the needs of the entire organization.

Organizational Culture

Just as an organization's structure affects its ability to manage projects, so does an organization's culture. **Organizational culture** is a set of shared assumptions, values, and behaviors that characterize the functioning of an organization. It often includes elements of all four frames described previously. Organizational culture is very powerful, and many people believe the underlying causes of many companies' problems are not in the organizational structure or staff; they are in the culture. It is also important to note that the same organization can have different subcultures. The information technology department may have a different organizational culture than the finance department, for example. Some organizational cultures make it easier to manage projects.

According to Stephen P. Robbins and Timothy Judge, authors of a popular textbook on organizational behavior, there are ten characteristics of organizational culture:

1. *Member identity*: The degree to which employees identify with the organization as a whole rather than with their type of job or profession. For example, a project manager or team member might feel more dedicated to his or her company or project team than to their job or profession, or they might not have any loyalty to a particular company or team. As you can guess, an organizational culture where employees identify more with the whole organization are more conducive to a good project culture.
2. *Group emphasis*: The degree to which work activities are organized around groups or teams, rather than individuals. An organizational culture that emphasizes group work is best for managing projects.
3. *People focus*: The degree to which management's decisions take into account the effect of outcomes on people within the organization. A project manager might assign tasks to certain people without considering their individual needs, or the project manager might know each person very well and focus on individual needs when assigning work or making other decisions. Good project managers often balance the needs of individuals and the organization.

4. *Unit integration*: The degree to which units or departments within an organization are encouraged to coordinate with each other. Most project managers strive for strong unit integration to deliver a successful product, service, or result. An organizational culture with strong unit integration makes the project manager's job easier.
5. *Control*: The degree to which rules, policies, and direct supervision are used to oversee and control employee behavior. Experienced project managers know it is often best to balance the degree of control to get good project results.
6. *Risk tolerance*: The degree to which employees are encouraged to be aggressive, innovative, and risk seeking. An organizational culture with a higher risk tolerance is often best for project management since projects often involve new technologies, ideas, and processes.
7. *Reward criteria*: The degree to which rewards, such as promotions and salary increases, are allocated according to employee performance rather than seniority, favoritism, or other nonperformance factors. Project managers and their teams often perform best when rewards are based mostly on performance.
8. *Conflict tolerance*: The degree to which employees are encouraged to air conflicts and criticism openly. It is very important for all project stakeholders to have good communications, so it is best to work in an organization where people feel comfortable discussing conflict openly.
9. *Means-ends orientation*: The degree to which management focuses on outcomes rather than on techniques and processes used to achieve results. An organization with a balanced approach in this area is often best for project work.
10. *Open-systems focus*: The degree to which the organization monitors and responds to changes in the external environment. As discussed earlier in this chapter, projects are part of a larger organizational environment, so it is best to have a strong open-systems focus.[3]

As you can see, there is a definite relationship between organizational culture and successful project management. Project work is most successful in an organizational culture where employees identify more with the organization, where work activities emphasize groups, and where there is strong unit integration, high risk tolerance, performance-based rewards, high conflict tolerance, an open-systems focus, and a balanced focus on people, control, and means orientation.

STAKEHOLDER MANAGEMENT

Recall from Chapter 1 that project stakeholders are the people involved in or affected by project activities. Stakeholders can be internal to the organization, external to the organization, directly involved in the project, or simply affected by the project. Internal project stakeholders generally include the project sponsor, project team, support staff, and internal customers for the project. Other internal stakeholders include top management, other functional managers, and other project managers. Since organizations have limited resources, projects affect top management, other functional managers, and other project managers by using some of the organization's limited resources. Thus, while additional internal stakeholders may not be directly involved in the project, they are still stakeholders because the project

affects them in some way. External project stakeholders include the project's customers (if they are external to the organization), competitors, suppliers, and other external groups potentially involved in or affected by the project, such as government officials or concerned citizens. Since the purpose of project management is to meet project requirements and satisfy stakeholders, it is critical that project managers take adequate time to identify, understand, and manage relationships with all project stakeholders. Using the four frames of organizations to think about project stakeholders can help you meet their expectations.

Consider again the laptop project from the opening case. Tom Walters seemed to focus on just a few internal project stakeholders. He viewed only part of the structural frame of the college. Since his department would do most of the work in administering the laptop project, he concentrated on those stakeholders. Tom did not even involve the main customers for this project—the students at the college. Even though Tom sent an e-mail to faculty and staff, he did not hold meetings with senior administration or faculty at the college. Tom's view of who the stakeholders were for the laptop project was very limited.

During the faculty meeting, it became evident that the laptop project had many stakeholders in addition to the Information Technology department and students. If Tom had expanded his view of the structural frame of his organization by reviewing an organizational chart for the entire college, he could have identified other key stakeholders. He would have been able to see that the laptop project would affect academic department heads and members of different administrative areas. If Tom had focused on the human resources frame, he would have been able to tap his knowledge of the college and identify individuals who would most support or oppose requiring laptops. By using the political frame, Tom could have considered the main interest groups that would be most affected by this project's outcome. Had he used the symbolic frame, Tom could have tried to address what moving to a laptop environment would really mean for the college. He then could have anticipated some of the opposition from people who were not in favor of increasing the use of technology on campus. He also could have solicited a strong endorsement from the college president or dean before talking at the faculty meeting.

Tom Walters, like many new project managers, learned the hard way that his technical and analytical skills were not enough to guarantee success in project management. To be more effective, he had to identify and address the needs of different stakeholders and understand how his project related to the entire organization.

MEDIA SNAPSHOT

The *New York Times* reported that the project to rebuild Ground Zero in New York City is having severe problems. Imagine all of the stakeholders involved in this huge, highly emotional project. A 34-page report (see the article reference for further information) describes the many challenges faced in the reconstruction of the former World Trade Center site nearly seven years after the terrorist attack of September 11, 2001. The report listed at least 15 fundamental unresolved issues, including the lack of final designs for the proposed World Trade Center Transportation Hub; the unfinished decontamination and

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dismantling of the former Deutsche Bank tower; and the resolution of a land-rights issue with the St. Nicholas Greek Orthodox Church.

"Perhaps most pressingly, the report identified a need for 'a more efficient, centralized decision-making structure—a steering committee—with authority to make final decisions on matters which fundamentally drive schedule and cost.'"[4] The "What Went Right?" example later in this chapter describes the benefits of having an executive steering committee to help projects succeed, especially when there are many stakeholders and challenges involved.

