

# Fundamentals of Project Management

Fourth Edition

by Reza Torkzadeh

# FUNDAMENTALS OF PROJECT MANAGEMENT

Reza Torkzadeh

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# 1

## *Introduction to Project Management*

### **Themes of Chapter 1**

- What is project management?
- What characteristics define an effective project manager?
- What principles are important in project management?
- What techniques are useful?
- What skill sets are important?
- Why is there a need for good project managers?
- How is the balance between managerial and technical factors achieved?
- What are the ethical values of a good project manager?

## Introduction

THIS CHAPTER INTRODUCES MANY OF THE THEMES THAT WILL BE DISCUSSED fully later in the book. It describes what project management is and what the characteristics of an effective project manager are. It points out the skill set needed by a project manager for the successful completion of a project. It outlines principles and techniques that are important for a project manager to succeed. The project development life cycle is defined in five stages, and its usefulness for successful project development is described. The various stakeholders who play key roles in a successful project are also described. These stakeholders include various types of clients, both internal and external to the organization. This chapter also describes why there is a need for good project managers and the ethical values that project managers need to have. Finally, this chapter describes what is presented in the rest of the book and how the content of this text is designed to provide a balance between managerial and technical aspects of project management. In the book, we will look at cases describing successes and failures (we learn from both) and some failing projects that have been turned around into successes.

### 1.1 What is project management?

A **PROJECT** IS temporary (though the time span may be from a few days to a few years); it has a particular purpose for the customer (sometimes referred to as the project sponsor); and it requires resources (the budget allocated will be for people, technology, and other resources).

*A PROJECT is a non-routine one-time job limited by time and budget to meet a specified need of the customer.*

The development of large and complex projects demands sophisticated processes for planning, scheduling, and controlling. The demand on resources, including human, financial, structural, and organizational resources, for these projects has increased. At the same time, executives are increasingly challenged to justify huge expenditures for proposed projects in value-added terms. They are also required to comment on the likelihood that the project will be delivered on time, within budget, and performing the expected functions. Large projects are prone to budget overruns, delays, and not delivering on promises. In other words, the challenges of delivering successful projects require excellent **project management**.

Whether the domain of the project is construction, systems development, production, operations, or whatever, project management remains the same in principle. The following definition is provided by the Project Management Institute (PMI):

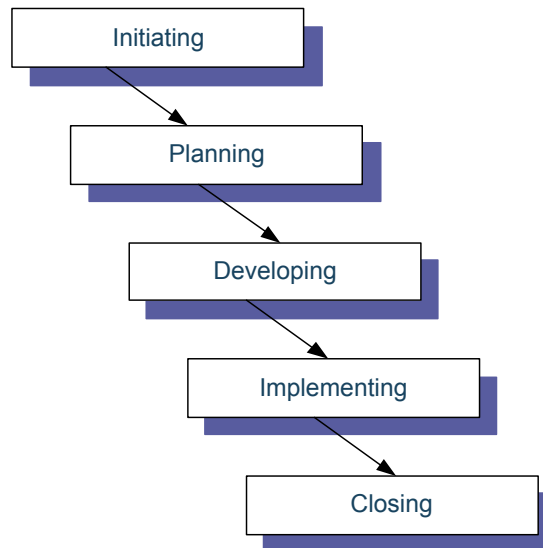
*PROJECT MANAGEMENT is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.*

Because of the potential organizational impacts of projects and the mixed records for project success, good project managers are in very high demand because they play such a critical role in the development and delivery of projects. In recent years, therefore, all disciplines have recognized the importance of project management skills. Business curricula have been increasingly revised to incorporate courses that deal with project management principles. Project management skills are



necessary for a team leader who is responsible for channeling collective team activities to produce a project within budget, in a timely manner, and with the required functionality.

For any project to be developed or modified successfully, several activities must take place to varying degrees. Although there are different terminologies applied to these stages, the activities relate to the **initiating**, **planning**, **developing**, **implementing**, and **closing** of a project. These five stages, shown in Figure 1.1, will be described further later in this chapter.



**Figure 1.1: Life cycle of a typical project – first approximation**

The quality and usefulness of the project outcome will depend on how well these activities are performed. The project manager is the person who is responsible for making sure that these activities occur on time and with the right emphasis. An effective project manager must not only understand the technology and its impact, but also the role that each of these activities plays in the successful development and implementation of a project. Thus, this book emphasizes the impact of projects on people and the organization – it is concerned with the organizational aspects of change that are brought about by the development and implementation of a project.

Interestingly, most books on the subject concentrate on the technical side, yet our interviews of project managers, as well as our personal experience, indicate that the non-technical aspects are of more concern to project managers than the technical aspects. In this book, we have a balance of the two aspects.

## 1.2 Project management in modern organizations

ORGANIZATIONS REEVALUATE JOB descriptions frequently and add management responsibilities for new and current employees. As a result, separate and distinct tasks in the traditional work environment are now integrated and managed by the same person. This trend has gradually reduced the need for some middle level managers who were primarily responsible for work planning as well as horizontal and vertical communication with other middle level managers, subordinates, and superiors. These middle level managers also made sure that ‘the left hand knew what the right

hand was doing' and thus avoided overlap and confusion as well as controlled the work flow. This essential function of middle level managers must not be lost in the change process.

The new reality reshaped the role and definition of the work unit; it made ordinary tasks more integrated and in need of instant coordination with other tasks. More and more jobs have become multi faceted and involve an increasing number of variables that influence decision outcomes. This has created the need for more specialized careers that did not exist before. These new careers involve the need for greater understanding of business missions, goals, and objectives. Integration of work across functions and organizations has increasingly become a norm. This has influenced career options in different ways: On the one hand, it has increased the responsibility, influence, and complexity of most jobs and, on the other hand, has created opportunities for those with the know-how to manage these multi faceted tasks effectively.

However, the growth of new ideas, products, and services created the challenge of keeping up with new projects. Delayed and over-budget projects became the norm rather than the exception. For example, a two-year backlog for the development of an information system was considered almost normal in many organizations. Fortunately, the adoption of rapid development methodologies, techniques, and tools has helped to ensure a more timely response to project development and implementation.

Project management has become one of the most sought-after positions in service as well as in manufacturing industries and in private as well as public organizations. Project management has gradually replaced the traditional middle management position. By its nature, the job of project manager combines a set of responsibilities that span from understanding the business model of a firm to managing human resources to addressing organizational needs. A project manager's primary role involves managing all aspects of a project from the beginning to the end and delivering it *as specified, on time, and within budget*.

### **1.3 Principles, techniques, and tools**

A PROJECT STARTS when someone within an organization initiates the idea of a new system or suggests the modification of an existing system. Initiation is the first step among many steps necessary for the development and implementation of a successful system. Whether or not the initial idea is carried forward into the development and implementation stages is influenced by a variety of factors, some of which are tangible and easier to measure (such as the cost of equipment and personnel) and some of which are intangible and harder to assess (such as organizational and political support).

Large organizations often employ some form of **project committee** that evaluates and recommends project proposals. This committee will normally follow a priority scheme that includes, among other things, the elements shown in Figure 1.2. In smaller organizations, senior management or 'the owner' usually makes the decisions.

Once a project is recommended for development and its budget is approved, it will go through the project development life cycle, which ends with the implementation of the proposed idea and the formal closure of activities, contracts, and documents.

- The strategic and operational needs of the organization as determined by top management
- Client requests for increasing the efficiency of operations or providing support not presently available
- Views of all stakeholders and their 'political' force
- Particular issues, such as 'customer value', 'improved processes', or concentration on particular performance measures
- Major revisions to existing products and services due to changes in the organization or its environment
- New opportunities, perhaps due to the availability of new technology
- Competitive pressure, a matter of 'keeping up with the competitors'

Figure 1.2: Prioritization factors

The **triple constraints** of **scope**, **time**, and **cost** affect all projects, regardless of size or type, and are reflected through the necessity of defining the project as specified, on time, and within budget. These triple constraints directly and proportionally affect each other like three sides of a triangle, as shown in Figure 1.3. For example, increasing the scope of a project will increase its cost and/or the development time. Reducing the time to delivery is likely to increase the cost of the project.

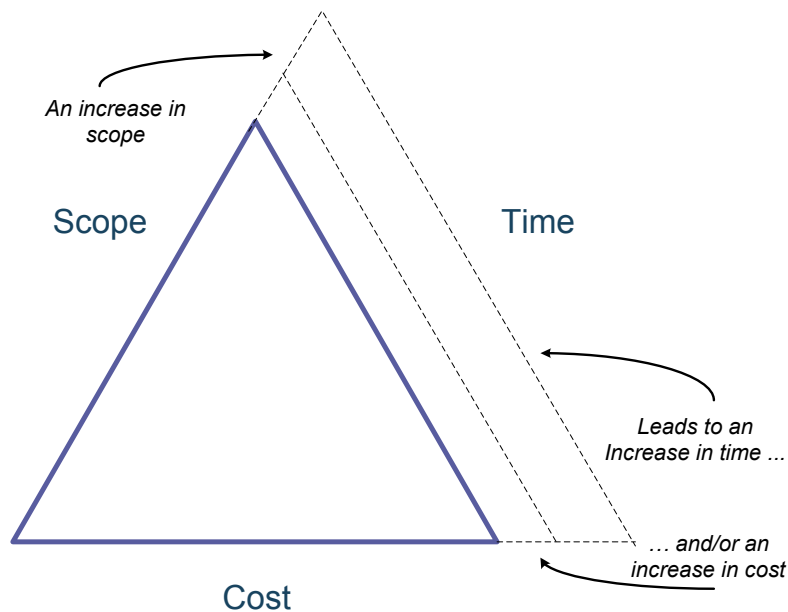


Figure 1.3: The triple constraints of scope, time, and cost

The project manager is responsible for the successful delivery of this one-time job within the limits of the allocated resources. In order to be successful, the project manager must start by getting answers to some important questions relative to the issues listed in Figure 1.4. Without the project manager, there will be real problems as there will be no one to galvanize the team together towards the goals of the project.

- Specific objectives of the project
- The expected delivery time for the project
- The limits on resources
- The extent of the available talent pool
- Key stakeholders – people who initiated the idea and those who will be recipients of the final product
- Top management support
- Inter-organizational relationships, especially for large projects

**Figure 1.4: The issues for the project manager to consider**

Let us look at these issues. A particularly important function of the project manager concerns project scope. The **project scope** is a key success indicator, as it defines objectives, is essential to evaluating resources, and is critical to achieving customer satisfaction. One of the persistent problems in most projects is the phenomenon known as **creeping scope**. This problem occurs when stakeholders or proponents of the project gradually expand their requests by adding new features or modifying initial specifications. The stakeholders may expect these improvements at the same cost. If not controlled, this creeping process will eventually affect customer expectations – they will be too high – and thereby the evaluation of the project's outcome inevitably leads to disappointment.

In order to save time and get the project underway, inexperienced project managers often spend too little time on developing a clear and agreed upon description of the project scope and detailed project requirements, and they start development activities prematurely. This will eventually haunt the project team in general and the project manager in particular because, as the project gets closer to the finishing line and customers have a clearer understanding of the project outcome, customers can keep coming up with even more requests. Not only does the scope creep affect the due date for the project, but it also affects resources and other projects. After completing a project, team members and the project manager may be assigned to another project that has been scheduled to start following the completion of the current project because the latter has had to be put back.

However, there is a balance to be struck here: Scope needs to be clearly defined, but within that, some change in requirements has to be expected and dealt with. The world does not stand still! Thus, there needs to be some built-in flexibility regarding changes in requirements. We will return to this problem later.

Once the scope is clearly defined, resources are estimated and the completion time for the entire project is established. A clearly-defined scope helps the project manager estimate the time, cost, and human resources required for the project. The available **internal talent pool** is often a key factor in deciding whether or not to outsource some aspects of the project. **Outsourcing** refers to the procurement of talent, such as consultants and suppliers, from outside of the organization and sometimes overseas. The latter is frequently referred to as **offshoring**. This is an important topic, and we devote an entire chapter to outsourcing and offshoring in this book.

The project manager must evaluate carefully what resources are available and for how long and with what flexibility they are available. Highly qualified individuals and domain experts may be

scheduled to work on separate projects and as a result their time is allocated to each project based on what was initially agreed upon for each project. In such cases, the project manager must make sure that adequate human expertise with necessary flexibility is allocated to the project in order for the project to be completed in a timely manner. Estimating resources is an important responsibility for a project manager, and it is extensively discussed later in the book.

The next two issues in Figure 1.4 relate to key stakeholders of the project and top management support, both of which are considered critical for the success of any project although in different ways. It is important to know how to communicate and to understand why communication skills are critical.

The project manager must be able to communicate properly with key **stakeholders** of the project throughout the project development life cycle. The stakeholders of a project include individuals at all levels who have interest in the project and its final product. The list includes the stakeholders shown in Figure 1.5. We look at stakeholders in more detail in a later section.

- Top management
- Those who fund the project, such as functional area managers
- Those who directly work on the project, such as team members
- Primary customers
- Clients of the project outcome
- Suppliers

Figure 1.5: Some of the stakeholders of a project

Top management support is critical to the success of a project for reasons of support as well as recognition. The project manager must initially succeed in convincing top management that the proposed system has organizational value and serves the overall business strategy that the organization has adopted. Without initial support by top management, the project will not start, and without the continued *full* (not lip-service) support of top management, its development will be hampered. If it is not seen as a top management priority, it will not be a project that people in the organization need to care about much or give the time and effort to that are necessary for its success. A key vehicle for obtaining continued support is clear and timely communication that informs top management as well as other key stakeholders about project progress and status. In particular, stakeholders would like to know whether the project is making timely progress (that it is on schedule) and is within budget. *It is important to communicate and explain, as early as possible, delays and unexpected costs.* It is the top management that will eventually have to approve additional funds and/or extend the project deadline; therefore, it is critical to minimize the element of surprise before requesting additional support, if it becomes necessary.

Inter-organizational relationships are important, particularly for large projects. The success of **integrated projects** depends on the broad participation of people in those functions that will be affected by the outcome. Further, globalization means that many – if not most – projects have additional international design considerations to take into account in their scope.

We will look in more detail at the human qualities required by a project manager, but good

communication skills are an obvious prerequisite. The project manager should understand and establish appropriate communication modes to inform all interested parties effectively. Early in the project development life cycle, the project manager should identify what communication model works best and establish the process and means to ensure good communications. For example, if email seems to work effectively and with ease for all concerned, then that could be the main mode of communication. However, there are situations or environments where email systems exist but they do not get used, for one reason or another. In that case, this communication medium may not be effective unless some behavioral changes take place in the organization. What is important is that the message is communicated effectively, by whatever means. Establishing the mode of communication early in the project development life cycle is important.

## 1.4 Project life cycle

EVERY PROJECT GOES through several distinct stages before it is complete. A typical project involves a spectrum of activities that starts from the initiation phase, when the project idea is formed, to the delivery phase, when the project is complete and team members and management can move on to other projects. The **project life cycle** gives a useful viewpoint for the project manager to employ in planning activities, allocating resources, setting milestones, monitoring progress, and communicating developments. While there are many different project life cycle models, a typical generalized one was introduced in Figure 1.1. Figure 1.6 is a more detailed version of Figure 1.1.

**Initiation stage** – At this stage, a project is initiated and a commitment is made. A person, a group, a unit, or units within the organization may initiate the need for a system. This need might have been identified when a problem arose in the organization or when a need for change was recognized. Usually a process is then followed to determine whether the idea should be supported or not. **Sponsors** of the idea must make the case as to why the new project is needed and how it helps organizational objectives. This is a challenging task since there are often competing proposals vying for limited resources. Proposals that are closely aligned with organizational strategic objectives have a better chance of receiving top management support. At this stage, someone is appointed as the manager of the project and will be responsible for carrying out the project through the development life cycle and delivering the final product, assuming the project comes to fruition: This is the **project manager**.

**Planning stage** – At this stage, the project scope is defined as clearly as possible, objectives are described, and activities are planned. Team members are identified and responsibilities are assigned. If the project manager was not appointed at the initiation stage, someone will be assigned this position at the early stage of planning. At this stage, the project manager is responsible for estimating cost, scheduling work, forming the team or teams, assigning responsibilities, establishing a communication mode, planning quality control, and designing risk analysis. If there are different proposals for achieving the objectives, a choice needs to be made between the alternatives. Sometimes there are constraints that limit choice, but the solution agreed upon needs to be reasonable to schedule, economically worthwhile, and organizationally acceptable. Specific and unique resource needs are also identified and commitments are obtained. For example, depending on the scope and

nature of a project, specialized know-how and expertise may be necessary. The project manager must, in such cases, determine whether in-house expertise is adequate to satisfy the project needs or whether arrangements need to be made to fulfill them externally. Planning activities are critical to the success of project management, since they map out what needs to be accomplished, how they are to be accomplished, how progress is to be monitored, how quality is to be controlled, and - in short - how the project is to be managed. Since estimates of resources and activities are not always projected accurately, planning must allow for some flexibility in this respect. Things are not cast in stone and a project plan may need adjustments during the development phase. However, changing the plan *must* be done following an agreed upon process. For large projects, a committee is usually responsible for the evaluation and approval of proposed plan changes.

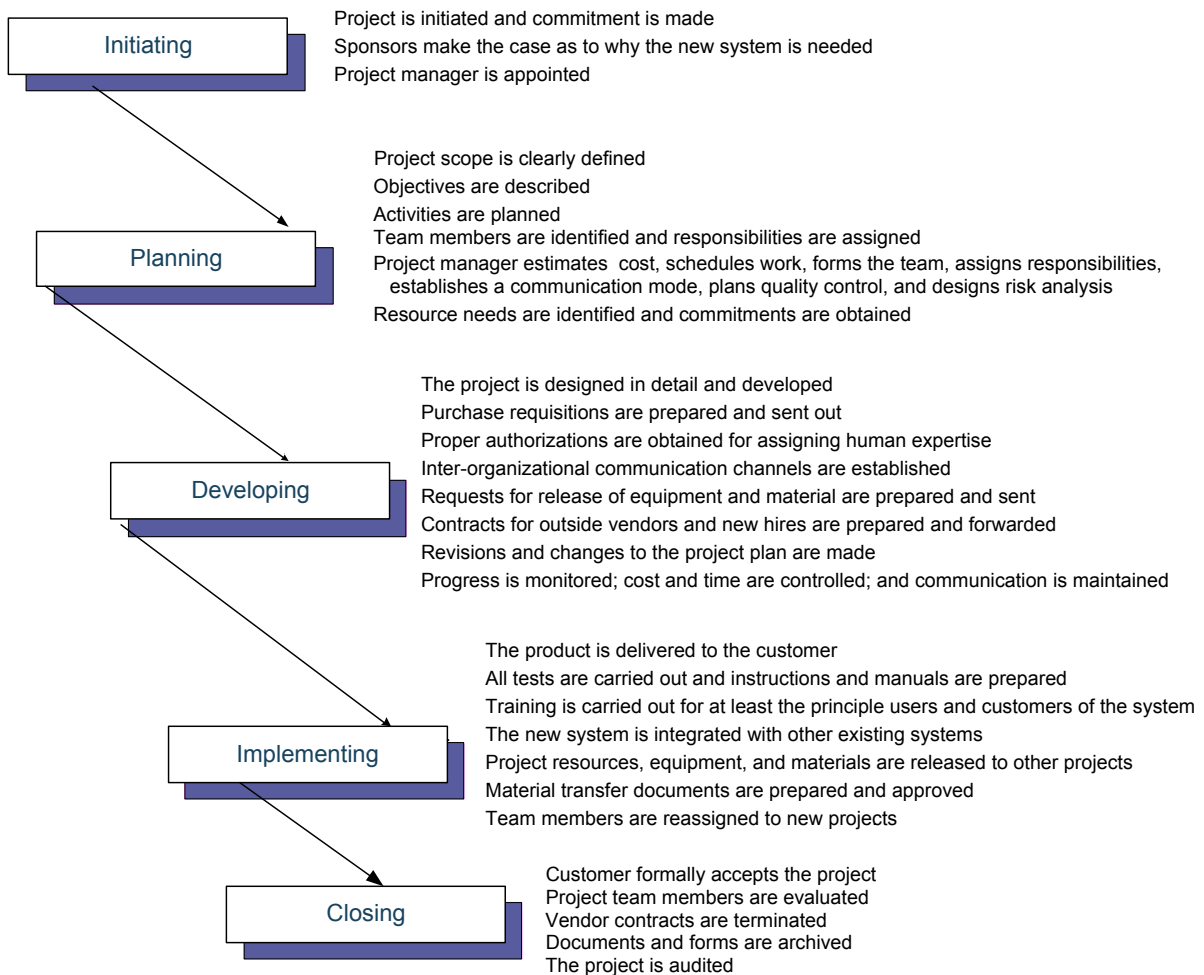


Figure 1.6: Life cycle of a project – more detailed

**Development stage** – This stage, sometimes known as the **executing phase**, encompasses the detailed design up to, but excluding, the final implementation of the plan. It is important that the design is detailed as it is difficult to estimate accurately if the design is unsure. The executing stage, as a whole, is the stage in which mental and physical activities take place. Activities are coordinated with the aim to deliver the specified outcome on time, within budget, and to the satisfaction

of the customer. Here are a few examples that illustrate activity types at this stage of the project development life cycle: purchase requisitions are prepared and sent out; proper authorizations are obtained for assigning human expertise; inter-organizational communication channels are established; requests for release of equipment and materials are prepared and sent; contracts for outside vendors and new hires are prepared and forwarded; revisions and changes to the project plan are made by following an established process; progress is monitored; costs and time are controlled; and communication is maintained. Regular monitoring to determine that the project is being carried out according to specifications is critical at this stage. **Quality assurance** is obtained through quality control that is built into the process, with responsibilities clearly assigned.

**Implementation stage** – At this stage, sometimes known as the **control phase** (though we would argue that ‘control’ features throughout the project), the product is delivered to the customer. All tests are carried out and instructions and manuals are prepared. When necessary, training is planned and carried out. Such training programs may be specific and limited to certain individuals or may be more general and include a wide range of clients. In any case, training programs must be designed to facilitate their effective use by the customer. The project manager must be careful not to disrupt other projects or operational systems. Project resources, equipment, and materials are released and redeployed to other projects. Material transfer documents are prepared and approved. Team members are reassigned to new projects.

**Closing stage** – At this stage, the project is closed from an administrative point of view. Activities at this stage include: formalizing customer acceptance of the project; evaluating the project team members; terminating vendor contracts as well as the employment of those hired specifically for the duration of the project; archiving all documents and forms relative to the project; and conducting of the project audit by individuals other than the project manager or project team. The primary intent for the **project audit** is to formalize and document the lessons learned, to generate a report that summarizes experiences gained, and to suggest ideas beneficial to future projects. The intent of the project audit is not to point a finger at individuals or to punish anyone. The project audit is a review of facts relative to events, activities, and processes for the purpose of **organizational learning**. Organizations need to learn from their successes and failures through this knowledge sharing (its **organizational memory**) and build on this past experience to improve future performance.

However, Figure 1.6 represents an idealistic view of project management. In fact, in any project this process is likely to be much more complex, with many iterations and jumps. Figure 1.7 attempts to show the complexity of a real project.

## 1.5 Stakeholders

STAKEHOLDERS ARE PEOPLE who will be in some way associated with the project and include internal or external individuals or groups. The boundaries between internal and external stakeholders are often blurred. Think, for example, about situations where products are developed between groups of internal and external people under outsourcing conditions. Many organizations do not have a rigid separation between internal and external groups working on a project. Often



multi-skilled project teams, capable in both business and technology, are formed for a particular project. They all have some kind of stake in the success of the project and need to work together towards a common goal. Good communication will help to make such an atmosphere feasible.

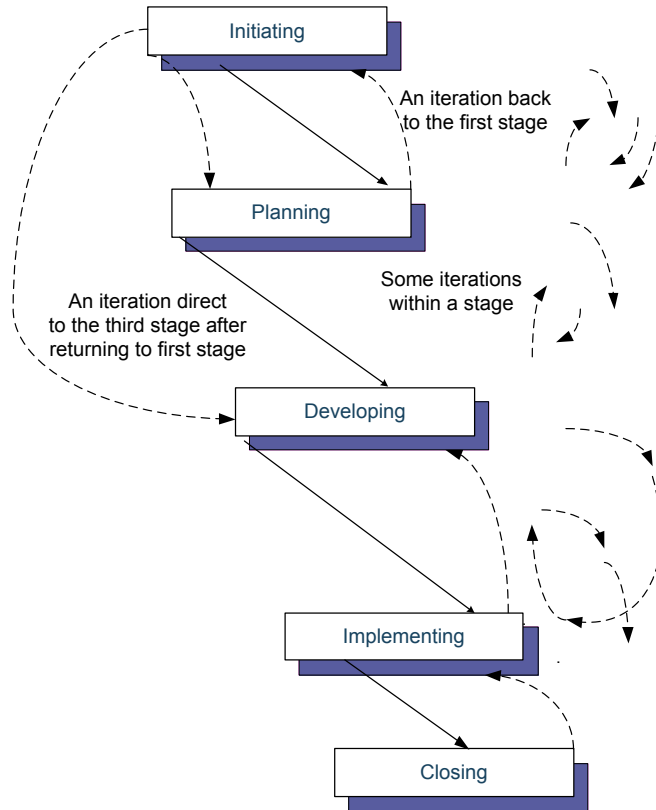


Figure 1.7: Indicating the potential added complexity of a real project

However, if we accept this wider view of the stakeholders of a project, it might be difficult for the project manager to decide how to proceed. For example, how does the project manager evaluate the relative importance of each stakeholder if there is conflict? **Stakeholder analysis** is a technique to help project managers in such circumstances (Figure 1.8).

Stakeholder	Attitude	Power/Influence	Actions
Tom (clerk)	Negative – concerned about job	Little	Keep him informed and try to reassure him that his job is safe
Doris (manager)	Positive – sees potential increase in status	Medium – but key member of the project	Manage her closely and ensure her satisfaction with the potential of the project and her role in it

Figure 1.8: Stakeholder map

Stakeholder analysis is often done in a kind of **brainstorming session** and then documented as a list or a set of interconnecting circles, sometimes known as a **stakeholder map**. These stakeholders are then considered as having some relevance or potential input to a system under develop-

ment and therefore might be consulted and involved. We might consider stakeholders as having higher and lower power (and influence) and higher and lower interest. We may simply monitor those stakeholders who are in the low power/low interest quadrant but involve those stakeholders in the high power/high interest quadrant. Other stakeholders warrant at least to be kept informed. The stakeholder map might look at the needs of each group or individual. Some practitioners argue that 'interest' is too narrow a term and use 'attitude' and 'confidence' instead. Usually each stakeholder group is considered as having some specific requirement that needs to be considered and addressed in the project. They are seen as groups who have diverse requirements that need to be addressed by the project in order for it to be successful. Indeed, a project manager might hold a workshop with the key stakeholder groups at the beginning and at other times in a project. Stakeholder analysis provides a way to make explicit, or give a voice to, the claims of all the stakeholders involved in the project.

## 1.6 Project management and ethics

THE DISCUSSION OF **ethics** in business courses often generates interesting reactions. Some students see ethical issues less relevant to the business domain. Some consider ethics as an individual trait that is formed early in life and influenced by the family environment and values and feel that it is less likely to change later in life. As our thought processes evolve through learning, experience, and interaction with others, our values are reaffirmed or reformed. In reality, ethics influences our decisions continuously as we try to distinguish right from wrong. Ethical issues in project management are prevalent as we provide estimates of time and cost, evaluate individual performance, communicate completion dates, and so on. We estimate project costs and time to the best of our abilities by trying to use our professional expertise and experience. It is unacceptable to falsify these estimates or to exaggerate benefits. Ethical issues are more acute in situations where there is pressure on the project manager to give 'good' news about the due date, progress, safety, accuracy, and the like. It is important to distinguish mistakes from misrepresentation or falsification.

*Do you think students who cheat (in exams or by copying coursework) are likely to continue this habit in the business domain?*

Many companies have **codes of conduct** to guide employee behavior. Professional organizations have in place codes of ethics that they publicize and make available for their members as well as for the public. For example, see the Project Management Institute (PMI) members' code of ethics and the joint Institute of Electrical and Electronic Engineers and Association of Computing Machinery (IEEE/ACM) code of ethics and professional practices for software engineers. Similar codes are available for other organizations and many are available on the web (see, for example, that of the British Computer Society at [www.bcs.com](http://www.bcs.com)). There is a great deal of overlap in professional and ethical codes for different organizations because they share core principles. Decisions have consequences. Project managers must always contemplate the impact of their decisions and continuously ask themselves how their decisions affect the stakeholders and how their decisions will be judged by everyone in the organization.

An individual's ethical conduct is influenced by education, family, religion, and work envi-

ronment to varying degrees. Organizational environment, culture, decision processes, and reward systems also influence employees' beliefs in doing the 'right' thing. The organizational environment is also affected by the conduct of individuals. Organizations benefit from the ethical behavior of their employees and, therefore, they have a vested interest in promoting it. The ultimate success of a project is based not only on the actual outcome but also on the way the outcome is accomplished. Good means and good deeds go hand in hand; falsifying one leads to falsification of the other.

It is important to project managers that they can be trusted and are trusted. Team members are prepared to go the extra mile and put in the extra effort for leaders that they trust and respect. It is hard to define *trust*, but we know that individuals are trusted depending on their character, competency, and ethical standing. Project managers who are perceived as 'political animals' or 'manipulators' may succeed for a while by pulling rank or enforcing rules but will eventually face resistance and non-cooperation. The project manager's leadership should be free of 'game play'. When team members feel that games are being played or that there are hidden agendas, their interaction will be affected, and soon, the entire environment will be changed. Project managers need also to build trust among team members, and trusted project managers have an easier job of doing that.

There are situations where not all of the facts are known and ambiguity may exist. Effective project managers are upfront about these situations and explain what they know and what they do not know about the situation. It is important to realize that trust is built over time, and trusted individuals are given the benefit of the doubt in unusual situations. For project managers who have not been on the job long or have not worked with their team long enough to build the necessary level of trust, unusual situations may prove more challenging. On the other hand, ambiguous and unusual situations provide unique opportunities for the project manager to demonstrate competency and built trust. *It is very important that your team members feel that you want to do the 'right' thing.*

In his book, *Seven Habits of Highly Effective People*, Stephen Covey suggests that effective managers have **ethical characteristics** evidenced by respect for the individual, dignity, fairness, pursuit of truth, and helpfulness. In situations where there is sufficient funding, support, equipment, and the like but resentment and lack of full cooperation is still present, project managers should ask themselves the questions seen in Figure 1.9.

- Have you been true to the purpose of the project?
- Have you treated everyone alike, giving everyone a chance?
- Have you been consistent, do people know where you stand?
- Have you been fair in your evaluation of others?
- Have you been open to suggestions and opinions?
- Have you accepted responsibilities and admitted mistakes?

Figure 1.9: Reflections on ethics

These are not ambiguous questions that require a great deal of analysis. You may even be able to ask some of your key team members for feedback on some of these questions. If you have been open about your mistakes and have shown that you respect the opinions and suggestions expressed by others, you will get valuable feedback.

If you ask people what they like about their boss, you will be surprised how much simple things make a difference: “I like working with my boss because she listens carefully and explains things clearly,” “I like my boss because you always know what he expects from you,” “I like my boss because she treats everyone the same,” or “I like my boss because he is reasonable.” These comments indicate both trust and competency. *You cannot develop trust in people who do not know their field and cannot promote confidence in those they work with.* Competency must be evident in technical as well as business domains. A software engineer who is well trained to design and develop complex systems may not necessarily be able to manage a project. Developing a project involves more than knowing the technical dimension alone: It involves human resource management, conflict resolution, confidence building, networking, coordination, control, and the like. Indeed a technical deficiency can be made up for through the support of experts, but an ethical deficiency is much more difficult to fix.

## 1.7 Text content and objectives

THE INTENT OF this text is three fold:

First, to study and understand *the job* of project management:

- What kind of subject area it is
- What it entails
- How it relates to other subject areas
- What opportunities and challenges it provides
- Why it is important for business professionals

Second, to study and understand what makes a *person* successful as a project manager:

- What kinds of skills are needed?
- How much technical expertise is required?
- How much management talent is necessary?
- What individual traits are important to be successful at this job?

Third, to study and understand the *methods, tools, and processes* necessary for successful project management:

- How to manage time.
- What software tools are available and how to use them.
- How to measure quality.
- How to measure performance.
- What techniques are available for quality control?
- What methods are most useful to the project manager for keeping track of events and activities?

This text, therefore, focuses on what project management is, what type of person will make a successful project manager, and what helps an individual to be a successful project manager. While these three themes run throughout the text, the chapters are not arranged under three modules. This is because it is important to learn about all three areas concurrently. It is also due to the fact that it is not always practical, or useful, to deal with one concept in isolation, without reference to

the others. Therefore, while some chapters may discuss only one theme, others combine multiple themes.

However, these **three aspects of project management** are seen in the context of how project management impacts the organization as a whole, and more specifically those stakeholders directly impacted by a project.

This text is also written with a broad spectrum of project managers in mind. In other words, the intent is to make this text valuable to a wide range of professionals and relevant to management students in general. Thus, the type and coverage of each topic is determined and evaluated with the intent to create a balance between the science and the art of project management. Management issues, such as evaluation, planning, and strategy, are combined with analytical and software skills, such as understanding networks, techniques, and tools such as PERT-CPM, to create an appropriate balance so that individuals with backgrounds either in areas of management or technology are able to benefit from the text. This balance is important since most project management jobs require both technical and managerial competencies.

Even if you have no intention of becoming a project manager in the near future, at work you are very likely, nevertheless, to be a member of a project team, and therefore, the interests of the book are still very relevant to your career development.

The **Introduction** chapter introduced the topic of project management and provided an overview of project management principles and tools. This chapter has introduced many of the concepts and themes that are discussed more fully in the chapters that follow. This chapter also outlined the intent and focus of the text and set the tone for the remaining chapters.

In the chapter on **Scope**, the initial and important stages of project development are described. It shows how to define project scope at an early stage so as to assist development and implementation in meeting project requirements.

The chapter on **Cost** describes how to estimate costs in order to be able to carry out project activities and deliver a final product that provides the predicted benefits.

Once a project is identified and costs are projected, the task of scheduling activities starts. The chapter on **Scheduling** describes the essentials of project time management and scheduling. This is an important chapter since it describes how activities depend on one another and how progress is monitored through proper scheduling. Time management tools, such as PERT, are described that assist project managers in monitoring progress. Reliable estimates are essential for setting and controlling activities and schedules.

The chapter on **Leadership** describes project management leadership and its importance to the success of any project as well as its impact on the project as a whole. The roles of team members are discussed and information provided about project management careers in this chapter.

The **Team** chapter describes team formation. Identifying competent and reliable individuals as team members is an important activity for the project manager. We discuss characteristics of an effective team.

In the chapter on **Risk**, we describe how project risks are identified and planned for. It describes the need for contingency planning in the event that changes become necessary or that ad-

ditional resources are required. Continuous monitoring of project activities is a critical function of project management.

Outsourcing and offshoring are now key elements of any decision in project management. Will some of the project be developed by another company, perhaps in another country? This is discussed in the chapter on **Outsourcing and Offshoring**.

Projects are evaluated from different perspectives: top management, the customer, team members, and the triple constraints of cost, time, and quality of outcome. The chapter on **Measuring Success** shows why measuring project success is important and describes approaches that help an organization evaluate the final product effectively.

Finally, the chapter on **Closure** describes the final step in the project life cycle: administrative closure. Formal closure helps tie up loose ends and creates archival documents for future use.

Each chapter ends with a summary, discussion questions, exercises, and a short bibliography for further study. Some chapters have an appendix, which might be a case study, other reading material, or another exhibit for further study, discussion, group work, or class work.

## **1.8 Interview with a project manager**

REAL WORLD SITUATIONS do not always correspond with what is covered in text books. Text books tend to be comprehensive, covering all aspects of a subject area. However, there is always something unique about any situation that makes it different from all others. In order to understand the career of project management better and get a perspective of real world issues, we conducted numerous interviews with qualified individuals. All of these individuals were professionals who either started their career managing projects or grew into a project management career. Some of these individuals have had formal training in project management, and many of them learned through practice and experience. Some planned their career towards project management, and some were drawn into it because of demand and company needs. In any case, they all find the project management experience both challenging and rewarding at the same time.

We will share examples of these interviews here and elsewhere in this text to complement, not replace, the material. We did not plan the study to capture everyone's responses to the same questions. Rather, we asked each respondent a somewhat different set of questions, although the more important questions were repeated. Repeated questions relate to opportunities and challenges, successes and failures, personality traits and skills, and so on. We are indebted to all interviewees and thank them for sharing their insights and experiences with us.

The interview in each chapter does not necessarily directly relate to the material covered in the chapter, but the issues and lessons within the interview content can be appreciated by the reader at that time.

Most of our interview transcripts represent excerpts from an interview with a project manager who learned their career through practice and experience. Our first one, however, is now an owner-manager of a small company, and we wondered whether he thought that his issues were different from that of a project manager in a larger firm.

## Interview

**Q** TELL me about your background?

“I am now owner of a small company of 15 full-time employees and several part-time staff working at home and we develop niche software products. I am effectively project manager for all projects in the business. Previously, I was at a large company as a senior analyst, developing software products”

**Q** HOW are the project management concerns different?

“You have no idea. All the books and courses seem to be for large companies. At my previous company we had strategies, plans, and objectives all worked out. We had groups representing user interests. We had formal procedures for justifying and evaluating our projects. It was very bureaucratic. Mind you, we still got it wrong a lot of the time. So they should still learn a lot from you.”

“But in a smaller company like ours there is much less need for a formal procedure, and we cannot afford it in any case.”

**Q** HOW can you justify that statement?

“Look, there are relatively few people involved and I know them all – even people working at home. It is much easier to judge things. Accountability is clear, we know whose fault it is if things go wrong, and in any case, everybody involved is working to ensure the success of the project. My staff are much more flexible than the unwieldy

project teams I had to deal with before. And in any case, things are usually simpler.”

**Q** WELL let me put a few arguments to you. For example, your approach may lead to you overlooking things or jumping on the first solution, which may not be the best, as you haven't discussed the issues fully.

“There may be some truth in what you say, but we don't have the resources or the time to do what big companies can do. The danger that I see most is a bit different and that is I basically own the company and, though I think I am a nice man, I am seen as the boss. People don't challenge me as they should even though I ask to be contradicted. Yes, that is a concern and I am not infallible.”

“Actually when I think about it, I do many of the things a large company does, even if I do it less formally. For example, I make sure our important customers get what they want, and I work out risk factors, costs and benefits, and the rest.”

**Q** FINALLY, how do you work out your priorities?

“First, I know what our key business needs are and I start with the most critical. I am interested most in the bottom line and projects with the highest potential payoff get the highest priority. Finally, I give priority to those projects which have the lowest risk of failure – at least how I see it!”

## Chapter summary

INCREASINGLY, SOME MIDDLE managers of the past who managed routine tasks and functions are being replaced with project managers who are responsible for non-routine, one-time, developmental projects with specified times and budgets and for delivering these projects to the satisfaction of the customers. This change has caused a significant demand for skilled project managers. Project management competency requires a balance of managerial and project domain expertise. Successful project managers are able to plan work activities, manage people, communicate with all stakeholders effectively,

monitor project progress, plan and manage change, deal with the unexpected, understand organizational processes, and so on. They must understand the project development life cycle and have competency in initiating, planning, developing, implementing, and closing a project. They must also behave ethically throughout the project development life cycle. Career opportunities for individuals with such qualifications and traits have never been stronger than they are today. All managers and professionals need to be aware of the issues discussed in this book.

## Discussion questions

- a) Project management competency skills include managerial and technical expertise. It has been suggested that technical aspects represent the “science” of project management and the socio-cultural aspects represents the “art” of managing a project. What do you think of this statement?
- b) This chapter defines the project life cycle in terms of initiation, planning, development, implementation, and closure. Discuss how this multiple stage perspective helps the success of project management.
- c) In your opinion, what are the most important individual traits for a successful project manager? What would be your three most important traits? Would the list change from project to project?
- d) It may be argued that it is not the individual traits that make a successful project manager but the knowledge of all aspects and the understanding of how they interact and influence each other that matters. Would you agree with this statement and, if so, why?
- e) Do you agree with the small firm company director (see interview) that his project management concerns are totally different from larger companies?

## Exercises

- a) In your own words, describe a project and identify major components and activities for it. What is unique about the project that you have described?
- b) What makes a particular project different from other projects: a bridge, planning a conference, planning a holiday, or developing a new degree program? Do you expect skill differences across different projects? If so, list these differences.



- c) For an organization that you know (your university, for example) identify the stakeholders of any project (student records, for example). Were the stakeholders all consulted about the project?
- d) You are scheduled to interview a project manager. For your interview, prepare a list of six questions that would further enhance what you have learned in this chapter. For example, ask about opportunities and challenges of a project management career or the most important skill based on the experience of the person you will interview.
- e) You are scheduled to interview another project manager. This time your assignment is to write a short report that describes a day in the life of a project manager. Try to point out things that are specific to this career that make it different from any other management job.
- f) Search the project management literature on the web and print an article that you find interesting and that relates to a topic in this chapter. Read and prepare a short presentation describing the content of that article.
- g) Write an exam question based on the contents of this chapter. Ask the person sitting next to you for an answer to your question. Share with the class your question and the response and point out whether you would agree with the response or not and why.

## Important Concepts

**closing stage** (pg. 10)

**codes of conduct** (pg. 12)

**control phase** (pg. 10)

**development stage** (pg. 9)

**ethical characteristics** (pg. 13)

**executing phase** (pg. 9)

**implementation stage** (pg. 10)

**initiation stage** (pg. 8)

**planning stage** (pg. 8)

**project** (pg. 2)

**project audit** (pg. 10)

**project committee** (pg. 4)

**project life cycle** (pg. 8)

**project management** (pg. 2)

**project scope** (pg. 6)

**role of project manager** (pg. 8)

**scope creep** (pg. 6)

**sponsors** (pg. 8)

**stakeholder analysis** (pg. 11)

**stakeholder map** (pg. 11)

**stakeholders** (pg. 7)

**triple constraints** (pg. 5)

**three aspects of project management** (pg. 15)

## Bibliography

Avison, D., Fitzgerald, G. (2006) Information systems development: Methodologies, Techniques and Tools. 4th ed., McGraw-Hill.

Cadle, J., Yeates, D. (2004) Project Management for Information Systems. Prentice Hall.

Dejoie, R., Fowler, G., Paradise, D. (1991) Ethical Issues in Information Systems. Boyd & Fraser.

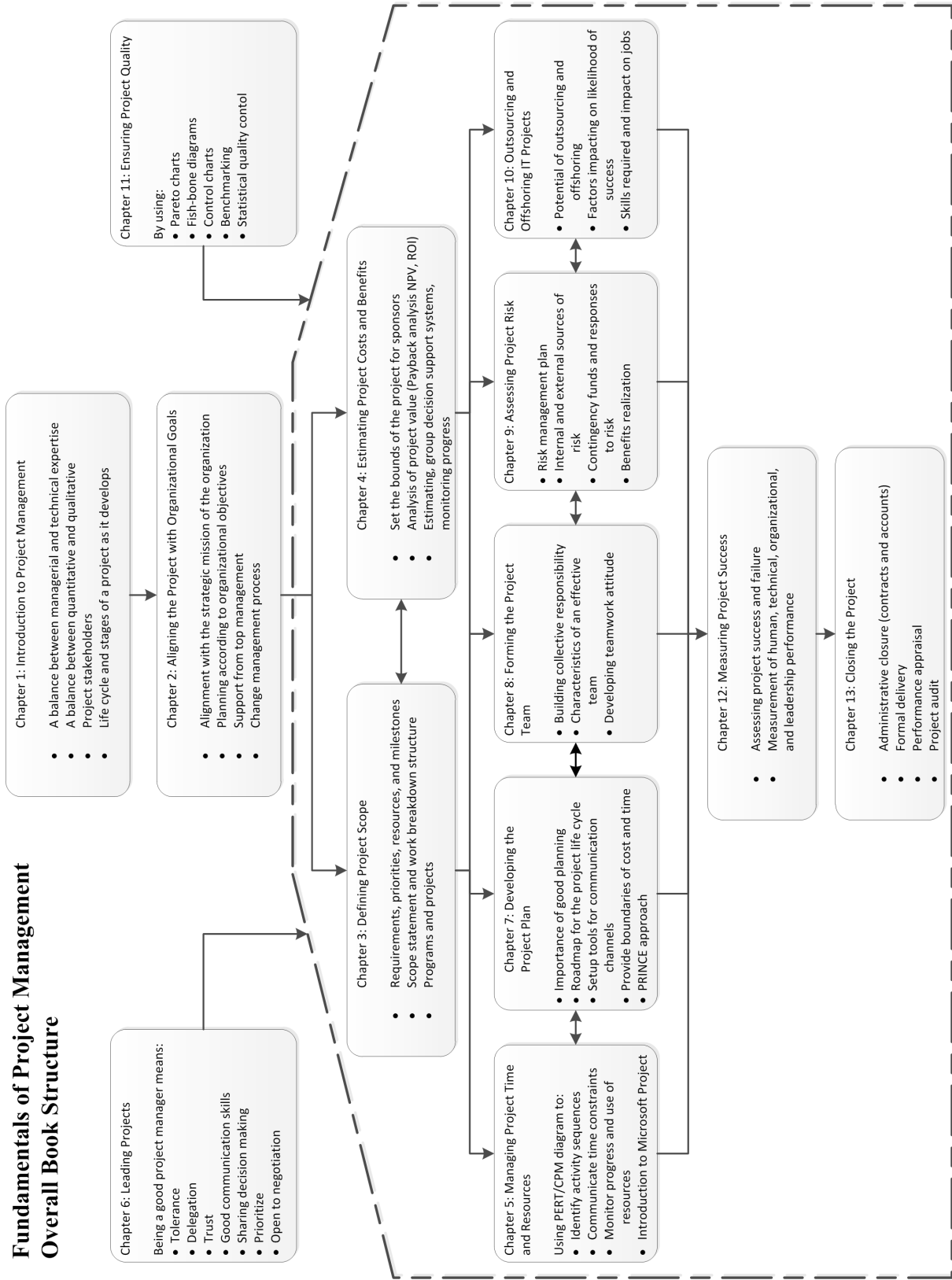
Fitzgerald, G. (2000) IT at the heart of business, British Computer Society.