The Importance of Top Management Commitment

People in top management positions, of course, are key stakeholders in projects. A very important factor in helping project managers successfully lead projects is the level of commitment and support they receive from top management. Without top management commitment, many projects will fail. Some projects have a senior manager called a **champion** who acts as a key proponent for a project. The sponsor can serve as the champion, but often another manager can more successfully take on this role. As described earlier, projects are part of the larger organizational environment, and many factors that might affect a project are out of the project manager's control. Several studies cite executive support as one of the key factors associated with virtually all project success.

Top management commitment is crucial to project managers for the following reasons:

- Project managers need adequate resources. The best way to kill a project is to withhold the required money, human resources, and visibility for the project. If project managers have top management commitment, they will also have adequate resources and not be distracted by events that do not affect their specific projects.
- Project managers often require approval for unique project needs in a timely manner. For example, on large information technology projects, top management must understand that unexpected problems may result from the nature of the products being produced and the specific skills of the people on the project team. For example, the team might need additional hardware and software halfway through the project for proper testing, or the project manager might need to offer special pay and benefits to attract and retain key project personnel. With top management commitment, project managers can meet these specific needs in a timely manner.
- Project managers must have cooperation from people in other parts of the organization. Since most information technology projects cut across functional areas, top management must help project managers deal with the political issues that often arise in these types of situations. If certain functional managers are not responding to project managers' requests for necessary information, top management must step in to encourage functional managers to cooperate.
- Project managers often need someone to mentor and coach them on leadership issues. Many information technology project managers come from technical positions and are inexperienced as managers. Senior managers should take the time to pass on advice on how to be good leaders. They should encourage new

project managers to take classes to develop leadership skills and allocate the time and funds for them to do so.

Information technology project managers work best in an environment in which top management values information technology. Working in an organization that values good project management and sets standards for its use also helps project managers succeed.

BEST PRACTICE

A major element of good practice concerns **IT governance**, which addresses the authority and control for key IT activities in organizations, including IT infrastructure, IT use, and project management. (The term *project governance* can also used to describe a uniform method of controlling all types of projects.) The IT Governance Institute (ITGI) was established in 1998 to advance international thinking and standards in directing and controlling an organization's use of technology. Effective IT governance helps ensure that IT supports business goals, maximizes investment in IT, and addresses IT-related risks and opportunities. A 2004 book by Peter Weill and Jeanne Ross called *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results*[5] includes research stating that firms with superior IT governance systems have 20 percent higher profits than firms with poor governance. (See the ITGI's Web site *www.itgi.org* for more information, including many case studies and best practices in this area.)

A lack of IT governance can be dangerous, as evidenced by three well-publicized IT project failures in Australia—Sydney Water's customer relationship management system, the Royal Melbourne Institute of Technology's academic management system, and One.Tel's billing system. Researchers explained how these projects were catastrophic for their organizations, primarily due to a severe lack of IT governance, which the authors dubbed *managerial IT unconsciousness*, the title of their article.

> "All three projects suffered from poor IT governance. Senior management in all three organizations had not ensured that prudent checks and balances were in place to enable them to monitor either the progress of the projects or the alignment and impact of the new systems on their business. Proper governance, particularly with respect to financial matters, auditing, and contract management, was not evident. Also, project-level planning and control were notably absent or inadequate—with the result that project status reports to management were unrealistic, inaccurate, and misleading."[6]

The Need for Organizational Commitment to Information Technology

Another factor affecting the success of information technology projects is the organization's commitment to information technology in general. It is very difficult for a large information technology project (or a small one, for that matter) to be successful if the organization itself does not value information technology. Many companies have realized that information technology is integral to their business and have created a vice president or equivalent-level position for the head of information technology, often called the Chief Information Officer (CIO). Some companies assign people from non-information technology areas to work on

large projects full-time to increase involvement from end users of the systems. Some CEOs even take a strong leadership role in promoting the use of information technology in their organizations.

Gartner, Inc., a well-respected information technology consulting firm, provides awards to organizations for excellence in applying various technologies. For example, in 2006, Gartner announced the winners of its eighth annual Customer Relationship Management (CRM) Excellence Awards. BNSF Railway received the award in the "Excellence in Enterprise CRM" category, and UnitedHealth Group received the award in the "Excellence in Sales, Marketing or Customer Service" category. (Electronic Arts, an independent producer of electronic games, won the award in 2007.) The 2006 award winners had the following to say:

- *Elizabeth Obermiller, director of ERM systems for BNSF Railway*: "Our success was driven by the ongoing executive commitment and passionate and talented teams, who were able to implement a planned and phased approach with advanced application of analytics to monitor, measure and drive success."
- *John Reinke, a senior vice president of Uniprise, a UnitedHealth Group*: "We are excited to receive this award for our partnership with eLoyalty to implement a new, cutting-edge call center technology application called Behavioral Analytics™. This technology allows us to engage in deeper, more personally relevant phone conversations with each consumer who speaks with a customer care professional. Health care consumers often face complex and emotional issues, and this is a great example of how technology can help improve their experience."[7]

The Need for Organizational Standards

Another problem in most organizations is not having standards or guidelines to follow that could help in performing project management. These standards or guidelines might be as simple as providing standard forms or templates for common project documents, examples of good project management plans, or guidelines on how the project manager should provide status information to top management. The content of a project management plan and how to provide status information might seem like common sense to senior managers, but many new information technology project managers have never created plans or given a non-technical status report. Top management must support the development of these standards and guidelines and encourage or even enforce their use. For example, an organization might require all potential project information in a standard format to make project portfolio management decisions. If a project manager does not submit a potential project in the proper format, it could be rejected.

As described in Chapter 1, some organizations invest heavily in project management by creating a project management office or center of excellence, an organizational entity created to assist project managers in achieving project goals and maintaining project governance. Rachel Hollstadt, founder and CEO of a project management consulting firm, suggests that organizations consider adding a new position, a Chief Project Officer (CPO). Some organizations develop career paths for project managers. Some require that all project managers have Project Management Professional (PMP) certification and that all

employees have some type of project management training. The implementation of all of these standards demonstrates an organization's commitment to project management.

PROJECT PHASES AND THE PROJECT LIFE CYCLE

Since projects operate as part of a system and involve uncertainty, it is good practice to divide projects into several phases. A **project life cycle** is a collection of project phases. Some organizations specify a set of life cycles for use on all of their projects, while others follow common industry practices based on the types of projects involved. In general, project life cycles define what work will be performed in each phase, what deliverables will be produced and when, who is involved in each phase, and how management will control and approve work produced in each phase. A **deliverable** is a product or service, such as a technical report, a training session, a piece of hardware, or a segment of software code, produced or provided as part of a project. (See Chapter 5, Project Scope Management, for detailed information on deliverables.)

In early phases of a project life cycle, resource needs are usually lowest and the level of uncertainty is highest. Project stakeholders have the greatest opportunity to influence the final characteristics of the project's products, services, or results during the early phases of a project life cycle. It is much more expensive to make major changes to a project during latter phases. During the middle phases of a project life cycle, the certainty of completing a project improves as a project continues, more information is known about the project requirements and objectives, and more resources are usually needed than during the initial or final phase. The final phase of a project focuses on ensuring that project requirements were met and that the project sponsor approves completion of the project.

Project phases vary by project or industry, but some general phases in traditional project management are often called the concept, development, implementation, and close-out phases. The *PMBOK Guide®, Fourth Edition* calls these phases starting the project, organizing and preparing, carrying out the project work, and finishing the project. These phases should not be confused with the project management process groups of initiating, planning, executing, monitoring and controlling, and closing, as described in Chapter 3. The first two traditional project phases (concept and development) focus on planning and are often referred to as **project feasibility**. The last two phases (implementation and close-out) focus on delivering the actual work and are often referred to as **project acquisition**. A project should successfully complete each phase before moving on to the next. This project life cycle approach provides better management control and appropriate links to the ongoing operations of the organization.

Figure 2-3 provides a summary framework for the general phases of the traditional project life cycle. In the concept phase of a project, managers usually develop some type of business case, which describes the need for the project and basic underlying concepts. A preliminary or rough cost estimate is developed in this first phase, and an overview of the work involved is created. A work breakdown structure (WBS) outlines project work by decomposing the work activities into different levels of tasks. The WBS is a deliverable-oriented document that defines the total scope of the project. (You will learn more about the work breakdown structure in Chapter 5, Project Scope Management.) For example, if Tom

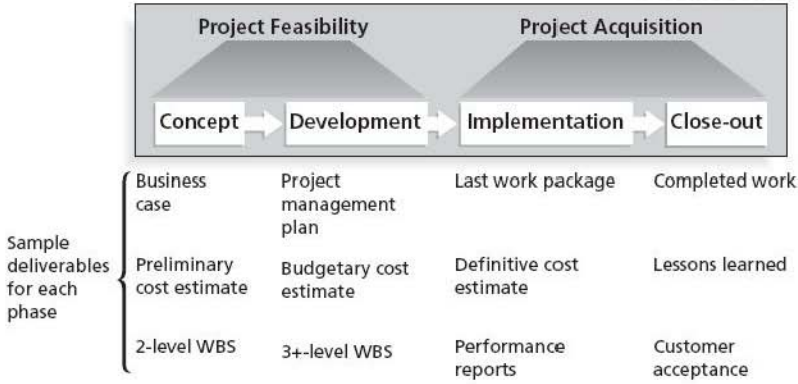

FIGURE 2-3 Phases of the traditional project life cycle

Walters (from the opening case) had followed the project life cycle instead of moving full-steam ahead with the laptop project, he could have created a committee of faculty and staff to study the concept of increasing the use of technology on campus. This committee might have developed a business case and plan that included an initial, smaller project to investigate alternative ways of increasing the use of technology. They might have estimated that it would take six months and $20,000 to conduct a detailed technology study. The WBS at this phase of the study might have three levels and partition the work to include a competitive analysis of what five similar campuses were doing, a survey of local students, staff, and faculty, and a rough assessment of how using more technology would affect costs and enrollments. At the end of the concept phase, the committee would be able to deliver a report and presentation on its findings. The report and presentation would be an example of a deliverable.

After the concept phase is completed, the next project phase—development—begins. In the development phase, the project team creates more detailed project management plans, a more accurate cost estimate, and a more thorough WBS. In the example under discussion, suppose the concept phase report suggested that requiring students to have laptops was one means of increasing the use of technology on campus. The project team could then further expand this idea in the development phase. They would have to decide if students would purchase or lease the laptops, what type of hardware and software the laptops would require, how much to charge students, how to handle training and maintenance, how to integrate the use of the new technology with current courses, and so on. If, however, the concept phase report showed that the laptop idea was not a good idea for the college, then the project team would no longer consider increasing the use of technology by requiring laptops in the development phase and would cancel the project before development. This phased approach minimizes the time and money spent developing inappropriate projects. A project idea must pass the concept phase before evolving into the development phase.

The third phase of the traditional project life cycle is implementation. In this phase, the project team creates a definitive or very accurate cost estimate, delivers the required work, and provides performance reports to stakeholders. Suppose Tom Walters' college took the

idea of requiring students to have laptops through the development phase. During the implementation phase, the project team would need to obtain the required hardware and software, install the necessary network equipment, deliver the laptops to the students, create a process for collecting fees, provide training to students, faculty, and staff, and so on. Other people on campus would also be involved in the implementation phase. Faculty would need to consider how best to take advantage of the new technology. The recruiting staff would have to update their materials to reflect this new feature of the college. Security would need to address new problems that might result from having students carry around expensive equipment. The project team usually spends the bulk of their efforts and money during the implementation phase of projects.

The last phase of the traditional project life cycle is close-out. In the close-out phase, all of the work is completed, and there should be some sort of customer acceptance of the entire project. The project team should document its experiences on the project in a lessons-learned report. If the laptop idea made it all the way through the implementation phase and all students received laptops, the project team would then complete the project by closing out any related activities. Team members might administer a survey to students, faculty, and staff in order to gather opinions on how the project fared. They would ensure that any contracts with suppliers were completed and appropriate payments made. They would transition future work related to the laptop project to other parts of the organization. The project team could also share its lessons-learned report with other college campuses that are considering implementing a similar program.

Many projects, however, do not follow this traditional project life cycle. They still have general phases with some similar characteristics as the traditional project life cycle, but they are much more flexible. For example, there may be just three phases, the initial, intermediate, and final phase. Or there may be multiple intermediate phases. There might be a separate project just to complete a feasibility study. Regardless of the project life cycle's specific phases, it is good practice to think of projects as having phases that connect the beginning and the end of the project, so that people can measure progress toward achieving project goals during each phase.

Just as a *project* has a life cycle, so does a *product*. Information technology projects help produce products and services such as new software, hardware, networks, research reports, and training on new systems. Understanding the product life cycle is just as important to good project management as understanding the phases of the traditional project life cycle.