Kerzner, H. (2003) Project Management: A systems Approach to Planning, Scheduling, and Controlling. Wiley & Sons.

Kemerer, C. (1996) Software Project Management. McGraw-Hill.

- Marchewka, J.T. (2003) *Information Technology Project Management: Providing Measurable Organizational Value*. Wiley.
- McLeod, G. and Smith, D. (1996) *Managing Information Technology Projects*. Boyd & Fraser.
- Meredith, J. R. and Mantel, S.J., Jr. (2000) *Project Management: A Managerial Approach*. Wiley.
- Olson, D. L. (2004) *Information Systems Project Management*. Irwin McGraw Hill.
- PMI (2004) *A Guide to the Project Management Body of Knowledge*, 3rd ed., Project Management Institute.
- Rosenau, M.D.J. (1998) *Successful Project Management*. Wiley, New York
- Reynolds, G. (2007) *Ethics in Information Technology*. Thomson Course Technology.
- Schwalbe, K. (2006) *Information Technology Project Management*. Thomson Course Technology.
- Tedesco, P. A. (2006) *Common Sense in Project Management*. Thomson Course Technology.
- Yourdon, E. (1997) *Death March: The Complete Software Developer's Guide to Surviving 'Mission Impossible' Projects*. Prentice Hall, N.J.

## Fundamentals of Project Management Overall Book Structure







# 2

## *Aligning the Project with Organizational Goals*

### **Themes of Chapter 2**

- How can projects support the goals of an enterprise?
- What do we mean by strategic alignment?
- What is meant by the governance issue?
- What is meant by the expectations gap?
- What is the role of the project manager?
- How can change be best managed in the organization?

## Introduction

THIS CHAPTER DESCRIBES THE PRINCIPLE THAT ANY INVESTMENT MUST be assessed from the point of view of the organization, and how it will benefit the long-term goals and objectives of the organization and, therefore, be more effective. It describes the importance of obtaining project proposal support through goal alignment and management recognition and shows the importance of the planning process. It also discusses how top management support can be encouraged and the importance of public relations. Finally, it discusses aspects of change management in organizations. We start with a brief comment on a large health care project (over \$12 billion US).

### Challenges for the IT Initiative of the UK National Health Service

Healthcare in the UK has been exploring the role of information and communications technology for over 50 years, and has had both successful and less successful experiences. The UK National Health Service (NHS) is presently going through a nationwide systems overhaul which was originally estimated to cost £6.2bn or about US \$12billion. It is a 10-year project and the largest non-military IT program in the world. However, cost estimates seem to have already risen two or even three times these original estimates.

The NHS's National Program for IT (NPfIT) is a huge project and the UK Government of Tony Blair hoped that it will help solve the problems in the much-criticized UK health service. Its aim is to provide 'cradle to grave' healthcare for all. The project includes secure email, patient e-bookings, e-prescriptions, integrated care records, picture archiving and communications systems, a service for general practitioners, and a public health website.

Such an ambitious and large project is bound to be difficult. There have already been a number of setbacks to patient administration systems. A failure at a data centre caused systems at 80 hospitals to collapse for about

four days, which is the NHS's biggest IT failure ever. A data recovery system also failed to provide backup. Polls have suggested reducing support for NPfIT among some NHS staff.

On the other hand, another application is 'Choose and Book', a national service that, for the first time, combines electronic booking and a choice of place, date, and time for first outpatient appointments. A website has been developed so that patients can book their own appointments online – at a time that suits them. Nearly 2.5 million patients have been referred to specialist care through Choose and Book. Approximately 40% of all such referrals already go through Choose and Book, representing nearly 65,000 patients a week. Feedback suggests that the electronic booking of referrals to specialist care improves patient experience and reduces costs.

There are bound to be 'teething problems' in such projects. And whilst some pundits suggest that it is a 'giant failure waiting to happen,' others argue that, with good project management, the prospects for a much improved UK National Health Service, supported by IT, are positive.

## 2.1 Setting priorities for project management

IN TODAY'S ORGANIZATIONS all management levels have come to be involved with **strategic planning** and strategic issues. This is in contrast with the past when only top executives and senior management would be concerned with strategic issues. Creating and maintaining a strong link between the organizational strategic plan and projects is an increasingly important role for the project manager, indeed it is important for all stakeholders. Everyone in the organization needs to 'buy into' the mission statement and the strategic plan at the broadest context and to the success of each stage of the project at the lowest levels. This is a difficult task that requires cooperation from all levels of management. The larger the organization, the more challenging this task will be.

An important factor that facilitates this cooperation is a process that defines how a project is to be aligned with organizational goals and objectives. This process can also be useful to the project manager in evaluating and verifying the extent, if any, to which a project meets organizational goals. Using this process, the project manager can then go ahead with the task of allocating project resources – people, equipment, and facilities.

Project managers are increasingly involved with the process of setting organizational priorities for technology selection, development, and implementation. Therefore, project managers have become a part of strategic planning and the organizational decision-making process. They are also affected by these processes since all projects should follow these criteria. Figure 2.1 details the advantages of involving project managers in this process.

- Project manager insights and expertise help develop realistic priority plans.
- Project managers can develop a high-level organizational perspective for projects.
- Project manager involvement helps networking and communication opportunities.
- Project managers gain an inter-organizational perspective for projects.

Figure 2.1: Advantages of project manager involvement at the organizational level

These are two-way benefits that help the project manager and the organization alike. The net result is that the project manager brings know-how into the planning process and gains an organizational and strategic perspective.

## 2.2 What is a strategic plan?

A **STRATEGIC PLAN** provides an organizational *road map* which suggests directions for resources and activities for the future. In setting a strategic plan, organizations need to analyze the three questions shown in Figure 2.2 very carefully. These are concerned with where we are now, where we want to be, and how to get there.

Answering the first question helps self assessment and realization. It provides the foundation for formulating a realistic plan for the future. Answering the second question helps the organization see themselves in the next five or ten years. It provides criteria and guidelines to evaluate the extent to which accomplishments have been made. Answering the third question helps set success measures and outlines criteria for monitoring progress.

It is important to realize how these three steps are interdependent. Careful definition and description of any one of these steps directly benefits the others. It is difficult to develop a workable and realistic strategic plan without a sound foundation - a clear understanding of what we are about and where we are at.

1. Where are we now? Organizations need to ask where they are at any point in time by assessing how they are perceived - what their position within the industry is, what their strengths and weaknesses are, and what lessons have been learned.
2. Where do we want to be? Organizations need to ask where they want to go in the future by describing what they aspire to become - what position they want to secure in the environment or in the industry they compete in.
3. How can we get there? Organizations need to ask how to get there by evaluating and outlining necessary resources, opportunities, challenges, and risks.

**Figure 2.2: Three questions concerning the strategic plan**

There are two important characteristics of a strategic plan. One is the fact that it looks into the future and maps directions. Another is that it is inclusive and broad, covering internal as well as external entities and resources. A strategic plan supports the organizational mission and is influenced by the organizational culture. Internally, it considers talents and skills, facilities, inter-organizational issues, and the like. Externally, it considers competition, partnership, government, environmental issues, and the like. It creates consistency across functions, across projects, and over time. An effective strategic plan is a critical success factor for the survival of the organization.

## **2.3 A strategic plan and project management**

AS SHOWN IN Figure 2.3, an effective strategic plan influences project management in several ways.

- It creates consistency across projects: all projects are assessed to ensure they support organizational goals and objectives.
- It reduces redundancy: cross functional resource sharing and inter-organizational communication are facilitated.
- It helps prioritize projects: projects that affect large groups of people and those that impact critical functions are ranked higher.
- It provides a long-term perspective for needs assessment of the customers: the needs of future customers as well as the future needs of current customers are considered.
- It provides criteria to measure project success: projects that do not support organizational goals and objectives can be discontinued. It can be helpful to a project audit and in evaluating the project outcome.

**Figure 2.3: The influence of the strategic plan**



It is only through its implementation that a strategic plan is effective and useful. *Projects, in general, are tools and mechanisms for the implementation of a strategic plan.* In other words, a collection of projects when implemented realizes goals and objectives formulated in the strategic plan. Without implementation, the plan remains just a written document. Projects are therefore instrumental in implementing the strategic plan. This is a major contribution towards accomplishing organizational goals and objectives and that is why it is critical for projects to be aligned with these goals and objectives.

## 2.4 Organizational mission, goals and objectives

ORGANIZATIONS ARE DEFINED through their **mission statement**. In other words, an organization exists for a purpose and that purpose is described in its mission. A mission statement therefore guides decisions and directs collective efforts. It is expressed in broad terms and is widely communicated so that all employees, customers, stakeholders, and the public are aware of what the organization strives for. Everyone working for the organization must know and understand the mission. It is not unusual for an organization to expect its employees to memorize the mission. The international accreditation body for colleges of business, for example, requires that all schools have a clearly defined and understood mission and that all faculty and staff are able to describe their college's mission.

Organizational success and performance in the long term can be assessed through a mission statement. A mission statement generally describes what product and services the organization wants to provide, in what region, and for whom. Further, it positions the organization relative to competitors and within the industry. For example, a software engineering firm may include in its mission statement that they want to be the primary provider of information security in the western region of the United States within five years. Or the statement could mention that the primary mission is to provide the most reliable information security.

*Can you describe your organization's mission? Does it correspond to any written statement that you can find for the organization in the foyer or in written documentation such as a company report?*

Notice that the first mission statement for our security company is silent on the issue of quality, suggesting that the firm's primary mission is growth. The second statement is silent on growth and volume, suggesting that the firm's primary mission is quality related. Both statements could belong to the same firm at different times since an organizational mission can be reviewed and changed if the purpose of the firm is modified. A specific mission statement provides clear direction to the employees but it also limits the scope. A firm must strike a balance between the specifics and the scope in the mission statement that serves its purpose.

A firm's philosophy and culture are also described through the mission statement. Although the management style and decision-making processes are more indicative of organizational culture, a mission statement is also used by organizations to create a public image by linking it to its contributions to society.

As Figure 2.4 suggests, a mission statement implies **goals and objectives** to be achieved; conversely, achieving these goals and objectives will make alignment with the mission statement

more likely.

Goals and objectives must be *clearly defined*, must be *measurable*, and must be *doable*. Relative to a mission statement, goals and objectives describe in more concrete terms what organizations like to do. While a mission statement sets the direction for the entire organization, goals and objectives define what specifically needs to be done in order to accomplish the mission. Therefore, goals and objectives are more specific and as a result they are more appropriate as measures of success. Functional areas and work units often set their own goals and objectives in accordance with the overall mission of the organization. Managers at all levels use goals and objectives to create targets for themselves and their employees. These targets are used to evaluate performance outcomes.

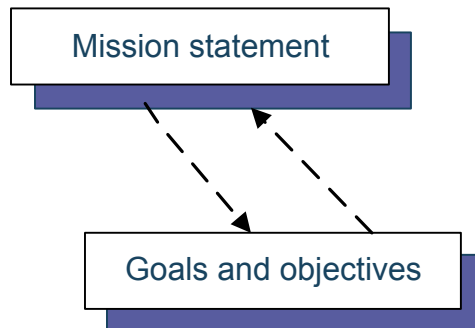


Figure 2.4: Mission statement and goals and objectives

You may come across organizational goals and objectives that mostly relate to the type and quality of products and services. As part of these goals and objectives, customer satisfaction is described and planned for. That is why you often see organizations refer to customer satisfaction as an important goal. Lower-level units develop goals and objectives in support of higher-level units. The hierarchy of goals and objectives exist in order to define responsibilities of the management hierarchy more clearly. For example, if a firm's goal is to have all internal communication paperless in two years then that becomes one of the Information Systems Department's goals to accomplish. That department needs to formulate strategies that describe how this goal can be achieved. As we move down the hierarchy path, goals and objectives become more specific and more closely linked with individuals and their skills (Figure 2.5).

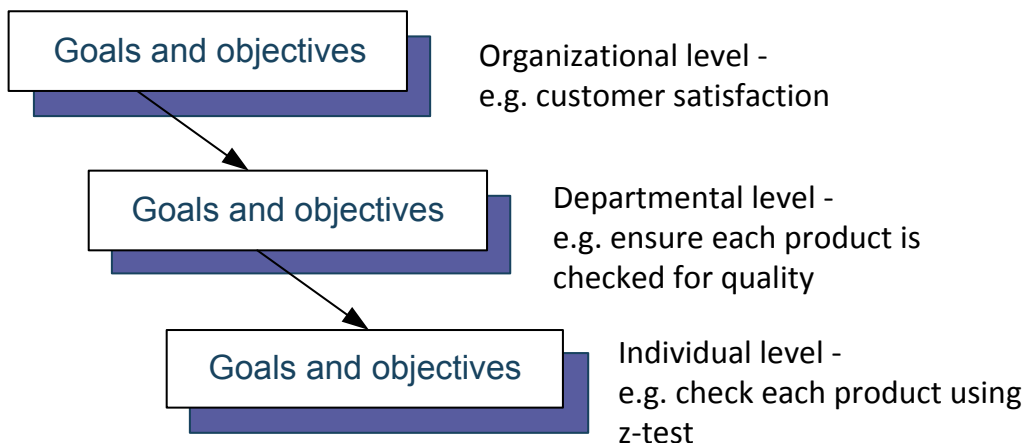


Figure 2.5: A hierarchy of goals and objectives relating to customer satisfaction

While goals and objectives conceptualize the organizational mission, **operational strategies** facilitate the implementation of these goals and objectives. As mentioned earlier, projects are implementation tools for strategies. Take the example of the firm that wants to convert all internal communications from paper to online. This may involve a combination of several information systems. The Information Systems Department will need to develop strategies for how best to accomplish this goal. The process may include developing several project proposals, obtaining approval for them, selecting a project manager, and finally authorizing development. Without goals we would not know what to pursue. Without strategies we would not know how to get what we want.

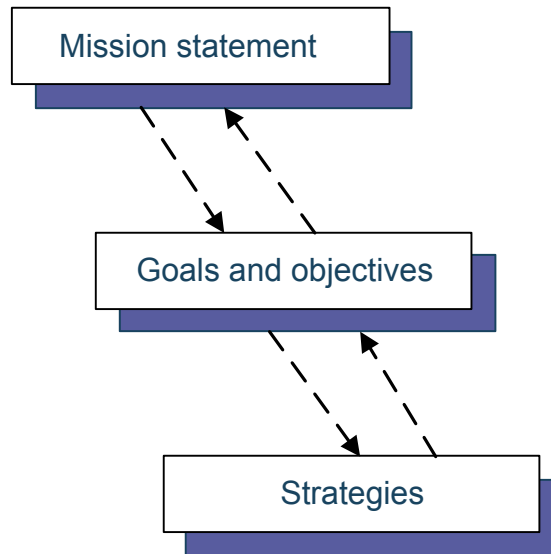


Figure 2.6: Strategies – ways of achieving goals and objectives

## 2.5 Planning

**PLANNING APPROACHES** ARE designed to counteract the possibility that projects will be implemented in a disjointed fashion, disconnected from other on-going projects in a way that it may not serve organizational goals and objectives. A narrow function-by-function approach could lead to the various sub-projects failing to integrate and serve the organization satisfactorily. Both top management and project managers should look at organizational needs in the early stages and develop a strategic plan for project development as a whole. This becomes a framework for more detailed plans. All projects are then developed within the confines of these plans. Another way, therefore, of looking at planning is to consider the three layers in Figure 2.6 as bounds for planning: long-term, medium-term and short-term.

**Long-term planning** considers the objectives of the project and provides rough estimates of resources required to meet these needs. It will normally involve producing a mission statement for the project group, which should reflect the mission statement of the organization as a whole.

**Medium-term planning** concerns itself with the ways in which the long-term plan can be put into effect. It considers the present requirements of the organization

and the projects that need to be developed to meet these needs. Information about each potential project will be spelt out in detail, including the ways in which they address the overall strategic objectives of the organization. The ways in which the projects are to be related will be stated. Priorities for development will also be established, and again, these will reflect the long-term plan and mission statement. A planning document will usually be produced that shows the current situation along with an action plan for future development.

**Short-term planning**, perhaps covering the next 12 months, will provide a further level of detail. It concerns the schedule for change, assigning resources to effect the change, and putting into place project control measures to ensure effectiveness. As well as detailing the resources required for each project in terms of personnel, equipment, and budget, it will contain details of each stage in the development process as suggested in the systems development life cycle.

## 2.6 Project proposal and management support

REGARDLESS OF HOW well strategies are formulated and communicated, they need to be supported. The most critical support for any project is provided by top management. It is critical to obtain **management support** for projects at the time of proposal development and maintain that support throughout the project development life cycle. Initial management support must come through the recognition that the project is aligned with organizational goals and objectives. It is important that the project proposal clarifies how the ultimate outcome supports these goals and objectives. It is also critical that top management support does not wane as the project progresses. Such support is even more critical if a project is overdue and behind schedule, since that is the case with most projects.

A major element of good practice concerns **governance**. This is defined as the patterns of authority for key project activities in firms as well as in project management. It is important to plan comprehensively and apply governance arrangements. In cases where there is an executive steering committee, the committee charter must be spelled out in detail. There must be prudent checks and balances. Governance, particularly with respect to financial matters, auditing, and contract management must be clear. Proper governance relies upon proper communication.

But **communication** is a two-way process. The project manager is responsible for communicating project progress to stakeholders including top management. If a project is not making adequate progress or if a project runs into unanticipated difficulties (for example, sudden turnover among key team members) top management must be informed of the situation as early as possible. This proactive approach helps prepare management for eventual requests for additional resources. It also suggests openness on the part of the project manager and team members. It is important to realize that top management has to deal with a plethora of decisions only some of which relate to supporting projects. Project managers must try and minimize the element of surprise by providing timely, accurate, and relevant information.

Managing expectations is a challenging task for project managers. Expectations vary and

are not always easy to predict. Top management expectations differ from those of individual units. Changes occur in the work environment that may lead to changes in **functional needs** that in turn may lead to changes in expectations. This leads to an **expectation gap**, that is, the difference between what the project outcomes is expected to be and what it actually is. Timely, accurate, and relevant information about project progress helps reduce this expectation gap. It enables top management and other stakeholders to adjust their expectations based on new and current developments.

## 2.7 Public relations

IN THE PAST, duties and responsibilities of project managers were more narrowly defined and primarily included project activities, team performance, deadlines, and the like. In other words, the project manager and the project team worked to deliver what was planned for ‘on time and within budget’.

Increasingly, this scope has widened to include **constant communication**, **negotiation**, and **public relations** across functional areas. In the past, the list of stakeholders only included groups that were directly affected by or were involved with the project such as sponsors, team members, customers, and users. However, as we saw in 1.5, this list has broadened to include support staff, suppliers, and can even include opponents of the project. The project manager is responsible for communicating continuously with these groups and updating them about the status of the project and whether the project is making progress as planned.

As we will see in the next section, change management is an important aspect of the project manager’s role. Other abilities that help with these challenging responsibilities include **organizational skills**, **leadership skills**, and **coping skills**. We will look at these in future chapters. All these help the project manager survive in increasingly integrated work environments where projects may affect productivity and the performance of other units and functions. Sometimes it impacts on the entire organization. **Organizational politics** is another factor that influences project selection priorities, funding arrangements, and eventually the outcome. The faith in a project is not decided by facts alone but also by convincing management that it aligns with the mission and helps organizational goals and objectives. Therefore, project initiators must be persuasive, consistent, and flexible. Experienced project managers recognize the importance of organizational networking and public relations.

Most large scale projects involve multiple functions. Team members of these projects have different backgrounds and loyalties. They belong to functional areas that may or may not benefit from the proposed deliverables. The project manager must work with these individuals and must keep a good relationship and good communications with their functional managers. Often, individuals who work on a project are evaluated and rewarded not by the project manager but by their functional manager. This obviously makes the situation more complicated for a project manager because of reduced influence over these team members. Good relationships with functional managers will help the management of these team members.

## 2.8 Change management

THERE ARE MANY themes to project management, but one that needs to be high on the agenda throughout concerns how we manage change. Inadequate attention to **change management** is a primary reason for project failures. Indeed, change management should be part of the strategic planning process, not merely just an afterthought event. People's long-term roles, responsibilities and reporting structures, as well as the way processing is handled and functions are carried out, will sometime change as a result of the new project.

Change management is another dimension added to the responsibilities of the project manager. Constant negotiation and communication is essential for the success of these inter-organizational activities. That is why communication is ranked very high on the list of skills for project managers. The project manager must make sure that information that is communicated to stakeholders is accurate, timely, and relevant. Too little or too much information can prove to be dysfunctional. Individuals tend to pay less attention when they feel information provided to them is repetitive or redundant.

One approach to dealing with change is called **force field analysis**. In this approach understanding of the change process is gained by identifying the forces working *for* and *against* the change being successful by analyzing the change from the point of view of people, resources, time, external factors and corporate culture and formulating a change strategy that is a good fit with these forces. The change can be **transformational**, that is, quick and dramatic, or **incremental**, that is, a much more gradual process. The latter is normally preferable as it allows time for training, reflection, adaptation and consolidation, but sometimes transformational change is necessary because of environmental circumstances (government requirements or quick response to a competitor's move, for example). Transformational change processes may encounter greater resistance. As previously suggested, all people need to 'buy into' the plans and this requires everyone being fully trained, to give one practical example. But this 'buy in' is also reflected in the organizational culture.

The organizational culture will impact on strategies for planning the project. Charles Handy suggests that there are four types of organizations. In those where power is **centralized**, the project manager needs a member of the power base to sponsor or champion the project. In a **bureaucratic** structure, it will be difficult to effect the change without following the rules and norms of that organization. Some organizations are more **individualistic**, and consensus is needed. Change is likely to be easiest to implement in organizations where project **teams** work on tasks as the norm.

Many organizations have undergone total change through a process referred to as **business process re-engineering (BPR)**. Firms undergoing BPR look at all aspects of the company and change many if not most aspects, sometimes 'reinventing' the company in another market, with a different product mix, processing methods, and staff. It is inevitable that new projects will be required in these circumstances.

However, in general, change is easiest to implement in organizations where *change is the norm* in the organization. In such **organic organizations**, people accept change, indeed embrace it, and regard it as a positive thing. Although a project might be a 'one-off'; change is not. Successful change and change strategies should be replicated elsewhere in the organization so that there is a

diffusion of best practice. Repeated change seems to be part of modern life and essential for business survival, partly due to globalization and the widespread use of communication technologies.

We will return to the issue of change management in different guises throughout this book, because it is so inter-connected with project management.

## 2.9 Interview with a project manager

### Interview

**Q** WHEN you started with the company did they expect any type of project management?

**“T**hey expected us to manage the project but not like they do today.”

**Q** CAN you clarify what you mean? How is it different today?

**“W**hen I started with computers, I would go in with a sales team and we would discuss what computers did, and they would benefit a business. Since computers were still fairly young, we had to do more than just sell the product. We had to set the computers up for installation, program them, and train the customer’s employees on how to use them and more. Now when we sell the product to people they have teams that sit down and figure out how to put these systems in with minimal disruption to the end-user. Back in ’72 we just sort of put the machines in; we didn’t sit down and figure out how long it would take using charts like we do today. The company just expected to finish when we got done.”

“Today, we have to show progress to managers and customers. They want to see charts showing expected completion times. They want to know how much disruption they should expect. They want all sorts of details. You simply

cannot make the sale without having some idea as to how the project should be managed.”

**Q** WOULD you say then that project management has become more than just a tool used by project managers?

**“A**bsolutely, I would say that if people expect to be successful in whatever field they are in they must learn at least the basics of how project management works. If they don’t, they’re in for a tough time. For example, if you and I went to XYZ corp. trying to sell them some widgets, let’s say for \$10 million. If you walk in and show XYZ management how long it will take you to install the widgets, and what phases they can expect you to be in at different times of the project, and I walk in with nothing more than a sales pitch of what widgets do, then you will certainly get the sale over me. Project management is a skill and it puts managers’ minds at ease. They like to know where everything is at any given time, especially when dealing with large sums of money.”

**Q** WOULD you say that interpersonal communication is a key part of project management?

**“I**nterpersonal communication is the key to project management. It may

## Chapter summary

be the most important part of it. The software will keep you on track with scheduling, but you'll get nowhere if you can't communicate with people what is required out of them and/or their departments."

**Q** AT what point in time do you think a project has finished successfully?

**“U**sually, it becomes apparent that a project is finished because all the tasks are completed on the list. If we finish our project within budget, and on time we call the project a success. If we have been forced to crash a project, meaning we were forced to maybe add more money in order to finish the project on time or finish early, then we go back and look at two things before we call it a success. Did we make money and did we meet the new deadline? If the answer to both of these questions is yes then we still call it a success. Although, we will return to the project later and try to identify what caused us to have to crash the project in the first place.”

**Q** IF you could offer one piece of advice concerning project management to students, what would that be?

**“L**earn it! You will use it more than you think, and it applies to so many areas that no matter what you find yourself doing, you will use it. You don't have to be an engineer or a scientist to use project management. It will only make you more valuable to your company and to your customer.”

ARGUABLY THE MOST important factor influencing the management decision to fund or not to fund a project relates to whether the project is aligned with the strategic mission of the organization and whether it supports organizational goals and objectives. Organizations define their existence through a mission statement. Goals and objectives collectively define what needs to be done in order to accomplish the mission. Strategies help map out how to operationalize goals and objectives. Projects are tools that make goals and objectives happen. It is therefore important that projects are selected based on what they do to help organizational goals and objectives become reality. This broadens the responsibilities of project managers in that they need to coordinate activities across functional areas, negotiate and obtain support from top management, be mission driven, communicate and maintain a good relationship with decision makers and other stakeholders, and so on. Stakeholders need to work together towards a common objective, requiring a 'buy in' to this common goal through good communications, training and other means. In addition, project managers are responsible for delivering project deliverables on time and within budget. Project management success has much to do with the change management process as a whole, and this in turn depends to a large extent on how the organization has effected change in the past.



## Discussion Questions

- a) What comes first, business strategy or project planning (or are they developed together)?
- b) The ultimate question about any project is linked to whether it meets specifications and whether it is done within specified resources. What is the best strategy that helps accomplish this objective?
- c) How might you encourage all the stakeholders to 'buy into' both the high level strategy of the organization and each of the development projects?
- d) It is suggested that an integrative approach to project management is important in today's environment. An integrative approach includes two parts. First, projects must have a strong link to the organizational strategic plan, which is directed toward meeting the customers' needs. This linkage is reinforced by a project priority plan, which prioritizes projects by their contribution to the strategic plan and allocates resources based on this priority plan. Second, an integrative approach provides an integrated approach within a socio/cultural environment for the actual implementation of the project. This creates a positive and active environment for the team members responsible for completing the project. Discuss pros and cons of an integrative approach to project management.
- e) This chapter suggests that the expectation gap can be addressed and improved through timely, relevant, and accurate information. Discuss how information overload or redundant information might affect the expectation gap.
- f) You are on the steering committee in your organization that approves funding support for projects. You have been asked to analyze and recommend two of the three project proposals that have been proposed for development by user departments. Proposal 1 intends to improve inter-organizational communication. Proposal 2 intends to improve information security and privacy. Proposal 3 intends to improve customer satisfaction. Your preliminary analysis of these proposals suggests:
- All three proposals support organizational strategy in different ways.
  - Sufficient expertise and resources exists to support any of these projects.
  - Economic, political, and environmental reasons exist for each proposal.
  - The three user departments feel strongly positive about their proposals.
- What steps would you take to make a recommendation and to rationalize your decision?

## Exercises

- a) Search the project management literature on the web and find what you can learn about the history of project management. How did it start? When did it start? Who used it first? And, so on. Prepare a short presentation describing your findings.

- b) For an organization of your choice, sketch out lists of long term, medium term and short term plans concerning projects.
- c) Search the project management literature in the library or on the web and write a short paper about ethical issues of project management. Conclude your paper with a paragraph about your own opinion and describe why ethical issues are (or are not) important to project management success.
- d) Search the web for examples of 'mission statement' and 'goals and objectives'. Compare the two and describe how they differ.
- e) Write an exam question based on the content of this chapter. Ask the person sitting next to you to provide you with an answer to your question. Share with the class your question and the response and point out whether you would agree with the response or not. Give reasons for your answer.

### Important Concepts

**business process re-engineering (BPR)**

(pg. 32)

**change management** (pg. 32)

**expectation gap** (pg. 31)

**force field analysis** (pg. 32)

**four types of organizations** (pg. 32)

**goals and objectives** (pg. 27)

**governance** (pg. 30)

**incremental change** (pg. 32)

**long-term planning** (pg. 29)

**management support** (pg. 30)

**medium-term planning** (pg. 29)

**mission statement** (pg. 27)

**operational strategies** (pg. 29)

**organic organizations** (pg. 32)

**planning approaches** (pg. 29)

**short-term planning** (pg. 30)

**strategic planning** (pg. 25)

**transformational change** (pg. 32)

### Bibliography

Avison, D., Powell, P., Wilson, D. (2004) Using and Validating the Strategic Alignment Model, *Journal of Strategic Information Systems*, 13, 3, pp. 223-246.

Edwards, B. (1989) Project sponsors: their contribution to effective IT implementation. In: *The Oxford/PA Conference*, Templeton College, Oxford.

Gary, C.F. and Larson, E.W. (2000) *Project Management: The Managerial Process*. Irwin McGraw-Hill.

Handy, C. (1995) *The Gods of management: The changing work of organizations*. Arrow.

Jurison, J. (1999) Software project management: The manager's view, *Communications of the Association for Information Systems*, Vol. 2(17).

Marchewka, J.T. and Keil, M. (1995) A Portfolio Theory Approach for Selecting and Managing IT Projects. *Information Resources Management Journal*, Vol. 8, 5-14.

McFarlan, F.W. (1981) Portfolio Approach to Information Systems, *Harvard Business Review*, Sept-Oct.

Papp, R. (2001) *Strategic Information Technology: Opportunities for Competitive Advantage*. IGI Publishing.

Strassmann, P. A. (1997) *The Squandered Computer: Evaluating the Business Alignment of Information Technologies*, Information Economics Press.

Torkzadeh, G., Chang, J. C. J., and Hansen, G.W., "Identifying Issues in Customer Relationship Management at Merck-Medco." *Decision Support Systems*, Vol. 42(2), 2006, pp. 1116-1130.



# 3

## *Defining Project Scope*

### **Themes of Chapter 3**

- How can we determine requirements?
- How can we prioritize?
- How can we produce a scope statement?
- How can we cope with change requests as the project develops?
- How can we develop a work breakdown structure?

## Introduction

**D**ETERMINING EXACTLY WHAT CUSTOMERS AND SPONSORS OF A PROJECT need is not always easy. Experienced project managers save a great deal of time and effort down the road by spending time upfront specifying the project expectations as clearly as possible. A **scope statement** goes a long way towards establishing this objective. It becomes a means of communication with all stakeholders; particularly team members, clients, and sponsors. It is possible that some changes to the requirements will become necessary as the project develops. The project manager must plan and manage change within the broad scope of the project. This chapter describes what the project scope is and why it is important to define it carefully before any project activity starts. It describes how to develop and manage project scope. It describes how to develop a useful work breakdown structure, an important step in any project development. It also describes how to plan and manage change, if and when it is necessary. We first look at the question of stakeholder requirements as these issues reflect on all the topics of this chapter.

### 3.1 Requirements definition

**THE DEFINITION OF requirements** can be problematic, but it can be said to be a balance of what can reasonably be provided between everything that relevant stakeholders want from a project on the one hand and the various cost, time, and other resource constraints on the other. Issues associated with identifying, gathering, analyzing, documenting, and communicating requirements are at the heart of project management. Incorrect requirements, changes to requirements, misunderstood requirements, and many other requirement problems are an ongoing problematic theme. Requirements are obviously important because they determine what the project will do and, to some extent, how it will do it. They are also important because of the costs in both time and money of getting requirements wrong. According to Dean Leffingwell, requirement errors account for between 70 and 85% of rework costs. Further, a number of studies exist that suggest that the costs of fixing errors at the planning stage are around 80–100 times less than if an error is discovered at the later controlling stage.

It is not easy to define requirements early. At the beginning, stakeholders may only have a vague notion of what the project should achieve. Worse, these notions will vary between stakeholders. These problems need to be resolved, and the resolution process is difficult and time-consuming and may involve interviews, meetings, surveys, workshops, prototypes, storyboards, and so on. Traditionally, a specification was then fed back to the stakeholders (or their representatives) for agreement and they ‘signed off’ on the specification document that was then ‘frozen’. If the project was delivered to the stakeholders matching this specification, then the project could be deemed a ‘success’. Unfortunately, the term ‘success’ may be misleading.

Since the time of client sign-off, the environment may have changed so that the approved specification may no longer be appropriate. Further, the stakeholders may not have fully understood the issues at that early stage, and they may have been ‘signing in the dark’. Some stakeholders may not have been willing to devote much time to the project at that early stage and paid ‘lip-service’

to participation, whilst others may have been so interested in the project that they suggested large and inappropriate ‘wish lists’ that became firm deliverables. Further, stakeholders may have been inconsistent, and the compromises reached might have led to inappropriate decisions.

Clearly, changing and evolving requirements create a problem for the requirements process. Requirements can and do change while the project is being developed, and this is a major issue because the specification may have been ‘frozen’ at client sign-off.

However, the designers of the scope statement need to go from general requirements to **measurable objectives**. As one of our referees put it: *‘(This process) cannot be just touchy-feely’*. It is very desirable and even necessary for there to be a strong underlying understanding of the project with specific and measurable objectives before completing the scope statement, because the scope statement is the blueprint for the work breakdown structure. This process will require back and forth communication until the scope statement is finalized.

The traditional requirements process also embodies an assumption that requirements are conceptually possible to ‘discover’ from stakeholders. However, some requirements are so complex and so obscure that they are not easy to capture in this way, no matter how diligent and hard-working the participants. Further, terms like ‘reliable’, ‘available’, ‘flexible’, ‘easy-to-use’, and so on are often difficult to specify to the project team in meaningful and measurable ways. Also, if the project is of a strategic type, requirements will be much more difficult to ascertain than they are for standard efficiency projects.

One response might be to try to build *flexibility* into the ‘philosophy’ of the project manager so that the requirements are flexible, the nature of the change process is flexible, and the project itself is flexible. But even if this is feasible, there are likely to be trade-offs; for example, between flexibility and other characteristics. These trade-offs may be with political realities within an organization, complexity, efficiency, effectiveness in relation to particular objectives, ability to combine with other projects, and other factors.

Flexibility is nearly always seen as a ‘good thing’. It appears to have three broad advantages:

- It improves the **quality** of internal processes in ways that may offer a variety of performance improvements. Advantages accruing might include higher staff morale.
- It may give firms a **competitive edge**, for example, through the speed of response to an unexpected increase in sales orders that other firms could not meet.
- It is part of the **‘survival kit’** of an organization. It may be that a measure of flexibility is necessary in a turbulent world: ‘be flexible or cease operating’.

As a number of writers have noted, the acquisition of flexibility is not without costs, and these costs need to be compared with the likely benefits. In this section, we have illustrated the difficulties inherent in only one aspect of project scope. This provides a useful backdrop to the discussion on project scope, as a whole, and the procedures that follow.

## 3.2 Project scope

THE PRINCIPAL QUESTIONS for any project relate to *where* you want to go and *how* you intend to get there. Both questions are equally important. However, without a clear understanding of the first question, there will be little or no progress made on the second one. It is equally important for project managers and team members as well as clients and sponsors of the project to have the same understanding of what the project intends to accomplish. The convergence between these two understandings is critical:

- For obtaining support throughout the project development life cycle.
- For effective allocation of resources during the project development life cycle.
- For the success and final evaluation of project outcome.

A **project scope statement** is critical for obtaining support because it gives sponsors confidence that the developers know exactly what the project is expected to accomplish. It is important for effective allocation of resources because it helps developers plan expenditures according to what is needed and saves time and energy by eliminating/reducing features that have little value to the client. The success of any project is closely associated with meeting client expectations and client expectations are closely tied with the client needs specification. Therefore, it is important to understand the cause-and-effect relationship between these two aspects of ‘what’ is to be done and ‘how’ to accomplish it.

The project scope specifies outcome as it relates to client expectations. It defines the limits of the project, and within that, it describes deliverables for the client. An experienced project manager values a scope statement and spends time upfront to define the mission of the project clearly. The project scope is the source for developing the project plan, and that in turn, becomes the guide for project execution. There is a clear association between a good **project plan** and a clearly defined **project scope**. Research studies report that a successful project is more likely to have a clearly defined scope statement. It is also reported that a poorly defined project scope statement leads to inadequate project planning.

The project manager is responsible for developing the project scope but should do so through close collaboration and interaction with the client. The scope clearly describes deliverables that should be both *realistic* and *obtainable*. They should also be *measurable*, where appropriate, as vague and poorly described scope statements not only do not help project planning and execution but also become sources of confusion. As mentioned earlier, both project developers and recipients must be clear on what the project intent is and what the deliverables are. The project scope statement is published and shared by the project manager and the client and is a source for measuring progress and quality of the project. The project scope specifically includes the following four aspects:

### 1. The overall objectives of the project based on customer needs.

This is essential as it provides a legitimate background for the rest of the document. For example, consider a firm that wants to integrate the inventory systems of all its suppliers with its own, and make the system accessible through the web. The overall objective of

this system can be stated as “*the development and implementation of a web-based inventory system that integrates all suppliers within 18 months at an approximate cost of 100,000 dollars.*” This statement makes clear what is expected, when it is expected, and at what cost.

## 2. The specific deliverables in support of the overall objectives.

The overall objectives act as a base for the development of a list of deliverables. **Deliverables** may be expected during the development life cycle or at the completion of the project. If a project specification defines deliverables to include, for example, a prototype of the system at an early stage, then delivery of the prototype system is expected before the development of the actual system. Other usual deliverables for projects include the development and delivery of manuals, development and implementation of training programs, and testing of the final product.

Every deliverable must have a time, cost, and specification associated with it. In other words, the outcome must be delivered on time, within budget, and as specified. Specifying cost and time for deliverables that are due during the project development life cycle informs sponsors and top management of the likelihood that the entire project will be complete on time and within budget.

Consider our example of the prototype system as an early deliverable. If this prototype system takes significantly longer than expected to develop and costs significantly more than what was initially estimated, then the management may need to decide whether it is viable to continue with the project or necessary to abandon the idea. Based on the list of deliverables, it may be necessary to reevaluate the entire project plan and reallocate resources to obtain a timely outcome. Deliverables are also used as a basis for assigning responsibilities and evaluating performance. Deliverables often become bases for setting project milestones.

## 3. The milestones that help control quality and monitor progress.

A **milestone** is a point in the life of a project when a significant piece of work has been accomplished. It indicates a major event in the project development life cycle. The milestone is a clear aid for the project manager in determining whether the necessary progress is being made and if the whole project is on schedule for completion. Once the deliverables of a project are defined, then milestones are developed that point towards achieving those deliverables.

For example, consider a company that sells outdoor gear and sporting goods through retail stores and chains. A system has been proposed for this company that would replace the current sales function with an online version, eliminating face-to-face contact with customers. This proposal has been evaluated through a cost-benefit analysis (*see chapter 4*) and has been determined to meet organizational goals and objectives.

A prototype of this system has been included as part of the system development life cycle. The development of this prototype system is an example of a milestone. Once client feedback and experience with the prototype system are gathered and used to modify project plans, activities begin for the development of the actual system. Another milestone can be

set for when the actual system is developed and is ready to be tested. The next milestone can be set for when the system is tested, modified, and ready for implementation. A training and implementation phase can be considered, the end of which is seen as another milestone. The final milestone can be set for when the project is administratively closed. These milestones should be easy to recognize by all team members and sponsors. Milestones indicate a logical point in the development life cycle of the project and an appropriate point in time when progress can easily be assessed. Setting milestones is critical to the quality control process as well as to progress assessment, especially for large systems.

#### 4. The resources that are needed to complete the project.

The list of **resources** could be divided into three main components: human resources, facilities and equipment, and organizational resources. **Human resources** refers to the talent and skills of the project team members. The project scope must describe special talents that are required for project success. For example, individuals with language skills may be included as project resources. Examples of **facilities and equipment** may include high-speed communication channels or specific testing tools. **Organizational resources** can be critical, especially when multiple functions and departments are involved or when outsourcing or other collaboration with outside organizations is necessary.

An experienced project manager foresees unique requirements and special resources that are critical to the fulfillment of the project objectives and includes them in the project scope. Extensive demand for system training time may be necessary for large and complex projects. Client departments are usually reluctant to free up large groups of individuals for training for an extended period of time. In such cases, organizational support may help these client departments with their human resource needs (for example, by hiring temporary help).

These four components define (a) what the project is about, (b) what it intends to accomplish, and (c) what it needs in order to accomplish its goals. They help to set the boundaries for the project and, in that sense, protect the project manager from excessive demands or unrealistic expectations. Additional statements can be added to the project scope to limit the project manager's responsibilities to within reasonable boundaries. These **exclusion** or **exemption clauses** also help the customer develop realistic expectations. These clauses are similar to a disclaimer that communicates to the customer what should or should not be expected from the project. Examples of statements of limitations include the extent and length of training programs or system maintenance.

It is important that the customer agrees and signs off on the scope statement. One practical way to achieve this is to get all stakeholders to sign or initial the scope statement and, in that way, confirm what is agreed upon by all. If necessary, the project manager must go over issues with the customer to make sure the focus of the project and its objectives are clearly understood, and that the customer will be satisfied with the deliverables. By doing this, the project manager makes one more attempt to form realistic expectations with the customer. The project manager must also make sure that the customer understands limitations and exclusions that are included in the project scope, as they influence expectations in the same way that deliverables do. In summary, the development of



project scope provides a useful forum to eliminate misunderstandings at the early stage of the project development life cycle and to create a document that is used to clarify future questions.

The scope statement should be short and to-the-point but cover important issues, as described above. The scope statement may vary depending on the size and the type of the project. In most cases, the scope statement is between one and three pages. Most companies use a document known as a **project charter** to formally support the project and to authorize the project manager to start planning activities. The project charter is often about one page and includes the following items (an example project charter is shown as Figure 3.1):

- Title of the project
- The sponsor or sponsors of the project
- Name of the project manager
- Project start date
- Project objectives
- Project costs and resources
- Due date for project completion

Project title: Migration from legacy systems to People Soft  
Project sponsors: OIT Support Services  
Project manager: Misty Blue  
Start date: November 1, 2010  
Project objectives: Migrate all systems to People Soft for all employees within 24 months. See attached page for the list of eligible employees.  
Project cost: Budgeted \$250K for labor costs and \$1500K for software.  
Completion date: November 1, 2012  
Comments: We expect Dew Berry and Jap Napa from Instructional Development Office to work on this project. See attached for the list of team members.

Figure 3.1: Example project charter

A project charter does not replace the project scope statement and it is not always used. Some companies authorize project responsibilities more informally through verbal communication. However, when a project charter is written, it provides a basis for the development of the project scope. As described above, the project scope is more comprehensive than a project charter. As we see in the next section, the project scope is operationalized through the development and implementation of the **work breakdown structure**.