Product Life Cycles

Recall from Chapter 1 that a project is defined as "a temporary endeavor undertaken to create a unique product, service, or result," and a program is defined as "a group of projects managed in a coordinated way." A program often refers to the creation of a product, like an automobile or a new operating system. Therefore, developing a product often involves many projects.

All products follow some type of life cycle—cars, buildings, even amusement parks. The Walt Disney Company, for example, follows a rigorous process to design, build, and test new products. They assign project managers to oversee the development of all new products, such as rides, parks, and cruise lines. Likewise, major automotive companies follow product life cycles to produce new cars, trucks, and other products. Most information technology

professionals are familiar with the concept of a product life cycle, especially for developing software.

Software development projects are one subset of information technology projects. Many information technology projects involve researching, analyzing, and then purchasing and installing new hardware and software with little or no actual software development required. However, some projects involve minor software modifications to enhance existing software or to integrate one application with another. Other projects involve a major amount of software development. Many argue that developing software requires project managers to modify traditional project management methods, depending on a particular product's life cycle.

A **systems development life cycle (SDLC)** is a framework for describing the phases involved in developing information systems. Some popular models of an SDLC include the waterfall model, the spiral model, the incremental build model, the prototyping model, and the Rapid Application Development (RAD) model. These life cycle models are examples of a **predictive life cycle**, meaning that the scope of the project can be clearly articulated and the schedule and cost can be accurately predicted. The project team spends a large portion of the project effort attempting to clarify the requirements of the entire system and then producing a design. Users are often unable to see any tangible results in terms of working software for an extended period. Below are brief descriptions of several predictive SDLC models.[8]

- The waterfall life cycle model has well-defined, linear stages of systems analysis, design, construction, testing, and support. This life cycle model assumes that requirements will remain stable after they are defined.
- The spiral life cycle model was developed based on experience with various refinements of the waterfall model as applied to large government software projects. It recognizes the fact that most software is developed using an iterative or spiral approach rather than a linear approach.
- The incremental build life cycle model provides for progressive development of operational software, with each release providing added capabilities.
- The prototyping life cycle model is used for developing software prototypes to clarify user requirements for operational software. It requires heavy user involvement, and developers use a model to generate functional requirements and physical design specifications simultaneously. Developers can throw away or keep prototypes, depending on the project.
- The RAD life cycle model uses an approach in which developers work with an evolving prototype. This life cycle model also requires heavy user involvement and helps produce systems quickly without sacrificing quality. Developers use RAD tools such as CASE (computer-aided software engineering), JRP (joint requirements planning), and JAD (joint application design) to facilitate rapid prototyping and code generation.

In contrast to the predictive life cycle models, the **Adaptive Software Development (ASD)** life cycle model assumes that software development follows an adaptive approach because the requirements cannot be clearly expressed early in the life cycle. An adaptive approach is also used to provide more freedom than the prescriptive approaches. It allows the development to proceed by creating components that provide the functionality specified by the business group as these needs are discovered in a more free-form approach.

Important attributes of this approach are that the projects are mission driven and component based, using time-based cycles to meet target dates. Requirements are developed using an iterative approach, and development is risk driven and change tolerant to address and incorporate rather than mitigate risks. More recently, the term **agile software development** has become popular to describe new approaches that focus on close collaboration between programming teams and business experts. (See the companion Web site for the Suggested Readings related to agile and other software development methodologies.)

These life cycle models are all examples of SDLCs. Many Web sites and introductory management information systems texts describe each of them in detail. The type of software and complexity of the information system in development determines which life cycle model to use. It is important to understand the product life cycle to meet the needs of the project environment.

Most large information technology products are developed as a series of projects. For example, the systems planning phase for a new information system can include a project to hire an outside consulting firm to help identify and evaluate potential strategies for developing a particular business application, such as a new order processing system or general ledger system. It can also include a project to develop, administer, and evaluate a survey of users to get their opinions on the current information systems used for performing that business function in the organization. The systems analysis phase might include a project to create process models for certain business functions in the organization. It can also include a project to create data models of existing databases in the company related to the business function and application. The implementation phase might include a project to hire contract programmers to code a part of the system. The close-out phase might include a project to develop and run several training sessions for users of the new application. All of these examples show that large information technology projects are usually composed of several smaller projects. It is often good practice to view large projects as a series of smaller, more manageable ones, especially when there is a lot of uncertainty involved. Successfully completing one small project at a time will help the project team succeed in completing the larger project.

Because some aspects of project management need to occur during each phase of the product life cycle, it is critical for information technology professionals to understand and practice good project management throughout the product life cycle.

The Importance of Project Phases and Management Reviews

Due to the complexity and importance of many information technology projects and their resulting products, it is important to take time to review the status of a project at each phase. A project should successfully pass through each of the main project or product phases before continuing to the next. Since the organization usually commits more money as a project continues, a management review should occur after each phase to evaluate progress, potential success, and continued compatibility with organizational goals. These management reviews, called **phase exits** or **kill points**, are very important for keeping projects on track and determining if they should be continued, redirected, or terminated. Recall that projects are just one part of the entire system of an organization. Changes in other parts of the organization might affect a project's status, and a project's status might likewise affect what is happening in other parts of the organization. By breaking projects

into phases, top management can make sure that the projects are still compatible with the needs of the rest of the organization.

Let's take another look at the opening case. Suppose Tom Walters' college did a study on increasing the use of technology that was sponsored by the college president. At the end of the concept phase, the project team could have presented information to the faculty, president, and other staff members that described different options for increasing the use of technology, an analysis of what competing colleges were doing, and results of a survey of local stakeholders' opinions on the subject. This presentation at the end of the concept phase represents one form of a management review. Suppose the study reported that 90 percent of students, faculty, and staff surveyed strongly opposed the idea of requiring all students to have laptops and that many adult students said they would attend other colleges if they were required to pay for the additional technology. The college would probably decide not to pursue this idea any further. Had Tom taken a phased approach, he and his staff would not have wasted the time and money it took to develop detailed plans.

In addition to formal management reviews, it is important to have top management involvement throughout the life cycle of most projects. It is unwise to wait for the end of project or product phases to have management inputs. Many projects are reviewed by management on a regular basis, such as weekly or even daily, to make sure they are progressing well. Everyone wants to be successful in accomplishing goals at work, and having management involvement ensures that they are on track in accomplishing both project and organizational goals.

WHAT WENT RIGHT?

Having specific deliverables and kill points at the end of project or product phases helps managers make better decisions about whether to proceed, redefine, or kill a project. Improvement in information technology project success rates reported by the Standish Group has been due, in part, to an increased ability to know when to cancel failing projects. Standish Group Chairman Jim Johnson made the following observation: "The real improvement that I saw was in our ability to—in the words of Thomas Edison—know when to stop beating a dead horse. . .. Edison's key to success was that he failed fairly often; but as he said, he could recognize a dead horse before it started to smell .... In information technology we ride dead horses—failing projects—a long time before we give up. But what we are seeing now is that we are able to get off them; able to reduce cost overrun and time overrun. That's where the major impact came on the success rate."[9]

Another example of the power of management oversight comes from Huntington Bancshares, Inc. This company, like many others, had an **executive steering committee**, a group of senior executives from various parts of the organization who regularly reviewed important corporate projects and issues. This Ohio-based, $26 billion bank holding company completed a year-long Web site redesign effort using XML technology to give its online customers access to real-time account information as well as other banking services. The CIO, Joe Gottron, said there were "four or five very intense moments" when the whole project was almost stopped due to its complexity. An executive steering committee met

continued

weekly to review the project's progress and discuss work planned for the following week. Gottron said the meetings ensured that "if we were missing a beat on the project, no matter which company [was responsible], we were on top of it and adding additional resources to make up for it."[10]

Managers in the motorcycle industry now understand the importance of overseeing their IT projects. Harley-Davidson Motor Company used to focus only on producing and selling high-quality motorcycles. In 2003, however, management realized that it had to improve its IT operations and control to stay in business and adhere to new government laws such as the accounting reporting regulations of Sarbanes-Oxley. Harley-Davidson had no standardized processes for user access, change management, or backup and recovery at that time. "Although complying with Sarbanes-Oxley was going to be a challenge, the company took strong action, utilized COBIT (Control Objectives for Information and related Technology) and passed Sarbanes-Oxley year one compliance . . .. One of the major benefits of using COBIT as its overall internal control and compliance model was getting everyone—especially non-technical motorcycle experts—revved up about control activities and why controls are important.[11]

THE CONTEXT OF INFORMATION TECHNOLOGY PROJECTS

As described earlier, software development projects can follow several different product life cycles based on the project context. There are several other issues related to managing information technology projects. This section highlights some of the issues unique to the information technology industry that affect project management, including the nature of projects, the characteristics of project team members, and the diverse nature of technologies involved.

The Nature of Information Technology Projects

Unlike projects in many other industries, projects labeled as information technology projects can be very diverse. Some involve a small number of people installing off-the-shelf hardware and associated software. Others involve hundreds of people analyzing several organizations' business processes and then developing new software in a collaborative effort with users to meet business needs. Even for small hardware-oriented projects, there is a wide diversity in the types of hardware that could be involved—personal computers, mainframe computers, network equipment, kiosks, or small mobile devices, to name a few. The network equipment might be wireless, phone-based, cable-based, or require a satellite connection. The nature of software development projects is even more diverse than hardware-oriented projects. A software development project might include developing a simple, standalone Microsoft Excel or Access application or a sophisticated, global e-commerce system using state-of-the-art programming languages.

Information technology projects also support every possible industry and business function. Managing an information technology project for a film company's animation department would require different knowledge and skills of the project manager and team members than a project to improve a federal tax collection system or install a communication infrastructure in a third-world country. Because of the diversity of information

technology projects and the newness of the field, it is important to develop and follow best practices in managing these varied projects. That way, information technology project managers will have a common starting point and method to follow with every project.

Characteristics of Information Technology Project Team Members

Because of the nature of information technology projects, the people involved come from very diverse backgrounds and possess different skill sets. Most trade schools, colleges, and universities did not start offering degrees in computer technology, computer science, management information systems, or other information technology areas until the 1970s. Therefore, many people in the field do not have a common educational background. Many companies purposely hire graduates with degrees in other fields such as business, mathematics, or the liberal arts to provide different perspectives on information technology projects. Even with these different educational backgrounds, there are some common job titles for people working on most information technology projects such as business analyst, programmer, network specialist, database analyst, quality assurance expert, technical writer, security specialist, hardware engineer, software engineer, and system architect. Within the category of programmer, there are several other job titles used to describe the specific technologies the programmer uses, such as Java programmer, XML programmer, C/C++ programmer, and so on.

Some information technology projects require the skills of people in just a few of these job functions, but many require inputs from many or all of them. Occasionally, information technology professionals move around between these job functions, but more often people become technical experts in one area or they decide to move into a management position. It is also rare for technical specialists or project managers to remain with the same company for a long time, and in fact, many information technology projects include a large number of contract workers. Working with this "army of free agents," as Rob Thomsett, author and consultant for the Cutter Consortium, calls them, creates special challenges. (See the companion Web site for an article on this topic by Thomsett and other suggested readings.)

Diverse Technologies

Many of the job titles for IT professionals reflect the different technologies required to hold that position. Unfortunately, hardware specialists might not understand the language of database analysts, and vice versa. Security specialists may have a hard time communicating with business analysts. It is also unfortunate that people within the same information technology job function often do not understand each other because each uses different technology. For example, someone with the title of programmer can often use several different programming languages. A COBOL programmer, however, cannot be of much help on a Java project. These highly specialized positions also make it difficult for project managers to form and lead project teams.

Another problem with diverse technologies is that many of them change rapidly. A project team might be close to finishing a project when it discovers a new technology that can greatly enhance the project and better meet long-term business needs. New technologies have also shortened the time frame many businesses have to develop, produce, and distribute new products and services. This fast-paced environment requires equally fast-paced processes to manage and produce information technology projects and products.

Additional challenges and opportunities face IT project managers and their teams in the form of the recent trends of increased globalization, outsourcing, and virtual teams. Each of these trends and suggestions for addressing them are provided in this section.

Globalization

In his popular book, *The World Is Flat*, Thomas L. Friedman describes the effects of globalization, which has created a "flat" world where everyone is connected and the "playing field" is level for many more participants.[12] Lower trade and political barriers and the digital revolution have made it possible to interact almost instantaneously with billions of other people across the planet, and for individuals and small companies to compete with large corporations. Friedman also discusses the increase in "uploading," where people share information through blogging, podcasts, and open-source software.

Information technology is a key enabler of globalization, and globalization has significantly affected the field of IT. Even though major IT companies such as Microsoft and IBM started in the United States, much of their business is global—indeed, companies and individuals throughout the world contribute to the growth of information technologies and work and collaborate on various IT projects. As mentioned in Chapter 1, the total global spending on technology goods, services, and staff was projected to reach $2.4 trillion in 2008, and the main engines of growth were Asia Pacific and the oil-exporting areas of Eastern Europe, the Middle East, and Africa.