### 3.3 Work breakdown structure

THE WORK BREAKDOWN structure is an important document for project management in that it defines specifics for each part of the project in terms of what needs to be done, who is responsible for that task, how much it costs, and when it is due. The work breakdown structure (WBS) breaks down the entire project into manageable pieces. Each piece is a work unit assigned to an

individual or individuals to be done within the allocated time and budget. As we see in Figure 3.2, the work breakdown structure looks somewhat similar to an **organizational chart**.

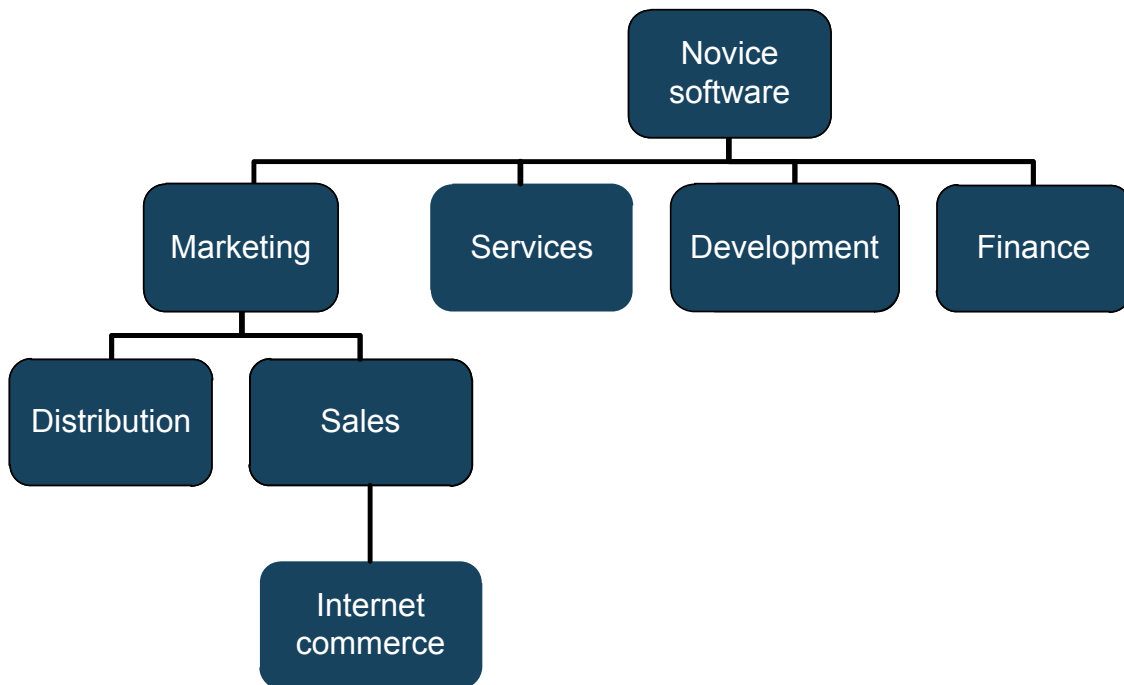


Figure 3.2: Company organizational chart

A quick glance at an organizational chart will tell you the number of divisions or departments that exist in that organization, the hierarchical relationship between those divisions (divisions and subdivisions), the title and responsibility of each division (for example, services, marketing, and sales), the person in charge of each division, and the size of each division (number of employees in that division). This is a generic description of an organizational chart and some organizational charts may provide more information. However, there is a tradeoff between the amount of information included in an organizational chart and its usefulness as a quick ‘big picture’ reference source.

A work breakdown structure works in a similar way to an organizational chart in that it provides an overview of how the project is broken down, who is responsible for which part, and so on. Consider a simple project that has the objective to develop a webpage for a small business. You may break this project down to three phases of design, develop, and implement and further define activities for each phase, as shown in Figure 3.3.

A quick look at this simple breakdown of the webpage project, as listed above and depicted in Figure 3.4, shows the three main parts to developing this project as well as the list of activities for each part. It also provides the hierarchical relationships between main activities (design, development, and implementation) and sub activities (needs analysis, software selection, and review).

Further information on due dates for each activity as well as who is responsible for each activity can be provided in a table (see Figure 3.5). Each activity can be referred to by the number associated with it (for example, 2.1, 3.2) to allocate costs or add measures of quality and assessment.

1. Design phase
  - a) Needs analysis determined through interviews with the business owner and employees
  - b) Review and selection of software
2. Development phase
  - a) Purchase software
  - b) Write programs and test
  - c) Review the product with client
  - d) Make revisions based on feedback from client
3. Implementation phase
  - a) Select server site
  - b) Obtain permission
  - c) Install and test

Figure 3.3: Work breakdown structure

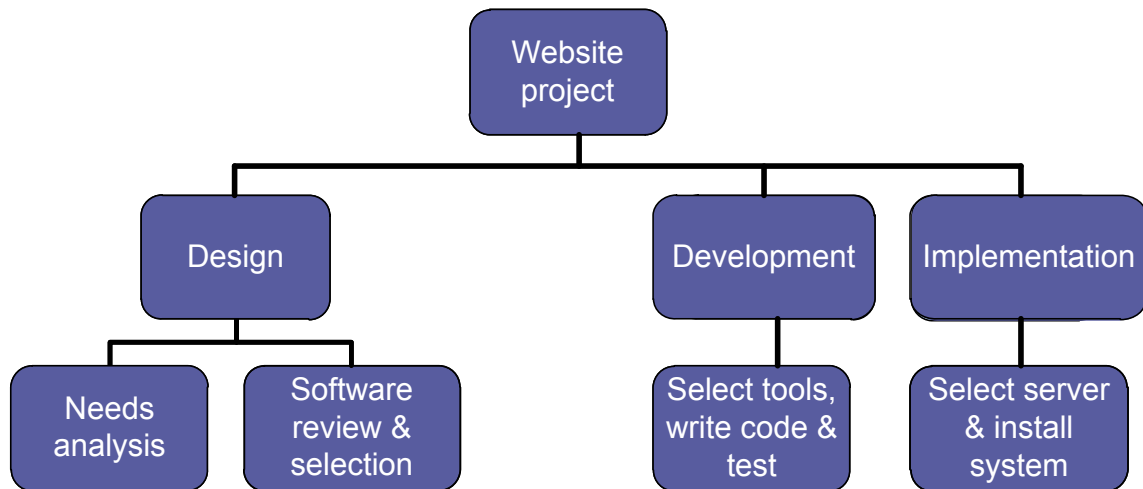


Figure 3.4: Breakdown for Webpage Project

Phase	Activity Description	Due date	Team member
1. Design	1.1 Needs analysis	2 days	Greg
	1.2 Software selection	2 days	Fred
2. Development	2.1 Purchase software	1 day	Fred
	2.2 Write program	4 days	Matt
	2.3 Review with client	1 day	Matt
	2.4 Make revisions	1 day	Matt
3. Implementation	3.1 Select server	1 day	Jennifer
	3.2 Obtain permission	1 days	Jennifer
	3.3 Install system	2 days	Matt

Figure 3.5: Webpage project task and responsibilities

The same information can be given in a tabular form with the same numbering system, giving the information in hierarchical form (see Figure 3.6). Levels of hierarchy are identified by the numbering system as well as the indentation level. Level 1 in this work breakdown structure represents the main activities of design, development, and implementation. Level 2 in this structure represents activities such as *needs analysis*, *write program*, and *select server*. This work breakdown structure also shows level 3 items for the ‘design’ activity. The numbering system with its levels and sub levels, depicted in Figure 3.6, is sometimes referred to as a **WBS coding scheme** and is used for reference purposes. Accounts, budget, and cost information for each activity are identified using these numbers. This coding scheme helps communication, documentation, and accuracy of information. It is, in effect, used for project and work unit identification.

1. Design
  - 1.1. Needs analysis
    - 1.1.1. Define owner needs
    - 1.1.2. Define client needs
  - 1.2. Software selection
    - 1.2.1. Define system needs priorities
    - 1.2.2. Survey available software
    - 1.2.3. Recommend software choice
2. Development
  - 2.1. Purchase software
  - 2.2. Write program
  - 2.3. Review with client
  - 2.4. Make revisions
3. Implementation
  - 3.1. Select server
  - 3.2. Obtain permission
  - 3.3. Install system

**Figure 3.6: Hierarchical information for Webpage Project Task**

A word of caution is appropriate here. Most systems projects go through several changes before they are complete. It is possible that clients may change their minds, project outcome may be needed sooner than initially planned, priorities may change due to reorganization or cost saving ideas, and the like. When a change is made in a level or a work unit number, all records must be updated for consistency. Frequent change makes this task more difficult. Further, since the project manager and team members are often preoccupied with deadlines and project progress, they may ignore or forget the documenting of changes. Fortunately, project management software packages like Microsoft Project will automatically adjust any changes throughout the WBS document (just as a spreadsheet program will work out all the repercussions of a single change to the whole worksheet).

### 3.4 Work breakdown structure as a management tool

THE WORK BREAKDOWN structure provides management with a tool to monitor and evaluate cost, time, and quality. Consider the example webpage project described earlier. Management can allocate and control cost for each phase or, if necessary, for each activity. In a large project, the project manager can appoint a key individual to be responsible for each phase of the project, and in turn, these key individuals will allocate tasks and activities to team members who report to them. In that way, management does not need to be concerned about each sub activity and management is not expected to know the details of each sub activity. Individuals must be given responsibilities that correspond with their competency and experience.

Large and complex projects involve more activities, resources, and communication and therefore need a more elaborate work breakdown structure, which corresponds to the project scope. There is no hard-and-fast rule to determine how many levels are appropriate in a work breakdown structure. As a rule of thumb, however, the lowest level in a work breakdown structure must be easily defined as a **work unit** or **work package**. A work unit or a work package should be easy to assign to an individual and easy to evaluate. In the example of our webpage project, *review and selection of software* is a work unit. It is easy to understand what it is, how long it might take to complete, the extent of the resources it might take, who might be a good candidate for the job, and whether or not it is successfully performed. A well-defined work unit should be possible to complete within a week or two. If it takes too long to complete a work unit, it might be necessary to further break down that work unit.

Work units identified by the work breakdown structure document are useful to the project manager for quality control purposes. Again, consider the work unit, review and selection of software, in our earlier example. It is relatively easy for the project manager to assess the outcome of this task. The outcome of this work unit not only identifies which software should be used but also describes how that decision was arrived at and the rationale for that choice. This would suggest to the project manager whether or not a wide range of software was considered and whether or not the reasons behind the selection include consideration of the overall project outcome, such as ease of use and maintenance.

Another benefit of WBS is that the quality can be checked at each work unit and, if necessary, adjustments can be made to avoid adverse effects on subsequent activities. If, for example, very few team members know about the software or if clients may ultimately have difficulty using that software, then it might be more cost effective to reconsider the decision to purchase that software in the early stage of the system development life cycle and choose another software solution. Therefore, each work unit defined at the lowest level of the work breakdown structure is a **control point** that assists with project management. Completion of work units is usually reported in reports and during meetings that are scheduled about once a week for progress status updates. Brief progress reports and meetings should be scheduled frequently so that adjustments can be made and quality can be controlled before it is too late or too costly to address these issues.

Each work unit usually includes a deliverable that makes it possible to allocate resources, define

time, and monitor progress. It is possible to have more than one work unit per deliverable and to have more than one deliverable per work unit. Some work units may include workers from different departments. In such cases, performance evaluations and monitoring of progress and quality is more challenging and may require further breakdown of the task. For small projects it may be more cost effective and practical for team members and individuals from different departments to participate in different work units.

In any event, a work breakdown structure must be developed with the outcome of the project in mind. In other words, the approach must be outcome oriented. Once the first draft of a work breakdown structure is complete, the project manager and team members should ask themselves, *'Does this WBS lead us to the desired outcome?'* or *'Is each work unit easily understood?'*, *'Is each work unit independent of other work units?'*, and *'Is it easy to monitor the progress for each work unit?'*. A useful and functional WBS has clear deliverables and leads the project to the specified outcome. The project manager must be outcome oriented and consider these issues as they design and develop work breakdown structures.

### 3.5 Work breakdown structure approach

THE DEVELOPMENT OF a useful and practical WBS is time consuming and challenging. This is particularly true for large and complex projects that involve multiple organizational units and include both internal and external entities. Experience is the most important asset in developing effective WBSs. Large organizations, such as the Department of Defense and Boeing, that regularly deal with projects use well-practiced guidelines that are suitable for their own purposes. Once a WBS is developed and tested through practice, it can be used as a generic version that, with minor modification, can be used for subsequent projects.

For a totally new system with no similar prior experience, project managers and team members often start either from the highest level and work their way down to the lowest level or start from the lowest levels and work their way up toward the overall project level. The first method is called the **top-down approach** and the second one is called the **bottom-up approach**. The top-down approach progressively refines activities, providing greater detail for each, until it reaches the level of work units. This approach is effective when the project manager can visualize the big picture and is able to identify key components to start the breakdown process.

The bottom-up approach is less structured. Team members, and sometimes clients, with ideas about activities that are necessary to complete the project will prepare brief descriptions of all possible work units. Next, these work unit descriptions are placed on a wall or a large board and, through an **iterative process**, the team will group them into several logical categories. These categories are then combined to create higher-level activities and to form the hierarchical information necessary for the WBS. This approach is time consuming and tedious but, because it involves broad participation and because it requires consensus-building among team members about work units and groupings, it provides valuable learning experience as well as commitment among participants. For an entirely new system, the bottom-up approach for developing WBS may be the more effective one.

One technique that can be valuable in documenting the bottom-up discussions (indeed can be

useful to document many complex situations) is **mind mapping**. This is often used to document the discussions before creating a WBS when confusion exists or the situation is particularly complex. Tony Buzan developed the mind mapping technique, which is based on the workings of the human mind. The technique adopts a holistic approach to note-taking and memory recall. Mind maps are simple to create. The main idea is first written in the center of a piece of paper. Branches are then added from the main idea and labelled with keywords. Creativity is the key for developing successful mind maps. The use of color, illustrations, and symbols assist in improving recall of the materials and details discussed. An example of a mind map is illustrated in Figure 3.7.

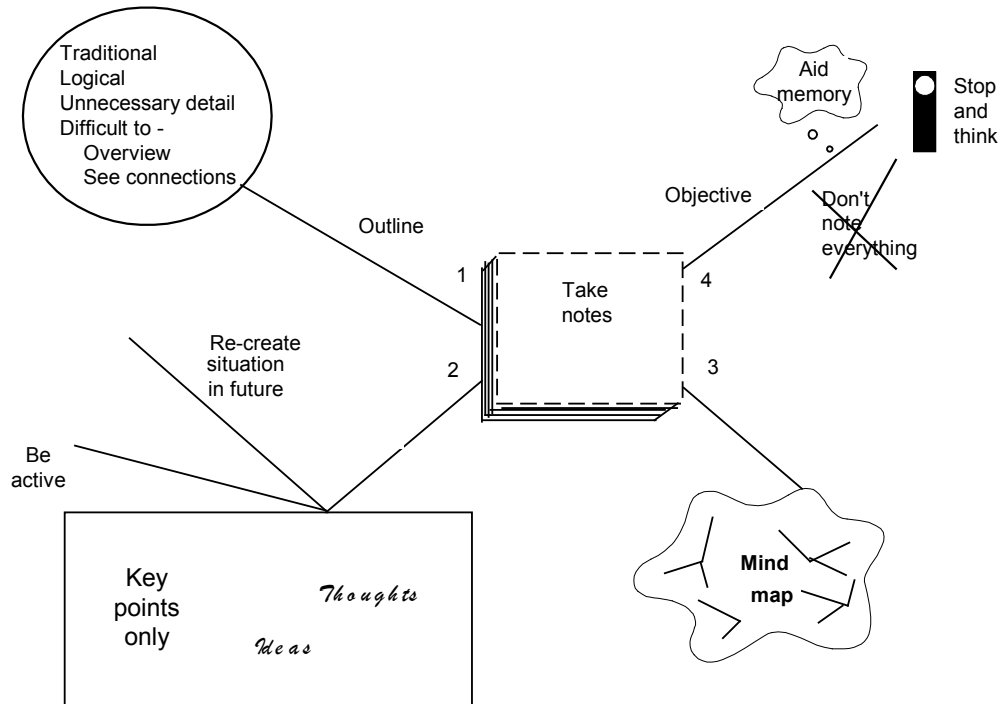


Figure 3.7: Mind mapping

The power and, yet, simplicity of mind maps has many applications beyond note-taking. Mind maps can be used, for example, in brainstorming sessions, project planning, structuring material to assist in report writing, and for the preparation of presentations. Mind maps are very flexible and one of their strengths is their ability to assist in the identification of relationships between concepts in the material.

In summary, it must be stated that developing practical and useful work breakdown structures is challenging and time consuming. Even experienced project managers will go through several iterations before they finalize a WBS. As stated earlier, there is no hard-and-fast rule about how many levels to have or which approach to use. Often experience is the best guide, but even that is not enough for unique and specific cases. The following check list, shown as Figure 3.8, can be used as a guide for developing an effective work breakdown structure.

- A work unit must be clearly defined and understood by those responsible for it.
- A work unit must be independent of other work units for ease of allocating cost and responsibility.
- Each work unit must have one person responsible for it even if multiple individuals work on it.
- The sum of work units must result in the project outcome.
- Involvement of the project team members in WBS development is essential to learning and commitment.

Figure 3.8: The WBS Checklist

### 3.6 Assigning responsibility

RESPONSIBILITIES ASSIGNED THROUGH the development of the work breakdown structure need to be documented and communicated. A simple tabular form can be used to do this. The partially complete Figure 3.9 illustrates key (principle) and support individuals for each work unit for the webpage project. A work unit, as described earlier, may have one or more individuals working on it. However, for ease of accountability and communication, there must be one person responsible for that work unit. The responsibility chart or table must include all work units identified in the WBS. For larger tables, symbols may be used to identify key individuals from support members or to add footnotes about specific roles or work units. In any case, the responsibility chart must be self-explanatory and easy to interpret.

Deliverables	Greg	Matt	Jennifer	Fred
Define owner needs	Principal			
Define client needs	Principal		Support	
Define system needs priorities		Support		Principal
Survey available software		Support		Principal
Recommend software choice				
.....				
.....				

Figure 3.9: Responsibility assignment for webpage project

In large projects, where there are very many work units, it might not be feasible to include all work units in one responsibility chart. Multiple tables and charts can be used in such cases to avoid information overload and confusion. However, there must be a logical grouping of responsibilities. One way is to break down the responsibility chart at higher activity levels (for example, level 1, level 2, etc.). It is also possible to use functions as a basis for the preparation of the responsibility chart. For example, important functions in a typical system project include requirement analysis,



prototyping, coding, testing, and so on. Consider testing of a large system that involves multiple sites and multiple client groups at each site. We can see that major functions can act as a basis for the development of the responsibility chart. The project manager must decide on a form of communication that is practical and easy and that is free from departmental politics.

Responsibility charts not only identify who is responsible for what but also suggest authority. Each member of the team that is responsible for a work unit needs to know the line of communication as well as the extent of their personal responsibility. This also helps coordination between work units. Lack of clarification on individual responsibility and authority is often the source of misunderstanding, poor coordination, and discontent. In small projects, where it is easy to see the entire project and it is clear what activities are needed, the responsibility chart may be sufficient, thus eliminating the need for the work breakdown structure: It is simpler, quicker, and does the job.

### 3.7 Structured walkthroughs

ANOTHER USEFUL TECHNIQUE that can be used, at any stage of the project, to ascertain views and point out errors is the **structured walkthrough**. This is a review of aspects of the project, and can be held at various stages of project development. Structured walkthroughs are intended to be team-based reviews of a product, but are not intended to be management reviews of individuals or their performances.

Walkthroughs are (normally) informal peer reviews of any product, for example the scope document. Normally the person responsible presents the product and she may herself raise areas of difficulty – it is not a process of ‘selling’ the product, but one of ensuring the best product is eventually produced by the process. As the document or other product is looked at in detail and step-by-step, the reviewers are expected to be critical in a positive way, providing feedback that will help in improving the product that is being reviewed.

If used at this stage, the team can have separate walkthroughs, for example, to see if all the requirements have been documented, that the project scope is realistic and obtainable, that the plan encompasses progress monitoring, that the resources committed to the project are appropriate, that the WBS is consistent, that there are no aspects omitted, and so on. These walkthroughs also provide an opportunity for the team to get to know each other.

The basic idea behind structured walkthroughs is that potential problems can be identified as early as possible so that their effect can be minimized. The benefits of this approach are seen in Figure 3.10.

Structured walkthroughs have been identified as being of considerable value in the development of projects, and they should be held on completion of certain phases of the development. It is impractical to hold formal walkthroughs too often, as it causes unnecessary administrative overhead. The best approach is to maintain the spirit of the walkthrough concept by having team members discuss all decisions with others without necessarily calling formal meetings. It is intended that this approach will normally promote discussion and the exchange of ideas within the team.

- The overall quality of each aspect of the project under scrutiny is improved, since more than one person is responsible for it, and the analysis and design are exposed to the scrutiny of others at every appropriate opportunity.
- There is the opportunity to detect errors earlier in the development of a project than might otherwise be possible, avoiding the errors propagating throughout the rest of the project.
- All team members have the opportunity to be 'educated' in the project, resulting in a much better understanding of the total project by a greater number of organizational personnel. This means that team members can take over work from each other more easily. Potentially, all stakeholders have the opportunity to familiarize themselves with the overall project as well as particular components.
- Technical expertise is communicated through discussion that is often generated as a result of a structured walkthrough. More experienced staff will spot common sources of potential problems and discuss these with other staff, thereby transferring their own knowledge and skills. This means that the relevant knowledge is dispersed more widely than would otherwise be the case.
- Technical progress can be more readily and easily assessed, and the walkthroughs provide ideal milestones and opportunities to do this.
- If carried out in the correct spirit and atmosphere, structured walkthroughs can provide an opportunity for less experienced people to gain experience and enable them to work on complex problems more quickly, due to their participation in walkthroughs with other more experienced team members and because of the opportunity of having walkthroughs done on their own work, where they receive specific comments and feedback in a non-threatening environment.

**Figure 3.10: Potential of structured walkthroughs**

For maximum benefit to be derived from the walkthrough, it is important that appropriate documentation is circulated well in advance of the walkthrough and that:

- Everyone attending is familiar with the subject to be reviewed.
- Each attendee should have studied it carefully.
- Minor points of detail are discussed before the walkthrough, so that valuable time is not wasted on trivial points.

Further, during the walkthrough it is important that:

- All errors, discrepancies, inconsistencies, omissions, and points for further action are recorded, so as to create an action list.
- One person should be allocated the responsibility of ensuring that all points from the action list are dealt with.

Formal walkthroughs should be attended by a number of team members because responsibility for the system is then placed on the whole team. All members of the team should be given the opportunity to contribute, from the most junior to the most senior. Walkthroughs are a very powerful technique and are most successful when they are carried out in an 'ego-less' environment; that is,

one in which the individual concerned with the particular activity does not feel solely responsible for it. The idea is not to criticize anyone but to identify any potential problems and resolve them as early as possible. It is important that all team members have responsibility for the overall project and the use of structured walkthroughs supports this.

### 3.8 Programs and projects

THE PROJECT IS frequently part of a much larger **program**, which consists of a number of integrated projects. For example, consider a program with projects related to pharmaceutical supplies, patient records, a call center, hospital bookings, a public website, and much more. This is obviously more complex than a single project because each project has to fit with related projects, like pieces of a jigsaw puzzle (Figure 3.11). Advantages include the single collection of data and the ability to relate information from different applications.

National Program for IT in Health

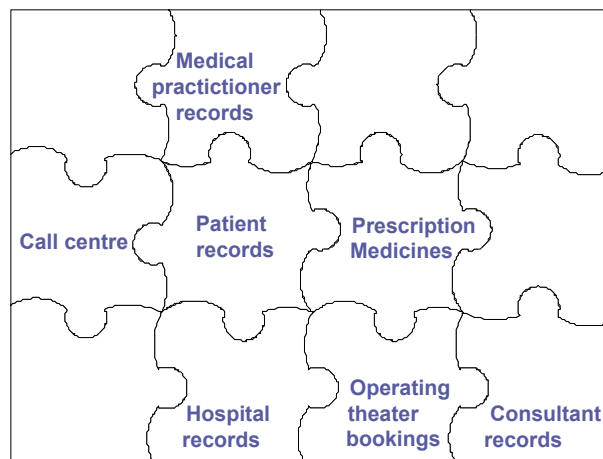


Figure 3.11: A program consisting of many integrated projects

In many senses, a program is a project, but will tend to be much more long-term (a project might be only of a few months' duration whereas the whole of a program may take five years or more to implement), and is large (consisting of the scale of a number of projects) and very complex (because the projects need to integrate).

This suggests that there will be an extra layer of project management activities, ensuring the overall program is coordinated and the overall program manager has an overview of each project and their project managers. We might call this overall view the **master plan**. Sometimes the projects are developed sequentially, but more often, some of the projects are developed simultaneously so that the task of the program manager is difficult. It is important that, once a project is finished, it is checked for quality not only as a 'stand-alone' project but also for compatibility with related projects, for the developers may be working on another project or may even have left the organization by the time the program is checked for quality as a whole. However, the basic material for the project manager described in this book also applies to the program manager.

### 3.9 Interview with a project manager

#### Interview

**Q** OF these (developing budgets, customer support, staffing, policies and procedures) what would you consider to be the most important?

“**D**efining the project is the most important, because, no matter what you are doing, if you do not define it correctly, you will end up with garbage. If you do not spend time designing something and developing it, you will not end up with the quality that you have hoped to.”

**Q** YOU said earlier communication is necessary and to what degree in Project Management?

“**I**t is very important. In some ways it might be more important than defining the project. You have to be able to define a project or a problem, but what good are you if you are not able to communicate to the user or your team. Regardless of who is involved, you must have communication skills”

**Q** WHAT types of qualities does a project manager have to have to be successful?

“**C**ommunication skills, adaptability, personable, intelligent, common sense, fiscally responsible or budget conscience, organizational skills are definitely a bonus, and you must be team oriented.”

**Q** WHAT is the most favorite part of your job?

“**W**hen someone brings you an issue and they want it to be done differently, actually being able to change it and make it to their liking. Project completion is my favorite part of my job because I know that I have accomplished something.”

**Q** WHAT is the least favorite part of your job?

“**B**eing asked repetitive questions on the same subject matter. Like when you have two passwords to log on to the network and then into the system. Explaining to users the same answer to the same question in different ways for them to understand gets very old.”

**Q** WHY do you feel project management is a necessary function?

“**I**f you do not manage the project, your team will be going in all different directions. If you do not manage the project, you will get the cart before the horse and it will wind up costing you more money in the long run.”

**Q** DO you feel project phases are necessary in planning a project?

“**Y**es, only to the extent of the size of the project. You must reevaluate

ate where you are from time to time. It cuts the project up into manageable pieces.”

**Q** WHAT advice would you give to someone who is interested in becoming a project manager?

“**T**he most important thing would be to find a mentor and learn the dos and don’ts of their career and see how they work for you.”

### Chapter summary

THE PROJECT SCOPE definition is an important activity in the project development life cycle. A well-developed project scope will help to achieve several important objectives: project planning, communication, resource allocation,

time and cost estimates, monitoring progress, controlling quality, and evaluating outcome. A good project scope defines project *objectives, deliverables, milestones, and resources*. The project scope becomes the basis for the development of the work breakdown structure. The work breakdown structure breaks the whole project into manageable pieces, or work units to be assigned to individuals, with specified cost and time allocations. The work breakdown structure represents a work map that guides project activities. It specifically describes *what needs to be done, who will do it, how much it costs, and when it is due*. Based on the WBS, a project schedule or network of activity is developed to ensure timely completion of work units. We will look further into aspects of this chapter when we discuss Project Evaluation and Review Technique (PERT).

### Discussion questions

- a) What are the challenges associated with expectation change and how can the project scope help shape expectations?
- b) Discuss the difference between the project charter and the project scope statement. Can you replace the project scope with a project charter?
- c) What would you do in cases where deliverables are difficult to define? Can you use milestones as deliverables?
- d) Discuss the role of work units in a work breakdown structure for quality control. How would you use work units to control for quality?
- e) This chapter suggests that ‘expectation gap’ can be addressed and improved through *timely, relevant, and accurate* information. Discuss how information overload or redundant information might affect the expectation gap.

### Exercises

- a) Describe a WBS and list its characteristics. How does a WBS differ from the project network? How are the two linked?
- b) Describe a project: define its scope, list major activities involved in that project, and develop a work breakdown structure for it.
- c) A good example of an event project concerns the organization of a conference

where you would need to coordinate many activities and be mindful of deadlines and commitments. Assume an international conference is to be held in your city in 26 weeks' time. Describe objectives, scope,

work breakdown structure, deliverables, milestones, and criteria for success.

- d) If available to you, use Microsoft® Project to develop a WBS using the information provided in Figure 3.6.

## Important Concepts

**bottom-up approach** (pg. 48)

**control point** (pg. 47)

**deliverables** (pg. 41)

**exemption clauses** (pg. 42)

**master plan** (pg. 53)

**measurable objectives** (pg. 39)

**milestone** (pg. 41)

**mind mapping** (pg. 49)

**organizational chart** (pg. 44)

**program** (pg. 53)

**project charter** (pg. 43)

**project plan** (pg. 40)

**project scope** (pg. 40)

**project scope statement** (pg. 40)

**requirements definition** (pg. 38)

**resources** (pg. 42)

**scope statement** (pg. 38)

**structured walkthrough** (pg. 51)

**top-down approach** (pg. 48)

**WBS coding scheme** (pg. 46)

**work breakdown structure (WBS)**

(pg. 43)

**work package** (pg. 47)

**work unit** (pg. 47)

## Bibliography

Avison, D., Fitzgerald, G. (2006) Information systems development: Methodologies, Techniques and Tools. 4th ed., McGraw-Hill.

Buzan, A. (2003) The Mind Map Book: Radiant Thinking - Major Evolution in Human Thought. BBC Active.

Clark, K.B. (1989) Project Scope and Project Performance: The Effect of Parts Strategy and Supplier Involvement on Product Development, Management Science, Vol. 35 (10).

Fowler, M., Scott, K. (1997) UML Distilled: Applying the Standard Object Modeling Language. Addison-Wesley.

Gary, C.F., Larson, E.W. (2000) Project Management: The Managerial Process. Irwin McGraw-Hill.

Hofstede, G., Hofstede, G.J. (2005) Cultures and Organizations: Software of the Mind, 2nd ed., McGraw-Hill.

Leffingwell, D. (1997) Calculating the return on investment from more effective requirements management, American Programmer, 10, 4, 13–16.

Schneiderman, A.M. (1999) Why Balanced Scorecards Fail, Journal of Strategic Performance Management, January, 6-12.

Turner, J.R., Cochrane, R.A. (1993) Goals-and-methods matrix: Copying with projects with ill defined goals and/or methods of achieving them, International Journal of Project management, 11.



# 4

## *Estimating Project Costs and Benefits*

### **Themes of Chapter 4**

- How do we estimate the cost of a future project?
- How do we estimate the time it will take to implement?
- How do we monitor progress?
- What can we do if things go wrong?
- How can we measure intangibles like added security or greater risk?
- What skill sets are important?
- Can we provide a broader view of our criteria?

## Introduction

The **triple constraints** of time, cost, and scope set boundaries for a project. The effective management of a project depends, to a large extent, on how well these constraints are defined, documented, and managed. Each of these constraints is a yardstick for monitoring progress and, ultimately, for measuring project success. Cost estimates provide a fiscal boundary within which a project is designed, developed, and implemented. Accurate estimates are critical to the decision making process. Management and project sponsors pay close attention to cost estimates in their decision to support a project and to evaluate its success. Experienced project managers take cost estimating seriously and plan for it carefully. This chapter first describes ways of assessing project value. It then describes several techniques and sources to help estimate cost. It describes important considerations that help project managers in their efforts to develop reliable cost estimates. Lastly, it looks at group decision support whereby computer software is used to support decision making based on qualitative, rather than quantitative, analysis.

### 4.1 Estimating costs and benefits

THE OVERALL COST of a project is a key determinant for management in deciding whether or not to support a project. This overall cost is based on the aggregated costs of the work units described in the work breakdown structure. The accuracy of a work unit estimate is a function of how well that work unit is defined and the knowledge and experience of the estimator. The work unit approach makes the process of cost estimating more manageable. It is easier to estimate and assign cost for a work unit rather than a large section of a project. However, there might be situations where the overall cost of the project is required for the initial decision, before the work breakdown structure and work unit analysis are done. In such cases, the project manager needs to provide estimates of the overall costs as best as possible and describe conditions that will influence the accuracy of those estimates. In other situations, some leeway regarding costs is accepted in the organization and, in others, renegotiation might be possible. But very often the first estimate is the one that the project manager has to 'live with'.

Some costs are considered tangible while others are described as intangible. Further, costs are classified as direct or indirect. These are all described below.

- **Tangible costs and benefits**

**Tangible costs and benefits** are easier to define and thus to measure. Consider, for example, setting up a computer network lab. This network will need monitors, micro processors, routers, switches, connectors, cables, servers, and the like. It will also need an operating system and various software applications. First, we need to determine the type of hardware and software that will best support the goals and objectives of the lab (as described in the project scope). Next, we need to determine the **vendors** that we want to purchase from. Some organizations use a list of authorized vendors that they usually purchase from and base this list on service, price, reliability, past experience, and the like. These vendors are then surveyed for estimates of hardware and software costs. Multiple



vendors may be surveyed and the average price may be used for cost estimates. Tangible benefits are also more straightforward to measure. For example, if a new system saves five hours per week per person for one hundred employees, then the total benefit for the year is 26,000 hours ( $5 * 100 * 52 = 26,000$ ). The benefit in monetary terms can be calculated by multiplying the 6000 hours by the average cost of workers per hour.

- **Intangible costs and benefits**

**Intangible costs and benefits** are more difficult to define and to measure. Consider, for example, a proposal to outsource certain services of an organization. While this might be advantageous in terms of cost savings and efficiency, it can also have disadvantages associated with it. It is easier, in this case, to estimate the tangible costs and benefits of this decision. For example, it is easier to compare what it costs to provide the services internally to the costs of the outsourcing option. However, outsourcing of those services may diminish organizational expertise and know-how in that area over time. Replacing such expertise is much more expensive if the organization later decides to reverse this decision and once again insource those services. However, it is difficult to estimate the replacement cost of such expertise and know-how. Other examples of intangible costs may relate to loss of control and security risks. Again, it will be very difficult to allocate dollar amounts for diminished control or information security. Examples of intangible benefits of insourcing include employee learning that adds to the know-how of the department and organization, or the increased satisfaction due to employee involvement in those services. While it is obvious that increased satisfaction is beneficial, it is difficult to assign dollar amounts to the incremental increase.

- **Direct cost**

Costs that are easily associated with a work unit are classified as **direct costs**. For example, if two individuals need to spend 10 hours each to accomplish a work unit, then these twenty hours are directly accounted for in the budget for that work unit. The project manager who is in charge of the entire project spends some of their time overseeing the progress of this work unit. Therefore, that portion of the project manager's time is also directly associated with this work unit and must be charged to the account for this work unit. There are other such costs that are usually prorated using percentages. These prorated costs include management costs, facility expenses, rental agreement costs, and the like. These costs are called **direct overhead costs** and usually are incurred for the entire project rather than a work unit. There are different ways of allocating these direct overhead costs to individual work units. One approach is to consider units of time spent on a work unit relative to the total time for the entire project. For example, if a project takes 20 weeks to complete and a work unit in that project takes 2 weeks to complete then direct overhead costs for that work unit are 10%.

- **Indirect cost**

**Indirect costs** are not easily associated with a work unit or a project. These include overall organizational costs that are incurred by all activities of the organization. For ex-

ample, if an organization spends one million dollars to enhance its image and credibility within the industry, the outcome of such expenditure is expected to benefit all units and functions of the organization. It is difficult to charge a portion of one million dollars to a project in one department that has a life cycle of only five years. Nevertheless, those dollars must be recovered by all activities of the organization. These indirect costs are often prorated. One approach to arrive at a cost percentage for a project is to consider the cost of the project relative to the overall administrative costs of the organization. Sometimes, the number of employees in a functional area as a percentage of the total number of employees in the organization is used for allocating these costs. To arrive at the relative cost of a project, the number of people working on the project is divided by the total number of people in that department. In any case, these cost allocations are subjective, relative to direct overhead costs.

## 4.2 Project value

IN THIS SECTION we look at three techniques that are used to estimate the **value of a project**, that is, the balance of benefits over costs (which can, of course, be negative).

### ◦ Payback analysis

**Payback analysis** is a frequently used financial approach for deciding whether or not a project should be selected for development. Most organizations would like to know how long it will take before their investment in a project results in a positive cash flow. *The payback period is therefore the length of time that it takes for a company to recover the amount of money invested in the project.* This will be the time after which the company starts earning from their investment. For short-term investors the payback time may be two or three years, whereas organizations with a longer strategic plan may be looking further into the future and are prepared to invest and expect returns in the long-term (usually seen as five or more years).

The payback occurs when the cumulative benefits are greater than cumulative costs. Consider two project proposals submitted by two departments for consideration and approval by top management. The first proposal (Project A) is for a system to track sales and advertising data and to produce reports and charts for the incremental sales increases that result from advertising expenditures. This system will help management determine the relative long-term impact on sales of print media, radio, and TV. The second proposal (Project B) is for a project that controls online communication between employees and customers and that reports frequency, duration, and outcome of such communication in terms of customer satisfaction and sales.

The projected cost and revenue for the next six years for Projects A and B are presented in Figure 4.1. For example, cost and revenue for Project A during the first year of development is \$20,000 and \$0, respectively, resulting in net cost of \$20,000. The first year numbers for Project B are \$25,000 cost and \$10,000 revenue resulting in a net cost of \$15,000. The total cost over the six year period is \$70,000 for Project A and \$85,000 for

Project B. The total revenue over the same period is \$120,000 for Project A and \$130,000 for Project B. The net benefit over the six year period is therefore \$50,000 for Project A and \$45,000 for Project B.

Project A	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
Cost	20,000	20,000	10,000	10,000	5,000	5,000	70,000
Revenue	0	0	30,000	40,000	30,000	20,000	120,000
Difference	(20,000)	(20,000)	20,000	30,000	25,000	15,000	50,000
<b>Cumulative</b>	<b>(20,000)</b>	<b>(40,000)</b>	<b>(20,000)</b>	<b>10,000</b>	<b>35,000</b>	<b>50,000</b>	
Project B	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
Cost	25,000	25,000	15,000	10,000	5,000	5,000	85,000
Revenue	10,000	15,000	45,000	30,000	20,000	10,000	130,000
Difference	(15,000)	(10,000)	30,000	20,000	15,000	5,000	45,000
<b>Cumulative</b>	<b>(15,000)</b>	<b>(25,000)</b>	<b>5,000</b>	<b>25,000</b>	<b>40,000</b>	<b>45,000</b>	

Figure 4.1: Payback Analysis for two Projects

Payback analysis suggests that Project A, having recovered its costs, generates benefit in Year 4 whereas Project B recovers cost and generates benefit in Year 3. Therefore, Project B is seen as a better investment given these results and using this technique. Notice that Project A generates more benefit in six years than Project B would. This analysis stresses *how quickly* costs of a project are recovered and how soon a project starts generating benefit; it does not take into account benefits over the life of the project, in this case a six year period. Some organizations have a fixed payback time beyond which they would not support any project development plan. In our example, if the organization requires a payback time of only two years, neither of these two projects would be approved. Some organizations use a payback period of only one year for IT projects, and projects that do not make this severe test are not pursued!

The length of payback is influenced by organizational culture, strategic plans, top management decision patterns, or simply economic data. The payback for information technology investment, for example, is relatively shorter than it is for other technologies where the rate of change is not as great. With rapid changes in information technology innovation and development, organizations are concerned that the technology they are investing in may quickly become obsolete. This results in expectations of quick results. However, large and complex systems development projects require long term commitment, and expectations of quick results may not be in the long term interests of the organization. Many projects seen as *'strategic'* rather than *'operational'* may be of this type.

This poses challenges for project managers to convince top management that in some cases the long term projection of results is necessary. They need to explain why a 'quick

return' policy may not always be in the company's best interest for long term viability. The well-known cases of the frequent flyer program by American Airlines and the direct ordering system by American Hospital Supply are good examples of long term strategic decisions that involved significant cost and time commitments and resulted in important long-term competitive advantage. This does not mean that organizations should not expect a speedy payback in some cases. In fact, specific projects designed to respond to well-defined problems should normally recoup expenses quickly.

◦ **Net present value**

**Net present value (NPV)** is another approach that is often used to evaluate the expected monetary gain or loss of a project. It is based on the calculation of expected cash flow. Projects should reflect positive cash flow to be considered for development and the higher the positive cash flow, as calculated by NPV analysis, the more likelihood of gaining support for the project's development. *This approach uses a rate of interest to calculate the present value of the future cost and benefit for a project.* The rate of interest used is based on the cost of capital. In other words, how much would the company earn from its capital if the company were to invest that capital elsewhere.

**The formula for calculating NPV is:**

$$NPV = \sum_{t=1 \dots n} A/(1+r)^t$$

where t represents the year of the cash flows, A represents the amount of cash flow each year, and r represents the discount rate. Using a specified rate of interest, this formula sums up the present value for the number of years that estimates have been made. For example, at 15 percent, the present value of \$3,000 cost projected for the third year of a project is \$1972.50, calculated as:

$$\begin{aligned} & \$3000 * 1/(1+0.15)^3 \text{ or} \\ & \$3000 * 0.6575 = \$1972.50 \end{aligned}$$

Let us consider another example. The present value for \$2000 projected value in the third year for the same project and with the same interest rate is \$1315.03, calculated as:

$$\begin{aligned} & \$2000 * 1/(1+0.15)^3 \text{ or} \\ & \$2000 * 0.6575 = \$1315.03 \end{aligned}$$

The net present value for the third year cost and benefit for this project is a negative amount of \$657.47 ( $\$1315.03 - \$1972.50 = -\$657.47$ ).

The sum of this calculation for estimated cost and benefit for all years represents the present value for the project and is used to make a decision. Most spreadsheet packages (such as Microsoft Excel) have a function to calculate NPV. However, it is useful to see the process and understand the discounted amount of one dollar for a given interest rate. To calculate the NPV for the two projects presented in Figure 4.1, we can first calculate the **discount factor**, the present value of one dollar, for each year and use that to calculate the present value for the projected cost and revenue amounts given in Figure 4.1. The discount factors for this example are shown in Figure 4.2.

Year	Formula	Discount factor
1	$1/(1+0.15)^1$	0.8696
2	$1/(1+0.15)^2$	0.7561
3	$1/(1+0.15)^3$	0.6575
4	$1/(1+0.15)^4$	0.5718
5	$1/(1+0.15)^5$	0.4972
6	$1/(1+0.15)^6$	0.4323

Figure 4.2: Discount factors for six years at 15%

Using the discount factor and the cash flow information (difference between revenue and cost), we can calculate NPV for Project A, as shown in Figure 4.3.

$$\begin{aligned} \text{Year 1} &= .8696 * (\$20,000) = (\$17,392) \\ \text{Year 2} &= .7561 * (\$20,000) = (\$15,122) \\ \text{Year 3} &= .6575 * \$20,000 = \$13,150 \\ \text{Year 4} &= .5718 * \$30,000 = \$17,154 \\ \text{Year 5} &= .4972 * \$25,000 = \$12,430 \\ \text{Year 6} &= .4323 * \$15,000 = \$6,485 \end{aligned}$$

$$\text{NPV (Project A)} = \sum_{t=1}^n A/(1+r)^t = \mathbf{\$16,705}$$

Figure 4.3: Estimating the net present value

Following this process, we obtain an NPV of \$20,176 for Project B. Therefore Project B gives a better present value for the company based on these calculations. All else being equal, the NPV analysis suggests that Project B is a better option for development even though Project A generates more cash inflow (\$5,000) by the end of year six.

◦ **Return on investment**

**Return on investment (ROI)** is another financial measure that is used to decide the relative worth of a project. *Return on investment is calculated as discounted benefits minus discounted costs divided by discounted costs multiplied by 100.* For example, a 20% ROI means that if you spend one dollar this year, it is worth one dollar and twenty cents next year. To calculate the ROI for this example, you need to divide the net income by investment that is  $(120-100)/100 = 0.2$  or 20%. The higher the ROI the better is the choice.

Figure 4.4 and Figure 4.5 show the ROI calculations for Project A and Project B respectively. These analyses suggest that Project A and Project B provide similar ROI (33.8% versus 33.1%). It might be necessary to consider other factors about these two projects since it is difficult, in this case, to make a decision solely on the basis of ROI.