It is important for project managers to address several issues when working on global projects. Several key issues include the following:

- *Communications*: Since people will be working in different time zones, speak different languages, have different cultural backgrounds, celebrate different holidays, etc., it is important to address how people will communicate in an efficient and timely manner. A communications management plan (like the one described in Chapter 10, Project Communications Management) is vital.
- *Trust*: Trust is an important issue for all teams, especially when they are global teams. It is important to start building trust immediately by recognizing and respecting others' differences and the value they add to the project.
- *Common work practices*: It is important to align work processes to come up with an agreed-upon modus operandi with which everyone is comfortable. Project managers must allow time for the team to develop these common work practices. Using special tools, as described in the next section, can facilitate this process.
- *Tools*: Information technology plays a vital role in globalization, especially in enhancing communications and work practices. For example, Timothy Porter, a project manager for Hundsun Technologies, a Chinese domestic software company building a global services business, describes several tools they use as follows:
  - XPlanner is used for project planning and project monitoring. This tool is suitable for agile software development and is Web-based for ease of distributed geographic access.

- TRAC is an enhanced issue-tracking system for software development projects. TRAC includes features such as defect management, source code control, project roadmap management, and an integrated wiki—a collaborative, Web-based feedback system—for project documentation that is very easy for stakeholders to review.
- CruiseControl is a framework for a continuous build process. It includes plug-ins for e-mail notification, source control tools, and so on. A Web interface is provided to view the details of the current and previous builds.
- WebEx, a Web-based conferencing tool, is used to record each development cycle's demo, which is stored on our wikis. These demos provide stakeholders visibility into our progress and can also be used as training materials for new staff members or the test team.
- E-mail, telephone, SKYPE (software that allows users to make telephone calls over the Internet), and instant messaging (IM) are used for routine daily communication among team members.[13]

After researching over 600 global organizations, KPMG International summarized several suggestions for managing global project teams:

- Employ greater project discipline for global projects, otherwise weaknesses within the traditional project disciplines may be amplified by the geographical differences.
- Think global, but act local to align and integrate stakeholders at all project levels.
- Consider collaboration over standardization to help balance the goals and project approach.
- Keep project momentum going for projects, which will typically have a long duration.
- Consider the use of newer, perhaps more innovative, tools and technology.[14]

Outsourcing

As described in detail in Chapter 12, Project Procurement Management, **outsourcing** is when an organization acquires goods and/or sources from an outside source. The term **offshoring** is sometimes used to describe outsourcing from another country. Offshoring is a natural outgrowth of globalization. IT projects continue to rely more and more on outsourcing, both within and outside of their country boundaries.

Organizations remain competitive by using outsourcing to their advantage. For example, many organizations have found ways to reduce costs by outsourcing. Their next challenge is to make strategic IT investments with outsourcing by improving their enterprise architecture to ensure that IT infrastructure and business processes are integrated and standardized. (See the Suggested Readings on the companion Web site for this chapter by Ross and Beath and KPMG International. Chapter 12, Project Procurement Management, also features more information.)

Because of the increased use of outsourcing for IT projects, project managers should become more familiar with negotiating contracts and many other issues, including working on and managing virtual teams.

Virtual Teams

Increased globalization and outsourcing have increased the need for virtual teams. A **virtual team** is a group of individuals who work across time and space using communication technologies. Team members might all work for the same company in the same country, or they might include employees as well as independent consultants, suppliers, or even volunteers providing their expertise from around the globe.

The main advantages of virtual teams include:

- Increasing competiveness and responsiveness by having a team of workers available 24/7.
- Lowering costs because many virtual workers do not require office space or support beyond their home offices.
- Providing more expertise and flexibility by having team members from across the globe working any time of day or night.
- Increasing the work/life balance for team members by eliminating fixed office hours and the need to travel to work.

Disadvantages of virtual teams include:

- Isolating team members who may not adjust well to working in a virtual environment.
- Increasing the potential for communications problems since team members cannot use body language or other communications to understand each other and build relationships and trust.
- Reducing the ability for team members to network and transfer information informally.
- Increasing the dependence on technology to accomplish work.

Like any team, a virtual team should focus on achieving a common goal.

Research on virtual teams reveals a growing list of factors that influence their success including:

- *Team processes*: It is important to define how the virtual team will operate. For examples, teams must agree on how and when work will be done, what technologies will be used, how decisions will be made, and other important process issues.
- *Leadership style*: The project manager's leadership style affects all teams, especially virtual ones.
- *Trust and relationships*: Many virtual teams fail because of a lack of trust. It is difficult to build relationships and trust from a distance. Some project managers like to have a face-to-face meeting so team members can get to know each other and build trust. If that is not possible, phone or video conferences can help.
- *Team member selection and role preferences*: Dr. Meredith Belbin defined a team role as "a tendency to behave, contribute and interrelate with others in a particular way."[15] It is important to select team members carefully and to form a team where all roles are covered. Each virtual team member must also understand his or her role(s) on the team. (Visit *www.belbin.com* for more information on this topic.)

- *Task-technology fit*: IT is more likely to have a positive impact on individual performance if the capabilities of the technologies match the tasks that the user must perform.
- *Cultural differences*: It is important to address cultural differences, including the dimensions of directness, hierarchy, consensus, and individualism. These dimensions will affect many aspects of the team such as communications and decision making.
- *Computer-mediated communication*: It is crucial to provide reliable and appropriate computer-mediated communication to virtual team members, including e-mail, instant messaging, text messaging, chat rooms, and so on.
- *Team life cycles*: Just as projects and products have life cycles, so do teams. Project managers must address the team life cycle especially in assigning team members and determining deliverable schedules.
- *Incentives*: Virtual teams may require different types of incentives in order to accomplish quality work on time. They do not have the benefit of physical contact with their project managers or other team members, so it important to provide frequent positive incentives like a thank you via e-mail or phone, or even a bonus on occasion. Negative incentives, such as payment withholding or fines, can also be effective if virtual team members are not being productive.
- *Conflict management*: Even though they may never physically meet, virtual teams will still have conflict. It is important to address conflict management, as described in more detail in Chapter 10, Project Communications Management.

Several studies have been done to try to determine factors that are positively correlated to the effectiveness of virtual teams. Research suggests that team processes, trust/relationships, leadership style, and team member selection provide the strongest relationships to team performance and team member satisfaction.[16] See the companion Web site for suggested readings on virtual teams and other topics discussed in this chapter.

As you can see, working as an information technology project manager or team member is an exciting and challenging job. It's important to focus on successfully completing projects that will have a positive impact on the organization as a whole.

CASE WRAP-UP

After several people voiced concerns about the laptop idea at the faculty meeting, the president of the college directed that a committee be formed to formally review the concept of requiring students to have laptops in the near future. Because the college was dealing with several other important enrollment-related issues, the president named the vice president of enrollment to head the committee. Other people soon volunteered or were assigned to the committee, including Tom Walters as head of Information Technology, the director of the adult education program, the chair of the Computer Science department, and the chair of the History department. The president also insisted that the committee include at least two members of the student body. The president knew everyone was busy, and he questioned whether the laptop idea was a high-priority issue for the college. He directed the committee to present a proposal at the next month's faculty meeting, either to recommend the creation of a formal project team (of which these committee members would commit to be a part) to fully investigate requiring laptops, or to recommend terminating the concept. At the next faculty meeting, few people were surprised to hear the recommendation to terminate the concept. Tom Walters learned that he had to pay much more attention to the needs of the entire college before proceeding with detailed information technology plans.

Chapter Summary

Projects operate in an environment broader than the project itself. Project managers need to take a systems approach when working on projects; they need to consider projects within the greater organizational context.

Organizations have four different frames: structural, human resources, political, and symbolic. Project managers need to understand all of these aspects of organizations to be successful. The structural frame focuses on different groups' roles and responsibilities to meet the goals and policies set by top management. The human resources frame focuses on producing harmony between the needs of the organization and the needs of people. The political frame addresses organizational and personal politics. The symbolic frame focuses on symbols and meanings.

The structure of an organization has strong implications for project managers, especially in terms of the amount of authority the project manager has. The three basic organizational structures include functional, matrix, and project. Project managers have the most authority in a pure project organization, an intermediate amount of authority in a matrix organization, and the least amount of authority in a pure functional organization.

Organizational culture also affects project management. A culture where employees have a strong identity with the organization, where work activities emphasize groups, where there is strong unit integration, high risk tolerance, performance-based rewards, high conflict tolerance, an open-systems focus, and a balance on the dimensions of people focus, control, and means-orientation is more conducive to project work.

Project stakeholders are individuals and organizations who are actively involved in the project or whose interests may be positively or negatively affected because of project execution or successful project completion. Project managers must identify and understand the different needs of all stakeholders on their projects.

Top management commitment is crucial for project success. Since projects often affect many areas in an organization, top management must assist project managers if they are to do a good job of project integration. Organizational commitment to information technology is also important to the success of information technology projects. Development standards and guidelines assist most organizations in managing projects.

A project life cycle is a collection of project phases. Traditional project phases include concept, development, implementation, and close-out phases. Projects often produce products, which follow product life cycles. Examples of product life cycles for software development include the waterfall, spiral, incremental build, prototyping, RAD, and the adaptive software development models. Project managers must understand the specific life cycle of the products they are producing as well as the general project life cycle model.

A project should successfully pass through each of the project phases in order to continue to the next phase. A management review should occur at the end of each project phase, and more frequent management inputs are often needed. These management reviews and inputs are important for keeping projects on track and determining if projects should be continued, redirected, or terminated.

Project managers need to consider several factors due to the unique context of information technology projects. The diverse nature of these projects and the wide range of business areas and technologies involved make information technology projects especially challenging to manage. Leading project team members with a wide variety of specialized skills and understanding rapidly changing technologies are also important considerations.

Several recent trends have affected information technology project management. Increased globalization, outsourcing, and virtual teams have changed the way many IT projects are staffed and managed. Project managers must stay abreast of these and other trends and discover ways to use them to their advantage.

Quick Quiz

1. Which of the following is not part of the three-sphere model for systems management?
   a. business
   b. information
   c. technology
   d. organization
2. Which of the four frames of organizations addresses how meetings are run, employee dress codes, and expected work hours?
   a. structural
   b. human resources
   c. political
   d. symbolic
3. Personnel in a _____ organizational structure often report to two or more bosses.
   a. functional
   b. project
   c. matrix
   d. hybrid
4. Project work is most successful in an organizational culture where all of the following characteristics are high except _____.
   a. member identity
   b. group emphasis
   c. risk tolerance
   d. control
5. A _____ is a product or service, such as a technical report, a training session, or hardware, produced or provided as part of a project.
   a. deliverable
   b. product
   c. work package
   d. tangible goal

6. Which of the following is not a phase of the traditional project life cycle?
   a. systems analysis
   b. concept
   c. development
   d. implementation
7. What is the term used to describe a framework of the phases involved in developing information systems?
   a. systems development life cycle
   b. rapid application development
   c. predictive life cycle
   d. extreme programming
8. Another name for a phase exit is a _____ point.
   a. review
   b. stage
   c. meeting
   d. kill
9. The nature of information technology projects is different from projects in many other industries because they are very _____.
   a. expensive
   b. technical
   c. diverse
   d. challenging
10. What term is used to describe when an organization acquires goods and/or sources from an outside source in another country?
    a. globalization
    b. offshoring
    c. exporting
    d. global sourcing

Quick Quiz Answers

1. b; 2. d; 3. c; 4. d; 5. a; 6. a; 7. a; 8. d; 9. c; 10. b

Discussion Questions

1. What does it mean to take a systems view of a project? How does taking a systems view of a project apply to project management?
2. Explain the four frames of organizations. How can they help project managers understand the organizational context for their projects?

3. Briefly explain the differences between functional, matrix, and project organizations. Describe how each structure affects the management of the project.
4. Describe how organizational culture is related to project management. What type of culture promotes a strong project environment?
5. Discuss the importance of top management commitment and the development of standards for successful project management. Provide examples to illustrate the importance of these items based on your experience on any type of project.
6. What are the phases in a traditional project life cycle? How does a project life cycle differ from a product life cycle? Why does a project manager need to understand both?
7. What makes information technology projects different from other types of projects? How should project managers adjust to these differences?
8. Define globalization, outsourcing, and virtual teams and describe how these trends are changing IT project management.

Exercises

1. Summarize the three-sphere model of systems management in your own words. Then use your own experience or interview someone who recently completed an information technology project and list several business, technology, and organizational issues addressed during the project. Which issues were most important to the project and why? Summarize your answers in a two-page paper.
2. Apply the four frames of organizations to an information technology project with which you are familiar. If you cannot think of a good information technology project, use your personal experience in deciding where to attend college to apply this framework. Write a two-page paper describing key issues related to the structural, human resources, political, and symbolic frames. Which frame seemed to be the most important and why? For example, did you decide where to attend college primarily because of the curriculum and structure of the program? Did you follow your friends? Did your parents have a lot of influence in your decision? Did you like the culture of the campus?
3. Search the Internet for two interesting articles about software development life cycles, including agile software development. Also review the Web site *www.agilealliance.org*. What do these sources say about project management? Write a two-page summary of your findings, citing your references.