Year	Factor	Revenue	Disc. Rev.	Cost	Disc. Cost
1	0.8696	\$0	\$0	(\$20,000)	(\$17,392)
2	0.7561	\$0	\$0	(\$20,000)	(\$15,122)
3	0.6575	\$30,000	\$19,725	(\$10,000)	(\$6,575)
4	0.5718	\$40,000	\$22,872	(\$10,000)	(\$5,718)
5	0.4972	\$30,000	\$14,916	(\$5,000)	(\$2,486)
6	0.4323	\$20,000	\$8,646	(\$5,000)	(\$2,162)
<b>Total</b>		<b>\$120,000</b>	<b>\$66,159</b>	<b>(\$70,000)</b>	<b>(\$49,455)</b>

Figure 4.4: ROI analysis for Project A

$$\text{ROI for Project A} = (66,159 - 49,455)/49,455 * 100 = 33.8\%$$

Year	Factor	Revenue	Disc. Rev.	Cost	Disc. Cost
1	0.8696	\$10,000	\$8,696	(\$25,000)	(\$21,740)
2	0.7561	\$15,000	\$11,342	(\$25,000)	(\$18,903)
3	0.6575	\$45,000	\$29,588	(\$15,000)	(\$9,863)
4	0.5718	\$30,000	\$17,154	(\$10,000)	(\$5,718)
5	0.4972	\$20,000	\$9,944	(\$5,000)	(\$2,486)
6	0.4323	\$10,000	\$4,323	(\$5,000)	(\$2,162)
<b>Total</b>		<b>\$120,000</b>	<b>\$81,047</b>	<b>(\$85,000)</b>	<b>(\$60,872)</b>

Figure 4.5: ROI analysis for Project B

$$\text{ROI for Project B} = (81,047 - 60,872)/60,872 * 100 = 33.1\%$$

A word of caution is appropriate here. There is a risk in using a single measure to evaluate the potential contribution of a project. While some organizations want projects to have a fairly short payback period and, as a result, put more weight on the payback analysis for their decisions, they should still consider net present value and return on investment. However, some organizations put a limit on the payback period and would not consider projects that do not meet that criterion. Similarly, some organizations use a minimum rate of return on investment as a criterion for selecting projects. There are advantages and disadvantages to having rigid standards. Advantages include consistency in the approval process, ease of communicating selection criteria, a rapid evaluation process, less politics, and so on. Disadvantages include lack of flexibility for professional judgment, fewer innovative proposals by employees because they are not sure if their ideas will satisfy criteria, and the like.

### 4.3 Resource estimates

ALL THREE METHODS described earlier rely on the estimates presented in Figure 4.1. Cost and benefit estimates for any project are always subject to variations and adjustments. Therefore, some discretion is prudent, especially for close results such as the ROI results presented earlier for

Projects A and B. Estimates are critical for allocating resources, monitoring progress, controlling quality, maintaining team moral, awarding merit, and ultimately ensuring project success. There are several ways of obtaining estimates and most estimates are based on experience, documentation, expert opinion, or a combination of these sources. Each of these methods has advantages and disadvantages.

**Experience** is a valuable source for obtaining estimates. It incorporates different dimensions, such as the culture of the workplace, the pool of talent, the history of inter-organizational cooperation, and human resource policies. It can also be affected by organizational culture and the top management's decision-making style. In some cases, individuals giving estimates tend to overestimate cost, time, and other required resources. This is partly due to the fact that most projects tend to be behind schedule and over budget. Individuals react to this reality and tend to give 'safe' estimates. Further, a study of 'human nature' would suggest that individuals who expect to be involved with the project development process might 'pad' their estimates because it will appear to lighten their work schedule and deadline. If only those individuals who are expected to work on the project provide estimates, then the overall cost and time estimates could turn out to be much higher than the actual figures.

**Documentation** is frequently used as a source for obtaining estimates, especially in environments where project development activities are more formalized and projects are administratively closed. Documentation is considered a very useful source when it is relatively current and when it describes similar cases. To the extent that it deals with the actual events of a project, documentation is free from bias and offers an advantage over estimates that are obtained from individuals. However, with increasing developmental costs, documentation can quickly become dated, although information on relative cost and time for activities within a project is still useful. When using documentation for estimates it is important to consider events and situations that may have changed. This might include new laws, new equipment, changes in working hours, and the number of holidays and vacations.

**Expert opinion** is also a widely-used source for obtaining cost, time, and other estimates. Internal expert opinion has similar pluses and minuses to those discussed under experience. Outside expertise can provide potential benefits in the form of broader experience and reduced game-playing. Also, this source is often used for new and innovative projects where little internal expertise is available. However, it might be limited, since outside experts may not have a good understanding of the organizational culture. Obtaining estimates through outside expertise is more formalized and costly when compared with the two approaches described earlier. Outside experts and consultants often require internal visits and ask for more information as part of their work. Confidentiality is an important issue that management must consider when outside experts are sought, especially for the development of strategically important projects.

**Scenario planning** is also widely-used in projects where there is a greater element

of risk. Scenario planning looks at different views of what the future might turn out to be and, therefore, enables the factoring in of many potential outcomes and estimates. This will be discussed under risk management.

Again, it is prudent to use a combination of these approaches for situations where highly innovative projects are considered or where significant resources are involved. For example, using a combination of internal and external expertise has the advantage of knowledge and information about organizational culture (internal expertise) and broad experience (external expertise). As described earlier, overestimation can happen, especially when individuals giving estimates expect to be involved with the project development. Underestimation can also occur. It happens where the same people who propose a project are involved with providing estimates and, in their eagerness to obtain approval for their project, they underestimate time and cost. Obtaining accurate time and cost estimates is an important skill set for successful project managers. The deliberate falsification of estimates is not only unethical but unwise, as the project management will be seen as either unethical or incompetent. However, accurate estimation is not easy.

Issues of overestimation and underestimation pose challenges to the process of project selection. It is important to establish guidelines not only for proposal development in general but also for obtaining time and cost estimates specifically. Guidelines could suggest that supporting material should be provided that details estimates and how the estimates were arrived at. Track records for project activities and individual performance provide a historical backdrop for managers to use to adjust their expectations and provide a firm basis from which to make decisions accordingly. For example, managers in an organization may regularly ask project initiators or proposal developers to adjust their estimates by a certain percentage. Of course this practice prompts those initiating an idea or developing a project proposal to overestimate or underestimate cost and time accordingly. This cycle creates game play and a non-productive environment.

But even the apparently simplest of estimates can, in reality, be difficult to make. To take one example, the contributions of colleagues will, of course, not be the same. A person-hour contribution from one worker will almost certainly be different from that of another. But most calculations are based on the assumption that the contributions from equivalent status workers will be the same. Further, in many circumstances the composition of the team will be determined by others and imposed on the project manager, and team members will differ in their effectiveness and individual efficiencies.

Organizational politics and game play are counter-effective and often result in poor estimates and wrong decisions. It is important to establish clear and realistic guidelines and to communicate them to all employees. Project selection committees or individuals should follow these guidelines and be consistent in their analysis and in granting awards. It might be necessary to reward project teams and project managers who provide accurate estimates and complete their projects within time and within budget. While game play has two sides to it, as described earlier, it is the responsibility of management to discourage it. Game play and politics are associated with organizational culture and organizational culture is closely associated with the management decision-making style.



## 4.4 Multiple estimates

OBTAINING GOOD ESTIMATES is challenging and difficult. It is easier to obtain estimates of work units and individual activities than for the project as a whole. Therefore, estimates should be gathered using a **bottom-up approach** and should start after individual work units are determined and defined. The exception to this is when a quick and rough estimate of the overall resources for a proposed project is sufficient for an initial decision. These are situations where time is very constrained or the project idea is so tentative that it does not currently warrant spending a great deal of time to obtain detailed estimates. In such exceptional cases, the management gives some idea as to how rough an estimate is necessary for their initial 'go or no-go' decision during the conceptual stage.

It is easier for experts to provide estimates for well defined and specific tasks. It is easier to define work units if the project scope is clearly developed. Estimates that do not involve memory recollection are more accurate. If it is difficult to estimate time and cost for a work unit, it might be useful to revisit the definition and the expected outcome for that work unit. The involvement of team members and individuals who will be working on project activities is important in obtaining estimates. Their involvement normally leads to an increased accuracy in estimates as well as commitment to the project. This also encourages estimates from people who are the most knowledgeable about a task.

In many cases **multiple estimates** of activity cost and time are strongly recommended. The same expert can be asked to provide a range of estimates for a project activity that includes **the best case scenario**, **the worst case scenario**, and **the most probable scenario**. Weights can be assigned to each of these scenarios to obtain a more realistic average. For example, the best and the worst scenarios may be assigned one point whereas the most likely scenario may be assigned several points (frequently four). Alternatively, different experts can be asked to provide estimates for the same activity. Again, weights can be assigned to these estimates depending on what we know about the experts, their past estimates, and their knowledge and experience. In any case, efforts must be made to match the tasks with the skills of those giving estimates.

In cases where multiple estimates are obtained, average scores as well as the variance are used for decision making. The smaller the variance for a set of estimates is, the more specific the results. Where there is a large divergence between estimates, it is prudent to provide for **contingency resources**, especially in cases where there is little or no flexibility in deadlines. We can calculate 'upper limit' and 'lower limit' measures of a project's duration by using the average score and the variance. Let us assume that you have collected three estimates for each of the 27 activities of a project in your organization. Your calculations suggest an overall estimate of 165 hours for the entire project and a standard deviation of 29 hours. Assuming plus and minus 3 standard deviations, you can obtain the results shown in Figure 4.6.

This suggests that there is a very high probability that the entire project will be complete within 78 to 252 hours. This range suggests that the project completion time may be over extended or under extended by about 53%. More discussion on the probability of completing a project on time is given in the chapter on Time Management (Chapter 5).

The project upper limit	$(3 * 29 + 165) = 252$ hours
The project lower limit	$(-3 * 29 + 165) = 78$ hours
Upper limit as % of estimate	$(252/165)100 = 152.73\%$
Lower limit as % of estimate	$(78/165)100 = 47.27\%$

Figure 4.6: Taking contingency factors into account

## 4.5 Phase estimating

IN SOME CASES, estimates are possible only for the initial phase of the project and the projections of cost and time for the subsequent phases depend on the outcomes of the earlier phases. It is unrealistic to obtain estimates for the entire project when there is a great deal of uncertainty associated with the design of the system, with the outcome, or with the final product. In such cases, detailed estimates are only made as the project progresses. This process is called **phase estimating**. Phase estimating can be based on the project development life cycle; initiation, planning, development, implementation, and closure.

In other words, detailed estimates of cost and time are made for one or two cycles at a given time, and rough estimates are generated for subsequent cycles. An example of phase estimating may be a three-stage projection of resources: the first one covers initiation and planning, the second one covers development, and the third and final one covers implementation and closure. After completion of one phase, detailed estimates are provided for the next phase, and the process continues until the entire project is complete. Any approach to estimating cost and time, including the multiple estimate approach, can be applied at each stage when detailed projections are necessary.

Phase estimating suggests that project owners and sponsors must commit to a project with incomplete information about how much it might cost and how long it might take, and that is rarely an easy situation. Information on project resources is important to project sponsors, as they decide whether or not to support a project. It is a challenging job to convince sponsors, especially conservative-minded ones, to support a project without any certainty about its final cost. Incomplete information also makes project managers uncomfortable, as it will lead them to provide incomplete or inaccurate estimates for projects that involve a great deal of uncertainty. Inaccurate or incomplete estimates create credibility issues that affect future support.

Phase estimating is an appropriate response to such situations. The project manager must convince the sponsors and other stakeholders as to why this approach is necessary. It is important to point out that the project sponsors have the option of terminating support after each phase if they are not satisfied with the current progress. In other words, their support for subsequent phases is conditional upon satisfactory progress of the ongoing phase. The sponsor does not have to make commitments to parts that they do not have estimates for and the project manager does not have to provide estimates that may be unreliable. Both parties potentially benefit from this 'compromise' approach.

## 4.6 Practical considerations

ESTIMATES ARE USED to make decisions, to prepare schedules, to negotiate contracts, to set goals, to evaluate performance, to request funding, and so on. Expectations are based on estimates. Project stakeholders, including the project manager, would like to have and to work with accurate estimates. While they can be based on realistic means and methods, estimates do not replace actual numbers. Events happen, technology advances, biases creep in, and priorities, goals, and objectives change. The project manager and team members should make every effort to obtain and report accurate estimates. They should be consistent in applying their methods to obtain estimates and should report to the stakeholders their methods of preparing estimates as clearly as possible. Any hint of secrecy in describing why a certain methodology is used will erode the *credibility of the estimates*, and *those preparing the estimates*, in the mind of the customer.

The strengths and weakness of the methodology should also be clearly explained. It is not as important to apply a method that is prominent as it is to apply a method that is appropriate. The project manager must be able to articulate the reasons for using a certain method of estimating cost and time. It is also important to specify the time horizon for estimates. Cost estimates for equipment, software, expertise, and the like may change quickly and, if the estimating process takes too long, the project manager may need to review and adjust estimates that were obtained early in the process. Further, a **learning curve** may become a factor when estimating time and cost for repetitive activities. The assumption here is that repeating the same activity over and over results in less and less time and cost for that activity. However, the learning curve results depend on the learning ability of the individual and the nature of the task. Of course, there is a limit to how far one can improve a process or learn to do an activity faster. Based on experience, estimates for repeated activity are adjusted.

Estimates should be free of extreme projections. In other words, estimates must be based on **normal conditions** and free from extreme case assumptions. For example, a normal shift includes eight hours and there are holidays and vacations that team members are entitled to. When you estimate that a project may take up to 8 weeks to complete, it is understood that you have considered a 40-hour week schedule and thus a total of 320 hours, assuming no Federal or State holidays fall within those eight weeks. Any deviation from the norm must be described and justified. Exceptions to normal conditions are critical as you develop a network of schedules for project activities. Consistency is also very important in the use of time units. Once the unit of time (hour, day, week, or year) is specified for the project, it must be used throughout. Smaller projects often use days or weeks as their units of time while larger projects use months or years.

- **Contingency planning**

It is not unusual in project development to expect out-of-the-ordinary situations. In fact, it is prudent to consider and plan for extreme or extraordinary situations. An appropriate way to prepare for extreme situations is through the use of a **contingency plan**. When necessary, contingency situations are described and **contingency funds** are appropriated for them at the planning phase of the project development life cycle. Contingency planning involves a careful analysis of the situation. It is necessary to document and com-

municate to the sponsors what is meant by a contingency situation, how it is identified, how it is assessed, and how it is mitigated. Simply put, adding a margin to estimates of cost and time to cover contingencies is not convincing. In fact, such an approach can be counter effective and indicative of poor planning. It may even be interpreted as add-on 'slush money' by watchful sponsors.

Contingency funds are not normally directly accessible to the project manager. The authorization to spend contingency funds is normally placed with management. This could be looked at as an additional layer of protection for the project manager because someone else, or a committee, will have to assess the need for releasing these funds. The project manager can request a release of funds for extraordinary situations, as specified in the contingency plan.

◦ **Risk analysis**

In reality, events rarely happen as planned or as expected. Costs may be over what was budgeted for and, as described earlier, contingency funds are appropriated in response to unexpected cost hikes. Similarly, time estimates can be seriously over or under projected. Any significant over or under time estimation raises the question of whether the method used was appropriate or not. A **risk analysis** of estimated times is appropriate when there is uncertainty regarding activity duration. It is necessary to identify and point out the level of risk associated with each activity. Risk analysis is part of a careful process for obtaining estimates. It is a useful way to communicate possible delays to the stakeholders, especially the project sponsors, to help them form realistic expectations.

A logical consequence of risk analysis is that it leads to developing alternative responses for use in cases where potential risks are realized. While it may not be necessary to spend a great deal of time and effort in preparing a full-blown alternative schedule for risks that have some likelihood of happening, it is very useful to think about such possibilities and be prepared. The fact that the project manager and team members consider risks, analyze them, and try to determine the likelihood that they will happen, prepares them for alternative responses. As seen in Figure 4.7, risk analysis serves multiple purposes.

- To identify possible risks
- To predict the likelihood of risks happening
- To estimate the potential impact of risks
- To communicate risks to stakeholders
- To prepare alternative responses.

**Figure 4.7: The purposes of risk analysis**

Depending on the nature and size of a project, these outcomes may be more or less formalized, more or less extensive, and more or less detailed. Risk analysis may actually result in a change in the schedule if the likelihood of events happening and their impact are great. Sometimes a risk may become more evident as the project progresses. If that happens, and

the risk is considerable, change may become necessary. A process for dealing with changes to requirements should be in place to evaluate change proposals and to determine whether any changes should be made and how the changes should be implemented.

◦ **Managing changes to requirements**

Some projects undergo several changes before they are complete. One of the main reasons for change is the fact that projects are proposed and approved based on estimates. Modern project management is a process of *constant negotiation, communication, and adjustment*. Change is often beneficial; innovative ideas or suggestions are often made by team members and individuals who are directly involved with the project. Change may also become necessary for external reasons, such as change related to the competition, vendors, and the law. All of this suggests the need for an approach to manage changes in requirements. A **requirements change committee** or group can facilitate and encourage these proposals. This committee usually includes stakeholders from the entire organization, and its responsibilities are shown in Figure 4.8.

- Establish guidelines for submitting proposals for changes in the project
- Develop and communicate criteria for the evaluation of proposed change
- Evaluate and approve change
- Ensure compliance.

**Figure 4.8: Responsibilities of the requirements change committee**

This committee should ensure that proposals for change are consistent with the overall goals and objectives of the organization and the broad scope of the project. This committee must also ensure that the change is doable. It is important to respond to change requests in a timely manner, especially for time-sensitive changes. The change management committee should provide, in their processing guidelines, a time limit for responding to time-sensitive changes. It may also provide a provision to process and decide on smaller changes more quickly. A proposal to change a project drastically, to the extent that the original scope is altered, might lead to cancellation of the current project and the start of a new one. Some changes may be significant and require additional resources. With the approval of management, these additional resources can be provided for through contingency funds. However, not all organizations are so enlightened and, in some, the project manager may have to live with the original estimates. In all organizations, much work needs to be put into making these estimates as accurate as possible.

## 4.7 Software and group decision support systems

IN THIS SECTION, we introduce ways in which computer software can support the project manager. One of the most important techniques for supporting project management is **Program Evaluation Review Technique (PERT)** and **Critical Path Method (CPM)** – the most widely-used for scheduling, monitoring, and communicating time aspects of projects – and is discussed

in the chapter on Scheduling and Time Management (Chapter 5). Another important tool is *Microsoft Project*, which is often sold independently even though it is an option for the *Microsoft Office* suite of programs and has the same 'look and feel' as other Office programs.

Earlier in this chapter, we showed how *Microsoft Excel* might be used to support the financial calculations used to assess project investment, such as net present value techniques. **Spreadsheets**, such as Excel, are often used for financial metrics and analysis of financial models and so may well be incorporated for simpler cost justification procedures. These are tools for decision makers, and decision makers of all types and all levels, in one way or another, use such tools to analyze, rationalize, formalize, and make decisions. A spreadsheet is one of the most popular decision tools because it enables the decision maker to ask 'what if' questions and to be able to change and modify variables in a decision model in order to evaluate the relative impact of each variable on the resultant outcome. Spreadsheets are easy to use, readily available, and often included in a suit of software, such as Microsoft Office.

**Simulation** programs are also decision tools that enable decision makers to formulate and build a decision model and to be able to analyze results and outcome. More complex computer simulations include probability estimates for variables that are included in the model. Monte Carlo simulation, for example, is a mathematical method that predicts the probability of possible outcomes for a given situation. Software such as *Simulink* (and *MathWorks* as a whole) and *Solver* will perform computer simulation in situations where practical testing and experimentation will be too costly or too risky.

Newer decision tools, or as they are often called **business intelligence software**, integrate functions of earlier tools and are intended to analyze current situations as well as forecast future trends. An example of these newer decision analysis tools is *Crystal Ball*, a suite of Microsoft Excel-based applications. Other decision analysis tools include *iDashboards* and *Profit Metrics*. These newer decision tools are particularly useful in situations where there is uncertainty and the need to forecast. They use predictive models and consider uncertainties and constraints in their solutions. Although it is possible to use spreadsheets to simulate a situation or to build a forecast model, it is more difficult and less flexible to do so. These newer decision tools have easy-to-use interfaces, provide graphical output, and are comparatively easy to combine and integrate with outputs from other tools, such as spreadsheets and databases.

Another new tool is *SimProject*, which is a web-based project management simulation tool that enables a project manager to break down a task into several milestones (just as *Microsoft Project* would), and it allows the user to monitor project progress and make adjustments based on what is learned about the project at any point. It also enables the user to provide qualitative and quantitative feedback at each milestone. The system provides simulated reports at each milestone that are useful for communication, interaction, and learning purposes. These reports are used by the team to make adjustments for the remaining activities of the project. In that respect, the system provides a dynamic environment conducive for learning as well as improving decisions.

As with any decision tool, it is important for the decision maker to (a) understand the tool and its functions, (b) be familiar with the data used by the tool, and (c) understand the industry and the

business environment in which the decision is being analyzed and made. *Crystal Ball*, for example, uses Monte Carlo simulation techniques with probability assumptions to forecast possible future outcome. These probability assumptions are also used to calculate Six Sigma figures to eliminate defects and variance levels of an activity within a set of events. These probability assumptions relate to revenue, costs, profits, and the like and will require intimate knowledge of the business as well as the industry. Although decision analysis tools vary in their power of analytical techniques, user friendliness, functions, and so on, they are equally affected by the quality of data they use.

Most of our discussion in this chapter has focused on estimating aspects of the project which are measurable, though we have discussed some intangibles and estimates using expert opinion and experience. We now turn to methods of gaining this advice by using software to support the human interaction. Very often it is advisable, when using expert opinion, to have more than one person provide estimates, as it is not an exact science and experiences and experts will differ. Obtaining a consensus might be a better basis on which to judge these qualitative decisions than relying on the views and experience of only one person. There are computer packages available that support such group or team decision making. Of course they can be appropriate for any group decision making and not just estimating project costs and benefits.

Much, indeed most, project work is carried out by a project team; that is, a group of individuals working in collaboration. Software tools are now available to support group work. And, this software takes many different forms. Some people might include email in this category, for example, because it can be used for information dissemination, though email systems have very limited groupware facilities. However, email might form the main medium for communication and decision making in groups.

*Lotus Notes* is a well-used group support system that places emphasis on communication between group members. It enables the documentation, sharing, storage, and access of information. It can be used to display the historical conversation that evolved over time between team members and that led to a particular decision. One example of its use might be to communicate 'notes' on viruses, which can be displayed on a bulletin board for all the project team. The calendar can be used to coordinate schedules of physical and virtual meetings. In general, Lotus Notes can be used to help inform members of the project team about progress in real time as well as stimulate that progress.

While there are sophisticated **collaboration suites** and **groupware** available on the market, a combination of some basic web or software applications may fulfill the same role. As mentioned before, some people may consider email as a group support application. If we add such electronic media as electronic mailing lists, newsgroups, instant messaging, internet forums, and wikis to the list, we will not be far from attaining a complete collaboration suite. Indeed, open source movements have been using these successfully as their only means of collaboration for a long time. Many low-budget project teams, especially those with geographically dispersed members, have been pursuing the same practice, since most of these tools are freely available on the internet.

The collective discussions about design, specification, and development issues are held on a members-only forum or newsgroup where each subject takes the form of a discussion thread, and

everyone can contribute to the threads by responding to one of the posted messages. At the end of the day, copies of the discussions are sent to all the members, through a mailing list, to keep them posted on progress. *Wikis* are very simple but flexible **content management systems**, whose usage has gained momentum recently as a result of voluntary content generation projects, such as *Wikipedia*.

More critical or complicated situations may be dealt with by using chat or instant messaging software, which enables real-time communication. Chat systems have been around for two decades, though the instant messaging services are adding new dimensions to online communication. File and photo sharing, voice and video conferencing, and graffiti boards are among the new enriching facilities integrated into *instant messengers*. In some instances the instant messaging software, boosted by today's fast internet connections that enabled widespread adoption, are competing with official telephony and videoconferencing services; as we know through the success of *Skype*, to give one example. The ever-rising quality of these services has convinced many workgroups to choose these protocols as their primary means of communication.

The use of such systems may change the nature of group work from being largely face-to-face to largely online. Trust becomes a major factor as online work lacks the usual signals gained from face-to-face contact. *Videoconferencing* can have an obvious role here (*Skype* has video capabilities). Web cameras used with email and internet conversations can provide support, as can voice-mail. Such systems also change roles, responsibilities, interactions, and the way work is carried out. Indeed, they may be introduced to achieve this result as well as to encourage and support teamwork in general. Of course, there are also privacy and security implications as well as the concerns of individuals about sharing their knowledge with others and perhaps losing their individual competitive advantage. The way such systems are introduced will, therefore, be a key factor in their potential for good will and better teamwork.

Angelo Failla provides a useful case study relating to how software is developed at IBM's international network of laboratories. Teams of work groups and managers can exist 'virtually', in many different locations. Developers write code, usually in small groups, while managers divide the work between group members and groups. Electronic mail, forums (shared files), conference call systems, faxes, and videoconferencing are all cited as tools that support group work in the case study.

One of the most sophisticated group decision support tools available is *ThinkTank*<sup>™</sup>, a product of GroupSystems ([www.groupsystems.com](http://www.groupsystems.com)). It supports innovative team spaces for sharing knowledge, discussing problems, coordinating effort, and collective decision making. It can be effective in situations where the group is working together in one room as well as where the team is geographically dispersed. It is sometimes used in special meeting rooms, called 'pods', where each user has a workstation with the software installed. It supports brainstorming, categorization, electronic white-boards, surveying and voting in particular, and strategic planning, vendor evaluation, risk assessment, priority setting, and other aspects of project management in general. It can also be used with other software so that databases, spreadsheets, websites, and so on can inform the decision-making process.

It can be used for remote decision making; not necessarily concurrently. This may be particu-



larly useful in projects where software is developed in different locations, 24 hours a day. Video conferencing facilities offer people the opportunity to see as well as to talk to others in another site or sites.

The brainstorming feature enables each member of the team to create ideas and comment on them. These are usually expressed anonymously so that it is the ideas that have force (or not); and not who is expressing those ideas. Brainstorming should encourage unusual thinking and ideas and innovation, and the option of anonymity when expressing these ideas reduces inhibiting factors. Some ideas will be rejected, but others will be kept and organized into separate categories for further evaluation. At the end of the meeting, there is a complete record available, and this can be particularly useful in organizational learning.

## 4.8 Interview with a project manager

### Interview

**Q** WHAT skills should project managers possess?

“**S**oft skills should include patience, and a penchant for organization and meticulousness. These are paramount for the success of any project, but especially for someone entrusted with the successful completion of a usually expensive project.”

**Q** DOES a project manager need to know everything that is going on in the company?

“**T**his depends on the scope of the project, and what the outcome is expected to provide for the company. Any manager in any field should understand the fundamental aspects of his or her business, even if it is not related to the manager’s particular area of education. For example, my entire career has been spent in IT, yet I work for a pharmaceutical company. As a result, I take a mild interest in the goings-on in this industry and, in particular, all aspects of the company’s business. After all, I

am but one cog in the larger machine.”

**Q** WHAT kind of control does a project manager hold? (Human resource, funds, etc)?

“**B**y and large, a project manager is entrusted with the responsibility and resources chartered to get a given project completed. This includes human resources, a budget (for overtime, material), etc. Project managers receive as much autonomy over the execution of the project as management deems appropriate, and they in turn delegate small amounts of their authority to lead personnel and other individuals. Ultimately, the project manager will be held responsible for the outcome of the project, whether over-budget in time or money.”

**Q** DO project managers usually get their way? What are some obstacles?

“**I**f the project manager is seasoned, and has a solid track record of success, he or she is usually afforded the privilege of

having almost total autonomy over a project, to a certain pre-defined limit. For example, a Vice-President, under whose auspices a project is being run, may authorize the project manager to exceed the budget by two percent.”

**Q** DID you get coaching on your first project assignment?

“**Y**es, but not much unfortunately. I was given the project, simple instructions on what was expected as the outcome, and I winged it from there. I took project management courses afterward because I knew there had to be a better way. There was.”

**Q** DO you find project management challenging or overwhelming? How?

“**P**roject management is definitely challenging. It is often difficult to wrangle the various human resources, material resources, contractors, calendar, and other factors together to create a successful outcome. However, it is this challenge that makes it exciting and worthwhile. If a project ever becomes overwhelming or seems out of control, it’s time for a pause and redirection.”

**Q** DO you find your estimates of scope, time, and cost in your past projects to be accurate? If not, how off were you? (Give examples)

“**I**n virtually every project there are some indefinable elements, things that are difficult on which to put a timeframe or dollar value. It is these areas that usually end up busting the budget. Not enough time allocated to research and development on some element,

or not enough money allocated to budget, or not enough resources allocated to balance either one. However, experience lends itself to getting closer to the mark each time at making better “guesstimates”.”

**Q** WHY do you think so many projects wind up finishing late?

“**N**ot using software on big projects, not thinking through the lead times and costs. Different scenarios should be played out and costs attached and the lead times should be figured out. This is difficult but you have to look at who you are competing with for resources, what has priority, and if you will have to work around other projects. The planning has to be done right, the timeline, dependencies, lead times, timing, and fiscal aspects all have to be thought out.”

**Q** HOW do you control/avoid scope creep?

“**E**asy: design the Scope and Requirements document in such a way that it clearly defines what you are setting out to accomplish. Make sure this document is circulated among all the principals and have their full and complete buy-in. After the project begins, if there is any request to expand or enhance the scope, refer the requestor to your S&R document.”

**Q** FINALLY, what advice would you give to a candidate on becoming a project manager?

“**L**earn all you can about project management in school. Take on a real-

life project for your school, church, or other organization, and treat it as if it were for IBM or General Motors. Utilize these practice projects to develop empirical understanding of what works, what doesn't, and above all, how you react under pressure, and how to manage that behavior. This will give you insight into project management in general, and how to succeed with yourself and your delegates."

## Chapter summary

ESTIMATES OF COST and time provide a boundary for the entire project. Sponsors need reliable information on cost and time before they can decide whether or not to support a project. Estimates are critical in planning resources, in monitoring progress, in evaluating performance, and ultimately, for measuring success. It is useful to distinguish between tangible and intangible costs as well as between direct and indirect costs. Tangible and direct costs are more easily determined than intangible and indirect costs.

There are several ways to analyze project value. One approach is called payback analysis, where it is determined how long it will take an organization to recover the project costs. Another approach is called net present value (NPV), where cash flow analysis of a project costs and benefits is performed. The third financial analy-

sis is called return on investment (ROI), where discounted benefits and costs are used to assess investment value. These financial analyses are used to compare project proposals and to determine which project to fund. Estimates of cost and time can be obtained based on experience, documentation, or expert opinion. A combination of these sources can also be used to obtain estimates. In some situations, it might be necessary to obtain more than one estimate to improve reliability.

In some situations, it is difficult to obtain upfront estimates for the entire project. In such cases, phase estimating is used, where detailed estimates are provided for the early phase of the project and rough estimates are projected for the later phases. Detailed estimates are then generated for the subsequent phases as the project progresses. Phase estimating is necessary for innovative projects or when the final outcome is dependent on results from the design phase. In reality, things change and it is not always easy to obtain accurate and reliable estimates. It is prudent to plan for change and analyze potential risks. Contingency plans should be prepared to address unexpected events and respond to change. Modern project management involves constant negotiation and communication, and effective project managers prepare for what can be expected as well as events that may or may not occur.

## Discussion questions

- a) Assume you are working for an organization that is keen to invest in information technology to improve employee innovation, productivity, customer satisfaction, and management control. However, top management in your organization has a short-term payback expectation for their technology investment. Explain to the leadership of your organization why such a policy may be dysfunctional in the long term.
- b) Three methods are described in this chapter for obtaining cost and time estimates. Advantages and disadvantages for these

methods are also described. Provide additional discussion on the pros and cons of each approach (experience, documentation, and expert opinion). What has been your experience?

- c) This chapter argues that organizational game play and politics are a function of management decision making style. Do you agree with this statement? Why? Is it possible to totally eliminate organizational politics? How should a project manager deal with these issues?
- d) As a project manager, how would you address issues of politics and game play that affect time and cost estimates for your projects? Would your reaction to cost and time over-estimation be the same as your reaction to cost and time under-estimation?
- e) How would you convince a conservative management that effectiveness criteria are as important as efficiency criteria in decisions concerning new projects?
- f) Describe and distinguish between a con-

tingency plan and risk analysis?

- g) Project sponsors are often reluctant to set up project contingency funds that seem to imply poor project planning. Some perceive contingency funding as an add-on slush fund. Others say they will face the risk when it materializes. Often such reluctance to establish contingency reserves can be overcome with documented risk identification, assessment, contingency plans, and planning for when and how funds will be disbursed. What else would you do to convince your sponsors?
- h) Risk should be monitored and based on defined milestones and decisions made regarding risk and mitigation strategies. Some project managers keep a list of frequently occurring risks and use it in the review and control process (see the table below). How would you track risks in order to maintain awareness and prepare mitigation strategies?

Risk item	# of occurrences in 3 months	Possible mitigating response
Inadequate planning	4	Revising the entire project plan
Poor scope description	3	Meeting with sponsors to clarify scope
Leadership problem	2	Assigning a new project manager
Poor cost estimates	2	Revising cost estimates

### Exercises

- a) Use a spreadsheet to calculate NPV for Projects A and B in Figure 4.1.
- b) Calculate the ROI for information provided in Figure 4.1 using different interest rates.
- c) The following table gives projected revenues and costs as well as the interest rate for two proposed projects. Use payback analysis.

sis, net present value (NPV), and return on investment (ROI) to recommend one of these projects for development (show your

work). Suggest other factors that would influence your decision.

Interest Rate: 12%					
Project 1	Year1	Year 2	Year 3	Year 4	Year 5
Revenues	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00
Costs	\$5,000.00	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Cash Flow	(-\$2,000.00)	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
Project 2	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues	\$5,000.00	\$4,000.00	\$3,000.00	\$2,000.00	\$1,000.00
Costs	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
Cash Flow	\$3,000.00	\$2,000.00	\$1,000.00	\$0.00	(-\$1,000.00)

d) Search the web and find out more about newer decision analysis tools such as *Crystal Ball*, *iDashboards* and *Profit Metrics*. Write a one page report and describe the similarities between these tools and the more traditional decision analysis tools. In what ways do these tools differ from the

earlier ones?

e) Search to find information that will enable you to compare and contrast *Microsoft Project* with *Crystal Ball* and *Microsoft Project* with *SimProject*. List the pros and cons of each from the perspective of a project manager.

### Important Concepts

**best case scenario** (pg. 67)

**bottom-up approach** (pg. 67)

**business intelligence software** (pg. 72)

**collaboration suites** (pg. 73)

**content management systems** (pg. 74)

**contingency funds** (pg. 69)

**contingency plan** (pg. 69)

**contingency resources** (pg. 67)

**Critical Path Method (CPM)** (pg. 71)

**direct costs** (pg. 59)

**direct overhead costs** (pg. 59)

**discount factor** (pg. 62)

**documentation** (pg. 65)

**experience** (pg. 65)

**expert opinion** (pg. 65)

**groupware** (pg. 73)

**indirect costs** (pg. 59)

**intangible costs and benefits** (pg. 59)

**learning curve** (pg. 69)

**most probable scenario** (pg. 67)

**multiple estimates** (pg. 67)

**net present value (NPV)** (pg. 62)

**normal conditions** (pg. 69)

**payback analysis** (pg. 60)

**phase estimating** (pg. 68)

**Program Evaluation Review Technique (PERT)** (pg. 71)

**requirements change committee** (pg. 71)

**return on investment (ROI)** (pg. 63)

**risk analysis** (pg. 70)

**scenario planning** (pg. 65)

**simulation** (pg. 72)

**spreadsheets** (pg. 72)

**tangible costs and benefits** (pg. 58)

**triple constraints** (pg. 58)

**value of a project** (pg. 60)

**vendors** (pg. 58)

**worst case scenario** (pg. 67)

## **Bibliography**

Chen, M.T. (1997) The modern project manager, Cost Engineering, Vol. 39(3).

Failla, A.(1996)Technologies for coordination in a software factory, In C.U.Ciborra (ed.) Groupware and Teamwork: Invisible Aid or Technical Hindrance?, Wiley.

Kinsella, S.M. (2002) Activity-Based Costing: Does It Warrant Inclusion in A Guide to the Project Management Body of Knowledge, Project Management Journal, 33(2), 49-55.

National Audit Office (2006) Delivering successful IT-enabled business change, The Stationery Office ([www.nao.org.uk](http://www.nao.org.uk)).

Rad, P.F. (2002) Project Estimating and Cost Management. Management Concepts, Inc.



# 5

## *Managing Project Time and Resources*

### **Themes of Chapter 5**

- What is project time management?
- What characteristics define an effective project manager?
- What principles are important in project management?
- What tools are useful?
- What skill sets are important?
- What is the life cycle of a project?
- Why is there a need for good project managers?
- How is the balance between socio-cultural and technical factors achieved?

## Introduction

THIS CHAPTER DESCRIBES PROJECT TIME MANAGEMENT AND ITS IMPORTANCE in the success of projects. A vital characteristic of successful project managers is the way they manage time and the way they help team members manage time. A critical success factor for effective time management is timely communication of standards and expectations. Setting milestones provides appropriate reference points for the project manager and team members. This chapter describes the **Program Evaluation Review Technique (PERT) and Critical Path Method (CPM)**; the most widely-used tools for scheduling, monitoring, and communicating time aspects of projects. Using this network approach, this chapter also describes how to analyze project schedules and modify them to meet deadlines. Finally, we provide suggestions that will help project managers keep to deadlines.

This chapter discusses techniques, but it is important to understand that although such techniques can be helpful to the project manager, the use of such techniques does not guarantee success. Indeed, as the discussion in the following exhibit shows, a combination of experience, a willingness to negotiate and the commitment of people can be even more important.

### The case against the use of techniques

#### (a discussion with a project manager)

Although I learned about PERT charts at university, I have never really used them in anger and I have not used many software-based tools either. My first experiences of project management were in a commercial research center. The central drive was to keep to schedule and budget through monthly reviews. The company had a strong financial drive, and I would get the project returns monthly.

The first largish project that I worked on was a European collaboration to develop a combination of circuit elements for optical communication. We built lasers, electronic drivers, waveguides, switches, photo-detectors and pre-amplifiers. Planning was done by a group, and again was financially constrained. Partners would tend to negotiate a share of the program and then work out what they believed they could do against their own in-

ternal strategies within the constraints of the program. The process produced a plan with a granularity of around 1-3 person months. Once finalized, this became the project plan against which progress would be reported.

Success or failure depended largely on being able to deliver meaningful outputs from that plan - to satisfy the partners (who might want to reduce your funding at the next round if they were unhappy) and the company (which had to find the matching funds).

One way or another, this was the basic model for all the work I did - plan using experience, cost up and then monitor monthly against hard financial figures. On the whole this worked well. We were optimistic about how long things would take - but only mildly so, and generally within the safety zones set



up through contingency budgets. Project plans would generally consist of a description, followed by milestone achievements and the dates by which each was expected.

As I became more senior in the organization, I took more interest in the bidding and in the monitoring of projects - especially those projects that fell within my own financial codes. Overall my role required skills in recruitment, staff development, contracts, negotiation, bid management and review. Costing was generally done through discussion and involved an analysis of what our best guesses were and what we thought the constraints were. Risk was explicitly addressed, but again was constrained by not wanting to frighten the customer with the level of risk.

Monitoring involved reviewing projects. I was expected to review small projects (less than US\$150,000, typically) each month with my staff. Larger projects were reviewed monthly with a team that included my boss, the Financial Director and the site Director. I was typically responsible for somewhere between \$US5-8 million per annum worth of projects and might have 20-30 small projects and 4-5 large ones for review. This gave a very clear idea of how much progress could be made in a month and how much it would typically cost.

I also would make up my own consolidated spreadsheet that reviewed how the division as a whole was doing. Ironically, in view of the amount of data we were given, the process became very internalized and intuitive. We used the project management terminology and understood what it meant, but did not often apply it formally.

The other element of the process was the ancillary systems - risk registers, health and safety, export licenses, quality, and so on. People management was also my responsibility - annual reviews, target setting, personal development, and pay reviews. These things tended to go on a six-monthly cycle.

My take was that experience and consensus were more important than the use of specific techniques, and we tended to apply the latter in only a general way or where the project was big. However, it is true that people working on big projects (\$US20 million to over \$100 million) were much more formal and rigorous in their approach.

When I entered the university sector recently, I obtained a grant portfolio around US\$10 million, my research focus lies in the value of healthcare technology and services. However I discovered it was time to learn a whole new set of skills. I recruited a project manager with commercial experience. But the academic teams hated it. They found it too bureaucratic and, I suspect, too restricting. We had to back off, and what worked best was to set academic targets. Along with my academic colleagues, I reasoned and cajoled the team members through to their deliverables.

The thing I have learned from both experiences is the importance of working with people and getting people onside. The most optimistic estimate can come in on time and to budget with a really committed team. The most generous contingency (and more) will always be spent by a team conditioned to fail and the use of techniques will hardly affect the result either way.

## 5.1 Time as a resource

TIME IS A RESOURCE IF IT IS MANAGED EFFECTIVELY, OTHERWISE IT WILL be a constraint. Timely delivery of projects has been one of the biggest challenges for project managers. Managing time effectively is therefore a critical component for project success. **Time management** relates not only to the anticipated planned activities but also to unexpected events, such as last minute changes, personnel issues, conflict resolution, and so on. A successful project is the one that is on time, within budget, and delivers what is expected. Project managers should set the standard for a timely outcome by example. If project managers cannot control their time, then they will have difficulties controlling team members and, consequently, the entire project is likely to be late. Project managers often work on tight deadlines and feel they have no time to think about time and its effective use. To be effective, a project manager must be organized and **prioritize** work. Depending on work habits, this could be done in different ways and may or may not be very formal.

A good way of understanding project time management issues is to consider personal time management. Organizing your own time might seem to be a fairly simple requirement, yet we all know how difficult it is in practice to use our time effectively. *To find out whether you have a time management problem, ask yourself the questions shown in Figure 5.1.*

- Do you spend a lot of time responding to email messages?
- Do you spend a lot of time returning calls?
- How often do you work overtime?
- How often do you miss social events?
- How often do you reschedule your appointments?
- How often do you feel you need a large block of time to finish a task?
- Do you have a gatekeeper for unexpected visitors who take up your time?
- Do you prioritize your work? Based on what?
- Do you plan your vacation?

**Figure 5.1: Question to ask when assessing your time management**

You may or may not be able to do something about all these but you will get a feel for whether you need to think about your own time management. In any case, whether you are able to address all these questions successfully or not is less important than the realization that time management is important. Effective use of information technology can be a significant advantage to time management, but sometimes it can use your time ineffectively.

We will use email as an exemplar of potential time management issues. Email can have a significant positive impact on communications in terms of timeliness, convenience, accuracy, cost, storage, retrieval, and so on. But it can be a problem if not handled efficiently. You may send or receive a message at any time, but it is not a good use of your time if you check whether you have new mail every few minutes. It is not very difficult to surmise a rough distribution pattern for your incoming messages after a while. For example, you may notice that early in the week you get a lot of messages and it slows down toward the end of the week. You also know that when you get into

your office on Monday morning there is a long list of email waiting for you and that there is even more when you return from a vacation.

*Organize your own time management that accommodates your own email patterns.*

With the ease of connectivity at hotels, conventions, airports, and elsewhere, many people tend to check their email messages when they travel out-of-town. While this may be useful when traveling on business, it does not help your overall productivity if you are on vacation. You must plan your vacation to **disconnect** with daily and routine work. Project managers often work under pressure, for time, resource, and high expectation reasons, and that can cause work stress and burnout. Your vacation must provide a relief from all of that. You must plan your communications, including email and voice messages, to give yourself flexibility. If you attend to your email continuously and voice mail messages throughout the day, you are an ineffective time manager. You may want to have a simple routine for checking your messages, such as once in the morning and once in the afternoon. If you are preparing to leave for a meeting you should not check your email unless you expect a message about that meeting. A last minute and unexpected email message can cause you to enter a meeting distracted, disorganized, and sometimes late.

This simple example relating to personal time management can be used to generally consider the time management of people in the organization. Activities need to be monitored, patterns detected, and appropriate plans organized so that time is used both efficiently and effectively.