   Note: For this exercise and others, remember that you can find references cited in this text, suggested readings, and links to general project management Web sites on the companion Web site.
4. Search the Internet and scan information technology industry magazines or Web sites to find an example of an information technology project that had problems due to organizational issues. Write a two-page paper summarizing who the key stakeholders were for the project and how they influenced the outcome.
5. Write a two-page summary of an article about the importance of top management support for successful information technology projects and your opinion on this topic.

6. Research the trend of using virtual teams. Review the information on team role theory from *www.belbin.com* and other related sources. Write a two-page summary of your findings, citing at least three references. Also include your personal experience and/or opinion on the topic. For example, what role(s) would you prefer to play on a team? Do you like working on virtual teams? If you have not yet worked on one, how do you think it would be different from working on a face-to-face team?

Companion Web Site

Visit the companion Web site for this text at *www.cengage.com/mis/schwalbe* to access:

- References cited in the text and additional suggested readings for each chapter
- Template files
- Lecture notes
- Interactive quizzes
- Podcasts
- Links to general project management Web sites
- And more

See the Preface of this text for additional information on accessing the companion Web site.

Key Terms

adaptive software development (ASD) — A software development approach used when requirements cannot be clearly expressed early in the life cycle

agile software development — A method for software development that uses new approaches, focusing on close collaboration between programming teams and business experts

champion — A senior manager who acts as a key proponent for a project

deliverable — A product or service, such as a technical report, a training session, a piece of hardware, or a segment of software code, produced or provided as part of a project

executive steering committee — A group of senior executives from various parts of the organization who regularly review important corporate projects and issues

functional organizational structure — An organizational structure that groups people by functional areas such as information technology, manufacturing, engineering, and human resources

human resources frame — Focuses on producing harmony between the needs of the organization and the needs of people

IT governance — Addresses the authority and control for key IT activities in organizations, including IT infrastructure, IT use, and project management

kill point — Management review that should occur after each project phase to determine if projects should be continued, redirected, or terminated; also called a phase exit

matrix organizational structure — An organizational structure in which employees are assigned to both functional and project managers

offshoring — Outsourcing from another country

organizational culture — A set of shared assumptions, values, and behaviors that characterize the functioning of an organization

outsourcing — When an organization acquires goods and/or sources from an outside source

phase exit — Management review that should occur after each project phase to determine if projects should be continued, redirected, or terminated; also called a kill point

political frame — Addresses organizational and personal politics

politics — Competition between groups or individuals for power and leadership

predictive life cycle — A software development approach used when the scope of the project can be clearly articulated and the schedule and cost can be accurately predicted

project acquisition — The last two phases in a project (implementation and close-out) that focus on delivering the actual work

project feasibility — The first two phases in a project (concept and development) that focus on planning

project life cycle — A collection of project phases, such as concept, development, implementation, and close-out

project organizational structure — An organizational structure that groups people by major projects, such as specific aircraft programs

structural frame — Deals with how the organization is structured (usually depicted in an organizational chart) and focuses on different groups' roles and responsibilities to meet the goals and policies set by top management

symbolic frame — Focuses on the symbols, meanings, and culture of an organization

systems — Sets of interacting components working within an environment to fulfill some purpose

systems analysis — A problem-solving approach that requires defining the scope of the system to be studied, and then dividing it into its component parts for identifying and evaluating its problems, opportunities, constraints, and needs

systems approach — A holistic and analytical approach to solving complex problems that includes using a systems philosophy, systems analysis, and systems management

systems development life cycle (SDLC) — A framework for describing the phases involved in developing and maintaining information systems

systems management — Addressing the business, technological, and organizational issues associated with creating, maintaining, and making changes to a system

systems philosophy — An overall model for thinking about things as systems

systems thinking — Taking a holistic view of an organization to effectively handle complex situations

virtual team — A group of individuals who work across time and space using communication technologies

End Notes

[1] Lee G. Bolman and Terrence E. Deal, *Reframing Organizations* (San Francisco: Jossey-Bass, 1991).

[2] Eva Hoare, "Software hardships," *Herald* (Halifax: Nova Scotia) (February 4, 2001).

[3] Stephen P. Robbins and Timothy A. Judge, *Organizational Behavior, 13th Edition* (Prentice Hall, 2008).

[4] Charles V. Bagli, "Higher Costs and Delays Expected at Ground Zero," *New York Times* (June 30, 2008).

[5] Peter Weill and Jeanne Ross, *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results* (Harvard Business School Press, 2004).

[6] David Avison, Shirely Gregor, and David Wilson, "Managerial IT Unconsciousness," *Communications of the ACM* 49, no. 7 (July 2006), p. 92.

[7] Gartner Inc., "BNSF and UnitedHealth Group Win 2006 Gartner CRM Excellence Awards," press release (September 25, 2006).

[8] Douglas H. Desaulniers and Robert J. Anderson, "Matching Software Development Life Cycles to the Project Environment," Proceedings of the Project Management Institute Annual Seminars & Symposium, (November 1–10, 2001).

[9] Jeannette Cabanis, "A Major Import: The Standish Group's Jim Johnson on Project Management and IT Project Success," *PM Network* (PMI), (September 1998), p. 7.

[10] Lucas Mearian, "Bank Hones Project Management Skills with Redesign," *ComputerWorld* (April 29, 2002).

[11] IT Governance Institute, "COBIT and IT Governance Case Study: Harley-Davidson," *www.itgi.org* (September 2006).

[12] Thomas L. Friedman, *The World Is Flat: A Brief History of the Twenty-First Century* (Farrar, Straus, and Giroux, 2005).

[13] Timothy Porter, "Tools for Facilitating Project Communication in an Onshore-Offshore Engagement Model," *PMI-ISSIG.org* (June 30, 2008).

[14] KPMG International, "Managing Global Projects: Observations from the front-line," *www.kpmg.com* (2007).

[15] Belbin® Team Role Theory, *Belbin.com* (accessed July 1, 2008).

[16] Jeremy S. Lurey and Mahesh S. Raisinghani, "An Empirical Study of Best Practices in Virtual Teams," *Information & Management* 38, no. 8 (2001).