## 5.2 Monitoring time

PROJECT MANAGERS WHO end up with a great deal of overtime or repeated delays should evaluate their time management principles carefully. An effective and experienced project manager should be able to evaluate, with reasonable accuracy, how long the project will take and how many staff hours are available for the project (leaving some margin of error for unexpected interruptions). Repeated delays and prolonged overtime may be the results of inaccurate evaluation of these two important components of time management.

It is possible to keep track of a small number of activities in your mind. But, for multi-activity projects, you will need a more systematic approach to control or keep track of time. In picking a method, try to select one that you feel comfortable with and that you can easily create and revise. For example, a simple status form, such as the one shown in Figure 5.2, can help your time management.

Activity tracking for project .....n a m e.....				
Activity	Date required	Duration	Start date	Status

Figure 5.2: Status form

A similar form with minor changes can be used for daily activities, like the one shown in Figure 5.3.

Activities to be completed today .....d a t e.....				
Activity	Time required	Duration	Start time	Status

Figure 5.3: Activity form

An effective project manager has a **priority list**. The lack of prioritization has an adverse effect on time management and decision-making. People procrastinate either habitually or because they do not know how to finish the job. In either case, indecisiveness negatively impacts time management. You may have worked with people who take too long to make a decision, not because they are not sure what to decide but because they hesitate to decide because they fear the consequences. Decision-making is a part of a project manager’s responsibilities and often project managers must make decisive decisions within a short time. **Indecisiveness** can affect project organization, progress, personnel, and ultimately the outcome. Decisions have consequences and that comes with the job. This does not mean that you should not consider all of the facts, should not solicit input from others, or should not think about consequences. All of this is essential to good management. However, consider the laws of **diminishing returns** where, beyond a certain point, additional time and energy is unnecessary and, if continued, can be counter-productive.

Managers, including project managers, are said to spend most of their time in meetings. Many managers would argue that they attend too many meetings and that most meetings are too time-consuming. What is important is not so much the number of meetings one attends or the amount of time spent in meetings, but what is accomplished in relation to the time spent. Frequent meetings lose significance and may become an end in and of themselves rather than a means to achieving goals. Sometimes people ‘fill in the space’ with unnecessary and even irrelevant remarks, leaving everyone else frustrated at this ‘waste of time’. Attending meetings can be tiring and is amongst the least favored activities that managers do, together with report writing and documentation. An effective project manager conducts a meeting with a few principles in mind (see Figure 5.4).

- Longer meetings do not necessarily produce better results.
- The need for an agenda that is communicated to all.
- The need for continued focus and control.
- Opportunity for participation by all.
- Summation of outcome and closure.

Figure 5.4: Principles for meeting management

### 5.3 Project activity network

A TYPICAL PROJECT management job involves planning, scheduling, and controlling all activities necessary to design, develop, implement, or maintain a project so that it is on time, within budget, and meets user expectations. Large and complex projects involve the participation of groups and individuals outside of the team. These might include clients, outside consultants, vendors, and government agencies. Projects will include a variety of inter-dependent tasks and expertise that require systematic record keeping and good communication channels.

It is very important for the project manager to be able to monitor progress for each activity at all times. To help project managers plan, schedule, and control projects, a variety of methodologies currently exist, many of them in the form of software tools that are easy to use and modify. This section will describe the techniques of **Program Evaluation Review Technique (PERT)** and **Critical Path Method (CPM)** for planning, scheduling, and controlling project activities. Although PERT and CPM were developed separately and for different reasons, there are similarities between them. In recent years features of both methods have been combined in project management software tools, such as Microsoft Project. As shown in Figure 5.5, PERT/CPM helps project managers with their job in a number of ways.

- Estimate minimum time required for completing the entire project
- Identify critical activities that must be completed on time in order for the entire project to be completed as scheduled
- Show progress status for critical activities
- Show progress status for non-critical activities
- Estimate the length of time that these non-critical activities can be delayed
- Estimate the likelihood of completing the entire project on schedule

Figure 5.5: Potential of PERT/CPM

PERT/CPM shows the *sequence* and *duration* for each activity and enables the project manager to determine which tasks may become **bottlenecks** and thus delay the entire project. It illustrates the interrelationship of events and activities involved in a project. PERT is described in terms of a network that consists of activities connected by arrows. Each activity is labeled by a number or a character and has a beginning, duration, and ending. You should be able to refer to each activity on this network in terms of when it starts, when it ends, and how long it takes to complete. Where each activity is depicted on the network suggests its position relative to other activities; activities that it follows and activities that it precedes.

Consider, for example, activities involved for a web page development project. We will use a simplified version just to demonstrate the principles of a typical **PERT/CPM network**. This project involves the following nine activities that were identified while producing the work breakdown structure: needs analysis, software selection, design, programming, user review, revision, server selection, and installation. We can also estimate the duration for each activity and establish a sequence. The information can be organized in the following table, shown as Figure 5.6.

Activity	Activity description	Duration (days)	Preceding activities
A	Determine user needs	2	-
B	Review software and languages	2	-
C	Purchase software	1	B
D	Design format and style	3	A, C
E	Write programs	5	D
F	Review outcome product with user	1	E
G	Make revisions	2	F
H	Select server site	1	-
I	Install on server and test	2	G, H

Figure 5.6: Development of a personal web page

Note that the total time required to complete the project is 19 days, but the project can be completed within 16 days because activities A, B, and H can start at the same time because they do not have preceding activities, making them independent of other activities. The PERT/CPM **network diagram**, shown in Figure 5.7, depicts these nine activities and the estimated duration for each. An arrow presents each activity. Activity duration is shown below the arrow. The network depicts the interdependence of all of the activities needed to complete this project. It correctly identifies activity B as the predecessor for activity C, activities A and C as the predecessors for activity D, and activities G and H as the predecessors for activity I, the final activity. An activity can start only after the preceding activity, when required, is complete.

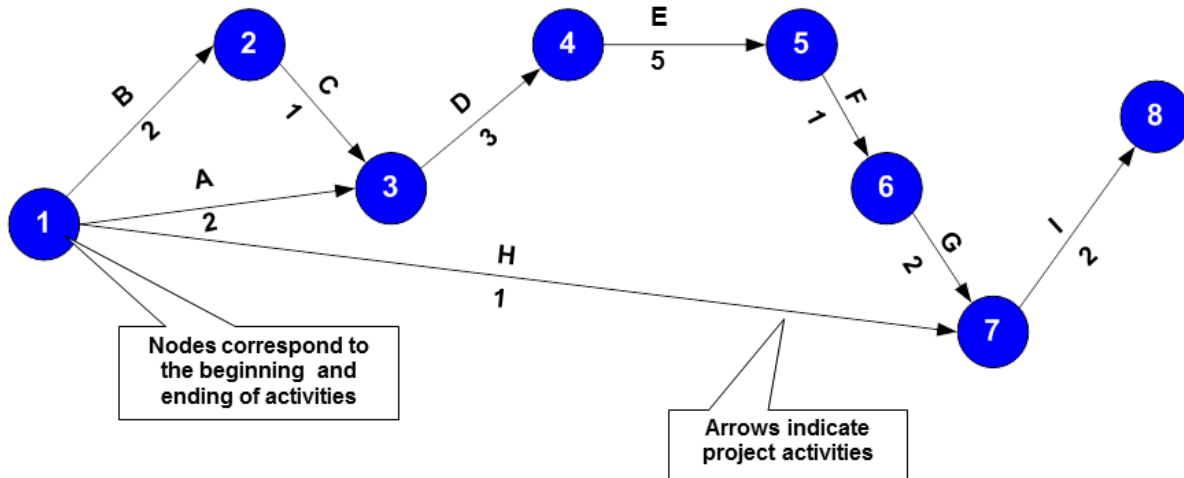


Figure 5.7: Network of nine activities

Using this network we can determine the total project completion time by identifying what is called the **critical path**. A **path** is a sequence of connected activities that extends from the starting node (1) to the completion node (8). The critical path in a network represents the longest path of activities. Analyzing our nine-activity network, we can identify three paths. One path includes

activities B, C, D, E, F, G, and I that are connected by nodes 1-2-3-4-5-6-7-8. Another path includes activities A, D, E, F, G, and I that are connected by nodes 1-3-4-5-6-7-8. And the third path includes activities H and I that are connected by nodes 1-7-8. The total path duration for the first path is 16 days ( $2+1+3+5+1+2+2$ ), for the second path is 15 days ( $2+3+5+1+2+2$ ), and for the third path is 3 days ( $1+2$ ). Thus the first path, with the *longest* path activities, is the critical path in this network.

To reduce the total duration of the project, we will need to examine activities on the critical path and try to see if we can shorten the duration of any of those activities. However, as we reduce duration for some activities on the critical path another path may become the longest, making it the new critical path. This process can get complicated as the network gets larger and more complex. A more systematic approach is required that helps identify properties of each activity within the network. It starts by determining the **earliest start** and the **earliest finish** as well as the **latest start** and the **latest finish** times for each activity as part of what is called **critical path analysis**.

## 5.4 Critical path analysis

TO ANALYZE THE critical path, we must first compute **earliest start (ES)** and **earliest finish (EF)** time for each activity in the network. Starting at the origin of the network that is node 1 in our diagram, we assign zero to the start of all activities that begin at node 1. The earliest finish time for an activity is calculated by adding the duration for that activity to the earliest start time for that activity. For example, activity A starts at time zero and has a duration of 2 days to complete. Thus the earliest finish time for activity A is  $0 + 2 = 2$ . Using the acronyms **ES** and **EF** to represent earliest start and earliest finish and  $t$  to represent time duration the relationship can be expressed as:

$$EF = ES + t$$

The earliest start time for activities with multiple predecessors is the largest finish time among all preceding activities because all activities leading to any specific activity must be completed before that activity can start. For example, activity D on our network can start only after activities A, B, and C are *complete*. Even though activity A is estimated to take 2 days, activity D cannot start until activity C is complete, that is, on day 3 because activity C (1 day) cannot start until its preceding activity, B (2 days), is complete. Thus, *the rule for setting the earliest start time for any activity is to consider the latest of the earliest finish times for all preceding activities*. To make our network more informative we present ES and EF information above the arrow and next to the letter representing each activity, as shown in the revised network diagram (Figure 5.8).

Once the earliest start and earliest finish times are worked out, we need to calculate the **latest start (LS)** and **latest finish (LF)** times. To do this, we must start from the last node and work backwards to calculate the LS and LF for each activity. In our network, we start from node 8 and activity I first. For activity I to complete on time, the latest finish time must be 16 (the same as EF time) and since it takes 2 days to complete this activity we can calculate the latest start time by subtracting 2 from 16. Using the acronyms LS and LF to represent latest start and latest finish and  $t$  to represent duration the relationship can be expressed as:

$$LF = LS + t \quad \text{or} \quad LS = LF - t$$

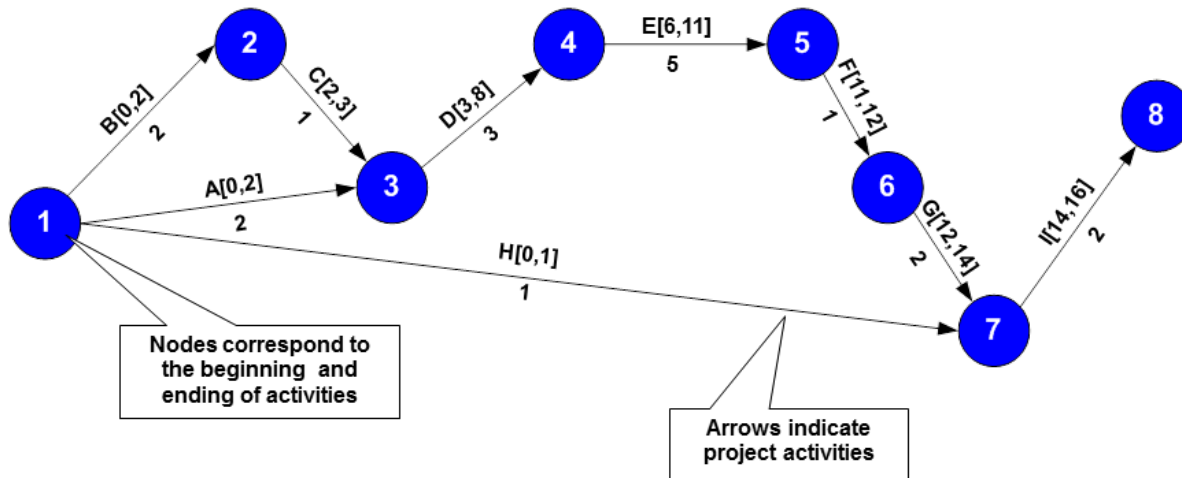


Figure 5.8: Network of activities with ES and EF

Using this expression, we work backward and calculate the latest start time and the latest finish time for each activity on the network. If there is more than one activity leaving a node, *the rule for calculating the latest finish time for that activity is to use the smallest value of the latest start time for all activities leaving that activity.* This simply means that the LF for any activity must be the same as the *smallest* LS for all activities following it. Otherwise it will cause delay in one or more of those activities that follow it. Using the relationship expressed as  $LF = LS + t$  (or  $LS = LF - t$ ), we work backward to calculate LS and LF for activity G:

$$LF = 14$$

$$LS = 14 - 2 = 12$$

We need to continue this calculation for all activities. To reflect this information on our network diagram, we present LS and LF values below the arrow and next to the duration for each activity, as shown in Figure 5.9. The start and finish times shown on the diagram give detailed information for all activities. For example, Figure 5.10 depicts the information about activity H as part of the entire project network diagram.

Note that activities with values of  $ES = LS$  and  $EF = LF$  form the critical path (Figure 5.9). Thus values in brackets above the arrow are identical to values in brackets below the arrow for critical path activities. Other activities are said to have **slack** or **free time**. For example, activity A has one day of slack time, calculated by  $LF - EF$  ( $3 - 2 = 1$ ) or  $LS - ES$  ( $1 - 0 = 1$ ). Similarly activity H has 13 days slack time, calculated by  $LF - EF$  ( $14 - 1 = 13$ ) or  $LS - ES$  ( $13 - 0 = 13$ ). This means that activity A can start one day late and activity H can be delayed for up to 13 days without the delays having any effect on the completion time for the entire project. Thus *activities with zero slack time form the critical path.* This information can be presented in a tabular form (Figure 5.11). Activities B, C, D, E, F, G, and I have zero slack and thus form the critical path.



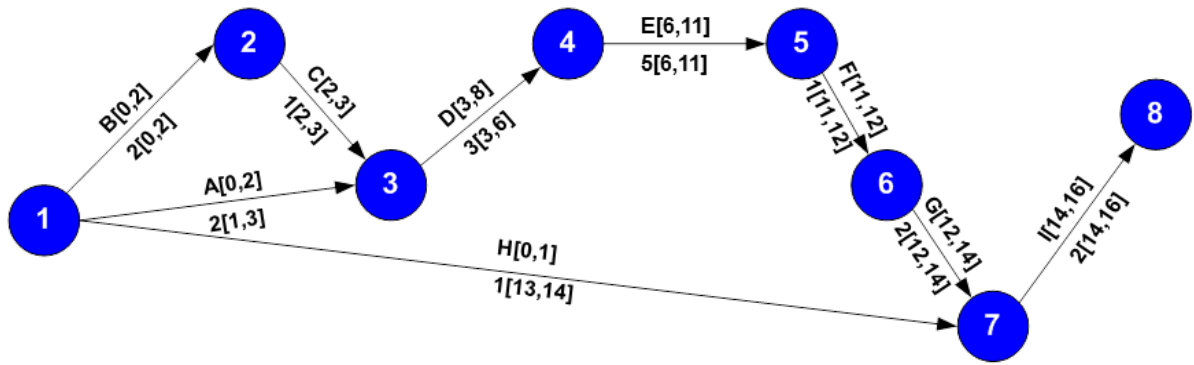


Figure 5.9: Network of activities with ES, EF, LS and LF

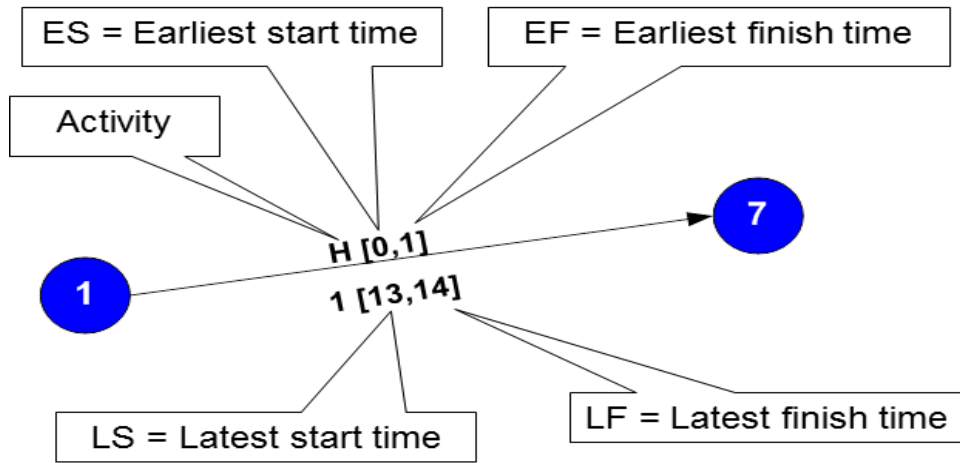


Figure 5.10: ES, EF, LS and LF for Activity H

Activity	Duration	ES	LS	EF	LF	Slack
A	2	0	1	2	3	1
B	2	0	0	2	2	0
C	1	2	2	3	3	0
D	3	3	3	6	6	0
E	5	6	6	11	11	0
F	1	11	11	12	12	0
G	2	12	12	14	14	0
H	1	0	13	1	14	13
I	2	14	14	16	16	0

Figure 5.11: Activity schedule for web page development

To summarize, PERT/CPM provides answers to the important questions that are shown in Figure 5.12.

- What is the total time to complete the project?
- What are the scheduled start and completion times for each activity?
- What activities are critical and must be completed as scheduled in order to complete the entire project on time?
- What are non-critical activities and how long can they be delayed before affecting the completion time for the entire project?

**Figure 5.12: Potential of PERT/CPM**

The outcome of any PERT/CPM application depends on:

- A complete list of activities necessary to complete the project.
- A proper sequence of activities and identification of preceding activities.
- Reliable activity estimates.

Once this information is established, a few steps are required to complete the procedure, as shown in Figure 5.13.

- Draw the network diagram showing all activities and their preceding activities.
- Calculate the completion time for the entire project by determining the earliest start time and the earliest finish time for each activity on the network. The earliest finish time for the last activity gives the project completion time.
- Calculate slack times by determining the latest start time and the latest finish time for each activity by working backwards on the network. For each activity, the difference between the latest start time and the earliest start time, or the difference between the latest finish time and the earliest finish time, is the slack time.
- Determine the critical path by identifying activities with zero slack time.

**Figure 5.13: PERT/CPM – the final steps**

## **5.5 Estimating activity duration**

IT IS IMPORTANT to estimate activity duration as accurately as possible. To estimate activity duration accurately, project managers rely on experience, documentation, and input from experts. Experienced project managers tend to use past projects as a basis for estimating activities. They may modify such estimates upward or downward, depending on changes in technology, the skill level of team members, vendor reliability, resource availability, and so on. For example, a new technology may speed up certain activities but, at the same time, may call for a higher skill set that requires training of project team members. Often a new technology is learned through self-training and that also requires additional resources. Documentation such as reports, time sheets, work plans, and so on also provide project managers with details about previous projects. In many cases, reference to

historical data is a better option than relying on memory. Experience and historical data are useful for repeat projects. Estimating activity time for unique projects is likely to prove more difficult.

In estimating activity duration for unique projects, or when experience is lacking or historical data does not exist, project managers can get input from experts to estimate activity duration. In fact, when uncertain, project managers may obtain multiple estimates for each activity and take the weighted average of the estimates rather than relying on a single estimate. A popular approach for estimating activity duration involves obtaining three estimates. One estimate is referred to as **optimistic** and is based on the assumption that everything is under control and that the activity will progress according to an 'ideal' plan. Another estimate is referred to as **pessimistic** and is based on the assumption that whatever can go wrong will go wrong. The third estimate is referred to as the **most likely** and is based on a reasonable assumption of normality, somewhere between the optimistic and the pessimistic.

These three estimates provide a range of values from the best possible situation to the worst possible one. In order to avoid putting undue emphasis on the extreme estimates, the most likely value is counted 4 times when compared with optimistic and pessimistic values. For example, if we have optimistic, most likely, and pessimistic estimates of 3.5 weeks, 5.5 weeks, and 9 weeks for a given activity, we can calculate the  $t$  value for that activity using the following formula:

$$t = (o + 4m + p)/6$$

Where  $o$  is for the optimistic estimate,  $m$  is for the most likely estimate, and  $p$  is for the pessimistic estimate. Thus, the expected duration for the activity in our example is:

$$t = (3.5 + 4(5.5) + 9)/6 = 5.75 \text{ weeks}$$

Given the distribution among the range of values for this activity, we can calculate the variance in these values using the commonly used **standard deviation formula**. The **variance** is the square of the standard deviation and is calculated using the following formula.

$$\sigma^2 = ((p - o)/6)^2$$

This formula assumes that standard deviation is approximately 1/6 of the difference between the extreme values of the distribution. Using this formula, the variance for our example will be:

$$\sigma^2 = ((9 - 3.5)/6)^2 = 0.84$$

The variance reflects the degree of uncertainty in the estimated value for any activity duration. The greater the range between the optimistic estimates ( $o$ ) and the pessimistic estimates ( $p$ ) the greater the variance and uncertainty.

We will review what we have covered for PERT/CPM through an example. Consider a project with seven activities, listed in Figure 5.14. The project manager has obtained three estimates that represent *optimistic*, the *most likely*, and *pessimistic* times (in days) for each activity. The activity sequence is also determined and preceding events for each activity are shown.

Given this information we want to:

1. Draw the network diagram.
2. Determine duration for each activity.
3. Determine the critical path.
4. Compute slack times for non-critical activities.
5. Compute the expected project completion time and the variance.
6. Use the variance information to compute the probability that the entire project will be completed in 35 days.

Activity	Preceding Activities	Optimistic (o)	Most likely (m)	Pessimistic (p)
A	-	6	7	8
B	-	6	9	14
C	A	7	9	11
D	A	5	10	12
E	C,B	7	10	12
F	D	8	8	11
G	E,F	5	8	10

Figure 5.14: Uncertain duration estimates for seven activities

The PERT/CPM network for the project is shown in Figure 5.15. The network depicts the preceding activities, as described in Figure 5.14.

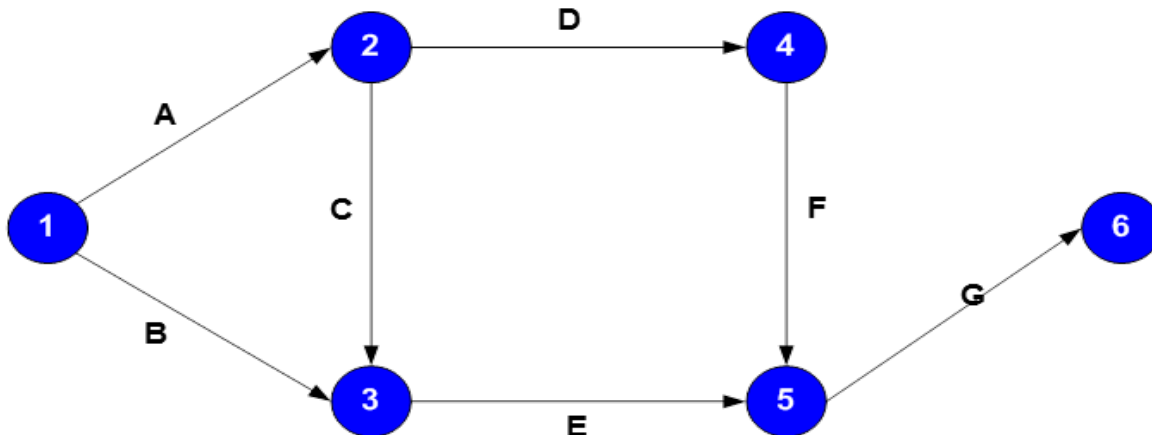


Figure 5.15: Network of seven activities

Next, we need to compute the duration for each activity using optimistic, the most likely, and pessimistic estimates, given in Figure 5.14. For example, using the formula provided above, the expected duration  $t$  for activity A will be:

$$t = (o + 4m + p)/6$$

$$t_A = (6 + 4(7) + 8)/6 = 42/6 = 7 \text{ days}$$

Using the above formula for variance and the distribution between values of 6 (optimistic), 7 (most likely), and 8 (pessimistic), the variance for activity A will be:

$$\sigma^2 = ((p - o)/6)^2$$

$$\sigma^2 A = [8 - 6]/6]^2 = 0.11$$

Note that for the variance formula we only use extreme values of optimistic and pessimistic. Using the data in Figure 5.14 and the above formulas, we continue and calculate expected duration and variance for all activities. Figure 5.16 provides the expected duration and variance for each of the seven activities. In this example, activity duration is estimated in terms of days. For larger projects, weeks and months may be used to estimate activity duration. Whatever is the unit of estimates, it should be used consistently throughout the estimating process, in progress reports, and all other documents.

Activity	Optimistic (o)	Most Likely (m)	Pessimistic (p)	Expected t (days)	Variance $\sigma^2$
A	6	7	8	7.0	0.11
B	6	9	14	9.3	1.78
C	7	9	11	9.0	0.44
D	5	10	12	9.5	1.36
E	7	10	12	9.8	0.69
F	8	8	11	8.5	0.25
G	5	8	10	7.8	0.69

**Figure 5.16: Expected duration and variance for seven activities**

Based on the information given in Figure 5.16 for activity duration, we now proceed to establish the earliest start (ES) and the earliest finish (EF) times for each activity going forward through the network. Figure 5.17 shows the network of seven activities together with activity duration and ES and EF information. On this network, the earliest finish time for the last activity, G, is 33.6 days. That means the expected duration for the entire project is 33.6 days.

Next, to find the critical path we need to calculate the latest start (LS) and the latest finish (LF) times by working backward through the network. The information computed through this procedure is given in Figure 5.18, showing the network schedule. The information about the earliest start (ES) and the earliest finish (EF) times as well as the latest start (LS) and the latest finish (LF) times are summarized in Figure 5.19. This information suggests that activities A, C, E, and G form the critical path for this project. These are the activities with zero slack time. The slack times for non-critical activities are shown in the last column of Figure 5.19. Note that activity B can start anytime between zero and 9.3 days without affecting the overall project duration.

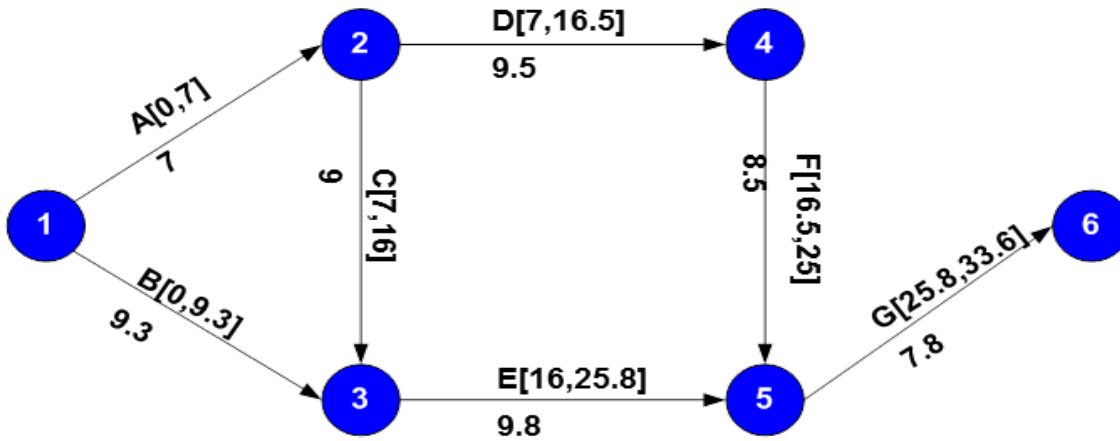


Figure 5.17: Network of seven activities with ES, EF, LS and LF

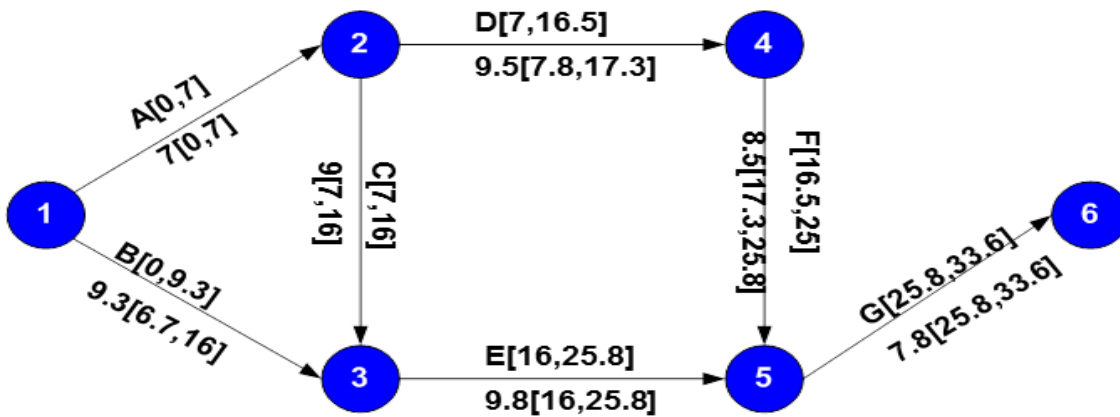


Figure 5.18: Network of seven activities with ES, EF, LS and LF

Activity	Earliest Start ES	Earliest Finish EF	Latest Start LS	Latest Finish LF	Slack (LS - ES)
A	0	7	0	7	0
B	0	9.3	6.7	16	9.3
C	7	16	7	16	0
D	7	16.5	7.8	17.3	.8
E	16	25.8	16	25.8	0
F	16.5	25	17.3	25.8	.8
G	25.8	33.6	25.8	33.6	0

Figure 5.19: Activity schedule for the project

Project managers are often asked whether a project will be completed by a certain date and the **probability** of that happening, similar to the last question on the list of questions we posed for the seven-activity project. In order to compute a response to our final question, we need to use the calculated variance for activities on the critical path and the commonly used table of standard normal distribution. This table gives the information for any value between the mean and a given value of standard deviation from the mean. The standard deviation is expressed by the letter  $z$  and is calculated by dividing the difference between the mean and the desired completion time (35 days in our example) by the standard deviation ( $\sigma$ ). As you will recall, the standard deviation is the variance squared. To calculate the variance for the entire project, we simply add the variances for activities on the critical path. If we represent the duration for the entire project by the letter  $T$ , we will have:

$$\begin{aligned}\text{Variance (T)} &= \sigma^2\text{A} + \sigma^2\text{C} + \sigma^2\text{E} + \sigma^2\text{G} \\ &= .11 + .44 + .69 + .69 = 1.93\end{aligned}$$

We then compute the standard deviation for the project's completion time as:

$$\sigma = \sqrt{\sigma^2} = \sqrt{1.93} = 1.39$$

The  $z$  value for the normal distribution at day 35 is computed as:

$$z = (35 - 33.6)/1.39 = 1$$

For  $z = 1$ , the normal distribution table suggests the probability value of 0.3413. This value is a portion in one half of the area under the normal distribution curve. Thus, the probability of completing the project in 35 days is  $0.3413 + 0.5000 = 0.8413$ . Thus there is an 84% chance ( $0.8413 * 100 \approx 84$ ) that the project will be completed in 35 days. We summarize responses to our five questions in Figure 5.20.

1. The network diagram is shown in Figure 5.15.
2. The critical path includes A - C - E - G (see Figure 5.19).
3. Slack times for non-critical activities are shown in the last column of Figure 5.19. Three activities have slack time.
4. The expected project duration is 33.6 days (see Figure 5.17) and the project variance is 1.93.
5. There is an 84% chance that the entire project will be completed in 35 days.

Figure 5.20: Responses to our five questions

## 5.6 Resource implications

THE **ALLOCATION OF RESOURCES** to a project is a task that can make or break a project and we look at the process of forming a project team in a separate chapter (Chapter 8). However, in this section we consider the more mechanistic aspects. In Figure 5.21 we show a simple form, using Microsoft Project, to support the resource allocation task. Here we are allocating the time of people (Joe, Bill, and Ted) to activities (tasks 1, 2, and 3).

By adding the hourly rate information for people to the resource details we can get a calculation of the costs of our resource usage for each task, as shown in Figure 5.22.

Resource Name	Work	Details	14 May '07															
			T	W	T	F	S	S	M	T	W	T	F	S				
Joe	36.8 hrs	Work		6.4h	6.4h	6.4h				6.4h	6.4h							
Task 3	4.8 hrs	Work																1.6h
Task 1	32 hrs	Work		6.4h	6.4h	6.4h				6.4h	6.4h							
Bill	28.8 hrs	Work		4.8h	4.8h	4.8h				4.8h	4.8h							1.6h
Task 3	4.8 hrs	Work																1.6h
Task 1	24 hrs	Work		4.8h	4.8h	4.8h				4.8h	4.8h							
Ted	46.4 hrs	Work		5.6h	5.6h	5.6h				5.6h	5.6h	5.6h	5.6h					2.4h
Task 3	7.2 hrs	Work																2.4h
Task 2	39.2 hrs	Work		5.6h	5.6h	5.6h				5.6h	5.6h	5.6h	5.6h					
Bill (half time)	11.2 hrs	Work		1.6h	1.6h	1.6h				1.6h	1.6h	1.6h	1.6h					
Task 2	11.2 hrs	Work		1.6h	1.6h	1.6h				1.6h	1.6h	1.6h	1.6h					
Ted (half time)	0 hrs	Work																
David	0 hrs	Work																
Printing	0	Work																

Figure 5.21: Allocating people hours to activities

	Task Name	Total Cost	Baseline	Variance	Actual	Remaining
1	Task 3	\$348	\$348	\$0	\$0	\$348
2	Task 1	\$1,400	\$1,400	\$0	\$0	\$1,400
3	Task 2	\$756	\$756	\$0	\$0	\$756

Figure 5.22: Costs of tasks

This information can be used to generate a **resource allocation graph**, using a computer software package such as Microsoft Project. As you will discover when using this software or another planning tool, although it may take time to learn, the software does support much of the work of the project manager and eases progress tracking, re-planning, and what-if analysis. Further the quality of presentation is much better than when attempting the same by hand.

Software packages can also aggregate the various resources, such as the number of people working on the activity, and attempt to smooth the use of the resources throughout the project. The **resource smoothing** process can be particularly useful for management reviews and during plan approvals. It is usually better to use resources as smoothly as possible during the lifetime of the project; otherwise staff will be used efficiently for only part of the project. Although the examples presented here and in Appendix B would not be too difficult to replicate by hand, software is required when a project has hundreds of activities and tens of people working on it. Such numbers are by no means unrealistic and resource smoothing, in such circumstances, can have a dramatic affect on reducing overall costs.

Normally, there is a trade-off between time and cost (assuming the same quality); in other words, the more resources allocated (and the more costly the project), the quicker it can be finished. Conversely, resource smoothing may well delay the project as fewer resources may lead to critical activities being delayed. However, by taking resources out of non-critical activities, the reduction in cost may not be associated with an equivalent increase in project time. It might also be possible to exchange certain resources when talents are duplicated. The project manager may also like to input various estimates of resource availability, basing them on past experience in terms of minimum, most likely, and maximum figures, as this will give three different results for time/cost comparisons.



Many project control packages will report on inconsistencies within the network, such as the same resource being used at the same time on more than one activity. Although the plan should allow for minor deviations, the package may permit the project manager to ask 'what if?' questions so that the consequences of more major deviations can be seen; for example, the implications of re-allocating staff, unexpected staff leave, or machine breakdown. Useful reports from a package might also include a list of activities presented in order of latest starting date and earliest starting date and information by department, by resource, or by responsibility.

Packages can simulate the effects of: prolonging an activity; reducing resources applied to an activity; or adding new activities. Similarly, they can be used to show the effects of changing these parameters on project costs. The project manager may be faced with two alternatives: a resource-limited schedule, where the project end date is put back to reflect resource constraints, or a time-limited schedule, where a fixed project end date leads to an increase in other resources, such as people and equipment. As Figure 5.23 shows, a package can also monitor progress to reveal the present situation and look at alternative plans to get a failing project back on track.

- Compare the time schedule with the actual progress made
- Compare the cost schedule with the actual costs
- Maintain the involvement of users and clients
- Detect problem areas and re-plan and reschedule as a result
- Inform management of the new plan and get their agreement
- Provide a historical record, both for projects meeting goals and those that do not, as they can both be useful for future project planning.

Figure 5.23: Progress monitoring

## 5.7 Avoiding project delays

PROJECTS ARE OFTEN not completed on time. Timely delivery remains a difficult task for project managers. Every project manager has reasons for justifying delays. Here are a few suggestions that will help in achieving a more timely delivery.

**Communications** – Time estimates for each activity as well as progress towards completing each activity must be clearly communicated to team members and be readily available to them at all times. Project managers need to decide what method of communication will best serve their situation. Computer technology and project management tools, such as Microsoft Project and spreadsheets, are readily available and easily applicable for preparing timetables and controlling schedules. Yet, most projects are late even when a software tool is used to keep track of time. Many project managers use software to keep themselves informed of project activity time and progress. However, they often keep that information to themselves, and it needs to be communicated to team members.

**Methods** – Activity times are as good as the methods used to estimate them. Complex and sophisticated methods do not automatically produce reliable estimates. Estimating takes time and needs careful preparation. Rushing through the estimation process will result in project delays later

on. Estimates are as good as their source. Experience is, by and large, the best source of estimating time requirements and that requires good documentation and archiving. For new activities where we have no historical records, the judgments of many experts provide a useful source. Team members must understand the methods that are used and believe that the estimates are realistic; people will more readily accept and comply if they understand how estimates are prepared.

**Separation** – Team members are responsible for work units that they are specifically assigned to and that they are accountable for. Project managers are responsible for separating team members' work and responsibilities from those of other stakeholders, such as users and functional managers, who may want to influence the project timetable or process. Team members might be bogged down by stakeholder interference or unexpected demands. Project managers should prepare and communicate clear policies that are intended to help team members with their time management.

**Support** – Team members must feel confident of project manager support in order to stick to their schedule. Often, when functional managers get involved with the project planning, they tend to continue that involvement into the development phase, and that could create confusion for team members about their responsibilities. Project managers must act as a buffer between team members and the management in order to provide the breathing space necessary for the project team to complete their tasks in a timely fashion. Project managers must use their political influence to support and protect their team members.

**Analysis** – Often project delay is due to poor upfront needs analysis. By and large, system developers are tempted to get to the development phase of a system too quickly, and as a result, they rush through the analysis phase. To avoid delays later on, project managers must provide leadership to ensure that careful needs analysis is carried out before the project is allowed to go on. Poor upfront needs analysis may ultimately cause significant project delays, especially in terms of project rework.

**Closure** – Many people do good work, but they just don't know when to do good work. The laws of diminishing returns suggest that the marginal benefits relative to time and effort spent on a task will eventually reach a point where benefits turn into costs. Team members need to be reminded that, similar to the project itself, each task requires closure and members need to move on to the next tasks. A similar problem exists when people waste a lot of time searching for information on the web, which may not exist or may be easier to get elsewhere, such as by asking colleagues. Project managers are responsible to move resources, including human resources, on to next phase and next project.

## 5.8 Interview with a project manager

THIS INTERVIEW took place with a project manager at one of the largest contractors in the United States.

### Interview

**Q** WHAT would you consider to be the most challenging aspect to being a project manager?

**“M**y company currently has many projects. In fact, they have more projects than project managers. This requires that all of us manage multiple projects concurrently. I am managing three of the top ten projects currently assigned to the IT department. I would say that both proper prioritization and time management are the most challenging. You must ensure you spend the right amount of time on the right project to ensure all your goals are met.”

**Q** WHAT Project Management tools and computer software do you find the most useful?

**“W**e are using Project 2002 and Project 2002 Server as our project management software tools. These allow us to track all of our projects and provide pretty accurate time estimates. It's best to estimate the project up front, and then provide a work breakdown structure once the estimate is provided. This is a pretty accurate method provided you have the expertise at your disposal to input accurate time estimates on the project.”

**Q** WHAT skills are essential to becoming a 'successful' project manager? How many projects have you been involved in and how many have actually been a 'success'?

**“P**eople skills have to be the most important for both internal and external communications. Many times you run into people who are very contentious and keeping the peace can be both extremely important and paramount to the continued success of your project. Next to that would be organization, especially when you're controlling multiple projects such as we do. Without the ability to stay organized and on-track, your project will most assuredly fail! For instance, as a project manager recording information is everything. Maintaining your paperwork, and relaying information to people helps keep your infrastructure (resources), on time, on schedule, and under budget. Most projects fail because everything wasn't recorded and something was omitted during the processing of requirements. Without defining the proper user requirements up front, you can bet your bottom dollar that the project has a good chance of failing.”

“A good case in point would be a colleague of mine who was in charge of a file expense recording system. He failed to ensure the data he was given was both accurate and complete. The project began suffering immensely from scope creep and the project ended up over time, and over budget, as well as incomplete.”

**Q** HOW do you forecast the necessary time to complete a step in the work breakdown structure?

**“W**e use two methods for forecasting time. Both are software

driven and were good when we first purchased them. The way they work is that you plug in input transactions, output transactions, and other deliverables and then the program will provide you an estimated time. We are currently preparing to evaluate some different software as it is more exact than what we currently employ.”

**Q** WHEN calculating project costs, do you budget in slack time or do you provide a full assessment and a separate contingency assessment? If you do use the contingency assessment, how do you determine what constitutes an appropriate amount?

“**E**stimates are sometimes, if not most often, overstated by experts. One project we had, not too long ago, estimated a particular time frame to completion. We provided this estimate to our experts who had actually been involved with a project very similar to this one. They gave us an estimate that cut the original one in half and we still ended up under time. Estimating is a science that is very difficult to master. One of the estimate tools we own is called QFM. It utilizes historic industry data as a factor where it takes knowledge obtained across the industry and factors that into the calculations for budgeting time. It always seems to provide us a poor time estimate as they always seem ‘out of whack’ by our experts.”

“Contingency time isn’t something that is well accepted by our upper management. They feel that putting down something called ‘contingency’ on paper leaves open too many questions. They feel it makes us look unprepared and looking for a way to factor in extra costs. We’re always expected to factor the contingency time across the entire project.”

**Q** HOW do you successfully manage customer expectations without overwhelming them with too much information about the project?

“**P**eople skills! Know your customer! By knowing the technical expertise of your customer, you have a pretty good idea of what or how much information to provide. Remember that scope creep is always a huge danger, so you should know how much to tell your customer, but you should always know where the ‘borders’ of the project are. Failure to clarify requirements can cause major problems as the project progresses. We call this the ‘Bring Me A Rock’ syndrome. Basically, the customer asks you to bring them a rock. When you provide it they say it’s too big. The next rock you bring is too small. The next one is too round. This goes on and on and on! You should always negotiate with the user up front for the scope of the project. If something is brought to you later, you must draw the line or negotiate different project phases. You close out the requirements list and then start a second one for the ‘second generation’ of the project.”

**Q** HOW do you ensure project team members are spending adequate time on their project-specific tasks when these people are not under your direct supervision?

“**I** use time sheets and weekly reports and weekly meetings to keep track of specific project tasks. Project Server is great for this as everyone must put in their own time into the program. I can download this weekly to obtain a results synopsis and know where to direct more of my attention.”

**Q** WHAT was the last project under your management? Was the project a success? What hurdles prevented you from successfully completing the project or what main factors contributed to the successful completion?

“**T**he last project I managed was an Automated Customer Price List Tracking program. The project was originally built by the customer in Microsoft Access which sat on one person’s desktop and allowed no one else access. We changed this into an enterprise application and brought it to a successful completion. The problems we encountered were the fact that the person who had built and maintained it no longer worked at the company. We had to figure out what the logic behind the application was before we could prepare any type of estimation of the project and this was extremely difficult.”

“I haven’t had a project that failed, but another colleague of mine did. This was a tracking application which just finished three weeks ago. It finished three weeks late in fact! This was due to scope creep caused by the customer and we had already received, in writing, the customer confirmation that they knew this would happen due to the additional functionality requested.”

**Q** HAVE you had to cancel a project after significant resources (time, money, and personnel) were already spent? If so, were there repercussions that affected your management of future projects?

“**Y**es!! In fact, I had just finished the project the day before and it was being deployed as I was on my way to work. I

received a call from our management screaming at me to stop its deployment immediately! We stopped it right away and later found out that this project was pretty much dead. I had inherited this project from the desk of someone who had been laid off months prior to its scheduled completion. It had been overlooked until the customer had called on a status update. The original estimate provided by the, now departed, project manager had been way off. Additionally, he had not recorded the entire project scope and much of what the project was expected to do was not available. We lost a lot of money on that project.”

**Q** OF the projects you have managed, which one was the most challenging? Please explain.

“**T**he Oracle 11-5-8 update has to be the most challenging yet. This project started back in the summer of 2000 and went into production in 2002. It was a huge effort that cost \$3 million in the first year, had three project managers, and consisted of implementing both new hardware and software. The software being used was Oracle and we had to have it upgraded twice before we could get it to work. This required a huge collaborative effort with the people at Oracle (the customer had a contact there and insisted on us utilizing it as the backend). Budgeting the resources was most challenging as there was a lot of overtime involved and it was costing a lot to keep the project going. We managed to pull it off though!”

**Q** HOW were you able to control a project effectively if there were three project managers?

“**T**he size of the project pretty much required that many. One project manager was a functional manager, another was in charge of documentation, and I was in charge of coordinating the efforts. This is where documentation and devotion to constant communication becomes necessary. What helped out a lot was co-locating the functional managers for both us and the customer. By working together (side-by-side), they were able to get instant answers and feedback when it was required.”

**Q** TELL me about the most difficult client contact you have made in the last six months. What obstacles did you face? How did you overcome them?

“**I** was put in charge of the Work Smart Standards project which was managed by the Department of Energy (DOE). The DOE asked me to take over for them and that’s when I found out the problems! No formal requirements had been developed. This caused me to stop the entire project and develop those requirements and time estimates before going anywhere. Several hands have a stake in this to include the DOE, my company, and the federal government. The bureaucracy is unbelievable! I finished the estimates several months ago, and I’m still waiting for an okay to proceed.”

**Q** AS a project manager, what are some tips you would give to aspiring project managers?

“**S**tock up on aspirin and antacids! Seriously, I would say that a project manager should always stay upbeat and take things ‘with a grain of salt’. What I mean is that if you get too caught up in the pressures of the

job, you’re just waiting for something to happen and it probably will. Always learn from your mistakes and take it all in stride. Most of all have fun doing it!”

**Q** DO you feel organizations consider formal project management processes and training a waste of resources?

“**M**y company most definitely does not! We are always getting the training we need, and there is an open door policy anytime something doesn’t seem to be going right.”

“Of course we’re not without problems. A good case in point is the title of Project Manager. Since my company is a Project Management company, we actually have a department of people who have the title of Project Manager. Since we are a small part of the overall company, politics decided we shouldn’t be called Project Managers.”

**Q** DO you think employees are adequately evaluated/compensated for their participation in projects, especially when this participation is above and beyond their day-to-day responsibilities?

“**I**’m not sure how others do this, but when I feel someone has really worked hard, I write letters to their immediate supervisors and department managers recognizing them for their efforts. I have no more control after that point and so I can’t tell you if they receive anything more than a pat on the back.”

**Q** HOW many of your projects have involved the participation of a third-party company? What unique challenges did

you encounter with this type of project team configuration?

“Most of our projects involve a third-party. We are a contractor, and therefore we contract to different companies all the time. Oracle and Northrop-Grumman are a few examples. It’s really hard to narrow down what unique challenges there are because they vary from company to company. Coordination is probably one of the factors I would say is challenging. Another is aligning our ideas and strategies with theirs.”

### Chapter summary

TIMELY DELIVERY OF any project is a critical success factor. Together with cost and project scope, time is considered a constraint in the triple constraints concept. A large project with many activities requires careful scheduling to allocate time for each individual activity. Com-

municating and monitoring these activity times is an important task for the project manager. One of the most widely used tools for managing time and schedules, is PERT-CPM. This helps with the management of the overall project duration as well as the individual activities. This time management tool *helps to set time, identify activity sequence, communicate time constraints, and monitor progress.*

A critical part of developing a PERT-CPM network is obtaining reliable estimates. Sources for estimating activity time include the experience of project managers themselves, input by others involved in similar project activities, and documentation. This chapter highlights the importance of time management and suggests ways to schedule activities better and monitor their progress. It also suggests ways of estimating the likelihood of project completion within a specified time and how time improvement can be made through the critical path analysis. Finally, it discusses resource implications and ways in which resource use can affect project time.

### Discussion questions

- a) Discuss the idea that time is a resource but also a constraint. Is this a contradiction?
- b) Describe signs that tell you if a project manager is managing time effectively or not. What specific suggestions do you have for a project manager who is deficient in time management skills?
- c) Discuss ways of obtaining good estimates for a project activity. What are good sources of getting estimates? What is prudent to do when you need to estimate an activity for the first time? Is it prudent to overestimate time for new activities or underestimate them?
- d) How does information on variance help you assess uncertainty? What would you do when you have higher confidence in one of the estimators?
- e) The Exhibit at the beginning of this chapter argues that experience, the willingness to negotiate, and the commitment of people are far more important than the use of techniques such as PERT in achieving a successful project. Yet others argue that the correct use of techniques will more likely lead to a positive result. Argue each case and also suggest ‘a middle ground’.

## Exercises

- a) Consider the IS project with seven activities (Figure 5.14) described in this chapter. Use the variance given and compute the number of days that gives the project manager a 95 percent chance of completing the entire project.
- b) Again, consider the IS project with seven activities (Figure 5.14) described in this chapter. What will happen if activity F took one day longer than it is estimated to complete?
- c) It is often suggested that project managers obtain three time estimates for work units that have significant uncertainty associated with their time estimates. Assume you have collected three time estimates for each activity for a performance monitoring system at an international airport baggage handling systems. Your 'cost estimate worksheet' suggests the following:  
Project estimate: 50 hours  
Project standard deviation: 18 hours  
Based on this information and assuming 3 standard deviations from the mean to include approximately 99.75% of the area under the normal distribution curve, calculate:  
a. project highest credible hours  
b. project lowest credible hours up-  
per confidence limit  
c. lower confidence limit  
Explain to the airport executives, your project sponsors, what these numbers mean.

## Important Concepts

- allocation of resources** (pg. 97)  
**bottlenecks** (pg. 87)  
**critical path** (pg. 88)  
**critical path analysis** (pg. 89)  
**Critical Path Method (CPM)** (pg. 87)  
**diminishing returns** (pg. 86)  
**disconnect** (pg. 85)  
**earliest finish (EF)** (pg. 89)  
**earliest start (ES)** (pg. 89)  
**estimating activity duration** (pg. 92)  
**free time** (pg. 90)  
**indecisiveness** (pg. 86)  
**latest finish (LF)** (pg. 89)  
**latest start (LS)** (pg. 89)  
**monitoring time** (pg. 85)  
**most likely estimate** (pg. 93)  
**network diagram** (pg. 88)  
**optimistic estimate** (pg. 93)  
**path** (pg. 88)  
**PERT/CPM network** (pg. 87)  
**pessimistic estimate** (pg. 93)  
**priority list** (pg. 86)  
**probability** (pg. 97)  
**Program Evaluation Review Technique (PERT)** (pg. 87)  
**resource allocation graph** (pg. 98)  
**resource smoothing** (pg. 98)  
**slack time** (pg. 90)  
**standard deviation formula** (pg. 93)  
**time management** (pg. 84)  
**variance** (pg. 93)



## **Bibliography**

- Brooks, F.P. (1995) *The Mythical Man-Month*. Addison Wesley.
- Cadle, J., Yeates, D. (2004) *Project Management for Information Systems*. Prentice Hall.
- Chatfield, C. S. (2003) *Microsoft Project 2003 Step by Step*, Microsoft.
- Kerzner, H. (2003) *Project Management: A systems Approach to Planning, Scheduling, and Controlling*. Wiley & Sons.
- Lowery, G. and Stover, T. (2001) *Managing Projects with Microsoft Project 2000*. Wiley & Sons, New York.
- Nicholas, J. M. (2004) *Project Management for Business and Engineering*, 2nd ed., Elsevier.
- Schwalbe, K. (2006) *Information Technology Project Management*. Thomson Course Technology.
- Van Genuchten, M. (1991) *Why Is Software Late? An Empirical Study of Reasons for Delay in Software Development*, *IEEE Transactions on Software Engineering*, Vol. 17(6).





# 6

## *Leading Projects*

### **Themes of Chapter 6**

- How can a project manager gain and keep the trust of colleagues?
- What are the communication skills required of the project manager?
- How to reduce stress?
- How can conflict between team members be best resolved?
- What are the basic leadership skills of the project manager?
- What is required of a team member?
- What jobs are available in project management?
- How can people qualify for these jobs?

## Introduction

The way in which a project team is led obviously greatly impacts how well the team performs and, therefore, the success of the project. This in turn will have an impact on the reputations of all of the team members, but it will impact most of all on the project manager, as he or she is responsible for the success of the project as a whole. As the book is about project management, in some respects the whole book is about leading projects. Indeed, there are many cross references in this chapter to sections elsewhere in the book where particular issues are dealt with in more detail and in different contexts. However, in this chapter we mainly explore personal questions about leadership and its impact on team motivation and team spirit, such as those related to values and trust. These will be influenced by the corporate culture as well as the personalities of the individuals involved. Some of these issues relate to communication skills and how to deal with stress and conflict, but many are to do with personal and organizational values. Even so, there are other skills required, including those relating to technical and business competence. The latter are usually gained through training and experience, and are discussed elsewhere in the book. However, we concentrate here on people related issues. A later section turns the topic around: how to be a good member of a project team. Readers are likely to be team members before they are team leaders, so it will also be pertinent, and we can learn how to be a team leader from our experiences of being a team member.

However, we start with two exhibits. The first exhibit looks very briefly at Stephen Covey's very influential '7 habits' (see bibliography for more details). Covey emphasizes how we should move from dependence to independence and eventually to interdependence in order to benefit from our interaction with others. It is a holistic approach to working in an environment that enables us to benefit from the support of everyone in our work place and to produce results that will benefit everyone in our environment. The second exhibit, based on the practice of Enid Mumford, suggests that leadership may be more about 'setting an example', 'values', 'delegating' and 'participation for all'.

### Covey's 7 Habits

(see Covey, S.R. (1989 and 2004) in bibliography)

- 1) Be proactive – that is being responsible for our actions and conduct. Commit ourselves to tasks that we undertake and carefully examine results and outcomes of our actions as they influence others.
- 2) Begin with the end in mind – that is using the end as a frame of reference in order to be effective in your proactive approach.
- 3) Put first things first – that is developing the principle of personal management and being able to prioritize and organize by relying on personal integrity.
- 4) Think win/win – that is to seek solutions for problems that are mutually beneficial.
- 5) Seek first to understand, then to be understood – that is, to be effective in com-

munication, you must first try to understand the point of view of others by paying attention to all forms of communication including words, sounds, and body language.

- 6) Synergize principles of creative communication – that is to develop tolerance and understand that the whole is greater than the sum of its parts. Avoid being defensive

in your communication.

- 7) Sharpen the saw: principles of balanced self-renewal – that is to work and develop the four dimensions of renewal: physical, spiritual, mental, and social.

In a more recent book, Covey proposes an 8th habit about personal fulfillment and helping others to achieve their own fulfillment.

### **Enid Mumford: Another view of leadership**

(inspired from the Enid Mumford special edition of the Information Systems Journal, 16, 4, 2006)

Enid Mumford practiced a humanistic set of principles associated with technology and change. She was a leader though her leadership was expressed by example rather than through being called a manager. She regarded the social aspects at least as important as the technical aspects. In any change situation, she argued that attention must be paid to providing a high quality and satisfying work environment for employees and that this would be more likely if they played a major role in the change, perhaps making the decisions themselves rather than have decisions made for them by the change agents.

One of her largest socio-technical projects was with the Digital Equipment Corporation in Boston. She argued successfully that the object of good design of a system is an improvement in the quality of working life and job satisfaction for those who had to work with the new system. At ICI, she had to study the situation first-hand in the office in order not only to understand the management's objectives in installing technology but also to note how the technology would impact the individual members of the work force and how that work-force could and would respond.

She had a profound belief that the understanding and knowledge of each stakeholder at any level in the organization could contribute to the design, implementation, and operation of systems even if the new system was based on a technology which itself was evolving. Indeed, she argued that without the contribution of all stakeholders, new or changed systems had a high risk of failure.

Through her intervention, she demonstrated that the contribution and even the leadership of members of the workforce led to the implementation of effective systems, which combined an improvement in the quality of working life with meeting the managerial objectives of improving the effectiveness of the business.

Hard bitten managers of the authoritarian school were persuaded to try her participative methods, provided she was there to coach the team and guide the team leaders. Participation, that is to say active and legitimized involvement in, and influence on, systems design, could be seen as a breach of managerial prerogative by the 'old school' and thus Enid had some interesting political moments with senior executives. However, her achievements often spoke louder than rhetoric.

## 6.1 Trust

IT IS IMPORTANT THAT TEAM MEMBERS TRUST YOU. SOME OF THAT TRUST may come automatically with the job (at least in the short term). Team members may well assume that you have the experience to do the job and that you will exercise good judgment, but if they think this is not borne out in practice, then trust can easily be lost and it will be much more difficult for you to achieve your objectives. On the other hand, trust may only come following a long spell of consistent and fair behavior. It has to be earned through you yourself working hard and making an effective contribution to the goals of the project. Consistency is one of the key criteria to first obtaining and then keeping the trust of colleagues. As a project manager, if you agree face-to-face and then go in another direction, then trust will be lost and will be difficult to retrieve.

High ethical standards are important, and this issue was discussed in Chapter 1. Team members are unlikely to give full commitment to the project and the project manager if they think the latter is behaving unethically. Again, it will be difficult to persuade a senior manager to **champion** the project if there is an inconsistency of ethical values between top management and the project manager.

The project manager needs to be committed to the project and all members of the project team. **Trust** is a two-way process, and if you do not listen and value what your team members say, it is unlikely that they will listen to you and show you respect. This respect for others can be gained by asking advice and delegating appropriately and trusting colleagues to do a good job. This is sometimes referred to as **empowerment**. Such encouragement may be at least as important as the more obvious financial and status incentives in motivating people to do their best.

Empowerment involves giving the responsibility of doing a job to individual team members. This is likely to be more successful, *at least in the long run*, than coercing people to work hard and achieving objectives through threats. Respect and trust are much less likely to be earned through disciplinary measures.

However, the trust of everybody is difficult to maintain if there is conflict between team members. In these circumstances, as you are the project manager, you must take responsibility and make decisions. Sometimes it is necessary, therefore, to resolve the situation by coming to a clear decision. The team is more likely to understand your resolution to a situation if the overall decision-making process has been fair. Team members need to know the decision-making process; that is, who is involved in the decision and what the criteria are for making the decision. There needs to have been full opportunity to discuss the issue. You may also need to ease the situation before formally announcing a decision, by discussing the issue with colleagues on a one-to-one basis, so that colleagues are at least aware of what might be an undesirable outcome for them and will not feel that their views were ignored. If you have the trust and respect of your colleagues, they are more likely to go with the decision positively, rather than reluctantly.

It is important to **lead by example**, delivering work of the highest quality yourself, neither making excuses nor blaming others for your own mistakes. Nobody is perfect, and when you make mistakes it is important to be honest about it. If you have the respect of colleagues, mistakes will be

forgiven. Likewise, you must be prepared for the mistakes of colleagues and support them in putting things right. Discussing the matter with colleagues informally on a one-to-one basis can help. **Performance appraisals** enable these concerns to be discussed more formally, but it is important that such discussions are not totally negative. The team members should end the meeting motivated to do well or better than before; not dispirited.

## 6.2 Communication skills

THE BEST PROJECT team member is often seen as the person that should be promoted to project manager. In some respects, this is surprising because the skills required to be a good team member are not the same as those for a good project manager, or at least the emphasis is not the same. In short, the team member is a doer while the project manager needs to manage, inspire, and support others and is much less of a doer.

In the project manager's role, **communication skills** are particularly important. In this section, we look at some of these skills:

### ◦ Presenting

A skill which will be particularly important concerns presentation. In particular, this involves presenting the project proposal and progress reports to management. Normally this will involve preparing a series of Microsoft PowerPoint (or similar presentation software) slides. There is no substitute for good *preparation*, as this can reduce the likelihood of nerves interfering with the quality of the presentation. One aspect of preparation concerns *knowing your audience*, and this should ensure that you know what to include and what not to include in the presentation and that the presentation is at the right level for your audience. In other words, the content must be appropriate for that audience. The content needs to be fair in presenting different arguments, particularly if a decision needs to be made. Otherwise, you might be accused of being manipulative.

Once the general content has been worked out, it needs to be well structured so that your audience can follow your arguments. The 'story' can be told in a hierarchical fashion, although there are other possibilities (such as following the structure of a good detective novel). Probably the best advice is to encourage you to do a '*dry run*'; that is a practice run through the content with some or all of your team. It can be a great confidence booster, as you will get to know your material, be able to time the presentation better, and get some feedback before the big event. This can also help to ensure that the content is balanced as well as accurate. Colleagues might also comment on whether there are areas which can be made more interesting - you do not want to bore your audience - and on the use of color, photographs, and graphs on your slides.

### ◦ Interviewing

A project manager may be part of an interviewing panel if the candidate is applying for a post on that manager's project team. Even before the interview, the project manager needs to spend time studying the candidate's CV, looking for gaps as well as strengths. Many project managers may concentrate on experience and technical skills when interviewing,

and it is important to dig deep at times to ensure the candidate's knowledge and experience are not superficial, but the ability to be a good team member also relates to things like attitude, friendliness, and so on. An important question is therefore: *Can you work with that person as a colleague?* The project manager will want to appoint the best person, so it is also important to impress the candidate as well as to be impressed by the candidate. However, the project manager should not over-sell the job, as this will lead the team member to disappointment afterwards and result in a potentially less effective team member than expected. Along with the formal interview, time needs to be spent informally discussing the job, and this can be done when showing the candidate around. Discussion should not be rushed, so a whole day may be allocated to interviewing just two or three people. This may seem to be a very large investment in time, but it is worth it because a mistake will be very costly.

- **Discussing**

At the outset, we have argued that successful project managers need to be good communicators. We have discussed formal procedures such as interviewing and presenting, but time spent informally discussing the project on an equal and often one-to-one basis can be invaluable. Informal face-to-face discussions can help resolve present difficulties and expose potential difficulties that may arise in the future. Without such sessions, the project manager can seem distant and inapproachable and, as a consequence, out of touch. Symptoms of poor relationships might reveal themselves as conversations in which one person is talking with (or dictating to) the other one while not listening, the atmosphere is one where there is sarcasm and ridicule between the participants, or the discussion is entirely negative and there seems to be a 'blame culture' within the team.

Some writers argue that the best form of management can best be described as **management through conversation**. Relationships where serious issues can be worked through in a friendly, conversational way enable good advice to be given (and taken). The project manager needs to spend time setting up such a relationship, and that requires taking the time to get to know people informally, perhaps away from the work setting. Conversations about sports, cinema, music, or the news are not necessarily a waste of time: They help to establish trust in the relationship as well as friendliness and openness. Time spent earlier in the project on this pursuit can pay huge dividends later when the pressure is on and decisions need to be made and work to be done quickly. It is then that you need cooperative colleagues.

- **Motivating**

One important skill of the project manager is to motivate others; in particular, members of the project team. This has two aspects: motivating the individual and motivating the team. Some leaders are naturally inspiring and charismatic, but all project leaders can be helpful, challenging, and hard working. We have also previously discussed the potential value of delegation to the individual: empowering them. But motivating the team as a whole is also very important, as the contribution of the team as a whole should be greater



than the sum of the individual contributions.

A first meeting is important in setting standards, means of communication and, in general, getting to know your colleagues. One approach is to try to encourage a sense of fun and camaraderie in the team at the beginning, and this, in turn, should help to instill trust and a willingness to help each other. In other words, develop a good **team spirit**. Celebrating the achievement of reaching intermediary objectives can help this process along, as can encouraging participation more generally. Many program managers start their project with a team-building course, perhaps using external specialists to run the course. Sometimes this might reveal gaps in the team. These gaps might be in particular skills or personality traits. Meredith Belbin's research has suggested that a diverse group is one of the most important factors in forming teams that will lead to a successful outcome.

- **Marketing**

To some extent, many of the activities that we have listed under communication skills concern marketing. The project manager needs to market the project from the beginning, when looking for funding and commitment from team members and other stakeholders, to the end, when the project becomes operational. *People need persuading and convincing*. All of this requires good communication skills. However, 'good words' need to be backed up by competence, credibility, ethical behavior and commitment so that the trust (described in the previous section) is deserved. Emphasis on these aspects is likely to be rewarded in both the short and the long term, as 'success breeds further success'. A reputation for delivering on promises may become ingrained and project managers will become trusted partners in the business.

## 6.3 Planning

PLANNING HELPS THE project manager and their colleagues by providing a structure or framework for thinking about a project. It focuses the project manager's thinking into those areas that are relevant. It also helps the project manager make decisions at the appropriate time and justify the decisions once they are made. The process of planning might reveal a shortage of resources, and the plan can provide the explanation to management as to why these resources are needed and to explain the risks associated with not complying with the plan.

A plan can be used as a defense against management's wishes to cut costs or to change delivery times inappropriately. Thus a plan is also a communication tool. It might be illustrated by a PERT chart, which can help contrast the plan with actual progress. As with all plans, the PERT diagram needs to be kept up to date. The plan may reveal a need for further resources, including staffing, training, and hardware and software.

However, these plans should not be distorted for political gain; for example, suggesting an inappropriately long deadline (so as to 'impress' people when it is delivered 'early') or inappropriately short deadline (to impress early on, only to deliver late and disappoint). Neither of these tactics will work in the long term, as game playing, dishonesty, and malpractice will be identified.

It will take time, but constructing a good plan will help to ensure resources are not wasted

on inappropriate pursuits. *Thinking must precede action.* Another important guideline is that *the person who executes a plan is the best person to do the plan.* This means that the project manager will do the overall plan but needs to delegate the planning of activities to those who will be doing them, though of course, the project manager needs to comment on and agree with these individual plans and construct the overall plan.

## 6.4 Stress management

STRESS IS OFTEN confused with **pressure**. The latter is normal. Deadlines exert pressure; loyalty to others exerts pressure; and pride in workmanship exerts pressure. These are potentially positive pressures. Sometimes pressure on the project manager will seem a large burden. But consider the jobs of airline traffic controllers, police officers, emergency hospital staff, and restaurant chefs. The pressure on them is at least as great and probably more intense. Some people enjoy pressure and are bored without it.

However, when pressure turns to stress it becomes negative and constraining. People differ with regards to the point at which pressure turns into stress. But this may occur when, for example, your 'to do' list becomes so large that you feel helpless and end up doing nothing, your personal relationships become very unpleasant because you are so frustrated at your limited achievements, or your partner complains that you do not give them adequate attention and time or says that you are moody.

Poor project management can cause stress for your team members. They may see you, for example, dithering on decisions, not involving them in any way, being unreasonable in your requirements, or displaying an aggressive style in your relationships with them. **Delegation** is important, and even though you could do a job, it may not be an appropriate use of a manager's time. Delegation can help in two ways. First, it can take some of the pressure off of you, and second, it can be seen positively by your colleagues, as they may feel more in control of 'their' task and they may enjoy the added responsibility. But colleagues must be clear about what is expected of them and you need to give appropriate feedback so that they are aware of progress. On the other hand, it is not good delegation if a manager always seems to be checking up on delegated work.

Targets and 'to do' lists can be useful, but they should be realistic (indeed, they can suggest that delegation is essential). Again, doing overtime can relieve pressure, but it will become negative if overtime periods are prolonged. Sometimes stress is caused because colleagues lack the skills needed. In this case, it is important to identify these needs early and make suitable training programs available. In other cases, stress can be relieved by doing another activity (including taking a break). This might put the problem into perspective and enable the individual to look at it afresh.

One particular symptom of stress where this approach can often help is '**paralysis by analysis**', which happens when an individual has spent too much time looking at an issue. Looking at the issue afresh, after a short period, may well enable the individual to make a *reasonable* decision or take a positive action. However, don't put off the decision forever, as making no decision is unlikely to solve a problem.

## 6.5 Conflict management

CONFLICT IS OFTEN the result of stress, but it is sometimes simply part of the job. After all, no-one is the same: everyone has different experiences, expectations, cultures, education, and the rest. So, it is natural for people to see things differently. Indeed, situations where everyone sees things together in one way, usually referred to as **groupthink**, are usually the result of a lack of motivation or interest or fear of reprisal. Groupthink occurs when the group seems to over-estimate the potential of the group and under-estimate the potential of the world outside of that group. This situation is usually not helpful in leading to the best decision.

However, though disagreements are normal, the project manager needs to try to keep things calm by allowing different views to be aired and mediating conflicts in a fair and egalitarian way. Conflicts are likely to occur relating to scheduling, staffing, money, technology, procedures, and personalities. This is normal, but conflict should not be allowed to get out of hand, and so if possible, it should be dealt with early. There may be a problem-solving mode to deal with this particular type of conflict, a way of finding a compromise where none of the players 'lose face', or a way of smoothing the disagreement by looking for aspects where there may be agreement. Project managers should not withdraw from the conflict, but should confront it and deal with it.

Sometimes it is necessary for the project manager to impose a decision. Certainly, the project manager must be aware of those scenarios that may be acceptable (even if some are not ideal) and those that are definitely not acceptable. *You are the project manager: it is your responsibility.* But imposing a decision should be seen as 'reasonable', and this requires that the project manager fully understands the issues and the alternatives. The best principle in steering the decision making is to concentrate on the issues and the arguments made, not the personalities making them. So the project manager needs to understand the issues well. Any decision that is made should be made on this basis and the project manager needs to state their reasoning to all parties. Sometimes it will be necessary to follow-up on this with one-to-one discussions, trying to persuade and encourage others to conform to the decision.

## 6.6 Essential skills and qualities of effective project managers

IN THIS SECTION, we look at particular skills that are required for the project manager. Of course, no-one is perfect, but it is useful to bear in mind the types of skills which will be useful. There are many training programs that might support some of these. For example, they may be featured in a course entitled 'organizational skills'.

**Prioritize.** Without **prioritizing**, tasks will be done in 'any old' fashion and the project is unlikely to finish on time and on budget. The important ability to make sure the urgent tasks with the highest payoff are tackled first helps team members to stay focused, might make decision-making easier, and should ensure that there is some early pay-off. This does not imply, of course, that only one task is done at any one time, just that tasks are done according to need, assuming that the dependencies on the network permit multi-tasking. There may be groups of priorities, those tasks in priority 1, 2, and so on.

A related difficulty concerns the issue of how well tasks need to be carried out. Many tasks

do not require the perfectionist's touch; others do. Experience and know-how are helpful in determining this, though advice from team members as well as customers and managers may be called upon usefully.

**Be proactive.** Many project managers tend to react to events. This may be reasonable when dealing with a management instruction about resources or a customer request for a change in requirements, but it is not always appropriate. Where possible, a good project manager will predict change in the environment (for example, be aware of a likely increase in equipment prices) or would like some change to happen (for example, motivate colleagues by instilling a better reward system for team members). In these cases it is beneficial if the project manager is **proactive**, trying to steer things in the direction that is good for the project and that will make things happen. Thus, buying equipment early might be a positive proactive decision to counteract a potential increase in hardware prices, and discussing a bonus system with management might be a proactive strategy to effect a change in reward systems. Similarly, if the project manager identifies missing skills in the project team early, it will be easier and less costly to deal with then, at the beginning of the project life cycle, than if it is identified later through failure in a deliverable. The worst thing that project managers can do is to ignore problems and hope that they will go away. They will not go away and will only become greater problems afterwards.

**Be thorough.** It is important to know the **requirements** thoroughly; be aware of any legal requirements; know the formal (and informal) company procedures to be followed; and verify that techniques (such as the work breakdown structure, PERT diagrams, and payback period costing) have been used correctly. The project manager is responsible and, therefore, will get the blame if, for example, an important requirement is missing or the date of delivery has been miscalculated. This applies whether the project manager performed the task or delegated it. *It does not help you by blaming a colleague on the team – you are the person responsible.*

**Be strong.** It is vital that you do not accept a reduction in resources or a reduction in the estimated time to completion if your calculations suggest that these are not feasible. The project plan should be thorough (and kept up to date) and therefore will be defensible and should be defended. Of course it is difficult and stressful to argue with management, but the project manager and the project (and therefore management themselves) will both suffer if management demands are unrealistic and the project manager agrees to an unfeasible timetable.

**Be willing to share.** Good project managers will be willing to involve others and take advice, even though the final responsibility rests with them. Sometimes outside expertise from consultants will be required, and should be sought, when the project manager is unsure about a major issue. **Sharing** can lead to better decisions, and it also enables colleagues on the team with expertise to feel valued. A decision reached by **consensus** is also more likely to be supported than one arrived at through **coercion**. Where a project manager is sure of the abilities of members of their team, many decisions and much work

can be delegated. Of course, the project manager may well have proven experience in work that will now be delegated and done by others. This means that the project manager will be able to turn their experience towards advising team members, helping when needed, and having good review systems in place. It does not mean that they will do the job themselves.

**Negotiate.** When **negotiating**, we are looking for an agreement where both parties feel satisfied with the outcome. We see this every day when we negotiate to purchase a product. At the end of the negotiation, the salesperson knows that there is still a good profit and the customer knows the price agreed is less than the original ticket price. Both sides have moved from the original situation, but the outcome is satisfactory to both. Preparation is important for successful negotiation (indeed it is vital for most of the issues discussed in this chapter). Without it, the project manager may 'give away' an important tenet of the project. A loss of one feature of the application may have negative implications that pervade the whole of the project.

**Be positive.** Good project managers will champion their project and **praise** the work of the project team. If the project manager is negative or cynical when talking about the project, then everyone else will be negative about the project and the team working on its development. But good words need to be backed up by good deeds. However, unless people know about these good deeds, success is unlikely to be rewarded. The project manager is the person to market the achievements of the team. Of course, problems will occur and will need to be discussed and resolved, but within reason, opportunities to be positive about the project should not be missed. It also makes people aware of the project, which will also be important for its ultimate success.

**Support your colleagues.** Being positive about the project is also a good way for the project manager to support their team colleagues, but it is also appropriate to mentor junior colleagues, praise colleagues for work well done, delegate some responsibility where appropriate, and advise training programs to fill gaps in background skills. Just-in-time training is often best, as it is only when people realize there is a gap in their background that prevents them from carrying out a job successfully that they commit themselves fully to the training program.

**Question everything.** Carefully asked and tactful **questioning** in the early stages of a project can save a great deal of work later. An error in the details will be more difficult and time-consuming to identify and correct towards the end of the schedule. Questioning does not imply criticism, though it is often taken as such in situations where communication is not good. It represents a wish to support colleagues and ensure that the final product will be as specified. General questions are useful at the beginning of a discussion, but it is also necessary to focus in on particular aspects. If the detail is not right, then the overall project will not be right.

It is often difficult for people to explain things well even if it is correct. But very often, the inability to explain well is due to poor thinking, analysis, or design. Of course some colleagues might be so steeped in one field, such as technology, that they find it difficult

to communicate in terms that others might understand. In such cases, it can be useful for the questioner to state his or her understanding in simpler language so that it can be confirmed or corrected. This can also reveal misunderstandings, such as assumptions that are not commonly shared. Creative questions can help here, such as, 'are there other ways to achieve that?' On the other hand, some people find the generation of ideas easy but focusing on solutions much more difficult. Take advantage of people's positive attributes. Again, much will depend on the people concerned, personal relationships, experience, and company culture when determining the best way to approach questioning.

**Be organized.** Good **time management** can enable the best use of your own contribution and can also help to avoid stress. If you do not meet your deadlines, then you cannot expect your colleagues to meet theirs. This also implies good diary management. If you do not turn up for a meeting, are double booked, or late, then it obviously sets a bad example for everyone else. Good **meeting management** is also important. Meetings are necessary on some occasions, but it is important to ensure that they are only as long as required, that there is an agenda known to participants beforehand, even if it is just a list of bullet points (people know what the topics are and have time to think about them before the meeting), and that only those people to whom the meeting is relevant are invited. At the meeting, take notes (or have a colleague do so) so that minutes can be completed afterwards, and stick to the agenda (let others speak, but only to this agenda). Sometimes it is necessary for project managers to state and argue their views, but it is often best for a project manager to act as facilitator, enabling different views to be expressed in a reasonable fashion and allowing time for reflection, discussion, and coming to an agreed decision. Often the latter requires the project manager to *sum up the feeling of the meeting* (which should not simply be his or her view unaffected by the discussion!) and suggest a way to resolve the issue.

**Implement a good review process.** A supportive **review process** will ensure work is checked and also help to prevent team members from being offended. Having the project manager's own work reviewed will also instill an atmosphere of support, not incrimination, as does asking for advice. Make clear that the objective of the process is to improve quality, not to criticize people. Another advantage of a good review process is that it also spreads knowledge to others. Such a process can also provide an opportunity to give positive feedback. Praising someone's work, if it is good, is as important as pointing out areas which need looking at. Where appropriate, it is useful to go outside of the team for reviews. For example, asking the customer and other stakeholders to review work will encourage stakeholder involvement and commitment as well as get some valuable feedback.

In our own research, during interviews with project managers, we asked them to assess the importance of 12 project management skills. To gauge the importance of these skills, a 5 point Likert scale was used in the study. A clear definition of each skill was provided. Respondents were asked to rate the importance of each skill as: 1. not at all; 2. a little; 3. moderate; 4. much; and 5. a great deal. Forty two project managers responded to this survey of skills and the results, presented

in Figure 6.1, are based on that sample.

It is clearly seen through Figure 6.1 that, in our study, communication and leadership skills ranked highest.

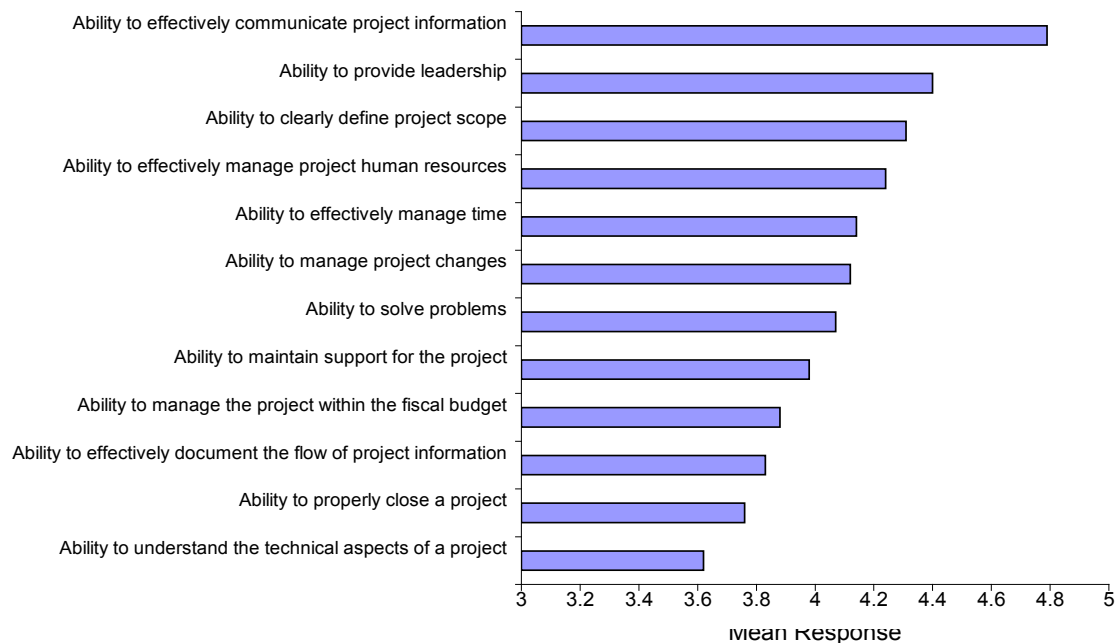


Figure 6.1: Ranking project manager skills

## 6.7 Being a good team member

WE NOW TURN the topic around: how to be a good member of a project team. We focus in this book on leadership, yet readers are likely to be team members before they are team leaders (for example, in groups when working on the case studies or as team members in the early stages of your career). Further, we can learn much about how to be a good team leader from our experiences of being a team member. Conversely, it is also important in being a good team member to consider what the team leader might require of their team members. Being a good team member can be just as demanding as being a good team leader. In Figure 6.2, we suggest some important requirements for team members.

- Develop communication skills.
- Support others in your team.
- Project management training is for everyone!

Figure 6.2: Being a good team member

The first requirement is to *develop communication skills*. For example, *it is important that the team leader and members know of any problems that you have*. Problems are unlikely to go away by themselves, and discussing it with the project manager and other team members may lead

to solutions. Good communication skills require good listening as well as good talking so that all participate. They also include competence and good behavior when using media, such as email, group decision support systems, and teleconferencing. Good team members reflect on what has been said, trying to clear any points of potential confusion, but when they hear of good ideas, they are enthusiastic and positive.

Some people can be selfish, but to be a good team member, you will need to *support others in your team*. This means being ready to listen to alternative ideas, not blaming others for problems nor bragging about your own successes, and getting involved by sharing ideas, proposals, and solutions. This will encourage ideas and, in general, a sense of mutual trust. Conflicts might occur, but good communications and an otherwise supportive atmosphere should resolve them easily so that consensus is achieved. Remember that the team should be working together towards a common goal, and this requires the commitment of all the members towards this goal. Supporting others also implies a fair contribution when carrying out the work, in writing things up, and so on. 'Free riders', who contribute little and don't deliver on their commitments, yet expect to gain from the contributions of others in the team will be revealed as such in the long term, if not the short. In general, teams rely on the ethical behavior of all members.

From the above, it should be evident that project management training is for everyone! It should also be apparent that many of the requirements for being a good team member (for example, communication, training, and so on) are similar to the requirements related to being a good team leader. We will discuss aspects of these requirements in more detail in the chapter about forming the project team.

## 6.8 Interview with a project manager

THE TABLES WERE turned somewhat in the following extract from an interview with a project manager. Before he was promoted to project manager two years ago to manage this project, he was a highly respected and very experienced team member. The project had recently been completed following 20 months work. In fact, the project is seen largely as a success by the company management, but the project manager felt that one aspect was a great disappointment and that was his deteriorating personal relationships with his team. He wanted to know '**what went wrong?**' so that he would not repeat the same mistakes in his next project, and it is this part of the interview that we report on here.

### Interview

**Q** CAN we now turn to discussing the aspects of the project that did not work well?

**“**I would like to focus on personal relationships in the project team, par-

ticularly the fact that I became alienated from some colleagues. Indeed a few members of the team have made it clear to management that they do not wish to work on another project with me as project manager. I work hard and know my job, and in any case, this project was



largely a success. Although I say it myself, I am basically a nice man, and I do not really understand why personal relationships deteriorated so badly.”

**Q** HOW did that alienation show itself?

“**I**t showed itself in a number of ways! First, half way through the project, one key member (very experienced) stopped talking to me socially (though he did his job and answered work questions) but he did not respond to my ‘good mornings’. It soured the atmosphere of the whole team. Second, I had advised management to short-list four people for a post to replace someone who had left. I put a lot of time and effort putting this shortlist together. Three of my colleagues, all senior people, then came to me as a group and said that we should only interview two of these people as they felt that the other two would not fit in well. After an argument (it was not a discussion) I gave way and told management that we had changed our mind. It was a bad decision as we finished up appointing someone that was nowhere near ideal. Third, one of these senior people in my team told me that I manipulated the group and he didn’t trust me. Do you want me to go on?”

**N**O, I’ve got the idea. Of course the first example you gave could be the result of a difficult colleague (not you), but there does seem to be a pattern here.

“**Y**es and I don’t understand it. I have done a few of the ‘how to be a good manager’ courses. I did most of the recommended things. I am not autocratic, I don’t order people around. My project was seen by manage-

ment as a key project and to be fair they were very supportive. I did my job well – the proof is in the success of the project (and I got a pay rise at the end of the project). And you are correct, this man is a well-known awkward case – in fact he is an obnoxious so-and-so (and the personnel manager agreed with me on this). He seemed to come to meetings just to put me down and try to get anything I wanted stopped. But it upset me personally as his behavior tainted me as well as him.”

**Q** WHY did you add this guy to your team?

“**M**y strategy was to get the best talent available for my project team. And to be fair he is very competent and experienced. I did not put the team together to have fun, we had a job to do that was important to me and the business. But I should have got him sacked from the project. If I had to choose, I would prefer a successful project from the business point of view with a poor atmosphere within the project team, than the other way round, but this guy was too much.”

**Q** HAVING both is not impossible! Tell me about the process that led to the shortlist of four candidates.

“**I** am very open and fair, and all the project team could look at all the applications. People made written comments on each candidate. I looked at these as well as the CVs and thought four were ‘appointable’ in principle. It is true that two of these did get some negative comments from my colleagues in the team, but they were very experienced people which made up for the deficiencies expressed. In

any case, we could always decide not to appoint on the day if these weaknesses showed themselves as being too much. Then I was accused of ignoring team members' comments which just was not true, and that I had been manipulative. If it is manipulative to want to look at the four best people then I plead guilty. I felt very stressed to face this accusation after I had been so fair and I lost my temper and finally shouted 'OK you can have your way'. Unfortunately this happened in the work's canteen, so it wasn't kept private. We lost two potentially good people, especially as the person we offered the job to first decided she did not want to come and the other one was appointed but no-one felt very enthusiastic and he has indeed been a disappointment to say the least. What a disaster – this affair risked the project as a whole. “

**Q** DID you discuss the matter with your colleagues afterwards?

“**N**o. I was so annoyed with them and so stressed out most of the time that I thought it best not to raise the subject again with them. Maybe I was 'too democratic' in letting them get their own way. They acted as a separate clique operating within the project team, forcing their own agenda and not the best agenda for the project. I should have said that I was the project manager and my decision was final on this, after all, I had top management support in this.”

**Q** WHAT about the trust issue?

“**T**o be honest, this hurt me greatly. What did he mean? I never truly lied to anyone in the team,

neither him nor anyone else. Obviously at times you need to be a bit evasive to maintain discipline and team spirit, but I never deserved this. You can surely see that this was not my fault, I was just unlucky with my team members. I will be more careful next time.”

“I am still angry about all this even though the project finished a few months ago. I did everything for the project and my team. Do you realize I haven't had a holiday for two years and hardly a weekend without going to work for some of that time? And this is the thanks I get.”

## Chapter summary

IN THIS CHAPTER we have looked at the personal skills and qualities required of the project manager. One of the most important requirements is that team members trust their project manager. The latter must be seen as being ethical, consistent, and fair. Delegation is a good skill to use as this empowers and motivates colleagues, though it does not mean that project managers are then 'rid of it' because they need to support colleagues in doing their tasks. The project manager needs to set a good example in their own work, time keeping, and organization. Good communication skills are vital to a project manager, and that means formally, such as presenting and interviewing, and informally, such as discussing and motivating. The project manager also needs to market the project and the team positively. There will be times when the project is stressful; for example, when there are conflicts or tasks are not being realized according to plan. There are a number of skills that may help, such as the ability to prioritize, to share decision making, negotiate, along with the general category of organizational skills.

## Discussion questions

- a) Read the first exhibit again and comment on the seven habits described by Covey. Prepare a short presentation for class with your own comments added.
- b) On reading the second exhibit, do you think that leadership by example is feasible? Do you think Enid Mumford's ideas were too optimistic and unrealistic?
- c) "The way to deal with teenagers is to decide if a principle is really important or not. If it is important, you must argue with your kid and ensure that your rules apply. If it is not important, really important, then don't bother. You will find that you argue much less and the household atmosphere is a lot better". Do you think this advice applies to project managers?
- d) Consider the interview with the project manager in this chapter and, in discussing the following questions, make known any assumptions that you make:
  - i) Do you think that the interviewer should have been more directive in offering advice? If so, what advice would you have given?
  - ii) Do you think that the project manager was correct in saying that the project was a success?
  - iii) Do you think he was 'too democratic'?
  - iv) Do you think he will ever become a good project manager? If so, how might you speed his development?
- e) Read cases on the web and identify personal skills being used by the project manager. Did these skills (or the lack of them) contribute to the project's overall success and failure?

## Exercises

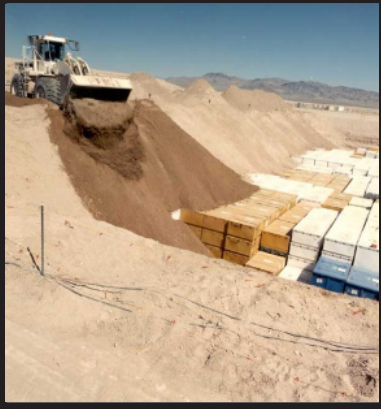
- a) Search project management job descriptions and list major components of their job descriptions. See if you can find from the literature how project management job description have changed over time.
- b) Search the US Bureau of Labor Statistics site and write a one page summary report on the status of the project management job market. Search similar sites for the European job market and compare these results with those from the US market.
- c) Search the web and find out more information about Forrester Research surveys as they relate to the project management job market. Prepare a short report to share your findings with the class.
- d) Search the web for salary survey reports by organizations such as PayScale and others and prepare reports of median salary for project managers by 'years of experience', 'industry type', 'job location', 'gender', and 'company size'. Compare median salary for project management professionals in 'public' vs 'private' organizations. Which company pays higher to project managers: IBM, Accenture, EDS, or HP?

## Important Concepts

- coercion** (pg. 118)
- communication skills** (pg. 113)
- conflict management** (pg. 117)
- consensus** (pg. 118)
- delegation** (pg. 116)
- discussing** (pg. 114)
- empowerment** (pg. 112)
- groupthink** (pg. 117)
- interviewing** (pg. 113)
- lead by example** (pg. 112)
- management through conversation** (pg. 114)
- marketing** (pg. 115)
- meeting management** (pg. 120)
- motivating** (pg. 114)
- negotiating** (pg. 119)
- paralysis by analysis** (pg. 116)
- performance appraisals** (pg. 113)
- planning** (pg. 115)
- praise** (pg. 119)
- presenting** (pg. 113)
- pressure** (pg. 116)
- prioritizing** (pg. 117)
- proactive** (pg. 118)
- questioning** (pg. 119)
- requirements** (pg. 118)
- review process** (pg. 120)
- sharing** (pg. 118)
- stress management** (pg. 116)
- team spirit** (pg. 115)
- time management** (pg. 120)
- trust** (pg. 112)

## Bibliography

- Aspray, W. Mayadas, F. and Vardi, M.Y. (Eds.) "Globalization and Offshoring of Software: A Report of the ACM Job Migration Task Force," Association for Computing Machinery, 2006, <http://www.acm.org/globalizationreport>
- Belbin, M. (1999) *Team roles at work*, London: Butterworth-Heinemann.
- Berkun, S. (2005) *The art of project management*, Sebastopol, Ca: O'Reilly.
- Career Resources (2007) [http://career-resources.dice.com/job-technology/hot\\_skills\\_shift\\_to\\_project\\_management\\_security\\_architecture.shtml](http://career-resources.dice.com/job-technology/hot_skills_shift_to_project_management_security_architecture.shtml)
- Covey, S.R. (1989) *The Seven Habits of Highly Effective People*, Simon & Schuster, London.
- Covey, S.R. (2004) *The 8th Habit: From Effectiveness to Greatness*, Simon & Schuster, London.
- Djavanshir, G.R., "Surveying the Risks and Benefits of IT Outsourcing," *IT Pro*, published by IEEE Computer Society, Nov/Dec 2005, pp 32-37.
- Kotter, J.P. (1990) *What Leaders Really Do*, *Harvard Business Review*, 68 (3), May.
- Loo, R. (2002) *Working toward best practices in project management: a Canadian study*, *International Journal of Project Management*, 20.
- Posner, B.Z. (1987) *What it takes to be a good project manager*, *Project Management Journal*, 28 (1).
- Whitehead, R. (2001) *Leading a software development team: A developer's guide to successfully leading people & projects*, Harlow: Addison-Wesley.



# 7

## *Developing the Project Plan*

### **Themes of Chapter 7**

- Why do we plan the project?
- Why is it not always appreciated?
- What is technical competency?
- What is management competency?
- What are the major steps in a project plan?
- What are the detailed activities in a project plan?

## Introduction

MOST PEOPLE CONSIDER PROJECT MANAGEMENT COMPETENCY FROM the two perspectives of technical competency and managerial competency. **Technical competencies** include detailed activities such as scheduling, estimating, quality control, and the like as well as hardware and software issues. **Managerial competencies**, on the other hand, relate to broader issues of planning, leadership, personnel, resource management, and so on. To be successful, a project manager needs to be competent in both of these areas.

This chapter describes the importance of planning in successful project management. It describes steps involved in project planning as well as steps for the execution of a project plan. We then look at PRINCE, which is an approach to project planning that is the preferred approach of the UK government and that has been influential internationally. But first our exhibit concerns a debate which will be fairly familiar to all students and their teachers: whose side are you on?

### A conversation with a student: Whose side are you on?

**Student:** Good morning Professor Jones.

**Student:** No. I was too ill to go to the doctor and my phone was not working.

**Professor:** Good morning Mr. Hmmmmm.

**Professor:** Pity.

**Student:** I'm sorry but I can't make the coursework deadline.

**Student:** Also I want extra time to perfect the coursework. I don't want to give you material which is not up to the high standards I require of myself.

**Professor:** But we agreed that the deadline was today and there will be a fail grade of 0% for anyone who missed the deadline.

**Professor:** What is your average coursework grade?

**Student:** But that is not fair as the Internet was down for two days.

**Student:** Around 55%. But I think I can really do some excellent work here.

**Professor:** But we allowed for contingencies such as this when the coursework was set five weeks ago.

**Professor:** Even so, today is the deadline.

**Student:** But I was also ill for a few days.

**Student:** I have trouble with people like you who say; "there are deadlines". My main concern is towards you bureaucrats that impose timelines to things. I admit that there are deadlines at which point a specific thing will need to happen, for example, a system needs to be ready for the new tax year on January

**Professor:** If you have an official sick note from the doctor this will be accepted and a delay in handing for the period officially off sick for submission is allowable. Have you a sick note?

1; an ambulance routing system responding to an emergency call must be immediately put right if it goes wrong, etc., but everything else is not a deadline but a convenience. Now, even in education where we should be aiming to achieve our best work we all appear to accept bureaucrats that impose timelines to things. I feel that coursework as a piece of work has its own internal time-life-span. With the motivation right, the quality is better, the focus is on the work not the timeline. What you are

saying is aim to exert as little as possible for minimum achievement, just make the deadline. Control the process and make it stupid. What of quality?

**Professor:** Good point, and I take your question as rhetorical. But the deadline is today.

## 7.1 Purpose of a project plan

PROJECTS OFTEN INVOLVE significant resources, require diverse talents and skills, influence many individuals and groups in different departments, and require close collaboration with end-users. This means that, for any project, a great deal of coordination, communication, and negotiation is required in order to produce a successful outcome. Planning is an effective mechanism that helps project managers accomplish these objectives. Planning is a mentally challenging task and it is often avoided for reasons such as “it is time consuming,” “the project is not big enough to warrant a plan,” “plans do not get implemented,” and “we need action not planning.” These arguments are not convincing and should not be accepted. Planning can help save much time and inconvenience in the long run.

To give you an idea of what planning can do for project management, consider the questions shown in Figure 7.1. These and other important questions can be answered where there is a proper project plan. A good plan should make it clear where you are going and how to get there.

1. Is it clear what the project is supposed to deliver?
2. Is it clear who will be working on the project?
3. Do you have a breakdown of activities?
4. Is it clear when deliverables are due?
5. Do you have established communication channels?
6. Are you clear who the stakeholders are?
7. Do you have milestones and due dates for them?
8. Do you know what resources are available?
9. Do you know what to do if you run into obstacles?
10. Do you know what to do if functional areas do not cooperate?
11. Are you aware of project risks and their impact?

Figure 7.1: Questions related to establishing a project plan

Despite the clear advantages, planning is not often appreciated. There are two primary reasons for this. One is that planning is a challenging and mentally demanding task. Careful planning requires knowledge, experience, and commitment. Information systems project planning, for example, involves a clear understanding of the technology, resources, talents, culture, politics, and procedures. The second reason for the lack of appreciation for planning relates to its perceived disconnect with action. Project managers and team members who think of themselves as ‘doers,’ or those who would want to be considered as such, often jump into ‘action’ without a clear understanding of the long-term goals. They tend to ignore the broad perspective of the design, development, implementation, use, and impact of a project.

This kind of **action-oriented project development** approach generates short-term momentum at the cost of long-term benefits. Team members and stakeholders involved with project activities, such as primary users and sponsors of the project, soon realize that any project goals are part of a larger set of organizational goals and to be useful the project goals must fit together within the larger organizational goals. Organizational goals and objectives should invariably take priority over departmental and functional goals and objectives. Likewise, project goals and objectives must be aligned with those of the organization. Projects with goals and objectives that are not aligned with organizational goals and objectives either do not get funding approval or run the risk of cancellation later on. It is critical to have the management on board for support before the project starts. Top management support is especially important for large projects that require significant resource commitments.

Planning places the project within a larger perspective and describes the project manager as the implementer of organizational goals and objectives. Remember, projects are tools and mechanisms by which organizations realize and implement their goals and objectives. A plan is implemented through actions. It must be seen as a road map for defining and executing activities. A **good plan** is *realistic, doable, and easy to understand*. It is an effective tool to monitor progress and evaluate success. More specifically, as shown in Figure 7.2, a plan helps in a number of areas.

1. Define project scope
2. Develop an activity list and work breakdown structure
3. Define activity sequence and duration
4. Estimate resources
5. Develop support and commitment
6. Establish milestones
7. Establish communication channels
8. Define responsibilities
9. Define due dates
10. Identify risks
11. Set standards
12. Monitor progress
13. Integrate project outcome

**Figure 7.2: The potential of project planning**



This list suggests the range of knowledge and abilities that are required to develop a useful plan. It further suggests that a useful plan must be comprehensive, and at the same time, it must guide execution. A plan is a **living document** that must be adhered to by all stakeholders, especially the project manager and team members. Project planning starts with the project scope (see Chapter 3) that defines the project outcome. In other words, the project plan guides activities that accomplish what is described in the project scope. The project manager plays a significant role in the development of a plan and is responsible for its implementation.

## 7.2 Project planning process

PROJECT PLANNING OUTLINES *ways, means, and methods* through which the project goals will be accomplished. Once a project is approved, the first decision should be to appoint a project manager. One of the first responsibilities of the project manager is to develop a project plan. Sometimes the core of a project team is also involved in assisting the project manager with the development of the project plan. The following steps and issues are important in developing a workable project plan.

**Project requirements** – Project managers must understand project requirements clearly before they can formulate a plan (see Section 3.1). The project requirements are closely linked and described through business needs. The project manager must analyze and understand business needs as well as project needs and make sure that they support each other.

**Project phases** – Project phases allow large projects to be divided into manageable components (see Section 1.4). The larger the project the more critical this step is in the project plan development. Phases should be linked to deliverables which are the products or services that the project will achieve, for example, a completed training program, a software module that has been fully tested, or successfully implemented hardware. To the extent possible, phases are determined to provide the customer with important functions, processes, or products of the project as early as possible with minimum risk to the business unit.

**Work units within phases** – Each phase is divided into work units or activities with each work unit linked to a single deliverable. A work unit is defined through its duration (start date and time, completion date and time), the resources required, and the person responsible for it (see Chapter 3). A clear definition of a work unit leads to more accurate estimates for resources and ultimately to a more reliable assessment of outcome.

**Project milestones** – Milestones are clearly defined events with significant importance to the customer and the project development life cycle and can be used to measure progress. For example, a milestone in an information systems development life cycle is when a prototype of the information system is complete and ready for testing. A milestone should lead towards the successful completion of a project. Indeed, an important milestone is the one where the customer accepts delivery of the product and signs off. A milestone is typically associated with a deliverable that can be defined, measured, developed and demonstrated.

**Management approval** – Executive approval is necessary in order for a project to start. This support is also necessary throughout the project and its progress towards a successful outcome. The project manager must identify all sources of power and influence that could impact on a project and make sure that the project is supported. To be effective, the project plan must be approved by the management and accepted by all stakeholders (Section 1.5).

**Project resources** – The critical resources for a project include human resources as well as materials and equipment. The talent and skills of the team members and their interaction is critical to the success of a project. Project team member selection and team building is an important task for project managers. Material and equipment use needs to be planned carefully and, when necessary, ordered from the supplier for timely delivery.

**Project constraints** – The critical constraints for a project include time and budget. A project starts and ends on specific target dates. The project duration is usually divided into shorter times for phases and work units. Some projects may have more flexible time frames than others. However, a prolonged project is likely to lose support and raise concern. As we saw in Chapter 4, PERT/CPM or MS Project are useful tools that help project time management. A budget is assigned to a project at the initial justification stage. It is usually divided into phases and then work units, with some flexibility to transfer funds between phases and work units.

**Potential issues** – The project manager is ultimately responsible for the successful delivery of the project outcome. Important issues that influence all projects and that a project manager must carefully consider include **strategic issues** such as the long term viability of a project, **tactical issues** such as day-to-day operations, **resource issues** such as human resources and technology, and **success measures** such as customer satisfaction with deliverables. Reflecting on these issues enables the project manager to prepare for alternatives.

**Policy and procedures** – Policy provides a general guide for decision making and problem solving. **Policies** provide broad parameters for decision making. **Procedures** describe detailed approaches to implement policies. Procedures are particularly important for individuals working on a project for the first time or for individuals who are not familiar with how things are done within the organization.

**Planning pitfalls** – The fact that every project is unique provides opportunities and challenges for the project manager. Following a generic recipe can be problematic. While lessons can be learned from each project, the limits of what can be learned from a past project must be understood. The uniqueness of a project provides opportunities for the project manager to fulfill organizational goals and objectives through the project.

**Planning techniques and tools** – There are a number of useful and effective project management techniques and tools including Gantt Charts, Work Breakdown Structures (WBS), Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and MS Project. The project manager must decide which tools and techniques

work best for a given situation. However, techniques and tools alone do not guarantee success, however well they have been used. The ability to relate business issues, think critically, and communicate effectively is probably the most important skill set for good planning. Techniques and tools are merely a support function intended to enable the project manager to carry out the tasks efficiently.

**Input from colleagues** – The WBS and the PERT network, including the critical path, are crucial parts of the project plan. Typical workers are asked to provide task inputs concerning the resources and time needed to complete a task (activity). They are expected to fill out forms detailing the specifics of each task. These forms create a kind of mini contract with the project manager and therefore are very important in forming an accurate project plan.

### 7.3 Planning and project success

PLANNING IS A *systematic* approach to understanding the project from the beginning to the end with the phases involved in between. A project plan is the primary means of communication among all stakeholders. A project plan must be accepted and adhered to by all stakeholders, and that requires broad involvement. It must be the result of collective efforts. It must have a summary that describes the project scope, phases, methods, deliverables, milestones, limits, responsibilities, and due dates clearly. Exceptions and contingencies are described and possible risks identified. A project plan predetermines a set of actions to realize the goals and objectives of an organization through the project scope. A project plan acts like a **road map** for the execution of project activities.

Planning involves **flexibility** because of the unpredictable nature of some of the events and activities. As seen in Figure 7.3, good planning helps project success for a number of reasons.

While each project is different, these points apply to most information systems projects. They also provide a frame of reference for evaluating good project plans. If a project plan does not address these issues, or a majority of these issues, it may be necessary to go back and review that plan. Sometimes for small projects the project manager may decide to develop the system by ad hoc decisions and an informal process. While this might work in some cases where there is a highly dedicated work force, it has the potential to create conflict, confusion, and crisis.

### 7.4 Practical considerations

IN THE FINAL analysis, a good plan helps management with decision making, monitoring, and execution. Although the content of a plan is not cast in stone and can be altered if necessary, it must provide a sense of *stability*, *continuity*, and *focus*. In other words, drastic change in the content of a plan may mean that the project focus is altered. Some project plans may go through more changes as the project develops because of the nature or the project. Information systems project plans, for example, are more likely to go through change because of the following reasons:

**Early adopters** – In information systems intensive environments, users tend to rely on self training and self learning, and as a result, their expectations are continuously changing. Some users are motivated and learn rapidly about new and upcoming technology.

This could lead to unrealistic expectations of system features that may not be practical or cost effective at the early stages of technology development.

1. It clarifies what needs to be done before the work starts.
2. It makes work manageable by breaking down the project into phases.
3. It defines the confines of each work unit in terms of time and budget.
4. It clarifies who is responsible for a task.
5. It gives perspective and links work units to the overall project.
6. It links the project to organizational goals and objectives.
7. It is a source of reference for clarifying issues.
8. It provides the basis for performance evaluation.
9. It provides the basis to monitor progress.
10. It provides the basis for measuring success.
11. It provides the basis for establishing communication channels.
12. It helps the formation of realistic expectations.
13. It helps generate support for the project.
14. It provides boundaries for the triple constraints of cost, time, and requirements.
15. It provides the project manager with the opportunity to demonstrate administrative and leadership skills.
16. It provides the project manager with the opportunity to set standards and describe expectations.
17. It reduces uncertainty.

**Figure 7.3: The potential of good planning**

**Reluctant users** – Because of their training and background, some users are hesitant to apply new technology in their work. These people often know their work and their business but are afraid of change or lack confidence in learning new tools. This also could provide problems due to inappropriate expectations.

**Expectation gap** – The rapid change in technology availability, capability, and ease of use influences user expectations. There is an expectation gap between the technology's potential and its benefits. Users often tend to expect the latest, the fastest, and the most flexible system and may well believe the 'hype' often associated with new technology at face value.

**Knowledge gap** – Some organizations have a rich pool of individuals with business knowledge developed over the years. These individuals are not necessarily technology savvy. Some organizations have a rich pool of individuals who have high expertise on technology application but are not necessarily experienced in business. These situations create a knowledge gap that can negatively influence an application or the innovative use of technology. Indeed, it may be expecting too much for the project manager to have knowledge of the business (for example, the supply chain, strategy and planning, organizational hierarchy, human resource management, and the rest) along with up-to-date technical expertise of specific technologies involved in the project. It is therefore more

realistic to expect that the team, of which the project manager is head, possesses this width and depth of expertise.

Because the above factors are very dependent on the particular people involved and the organizational culture, it is not possible to provide a specific and generic project plan for all occasions, but thinking fully about the above issues will likely achieve an appropriate plan for the particular situation. A good project plan will consider these organizational and human issues, and experienced project managers will build flexibility into their plan in response. The technology may become mature in the future and be able to meet 'current' expectations, but it is not fulfilling those expectations now. Sometimes users are not prepared to wait; they expect the best features now. Sometimes users develop false expectations because the internal developers or external vendors 'over sell' the technology. It is important for the project plan to clarify the project outcome and prepare realistic user expectations.

## 7.5 Projects in controlled environments (PRINCE)

PRINCE IS A structured and standard approach for project management originally designed for all IT projects of the UK government, although it is now used elsewhere and not just for IT projects. It is available from the UK Office of Government Commerce. The present version is actually PRINCE2, but we will shorten this simply to PRINCE here. A project is seen as having the criteria shown in Figure 7.4.

1. A defined and unique set of deliverables
2. A set of activities and their sequence to construct the products
3. Appropriate resources to undertake the activities
4. A finite lifespan
5. An organizational structure with defined responsibilities

Figure 7.4: A PRINCE project

The approach aims for projects to have: a controlled and organized start, middle and end; regular reviews of progress against the plan and against the **business case**; flexible decision points; automatic management control of any deviations from the plan; the involvement of management and stakeholders at the right time and place during the project; and good communication channels between the project team, project management, and the rest of the organization. These stated aims will coincide with the general approach that we have specified in this book.

The PRINCE approach aims to deliver the end products at a specified quality, within budget, and on time. Unlike many methodologies, for example **SSADM**, the emphasis is placed on the delivery of these products, not the activities to achieve their production. All the stakeholders should be involved during the project as appropriate, but the management structure of a PRINCE project is expected to consist of:

- A project board, with a senior executive as member along with a senior user
- A project manager who fulfills the day-to-day management
- Team leaders who report to the project manager

- A management champion for the project, who builds the business case and outlines the justification, commitment and rationale for the project.

The project is driven by the business case, and this is reviewed frequently. This suggests why the project is being done, the likely benefits of the project, and who is going to pay for it. The formation of detailed plans is a cornerstone of this approach. The highest level of the plan is the project plan, that is, an overall plan for the project, and this is broken down into stages. A detailed plan gives a further breakdown of activities within each stage. Although the project plan is important in showing the overall scope of the project, major deliverables, and resources required, it is the stage plans that are used for day-to-day control.

Ken Bentley describes in detail the components of PRINCE, including business case, organization, plans, controls, risk, quality, configuration management, and change control, and these are as shown in Figure 7.5.

1. Business case: This drives the whole project
2. Organization: This is the project team structure
3. Plans: These are based on products
4. Controls: information that reveals problems and ways to deal with them
5. Risk: Identify and manage risk factors
6. Quality: Standards and methods to assess quality
7. Configuration management: Components of the final product
8. Change control: Determines how change is handled

**Figure 7.5: The components of PRINCE**

The technical aspects include the project breakdown structure as well as PERT charts, which link the activities, showing their inter-dependencies, to create the end date. Resource plans identify the resource type, amount, and cost of each resource at each stage. **Gantt charts** are used to help with resource allocation and smoothing. However, the use of techniques and tools is seen as optional.

Meeting quality expectations, like time and cost, is seen as an important aspect of the approach. There are quality controls, which are defined in the technical and management procedures. And the descriptions of the deliverables in terms of fitness for a purpose also represent a statement about quality. The acceptance criteria need to be explicitly stated.

Within a PRINCE project there are eight processes, as shown in Figure 7.6, which are detailed in Figure 7.7.

PRINCE produces a set of reports which help control, in particular, the monitoring of actual progress against the plan and against the business case. Some of these reports are expected to form the basis of discussions at meetings. These meetings are normally held at the initiation and at the end of each stage in the project (and sometimes mid-stage as well). The reports highlight such things as progress, exceptions, and requests for change.

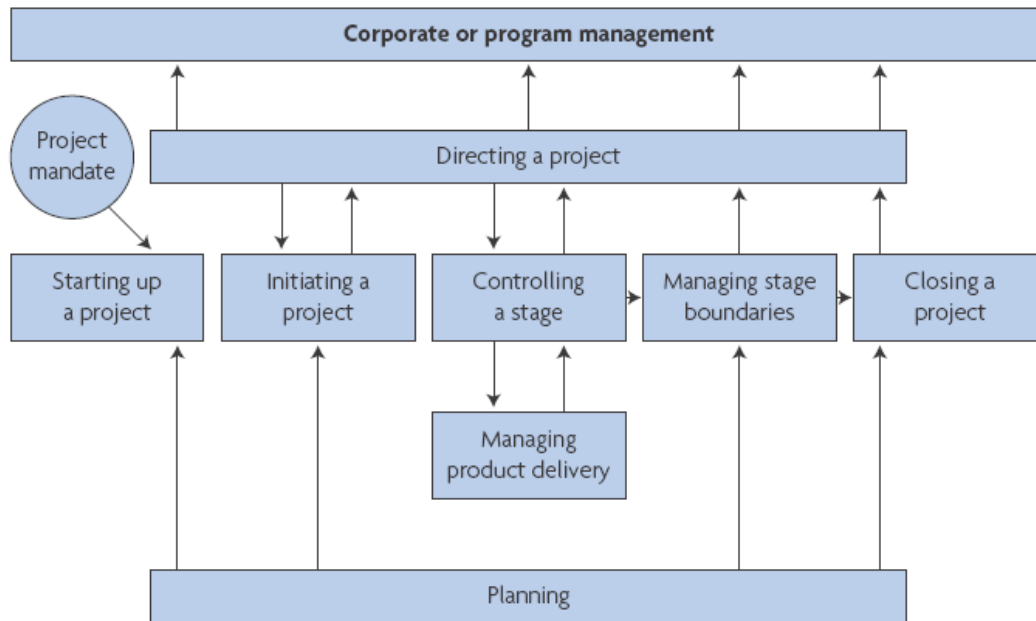


Figure 7.6: Overall PRINCE approach (modified from Bentley, 2002)

- 1) Directing a project: As we saw above, there needs to be overall direction to authorize the project, approve the go ahead, and monitor progress and closure.
- 2) Starting up a project: This short stage includes the appointment of the project team, agreeing with the aims of the project, deciding on the project approach, defining quality expectations, and planning and drawing up the contract (whatever form that takes) between customer and supplier.
- 3) Initiating a project: This includes agreeing that the project is justified, establishing management procedures, and creating the detailed plan and the project initiation document.
- 4) Controlling each stage: This process describes the monitoring and control activities, authorizing work to be done, gathering progress information, reporting and taking necessary action if there is deviance from the plans.
- 5) Managing product delivery: Work is allocated to the team, planned and carried out. Quality criteria are checked and reports made to the project manager. Finished products are formally accepted.
- 6) Managing stage boundaries: This process ensures that the plan is adhered to or updated as necessary and the next stage approved.
- 7) Closing a project: The project manager gains the project board's approval to close the project at its natural end (or premature end, if necessary). Customer satisfaction needs to be established in the former case. Maintenance procedures need to be in place. Lessons learnt need to be assimilated as part of the organization's knowledge management process.
- 8) Planning: This involves designing the plan, defining the project's products, identifying dependencies, scheduling resources, and allocating risks.

Figure 7.7: The eight processes of a PRINCE project

However, the first document produced is the **project initiation report**, which outlines the business case, defines a high-level plan, formally initiates the project, lists overall objectives for the project and defines personnel responsibilities. It may be more detailed, for example, identifying job descriptions for each person, providing a detailed cost/benefit analysis for the business case (sometimes referred to as a feasibility report), examining the risks associated with a project, and dividing the project into well-defined stages.

**End-stage assessment** is a control point, which if successful, signifies acceptance of the deliverables promised for that stage and provides authority to go on to the next stage. **Mid-stage assessment** may occur if the stage is of long duration, problems have been identified such as deviation from the plan, or there have been requests for change.

At the end of the project there is a **project closure report**, which lists the project's achievements in terms of deliverables achieved, performance in terms of comparisons of actual against forecasted duration, cost and resource usage, and quality in terms of errors or exceptions. It also provides information to help organizational learning, for example, experience with the use of tools and development methodologies. The report also includes formal acceptance letters from senior technical staff, users, and operations staff. There is also expected to be a post-implementation review.

Ken Bentley provides a very detailed step-by-step guide to the approach and provides an excellent check-list and series of questions to be address at each stage of the project. We also recommend the PRINCE website ([www.ogc.gov.uk/prince2/](http://www.ogc.gov.uk/prince2/)), which provides a set of 28 templates to document each aspect of PRINCE. Indeed these resources might be useful for program managers following any project management approach. These templates include those for documenting acceptance criteria, the business case, communication plans, the end project report, the end stage report, exception reports, issue reports, the lessons learned report, the post project review plan, the project brief, the project plan, the project quality plan, quality logs, and risk logs. There is also an on-line demonstration package which shows how to manage successful projects with PRINCE2.

## 7.6 Interview with a project manager

### Interview

**Q** HOW long have you been project manager? learned?

“**A** ctually for only three years, but I have learned so much about project management in that time that I feel very experienced!”

**Q** WHAT would you say were the three most important lessons that you have

“**I** think there are many more than three very important lessons but the importance of a good project plan, good communications and the contract would be on my list. They are all based on particular experiences so I can give you an example each time.”



**O**K start with the project plan

“**T**ime needs to be spent on the detail. The tasks need to be understood fully to allocate time and people resources to the task. But it is not always so simple. An obvious example is that if a task takes 10 days for 6 people, you can't assume it will only take 5 days for 12 people. I made that mistake early on and forgot about fixed aspects and communication aspects. The inter-relationship between the tasks also needs to be fully understood. I understood it for my last project and got it right. However, there was a problem. My project was part of a much larger project and so there were a number of project teams. Aspects of my project were dependent on another project and that was delayed causing unexpected problems for me. On one occasion things got bad and we required a high-level mediator to suggest a compromise.”

**Q** TELL me about the importance of communication skills

“**T**hese are the most important of the expected skills of the project manager. I am fairly young for a project manager and it is politically difficult for me to say ‘no’ to a high-ranking manager. You cannot agree to an unrealistic end date, even if it is difficult not to say ‘yes’ to a request from your boss. But you have to stick to your guns. I find team leadership easier and I am always willing to support my team members. For example, what is the point of saying ‘no’ to a vacation request – as another project manager did – when the person does little and is not co-operative generally because of being forced to stay. Better say ‘yes’ to the holiday and you have someone who is going

to be loyal and pull every stop when the chips are down! I am not saying that you should be a ‘buddy’ to team members, but you should be supportive. However, I have found relationships with management difficult at times and also, as illustrated in the discussion on the project plan, relationships with other project managers can be difficult. If there are team members more experienced (or, more likely, simply older) than you on the team, this can pose a management problem. You often have to be more gentle and flexible and aware of their ‘pride’ so that ‘it might be better if you try this’ is more appropriate than ‘do this’.”

**Q** EXPLAIN the importance of the contract and/or memorandum of understanding

“**T**hese should be very strong from a legal point of view. There should be no loopholes. One contract was a particular problem. For example, we had agreed a penalty clause for late provision. This is fair enough. However, in order to progress we needed information from the client. Frequently they did not show up at agreed meetings, so we could not progress and so we were late and we had to bear the cost!”

**Q** YOU suggested that there were other important lessons that you have learned

“**T**here are lots in fact from the seemingly trivial to the larger issues.”

You interest me – what do you mean by a trivial issue

“Well something that occurred recently. We were not happy with some test results. It turned

out that the people testing the system were colleagues of the developers and were reticent to point out some flaws and they 'signed off' some modules that were not adequately tested. OK we spotted that early, but there are lots of things like that which might appear trivial but could well damage the project."

**Q** ... and a more important issue?

**“W**ell, documentation is important as well. A 'trivial' issue concerning documentation relates to versioning. Make sure that each update has an associated date and/or version number, so that we know what the latest version is, and also make sure that the documentation is simultaneously kept up to date. Again, this 'lesson' has been based on an unfortunate experience, but documentation as a whole is important.”

**Q** FINALLY, what training were you given? Did you look at PM books?

**“I** was given some support through working with project managers, doing a course and we had access to books on IS project management. The latter were not of much help. Technical issues are probably less than a third of all the issues of an IS project manager. It may be surprising, but my experience suggests that it is the cultural and 'people' issues that are far more important. The books I saw gave the proportion as two-thirds technical. Also there is not enough 'real' material in books

(indeed like this interview). It is as if learning bookwork 'do this and it will work' will make you a good project manager. Well it won't. Truth is, project management is political, fuzzy, and complex. Also, no book tells you that a lot of project management is 'fire fighting' thinking on your feet, arguing-compromising-making up cycles with colleagues and just trying your best. You have to be both clever and reasonable at the same time. I describe real life project management, not the theory which hardly exists in my practice.”

### Chapter summary

PLANNING IS A time consuming and mentally challenging task. It is one of the first activities that the project manager must undertake. Key team members must be involved with the development of the plan but the primary responsibility rests with the project manager. Planning provides an opportunity for the project manager to demonstrate business knowledge and technical expertise. A good project plan provides a road map for the project development life cycle. It identifies responsibilities and provides boundaries of cost and time. It is a tool for establishing communication channels. A project plan puts the project in the perspective of organizational goals and objectives and puts work units in the perspective of the overall project. A good project plan is a tool for decisions, monitoring, and execution. It sets policies and procedures and is a source of reference for resolving differences. A project plan is a critical success factor. A manager who cannot plan a project cannot lead.

### Discussion questions

a) Following your reading of the exhibit, whose side are you on? Should lecturers be

more flexible with respect to coursework deadlines (and customers with respect to

supplier's project plans)? Should plans be seen as inherently malleable? What might be the consequences of such flexibility (or leniency)?

- b) This chapter argues that there are two broad perspectives for project management skills. One is technical competency that relates to detailed activities. The other is managerial competency that includes broad based issues of a project. Discuss and list examples of each. Do you think it feasible for one person, the project manager, to have both sets of competencies?
- c) It is suggested in this chapter that an 'action' oriented project management approach is often concerned with short-term objectives, sometimes at the expense of long-term goals. Does this mean that action is not necessary? What is your interpretation?
- d) This chapter suggests that one of the reasons that planning is not appreciated is that it is perceived as an activity that does not support action. A good plan should provide a roadmap for activities, for monitoring progress, and for measuring success. Discuss how you would develop a plan that would support these objectives?
- e) Project sponsors are often reluctant to set up project contingency funds because they seem to imply poor project planning. Some perceive the contingency fund as an add-on slush fund. Others say they will face the risk when it materializes. How would you overcome the difficulty of establishing contingency reserves?
- f) Do you think PRINCE would be appropriate for developing projects in an SME or is it suitable only for large projects in larger organizations?

## Exercises

- a) List and describe skills necessary for developing a good project plan. What kinds of skill are necessary for planning? Divide your answer into technical skills and organizational and business skills.
- b) Search the web or other sources for a project plan. Describe that plan and its components and give your opinion about it.
- c) Match the PRINCE templates (see [www.ogc.gov.uk/prince2/](http://www.ogc.gov.uk/prince2/)) with particular deliverables discussed in the book as a whole. Are there any missing templates? Are there areas not discussed in the book?

## Important Concepts

### action-oriented project development

(pg. 130)

**business case** (pg. 135)

**early adopters** (pg. 133)

**end-stage assessment** (pg. 138)

**expectation gap** (pg. 134)

**flexibility** (pg. 133)

**Gantt charts** (pg. 136)

**goals for a good plan** (pg. 130)

**knowledge gap** (pg. 134)

**living document** (pg. 131)

**management approval** (pg. 132)

**managerial competencies** (pg. 128)

**mid-stage assessment** (pg. 138)

**planning pitfalls** (pg. 132)

**policies** (pg. 132)

**procedures** (pg. 132)  
**project closure report** (pg. 138)  
**project constraints** (pg. 132)  
**project initiation report** (pg. 138)  
**project milestones** (pg. 131)  
**project phases** (pg. 131)  
**project planning process** (pg. 131)  
**project requirements** (pg. 131)  
**project resources** (pg. 132)  
**project success** (pg. 133)  
**projects in controlled environments**  
**(PRINCE)** (pg. 135)  
**purpose of planning** (pg. 129)  
**reluctant users** (pg. 134)  
**resource issues** (pg. 132)  
**road map** (pg. 133)  
**strategic issues** (pg. 132)  
**success measures** (pg. 132)  
**tactical issues** (pg. 132)  
**technical competencies** (pg. 128)  
**work units** (pg. 131)

## **Bibliography**

- Avison, D., Fitzgerald, G. (2006) Information systems development: Methodologies, Techniques and Tools. 4th ed., McGraw-Hill.
- Baccarini, D. (1996) The Concept of Project Complexity: A Review, International Journal of Project Management, Vol. 14(4).
- Beynon-Davies, P. (1995) Information Systems 'Failure': The Case of the London Ambulance Service's Computer Aided Dispatch Project, European Journal of Information Systems, 4, pp171-184.
- Bentley, K. (2002) PRINCE2: A Practical Handbook, Butterworth-Heinemann, Oxford.
- Fitzgerald, G., IT at the heart of business, BCS (2000).
- Hopper, M.D. (1996) Complexity: The Weed that Could Choke IS, Computerworld.
- Page, D., Williams, P. and Boyd, D. (1993) Report of the Public Inquiry into the London Ambulance Service, HMSO.
- PRINCE2, Office of Government Commerce, [http://www.ogc.gov.uk/methods\\_prince\\_2.asp](http://www.ogc.gov.uk/methods_prince_2.asp)
- Torkzadeh, G., Weidong Xia (1992), "Managing Telecommunications by Steering Committee," MIS Quarterly, 16 (2,) June 1992, pp. 187-199.
- Torkzadeh, G., Chang, J. C. J., Hansen, G.W., (2006) "Identifying Issues in Customer Relationship Management at Merck-Medco." Decision Support Systems, 42(2).
- Van Genuchten, M. (1991) Why IS Software Late: An Empirical Study of Reasons for Delay in Software Development, IEEE Transactions on Software Engineering, Vol. 17(6).



# 8

## *Forming the Project Team*

### **Themes of Chapter 8**

- How can the project team be formed?
- How will the project team work together?
- How can we create the right synergy?
- How can we ensure collective responsibility and avoid a blame culture?
- How can we encourage open communications?
- What kind of attitudes can be expected from the members of a team?
- What are the relationships between team characteristics and project success?

## Introduction

THE SUCCESSFUL DEVELOPMENT AND IMPLEMENTATION OF ANY PROJECT depends to a large extent on the project team and on how well team members work together. The project team members must not only be competent at their tasks but also be able to complement each other to create the right synergy. The collective efforts of team members should be greater than the sum of individual efforts. An effective team takes collective responsibility for what is to be done rather than allowing individual members to pass blame onto others or earn credit for themselves. The communication and interaction among team members should be open and effortless. Team members should be willing and eager to help each other and learn from one another. This leads to the understanding that *when the team wins, everyone wins and if the team fails, everyone fails*. This chapter will describe the importance of forming the right team for a given project and the kinds of attitudes the project manager should expect from members of a team. This chapter also describes the relationship between team characteristics and project success. It will describe the importance of team work and the individual characteristics that the project manager should look for when forming a project team. This chapter ends with an interview with a project manager. We start with the following exhibit that examines some aspects of good communication, which are important in all project management activities.

### Get to the point

Information is useful when it is accurate, timely, and relevant. You must have heard managers who ask for a 'complete' explanation of some event - managers who, when asked how much information they need to make a decision, will respond 'give me all that you have' or 'give me what you can find on the subject'. People ask for 'complete information' or 'all information' when they do not really know what they are looking for or how to go about dealing with an issue. And that is counterproductive.

Experienced managers know exactly what type of information they need, when they need it, and in what form they need it. Information overflow is a problem that is easily generated given the power of computers. The principles of accuracy, timeliness, and relevancy are important when you give or receive informa-

tion. When requesting information you need to be clear about: what type, what form, and by when. When giving information you need to follow the same principles.

Project managers spend a great deal of time preparing proposals for new projects. Effective proposals clearly describe: (a) that there is a need for a system; (b) what will it take to develop that system; (c) how it will be developed; and (d) what the outcome will look like. While the written proposal is always necessary and important, especially for reference, it is often the short presentation that will influence whether or not top management and the steering committee approve the proposal.

Often you are given as little as twenty minutes to present your idea and make your point. Your presentation must be accurate, timely,

and relevant. Also, remember that many people, including top management, have short spans of concentration. Use your time effectively and avoid any discussion that do not directly relate to your case, or you may distract your audience. Give the abstract and get to the outcome as soon as you can; make your point short and sweet in the few minutes that you have before you lose their attention.

Use the same principle when giving a status report of a project. Assume that you need to send an email to give a progress report. Use a few short statements: (a) You could use one clear statement to describe the current status. For example, “we are one week behind with the third milestone of the project”; (b) Then give a short statement that clarifies what that delay means to the bottom line. For example, “this will delay project delivery by at least one week”. (c) Next, describe your specific response to the problem. For example, “we plan to have three people on overtime for three hours a day for four days to make up for lost time”. (d) Then give a clear short explanation of how this happened. For example, “we fell behind because the vendor sent us the wrong routers for the network, and we had to wait

for replacements”.

You do not need to be defensive with your explanation; you need to be factual and give your professional assessment when necessary. The first statement in your message will get the attention of your audience; missing the deadline for a milestone. The second statement describes the consequence; late delivery. The third statement tells your audience that you have thought about the problem and have an idea of what it will cost; using overtime in response. Finally, the fourth statement puts the problem in context; a clear explanation.

People want to know very quickly the status of the project. Next, if something is not right, they are interested in knowing whether or not anything can be done about it. Remember, project status is about where the project is at at that point in time. You can provide the main line of your report in the subject line of your email message. That way, you are giving the bottom line even before your email is read. That also tells your audience whether they should open that email now or leave it for later.

## 8.1 Team as a core of activity

THE PROJECT TEAM is the unit that undertakes project activities that are defined and described in the project plan and in the work breakdown structure. While the project manager is responsible for the project development life cycle and its successful completion, team members carry out the actual work and make sure that individual work units are completed on time, within budget, and according to the specifications. An **effective team** is more than the sum of its parts. It exhibits *synergy, excitement, cooperation, innovation, coordination, and drive*. The project manager must form a team that shares a common vision for the successful completion of the project. While in-

dividual members differ in values, skills, styles, and other traits, they must function as a team and treat project objectives as common goals. A highly effective project team has the following characteristics:

**Competency** – the pool of talents that includes diverse knowledge and skills and that provides the capabilities for performing the range of activities described in the project plan. The team competency can be broadly defined through technical skills and managerial skills. The first one includes an understanding of and experience with equipment, analytical tools and techniques, and the like. The second one relates to inter-personal skills, leadership, written and verbal communication, and so on.

**Common purpose** – team members relate, understand, and work towards achieving the same set of objectives, as described in the project plan. This is an important characteristic that helps channel collective efforts towards the ultimate goal of the project.

**Sense of trust** – the team exhibits a sense of trust among themselves as well as between members and the project manager. Team members feel they can rely on each other for support. They feel comfortable discussing mistakes for the benefit of everyone without concerns for chastisement. Lack of trust among team members creates secrecy, rumor, and ultimately, a non-productive environment.

**Positive attitude** – the team exhibits a proactive and a realistic ‘can-do’ attitude, especially when it is faced with setbacks and difficulties. Most projects will face difficulty (resource issues, the untimely responses of vendors, and unexpected turnover) at one time or another before they are complete. An effective team will show a problem-solving attitude toward unexpected problems and, to the extent possible, will try to resolve problems within the allocated time and budget.

**Outcome oriented** – the team needs to know who the stakeholders are and understand and appreciate that project success is ultimately measured through customer satisfaction. The customers of a project include owners, managers, sponsors, clients, and users. The team strives to produce results that meet the specified needs of the customer.

**Problem solving** – the team accepts task responsibility and seeks creative means to accomplish goals and objectives, especially when faced with unusual situations. Problem-solving skills include the ability to see a problem before it arises and to be prepared to give an appropriate response for it in a timely manner. Experienced project managers and competent teams are expected to be proactive toward such situations. While this higher expectation poses a challenge for the project manager and the team, it also suggests respect for and recognition of the team’s competency.

**Synergy** – the team identifies itself as a unit that exhibits high levels of synergy and coordination. The communication among team members is frequent, open, and effective. Without synergy, the team’s energy as well as the project’s resources are dispersed and spent rather aimlessly; everyone is going in their own direction rather than working together towards common goals. With synergy, the team will produce greater results than



the sum of individual efforts. Experienced project managers are very mindful of team synergy as they select members for a project team.

**Responsibility** – team members consider their successes and failures as outcomes of the unit and not of the individual. The individual member succeeds when the team succeeds and vice versa. This does not mean that individual responsibilities do not matter. On the contrary, when individual members do not accept or understand responsibilities for their tasks, the chances of project success are greatly diminished. Thus, team members must not only feel responsible for their specific tasks but also for the outcome of the entire project.

**Openness** – the team exhibits openness for exchanging ideas. Team members do not hesitate to get input from other team members or to seek help when they need it. Closed and rigid environments discourage innovation and critical thinking and, as a result, are prone to failure. In an environment that is open to the exchange of ideas, team members often propose changes that are necessary and changes for situations that, if not dealt with in time, would eventually evolve into bigger problems.

**Professionalism** – team members hold high standards and have integrity. They treat each other with respect and behave professionally in their interaction with the customer and stakeholders. Project managers play a key role in this respect through their own behavior and treatment of others. They must establish, communicate, and adhere to a code of professional conduct. Established organizations such as the Project Management Institute (PMI), the Institute for Electrical and Electronic Engineers (IEEE), the British Computer Society (BCS), and the Association for Computing Machinery (ACM) have codes of professional conduct that are available on their websites, and they share common principles.

A highly effective team seeks to exceed customer expectations by completing the project ahead of schedule and below budget. An effective team that exhibits *energy*, *synergy*, and the *willingness* to go the extra mile, when needed, is the best resource that the project manager could ask for. Project managers have the opportunity to form an effective team since team formation is one of their first responsibilities. It is worth investing time and effort early in the project development life cycle to select individuals with the clear potential to become part of an effective team. Sometimes projects fail primarily because the team does not function as an effective unit despite the fact that there are sufficient resources, there is a good plan, and there is a clear scope statement.

## 8.2 Team work attitudes

TEAM WORK IS effective when team members demonstrate a willingness to work with each other, understand that the synergy among them results in a better outcome than the sum of individual efforts, and know that successes and failures are shared by all. As seen in Figure 8.1, a highly effective team exhibits several characteristics.

Collectively, these team attributes lead to a positive attitude toward team work. These are difficult conditions to meet for every project. However, the project manager can facilitate most of these conditions through:

- (a) clear definition of the project goals and objectives.
- (b) establishment of effective communication channels.
- (c) careful selection of team members.

- Members want to be part of the project team.
- Members understand and accept individual responsibilities.
- Members clearly understand project objectives.
- Members understand that they share successes and failures.
- Members see the big picture as well as their own contribution to the entire project.
- Members communicate openly and frequently with the project manager and among themselves.
- Members have respect for and feel accountable to the project manager.
- Members trust and respect each other.
- Members are committed to the project full time and for the entire duration.

**Figure 8.1: Characteristics of a highly effective team**

Many projects fail because members cannot work as a team. An important factor that influences a group to function as a team is a **sense of common purpose**. Goals and objectives of a project can be used to create that sense of purpose. Everyone on the team should clearly relate to the project goals and, specifically, to the needs of the customer and the project owner.

Some project teams have unique characteristics that pose opportunities and challenges for the leadership. For example, consider a system development project. Some of the characteristics stem from the fact that IT changes so rapidly and team members often work under strict schedules. Other characteristics are due to the fact that user needs and expectations change as new technologies are introduced. And still more characteristics are due to the fact that team members are highly focused in their specific areas of expertise and do not always relate to the bigger issues of project management, such as inter-organizational relationships or alignment with the organizational goals and objectives.

Sometimes customer needs are well understood by the project manager but are not communicated effectively to the project team. This could be due to inadequate or inappropriate means of communication. Some people tend to spend a lot of time in front of the computer. These people find email to be a very effective means of communication while others may find it more effective to have face-to-face interactions. There is no hard-and-fast rule as to which means of communication will work best. Project managers must be careful to identify and establish a means of communication that works for a given situation. For example, in situations where there is a need for immediate interaction and feedback, a meeting might be the most effective means of communicating the message and accomplishing the goal. Such meetings are often followed by an email message to confirm what was discussed or agreed.

Where feasible, selecting team members is another important responsibility for the project manager. The project manager must ensure that team members exhibit, among other things, a team work attitude. As described later in this chapter, the project manager must follow a systematic

process for selecting team members. Most experienced project managers realize the characteristics of a highly effective team. However, in reality, organizational, environmental, budgetary, and other constraints sometimes limit what a project manager can do. The project manager must ensure broad representation from functional areas (across departments and divisions) on the team even if such representation may result in a weak spot within the team. A mix of generalists and specialists might be appropriate. But most of all, it is important to ensure that all members want to be on the team and that the team functions as a unit.

In the process of team development, the project manager must assess the overall talent represented in the team and prepare the team for areas that need greater development. Sometimes teams are selected solely on the basis of technical competency. Such selections have obvious shortfalls that are related to inter-personal skills, team work attitude, understanding the overall objective of the project, and the like. **Teamwork attitude** can go a long way in addressing some of the skill problems that may exist within the team. Significant learning and development occurs as team members interact to help and to learn from each other. The project manager should facilitate the process of integration, ensure that everyone feels an equal member of the team, and encourage the teamwork attitude from the start.

Teamwork attitude is not necessarily an inherent individual trait. It can be developed through practice and experience. Some individuals have a good team work attitude depending on whom they are working with; conditions must be right. These individuals may be very sensitive to issues such as punctuality, reliability, or even the way they are communicated with. These individuals find it difficult to work with others who do not have the same traits or the same work habits. Some individuals do not have team work experience but are willing and eager to learn from others. The key for the project manager is to develop and energize the team to work together despite their differences in style, traits, and skills. Establishing hard rules for every process does not necessarily result in creating the right attitude. This task is more difficult than just establishing rules and requires sensitivity towards individual characteristics. The project manager must learn about each team member in order to be able to effectively lead the team to project success.

### 8.3 Team and project success

THE PROJECT MANAGER should try to create a sense of camaraderie among team members by providing the team with a common vision. This is a challenging task; especially for large projects where hundreds of professionals, representing different functional areas, vendors, and suppliers, may work on different parts of the project. The establishment of effective communication channels among team members and between key members and the project manager goes a long way towards helping such situations. A large project is often broken down into several sub-projects and the project manager acts as a 'clearing house' for messages among these sub-projects.

In these situations, the project manager needs to use discretion in disseminating information among team members and stakeholders. Not every piece of information needs to be shared with everyone. It is easy to create **information overload** by copying everything to everyone. When people receive frequent irrelevant email messages that have little or no value to their work, they tend

to ignore subsequent messages from that source and, in doing so, run the risk of losing valuable information. Therefore, one can argue that information overload could negatively affect productivity. Experienced project managers establish effective communication channels and use discretion in providing *timely*, *accurate*, and *relevant* information. What is timely, accurate, and relevant may vary from situation to situation and from case to case, making it necessary to use discretion.

Another challenging situation for creating a sense of camaraderie among team members is when individuals from different functional areas work part-time for the project. It is difficult to **develop synergy and commitment** in such situations. As stated earlier, it is important to involve individuals from different functional areas. However, such involvement should be full-time and for the entire duration of the project. The continuity of commitment to a project gives a sense of ownership to team members and helps them participate fully in the affairs of the project. Sometimes part time involvement happens due to the fact that functional managers are reluctant to let their key individuals leave to work on a project for a long period of time. In such cases, it is important to focus managers' attention on the organizational benefits of the project that will benefit their functional area. By participating in project activities, these functional areas are, in effect, contributing to the accomplishment of organizational goals and objectives.

**Organizational culture** is also an important factor in forming a project team. Some organizations have clear and established procedures for forming an inter-disciplinary team to work on a project. Others may have a totally ad hoc approach towards forming a project team. In any case, assigning individuals to a project must be done in consultation with the project manager. In situations where a functional manager or the general manager appoints individuals to a project without input from the project manager, the team work will be less effective. Individuals who work on a project should report to the project manager and their performance on the project should be evaluated by the project manager. In special situations when a team member works part-time on a project, the performance evaluation can be done by the functional area manager in consultation with the project manager. The project manager should work on developing **inter-organizational contact and communication** continuously to facilitate collaborative tasks, such as joint evaluations of team members who work partly for the project and partly for a functional area.

Sometimes, in the case of small projects, individuals from functional areas work on a project for only a short period of time and, as a result, continue to report to their functional managers and are evaluated by their functional managers for the work they do on the project. The project manager, in such cases, may well have no input in selecting these team members or appraising their performance. This will result in a situation where some team members are selected and appraised by the project manager and some are appointed and appraised by functional managers. This raises the issue of **consistency in evaluation** as well as influences team morale, loyalty, commitment, and synergy. It is difficult, in such cases, to create a common vision for the project team and a sense of camaraderie among its members.

In summary, a highly interactive and communicative management style is necessary for the project manager to *informate and stimulate* team members on the one hand and *informate and collaborate* with functional managers on the other. There is a critical balance that needs to be estab-

lished. The project manager must create an identity for the project team by establishing a common purpose that is understood and accepted by all members. Forming this identity helps the project team to stand out and be recognized as a unit. The project manager must also provide the necessary interface with the rest of the organization and ensure that everyone considers the project a mechanism for accomplishing organizational goals and objectives. In part, this interface will identify the project team as an integral part of the organization. The project manager is the conduit for this two-pronged communication channel; forming an identity for the team while making sure it is an integral part of the organization.

## 8.4 Team development

AS DESCRIBED EARLIER, forming a project team at the early stage of the project development life cycle is an important responsibility of the project manager. Depending on the size of the project and the extent of talents, the project manager usually has options in selecting members. Experienced project managers take advantage of the broadest pool of talent available within the organization. If necessary, the project manager can look outside the organization for special talents that are not available from within. A systematic approach, such as the one that includes the following steps, will enable the project manager to form an effective team.

**Talent pool** – the initial step in forming a project team involves putting together a list of individuals with the potential to contribute to the project. This should be an interdisciplinary list that includes individuals from different departments and functions within the organization. In addition to skill competency and experience, it is important that the project manager gathers information about work experience, habits, strengths, and weaknesses of each individual on the list. The ultimate goal is to form a team of competent individuals that will work; individuals on the team that will interact and collaborate to produce the required results effectively.

**Task pool** – based on the scope and specification of the project, the project manager needs to develop a comprehensive list of the possible activities and tasks required to achieve project goals and objectives. For example, if the proposed system is to help with organizational resource planning then the task pool should include skills relative to inventory, human resources, and planning. Alternatively, if the project specification suggests the need for special equipment or facilities, the list should include tasks and skills that directly relate to these activities. There are several other tasks that are required for almost all projects and the project manager must make sure they are considered: These include communication, documentation, personality traits, team work, and the like.

**Task-skill match** – the project manager must not only identify individuals who are skilled and competent in the job but also make sure that they do the job to the best of their abilities. One effective way to get people to perform to the best of their abilities is to assign them tasks that match their talents. When assigning responsibilities, the project manager must consider the level of difficulty in a task as well as the nature of the task. Under-utilization of team potential is often due to an inappropriate skill-task fit. Assign-

ing a highly experienced and skilled individual to a task that requires minimum expertise is not only a poor use of resources but also may lead to morale issues for the individual. Motivated and skilled individuals like challenging assignments that give them the opportunity to make meaningful contributions as well as to enhance their expertise.

**Appointment** – the final list of individuals must have the depth and breadth necessary to carry out all activities of the project and to satisfy objectives in a timely manner. That means appointing sufficient numbers of people with necessary expertise. Once this list is ready, the project manager needs to do two things: (a) obtain authorization from appropriate departments for the selected individuals to work on the project for the estimated development life cycle and (b) formally appoint these individuals to the project team. Individuals need to know that they are authorized to work on a new project, they need to know when their new assignment starts, and they expect to have an idea of the length of time that they will be working on their new assignment.

**Acquaintance** – it is important that the team members get to know each other as a team and appreciate the different styles, abilities, and work habits of the individual members before they actually start to work on the project. The project manager can facilitate this through a brainstorming session, where the project scope is discussed and ideas and input are solicited. It is important during this forum, that team members develop a clear understanding of what the project is about and what the sponsors' expectations are. This participative process provides an opportunity for the project manager to assess each member's ability and potential for contribution as the team members discuss the project scope and suggest ideas for its development. In this forum, individual traits are likely to surface that give the project manager the opportunity to evaluate and determine ways of relating to each team member.

**Performance** – at this point, all members are assigned their responsibilities. They understand the triple constraints of time, budget, and specification for their respective tasks. The information about each work unit and its constraints is defined through the work breakdown structure. Team members must also understand that, as part of their responsibilities, they must communicate their work progress as well as potential problems that may delay project activities to the project manager. They must understand that their line of communication is through the project manager. A large project is often divided into several smaller segments and a key member is appointed responsibility for each segment. In such cases, the line of communication may be confined to each segment. In any case, the project manager must determine what works best for the project and the team. Highly formal communication may strain team interaction and prove to be ineffective, especially when close and frequent collaboration between team members is necessary.

Most project managers go through a similar or a more informal **team development process**. As shown in Figure 8.2, a systematic approach to forming the project team helps the project manager in several ways.

This model for team development also gives the project manager the opportunity to learn early

in the process about team members: their style, their uniqueness, their way of interaction, and so on. It also gives team members a similar opportunity to develop necessary understandings about their project leader and co-members of their project team. This is an effective approach towards eventually accomplishing all of the project objectives.

## 8.5 Team and project execution

SOMETIMES PROJECT MANAGERS do not get much choice as to who their teams are comprised of: it is a *fait accompli*. But whether the project manager does or does not have a say, their job is to make the team work. The initial phase of project development is important in setting the tone and the trend for project activities. Project managers can save time and effort later in the project when they follow a systematic approach to team development and ensure that *priorities*, *responsibilities*, and *authorities* are clearly established and understood upfront. It is often suggested that experienced individuals make good team members and contribute to the success of the project. This statement is true in a general sense. However, sometimes team members have significant experience in projects that have a narrow and similar focus, And these individuals may find it difficult to adjust to a new and completely different situation. Project managers must recognize this and help these individuals adjust to new ideas and the new project.

- Review and list project activities
- Review and list needed talents
- Match individuals with appropriate tasks
- Observe and learn about team members as they interact with each other
- Formally assign tasks and appoint members
- Establish communication channels
- Link responsibilities to the project objectives

Figure 8.2: Advantages of forming the project team systematically

**Experienced individuals** within the organization are often in high demand for different projects. This high demand for a person's time and expertise may be stretched to the extent that it makes that person unavailable or unsuitable for the project. Something will have to give for over-committed individuals; either the quality will suffer or the deadline will have to be pushed back. Thus, the fact that an individual is highly experienced or has relevant expertise *does not make that person necessarily the one most suitable for the project*. **Highly motivated individuals** with less expertise will be able to make significant contributions to the development of a project. All things considered, the project manager must be able to assess and determine the bottom line contribution that a team member makes towards a project.

Sometimes team members develop strong loyalty and fondness for a specific tool or method and become partial towards its use. This may hamper new technology transfer and acceptance. For example, consider computer simulation as a management tool for decision making and problem solving. This approach is quite appropriate and powerful for situations where repeated trials and

experiments are either not possible or, if possible, too costly. Individuals with extensive experience in simulation modeling and its application may consider it as a panacea or a solution for all situations. This is obviously not always the case, as shown by the saying 'I have a hammer; all problems are nails'. The project manager must determine which technology or what method is appropriate for a given situation.

The project manager should **interview key individuals** before selecting them for the team, except in situations where this practice is not allowed by the organization. Some organizations do not allow direct interviews because of the negative effects of rejection on the individual, internal politics, and the like. However, when allowed, interviews provide an opportunity for the project manager to select key individuals and use them for recruiting other members of the team. To generate a list of candidates, the project manager should seek volunteers; the project focus should be described and all employees within the organization invited to apply for the project team. This will enable the project manager to generate a list of individuals who want to participate and feel they can make a contribution. When interviews are not possible, the project manager may use organizational contacts to obtain needed information before making a decision. The inter-organizational relationship in general and contacts with functional managers in particular, provide useful avenues to the project manager for obtaining information about team candidates.

Sometimes it is necessary to recruit individuals from outside of the company because the required talent is not available internally. To fill the need for these talents, the company may use an outside agency or run its own advertisements. Either way, **recruitment** is both expensive and risky. It is essential to be able to specify the job requirements clearly so as to avoid a lot of wasted time. The **job specification** should include specific duties, skills, knowledge, and experience required. Specifying, in writing, the personal attributes required is more difficult, but these also need to be specified and assessed during the interview. The person needs to be a good team player, work well under pressure, and so on.

As mentioned earlier, the first meeting of the team is important because it establishes the **ground rules** for project activities. The project manager should determine whether there are team members with narrow work experience during this meeting. By providing clear guidelines and purpose, the project manager can set an appropriate direction for project activities and the interaction among team members. Some of the ground rules described in this first meeting may change once the project gets underway and team members interact with each other. The project manager must evaluate and consider changes that are proposed by team members and ensure that the changes benefit the ultimate goals of the project, as described in the scope statement.

The **first meeting** of the project team should be well organized, prepared, and conducted so as to accomplish the required objectives. The project manager should prepare and communicate the agenda for all meetings, especially the first meeting. As mentioned earlier, in this meeting the ground rules are set and team members are given clear guidelines for their conduct within the team. The project manager must ensure that this meeting focuses on main issues and avoids getting bogged down with trivial issues. The team members must come away from this meeting feeling that:

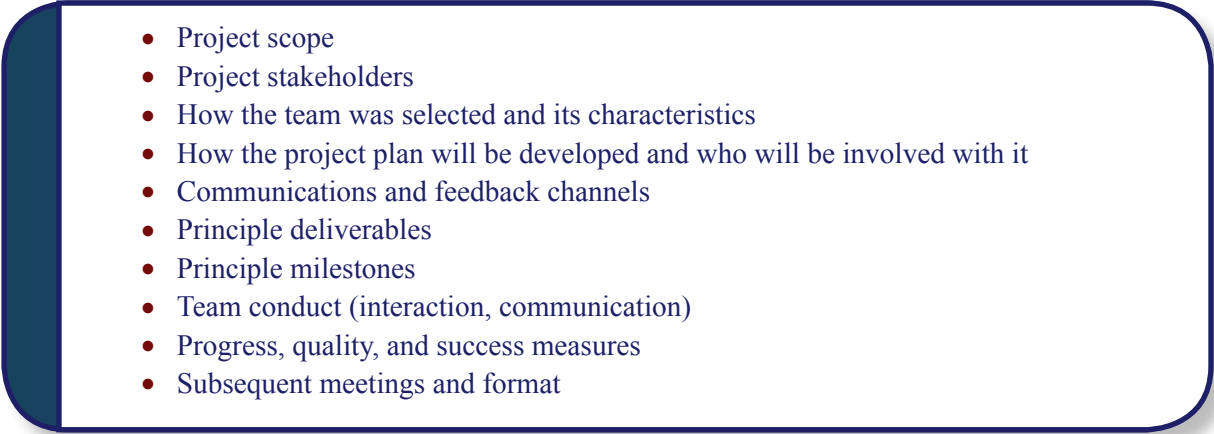


- They are participating in an important project with a clear contribution to the organizational goals and objectives; they feel good about being on the team.
- The project has a competent leader who knows what needs to be done and how to get things done; they feel confident about the direction and outcome.
- They were selected as team members because they can make the project accomplish its objectives; the project needs their expertise.

**Long meetings** are not necessarily more productive. A meeting must be just long enough to accomplish what is intended. It is difficult to prescribe a time limit that will work for all meetings. It is the responsibility of the project manager to manage the meeting and make sure that it runs its required course. To be effective, a meeting must:

- (a) Have a beginning that ensures a prompt and orderly start.
- (b) Have a focus through an agenda that describes what is to be covered.
- (c) Follow a logical sequence without going back and forth.
- (d) Have closure that gives a sense of accomplishment.

The first meeting of the team could be organized as a **retreat** where members spend a day or more away from the work environment in order to review, discuss, and finalize the project issues fully. In the case of a retreat or long meeting, the project manager may involve experienced individuals on the team to help with breakout sessions. Figure 8.3 suggests an agenda for when the first meeting is planned as a retreat.

- 
- Project scope
  - Project stakeholders
  - How the team was selected and its characteristics
  - How the project plan will be developed and who will be involved with it
  - Communications and feedback channels
  - Principle deliverables
  - Principle milestones
  - Team conduct (interaction, communication)
  - Progress, quality, and success measures
  - Subsequent meetings and format

**Figure 8.3: Agenda for the first planning meeting**

Successful project execution is sometimes a function of how well team members respond to **deadlines**. Every project goes through a period of heightened attention or ‘busy’ time, even when there has been no change in deadlines. Team members tend to be more sensitive about deadlines towards the latter part of the project life. Deadlines do not seem to have the same impact at the early stages of the project. Maintaining steady progress at all stages of the project development life cycle therefore poses a challenge for the project manager. Monitoring progress through milestones is an effective approach that enables the project manager to link team member performance and ac-

accomplishments with the initial commitment. The work breakdown structure defines work units in terms of deliverables and constraints that include deadlines.

The involvement of team members in estimating time and cost for each work unit helps not only to obtain estimates but also to create commitment. Important **milestones** should be highlighted by the project manager and the team that accomplishes any of these milestones should be rewarded. In other words, the project manager must make it clear that:

- (a) Monitoring project progress is a continuous process.
- (b) Milestones are used as yardsticks for measuring progress.

Team members must be challenged to adhere to the deadlines that they helped to establish for milestones and to work within the time frame that they helped to define.

*Do you treat deadlines for student projects the same when they are three weeks away as you do when they are three days away?*

## 8.6 Interview with a project manager

### Interview

**Q** WHAT other skills do you feel are necessary in becoming a successful project manager?

“**A**bout 90% of the projects I am called in to salvage are not due to technical problems – most are “People Problems” – so my response needs to be Interpersonal Skills- understanding personalities, defining roles/responsibilities, dealing with conflict, etc. These “soft skills” are often put down by most IT professionals as not important. Perhaps this is why the Gartner group/Standish Group studies show that the majority of IT projects fail because of schedule/budget challenges.”

**Q** IT is suggested that more and more companies are starting to require new positions for project managers to have project management certification. From what you have seen in the field so far, would you agree with this study?

“**I** agree that the trend is to require certification (yes, I am certified), but certification does not, by itself, produce an excellent PM – it is the result of practical experience which, unfortunately, can only come through the experience of working on both good and bad projects.... To me, the PMP certification is a necessity to work in this business and only shows that the PMP has the initiative and has a baseline understanding of PMI’s terminology.”

**Q** WHAT are some of the tools you currently use at work?

“**T**hey include E-Mail, Excel, MBWA (Managing By Walking Around), Teleconferences, Web, Document Repositories, Brainstorming, Sticky-Note parties (for WBS creation and initial dependency analysis), etc. Scheduling tools: MS Project, Niku (ABT workbench), Primavera, Artemis.”

**Q** HOW often would you say projects typically start and finish on time?

“**M**ost projects start on time and from my observations, end late – probably 80% of them finish late due primarily to scope mismanagement or non-performance.”

**Q** DOES the scope of a given project remain fairly consistent as unexpected problems and obstacles may occur during the project?

“**A**gain, scope changes as a result of a poor initial definition. The client’s scope definition (what they REALLY wanted doesn’t change) – the IT folks either ASSUMED incorrectly, or were not savvy enough to extract true requirements.”

**Q** WHAT are some techniques that you do to motivate other members in a project and keep everyone on a track with projects?

“**K**eeping the eye on the ball (objective). Partitioning the project such that a product is produced quickly. Keeping each development phase of the SDLC from 6-12 weeks (produce a sense of accomplishment). Humor is essential in all aspects and really is the No. 1 motivator. Respect for performance; ability to remove a non-performer; short, productive team meetings; and having team “traditions and rules.”

**Q** HOW much do politics in an organization play a part in new projects getting the okay to proceed, raise necessary funds

and or terminating a project that some upper management people would view as a waste of time?

“**P**olitics are part of everything that project managers do and are most essential in the initiation phase of the project when the project is authorized, stakeholders are analyzed, allies are groomed, and managers are contacted regarding resource commitments. Politics should be reduced as an active sponsor is identified. One of the roles of the sponsor is to manage politics.”

**Q** INVOLVING clients in the implementation phase of a new system helps them accept the new system. Do you feel people actually like being involved in this process and that their opinions matter?

“**A**bsolutely – in fact, it is essential. After all, the client is the custodian of the project’s product and must “live” with it long after the project is completed. The key stakeholder role of the client is “ownership.”

**Q** WHAT is the most important skill that a team member must have?

“**T**he most important skill to have as a team member is being able to communicate early and often so everyone knows what’s going on. You must stay focused so if there are problems they can be resolved early and efficiently.”

**Q** WHAT do you expect the demand for project managers to be three years from now?

“I believe the PM industry will continue to grow, but not exponentially as it has in the past 10 years; perhaps 5% a year. The demand for GOOD project managers will never be satisfied, as it is a combination of hard and soft skills which tends to be a rare combination in the individual.”

## Chapter summary

THE PROJECT TEAM is the key to project development and implementation. Team members must function as a team and must collectively feel responsible for the project's success or failure. For a project team to succeed in accomplishing project objectives, it must exhibit synergy and demonstrate that team members can work together. Forming the project team is one of the first responsibilities that the project manager undertakes. The project manager must create a sense of camaraderie among team members by providing the team with a common vision. The project manager should carefully select individuals who are technically competent and demonstrate traits that are important for team work, such as interpersonal skills, communication, analytical skills, tolerance, a 'can do' attitude, and the like.

The project manager should also make sure that the talent of each team member is carefully

matched with assigned tasks. Each member should be formally appointed for the duration of the project and should understand how their performance will be reviewed and appraised. Responsibility and authority should be assigned and communicated to key members. Individual team members should be clear about their tasks and about how to communicate their concerns, opinions, feedback, and so on. Team members should be clear about the extent of their commitment, when their commitment starts, and when it is expected to end.

The project manager should provide a forum for team members to interact with each other early in the developmental process. This could be accomplished through a meeting where project objectives are described, ground rules are defined, and ideas are exchanged. This is part of a systematic approach to forming and developing a project team. Project managers are well advised to spend time and effort upfront to carefully select a team that functions as a team and accomplishes project objectives. Project managers should carefully assess the tradeoff that may exist between technical competencies and interpersonal skills. It is also important to realize the difference between knowing how things work and actually making things work.

## Discussion questions

- a) This chapter argues that an effective team exhibits a sense of trust among members as well as between members and the project manager. It argues that a sense of trust enables team members to openly discuss their ideas and their mistakes without fear of being penalized. *As a project manager, what would you do to create a sense of trust among team members?*
- b) This chapter describes several characteristics of an effective project team. Describe *three* of these characteristics that you feel are most important and *suggest ways* of obtaining them.

- c) It is suggested in this chapter that highly interactive and communicative management styles will *informate* and *stimulate* team members on the one hand and *informate* and *collaborate* with functional managers on the other. It is argued in this chapter that, to accomplish these objectives, the project manager must become the conduit for a two-pronged communication channel. *What is meant by a two-pronged communication channel?*
- d) Sometimes individuals from functional areas work on a project for a short period of time and, as a result, continue to report to their functional managers and are evaluated by the functional managers for the work they do on the project. This will result in a situation where some team members are selected and appraised by the project manager and some are appointed and appraised by functional managers. *Discuss issues that such situations will raise for the team and the project manager.*
- e) Assume you are the project manager preparing for your first meeting with your team of 25 members. *Discuss (a) how you would prepare for your meeting, (b) what are the main items that you will plan to discuss in your meeting, and (c) what you would hope to accomplish in this first meeting?*
- f) Comment on the interview with a project manager described in this chapter. What do you think of the interviewee's comment about PMP certification? What is your opinion about this response? *"Again, scope changes as a result of a poor initial definition. The client's scope definition (what they REALLY wanted doesn't change) – the project folks either ASSUMED incorrectly, or were not savvy enough to extract true requirements."*

## Exercises

- a) Interview a project manager to obtain her or his comments on and opinion of the list of characteristics described in this chapter for an effective project team. Your interview should confirm or revise (add to or delete from) the current list.
- b) What makes a marketing project team different from other teams that construct a bridge, plan a conference, plan a holiday, or develop a new degree program? What team characteristics are unique to marketing project teams?
- c) Sometimes projects fail primarily because the team does not function as an effective unit despite the fact that there are sufficient resources, a good plan, a clear scope statement, and so on. It is important that the project manager spends time and effort upfront to select individuals with appropriate characteristics to function as a team. Create a table with two columns. In the first column, list what you think are appropriate characteristics of project management team members. In the second column, describe your rationale for each entry.
- d) An effective team exhibits a 'can-do' attitude that sometimes compensates for deficiencies, such as inadequate skills, difficult schedules, and so on. Describe three situational examples that tell you there is an attitude issue within your team and explain what you will do to address these situations.

e) Assume you are the project manager for a project that is authorized to integrate your organization's inventory system with several of your vendors. You have selected a team of 25 individuals from across the

organization to work with you. Draft an email to your team members inviting them to attend the first project team meeting and provide them with an agenda for your meeting.

## Important Concepts

**acquaintance** (pg. 152)

**appointment** (pg. 152)

**common purpose** (pg. 146)

**competency** (pg. 146)

**consistency in evaluation** (pg. 150)

**deadlines** (pg. 155)

**developing synergy and commitment**  
(pg. 150)

**effective team** (pg. 145)

**experienced individuals** (pg. 153)

**first meeting** (pg. 154)

**ground rules** (pg. 154)

**highly motivated individuals** (pg. 153)

**information overload** (pg. 149)

**inter-organizational contact and communication**  
(pg. 150)

**interviewing prospective team members**  
(pg. 154)

**job specification** (pg. 154)

**meeting length** (pg. 155)

**openness** (pg. 147)

**organizational culture** (pg. 150)

**outcome oriented** (pg. 146)

**performance** (pg. 152)

**positive attitude** (pg. 146)

**problem solving** (pg. 146)

**professionalism** (pg. 147)

**project team** (pg. 145)

**recruitment** (pg. 154)

**responsibility** (pg. 147)

**retreats** (pg. 155)

**sense of common purpose** (pg. 148)

**sense of trust** (pg. 146)

**synergy** (pg. 146)

**talent pool** (pg. 151)

**task pool** (pg. 151)

**task-skill match** (pg. 151)

**team development** (pg. 151)

**team development process** (pg. 152)

**team work** (pg. 147)

**teamwork attitude** (pg. 149)

## Bibliography

Berkun, S. (2005) *The Art of Project Management*, O'Reilly.

Cadle, J., Yeates, D. (2004) *Project Management for Information Systems*. Prentice Hall.

Edum-Fotwe, F.T., McCaffer, R. (2000) Developing project management competency: Perspectives from the construction industry, *International Journal of Project Management*, Vol. 18.

Lee, D. Trauth, E., Farwell, D. (1995) Critical skills and knowledge requirements of IS professionals: A joint academic/industry investigation, *MIS Quarterly*, September.



# 9

## *Assessing Project Risk*

### **Themes of Chapter 9**

- What are the risk factors for a project?
- Which risk factors are more or less serious?
- What are the consequences of each?
- Why do risks occur?
- How can project managers plan for risks?
- Can all risks be identified?

## Introduction

ANY PROJECT INVOLVES RISKS. SOME RISKS ARE MORE SERIOUS AND RESULT in outright project failure and some lead to budget overruns, delays, or quality issues. Risks may also occur because of organizational, individual, or procedural reasons. Experienced project managers know that they cannot avoid risks, but they can plan for them and, in the event that they happen, have a contingency plan ready. Inexperienced project managers may prefer to pretend that there are no risks or prefer not to think about them. Project managers must identify possible risks, determine the likelihood of their happening, make provisions, and plan to respond. Not all risks are possible to identify. Some risks are difficult to imagine. To the extent possible, project managers must identify what might go wrong and must be prepared to respond in the event that something does go wrong. A history of similar projects and individual experiences is often the best source for identifying project risks. This chapter will describe the importance of identifying and managing project risks. This chapter also describes ways of identifying and planning responses to project risks. This chapter ends with an interview with a project manager. But we start with the following exhibit, where we discuss the decision about when and where we may (or may not) take the risk.

### Whether to take a risk ... or not?

Big ideas carry high risks. Project managers can make significant contributions to their organization with their ideas and innovations. In fact, they are increasingly expected to propose new applications and put forward new ideas to help reengineer business processes. However, they need to be prepared for the potential risks that come with their ideas and innovations. In fact, they need to be prepared to explain their contingency plans for potential risks associated with their ideas. You do not have to be certain what the outcome will turn out to be, but you must be certain that you have a plan if things don't turn out right.

Project managers should not be afraid of risks but should be afraid of not being prepared to respond to risks. There are two key elements in risk management: (1) how to anticipate it, how to forecast it, and how to determine

the likelihood of it happening and (2) what should the response be in the event that the risk occurs, who should do what, who will be in charge of responding, what is their responsibility and authority, and what is at their disposal? It is critical that these two elements are carefully considered and assessed for every potential risk.

The benefits of effective risk management are two-fold: (1) the psychological preparedness of team members and their realizations of management insight about risk occurrence and risk planning and (2) the estimation and preparation of the resources necessary to alleviate the consequences of a risk. People living in hurricane and tornado prone regions are aware of the risks of natural disasters; they do not like it, but they prepare for it and respond accordingly. That is, they are psychologically



prepared and have the resources ready in the event that they are needed. People are not as afraid of a disaster as they are afraid of being caught off-guard when it happens. Therefore, both these factors are critical to the outcome of any response to risks.

Risk avoidance is not necessarily an appealing trait in professionals and executives, neither is obvious risk seeking. Of course, there are situations in which a project manager does not need to take a risk, but those situations are rare. Risk is a part of any decision making process: equipment or personnel; internal or external; formal or informal. The real question is not whether to avoid risk or embrace it, but how to anticipate and plan for it. In fact, risk-taking behavior has been on the rise in recent years due to increased competitive pressure to benefit from new technologies. Technology can offer major benefits, but at the same time, it could present significant risks.

Risks occur all of the time, and yet people are still surprised when they happen. Project managers cannot be excused for not planning for risk. Risk is a part of every project, and the responsibility to respond to risk rests with the project manager. That does not mean that the project manager must personally respond when risks happen. That means they must have a plan to respond and have identified people who will be responsible for carrying out specific tasks in the event that a risk occurs. Risk management requires discipline in planning, communicating, and monitoring, and that is part of the project management

skill set.

Project risk management fosters a culture of openness and responsiveness on the part of team members. Individuals will not hesitate to come forward with ideas when they know there are plans in place to avoid serious consequences, if necessary, or if their project backfires. Furthermore, when individuals propose new ideas they will also think of potential risks associated with their ideas, as well as how they might respond in the event that risks happen. In other words, project managers must encourage the culture of openness and innovation so long as it is combined with responsiveness; you can take risks, but you must be prepared.

Finally, it is worth mentioning that many project managers tend to put off risk assessment and risk planning; arguing that it sends the wrong message to team members, and it might be looked upon as a less optimistic way to start project activities. “Why talk about what may go wrong rather than what can go right” kind of arguments seem to support this way of thinking. That is just an excuse. Responsible people must behave responsibly. Risk planning and risk management are a responsible way to approach the goals of the project, team members, and the organization. Risk management is good for project managers, their projects, their team members, and their organization. Project managers should get into the habit of risk management and build the discipline for it.

## 9.1 Sources of project risks

PROJECT **RISK MANAGEMENT** involves understanding potential problems that might occur for a project and how these problems might impede project success. Project risk management helps project managers to *identify*, *evaluate*, and *respond* to potential project risks and increases chances of project success. Risk management is often overlooked, but it can help improve project success and protect the project manager and team members.

We take on risk in order to gain opportunities that can result from the risk-taking. High tech organizations provide ample examples of risk taking behavior that resulted in significant payoffs. Some individuals or organizations tend to take higher and more frequent risks. They are often referred to as 'risk-takers'. Some individuals or organizations tend to avoid risks and are very cautious when making decisions. They are often referred to as 'risk-avoiders'. There are those who are in between and tend to take risks only when they feel it is necessary and hard to avoid. There are arguably more people in this last group than in the other two.

The sources of project risks can be broadly grouped as internal or external. Important **internal sources of risks** include the following factors:

- Continued management support
- Top management style
- Alignment with organizational needs
- Attitude toward change
- Shifting goals and objectives
- Developmental expertise and talent pool

The goal of project risk management is to increase the chances of project success and to protect organizational resources. Effective project risk management involves several steps:

- (1) *Identify risk* – determine the types and the levels of potential risks for a project
- (2) *Quantify risk* – evaluate the range of possibilities that could affect project outcome for each risk that is identified
- (3) *Prepare risk response* – describe the steps to be taken and the resources to be used if a risk occurs
- (4) *Monitor risk response* – make sure appropriate actions are taken in a timely manner in response to a risk, and report on potential risks that could occur throughout the project development life cycle.

Arguably, the most important risk that could make or break an ongoing project is associated with the *continued support of top management*. This is particularly true when a project is behind schedule, over budget, or perceived as having little strategic value. It is crucial that the project managers maintain top management support for the project. It is also critical to assess the risk that such support will be discontinued. Management style and whether or not it supports the application of technology provides clues for future support. Volatile and changing *management style* poses a risk, especially for projects with expected delays.

Effective communication and demonstration of a project's contribution to *organizational*

*goals and objectives* is an important responsibility of the project manager. The need for the project and its outcome must be continually reinforced within the context of organizational goals and objectives. The project manager must be able to assess the likelihood for lack of continued support for the project at the outset. Assessing the **risk of discontinued top management support** depends on the following factors:

- The relationship between the project manager and top management
- The management's perception of the importance of the project
- The project's integration (how many divisions within the organization are affected by the outcome)
- The progress expectation (how reliable are estimates that will influence timely completion of the project within budget).

**Employee attitude toward change** in an organization can also be a particular risk for projects. Employees' attitudes towards change are influenced by organizational culture and management style. Some organizations aggressively seek new ideas and change. They provide extensive training and support when a new project is developed. They take chances with new ideas and maintain support when delays happen. These organizations are proactive and accept new and innovative ideas and thus pose less risk of reducing or even pulling support from an ongoing project. Some organizations behave differently and are more conservative with their support for new projects. Project managers should evaluate the organizational attitude toward change and assess the risk of losing support for a project that is innovative, that is new, or that involves uncertainty. Experience is the best source of evaluating project risks in such organizations.

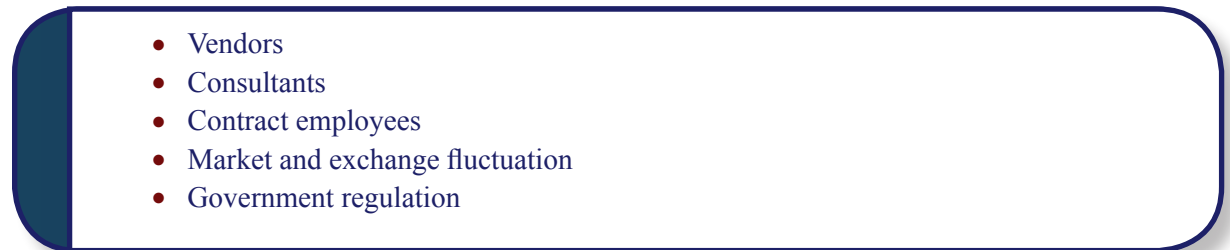
The development of a project, and ultimately its success, depends on **employee acceptance**. Some projects have the potential to create change in the work process, quality of work, work planning, customer service, management expectations, and the like. Because of the uncertainty that such a project creates, employees often react cautiously and, at times, negatively to change. *Shifting organizational goals and objectives* often enhance this negative response from employees. Such a negative response is a potential risk for any new project. Project managers need to evaluate the risk that is associated with employees' reactions. Participation in project development is often suggested as a means of increasing acceptance for and satisfaction with a project. When possible, project managers must assess the impact of employee participation and use it to improve the quality of outcomes and to increase acceptance. Participation in developmental activities is often a crucial success factor for project management and employee satisfaction.

*Individual expertise* and the talent pool within an organization are important resources for project development. The lack of such resources poses a risk as well as other challenges, such as dependence on external resources and security issues. Project managers are normally reluctant to draw upon external expertise for certain projects that may have implications for organizational competitive advantage.

Internal expertise is also essential for training, implementation, and project support; especially for organization-wide projects that affect a great number of people across organizational functions.

A major drawback for outsourcing some projects is argued to be the loss of in-house know-how. Professional expertise and in-house know-how are developed at a great cost and over a long period of time. Organizations that lack internal expertise are forced to rely on external resources with all of the potential cost and security issues that this entails.

**External sources of project risk** are associated with a number of issues, including those shown in Figure 9.1.

- 
- Vendors
  - Consultants
  - Contract employees
  - Market and exchange fluctuation
  - Government regulation

**Figure 9.1: External sources of project risk**

External *vendors* are essential for most projects. It is critical that they are reliable, follow deadlines, deliver products according to specifications, and adhere to the terms of the contract. The history of interaction with a vendor provides a good basis for the project manager to assess reliability and effectiveness. Outside *consultants* are often recruited to develop unique and specialized projects when internal expertise is inadequate. A great deal of effort goes into preparing these contracts to protect the interests of the organization and define the specifics of the required projects. Sometimes the company goes even further: to *outsource* and/or *offshore* developmental work.

Contracts will specify the type and extent of internal information that should be made available to consulting firms. Project team members of the consulting firm will visit with employees and developers within the organization to gather information in order to design the specification. Some of this information may be sensitive and confidential. The contract with the consulting firm must be prepared so that the integrity of the information and its confidentiality is protected. Organizations often continue working with vendors and consultants with whom they have had good experiences. First time vendors and consultants pose greater risks to project development. Project managers must consider this risk as they set deadlines for project activities that depend on external resources.

Large projects often involve **contract employees** who work for the duration of the project. Project managers must keep records of performance for these employees and refer to these records when hiring. As the number of contract employees involved in a project increases, the level of risk increases. This risk is higher when there is no prior experience or record for a contract employee. Risk sources include access to company systems, facilities, files, client information, and proprietary code, and the loss of key personnel or clients to outside contractors.

Organizations often support training for their employees and internal personnel to get them up to speed with project activities and responsibilities. However, they are reluctant to do the same for external employees, who are expected to be skilled and ready to make contributions towards the project's success. This poses a risk in cases where external employees do not have adequate skills.

Some of the external risks are difficult to control, in particular, *government regulation* and *market and exchange fluctuations*. However, it is important to assess such occurrences and plan for them. Project managers need to stay current with news about possible new regulations that may affect project development. Sometimes extended employee training programs may be necessary in response to a likely risk, hence the requirement to provide contingency funds and additional time for project development activities.

## 9.2 Identifying project risks

AS DESCRIBED ABOVE, there are multiple sources of risk for projects. Sometimes these risks interact and create new and more complex risks associated with project development activities. For example, developments such as new regulations or market fluctuations will more readily influence conservative leaders who, even at the best of times, tend to provide only cautious support for new projects. This makes the task of risk analysis more challenging. Good planning is the best response to the issue of project risk. In fact, poor planning is itself a risk to the success of a project.

**Risk assessment** should be done for every task. Probably around 80% of tasks are low risk, and the project manager will assume team members will do these tasks competently. The project manager needs to identify and then spend 80% of their time working on the 20% of tasks that are higher risk tasks. A serious concern for the project manager occurs when a high probability risk has a potentially high impact on the project. Thus project managers need to focus on the areas where there is a high probability of having a problem.

Project managers must ask themselves important questions that help them identify risks and assess the level and extent of those risks. Such questions should include those in the following four categories, shown as Figure 9.2.

During the project planning phase, the project manager is expected to benefit from the involvement of key team members (if not all members) for estimating activity duration, identifying the talent pool, deciding on project milestones, defining the project scope statement, and so on. Team members or key team members (in the case of large projects) can assist the project manager in identifying project risks.

The project manager could use a **brainstorming** approach for identifying potential risks. Brainstorming is a team activity aimed at generating a cross-stimulation of ideas. It is used in a semi-formal setting to generate ideas, where the ideas of one person serve as a stimulus to generate further ideas from other people, which in turn serve as a stimulus for further ideas, and so on. Judgment on the usefulness or validity of the ideas is 'suspended' until the brainstorming session is completed. The aim is to get a free flow of ideas. It may be feasible to produce a hierarchy of risks so that each type of major risk identified (technological, relationship, resource, and so on) has within it various examples of that general risk. Thus a **risk breakdown structure** is produced in a manner rather similar to the work breakdown structure.

### **Top Management Support**

- Is there a risk that top management would discontinue support for the project?
- What are the circumstances that may trigger such a response by top management?
- How likely is the occurrence of those circumstances? What are possible responses to them?
- What is the possibility of management turnover?
- How extensive could the turnover be and what would be the impact on the project?

### **Employee Acceptance**

- Is there a risk that employees would not accept the project outcome?
- What might be their main concerns?
- Is there a way to address those concerns ahead of time?
- What are planning actions that would address employee issues?
- Are there conflicting employee needs that may create acceptance problems at the end?
- Can these conflicts be clarified at the planning phase?

### **Supplier Problems**

- Is there a risk that vendors or suppliers would fail to deliver necessary products and equipment on time?
- How much do project team members need to interact with vendors and external resources?
- How important is this interaction between project team members and outside providers?
- What is the risk of losing internal talents to external providers?
- Can that be avoided through contractual agreement?
- What is the risk of communication failure with suppliers and what is the risk of that for the project?

### **Employee Problems**

- Is there a chance that employees will go on strike before the project is complete?
- Are conditions right for such an event?
- How much would that affect the project team and is there an alternative plan if that happens?
- Are there any new regulations formulated that will impact this organization or this industry?
- Are there any environmental laws that may affect the new system development?

**Figure 9.2: Questions to identify and assess the level and extent of risks**

Team members can also help to assess the level of importance for each risk and to create a priority list. Assume that there are five key team members who are helping the project manager to plan the project and identify risks. Once all possible risks are identified through the brainstorming session, a list can be prepared for priority allocation. This list is first used to obtain the collective assessment of the likelihood that a particular risk will occur. The planning team members are asked to assess the probability that each risk may occur. The average of all responses can be used as an indication of the overall likelihood for any risk. Figure 9.3 provides an example of this where five assessments are used to generate likelihoods for four potential risks.

Risk	Member 1	Member 2	Member 3	Member 4	Member 5	Overall likelihood
Management support	.25	.30	.28	.32	.41	.31
Employee acceptance	.40	.38	.32	.45	.50	.41
Vendor timely delivery	.15	.21	.25	.20	.22	.21
Employee strike	.10	.12	.15	.18	.15	.12
Other	...	...	...	...	...	...

**Figure 9.3: Assessment of risk likelihood by a five-member team**

The same list of risks can then be used to obtain the collective assessment of the importance for each event. The planning team members are asked to assess the importance of each risk to the successful completion of the project by assigning a number between one and one hundred to each risk. Again, the average of responses for each risk can be used to indicate the level of importance for that risk. Figure 9.4 provides an example using the same list of risks. It is also a good idea to calculate the variance for the numbers to gauge how closely team members have assessed each risk. In order to reduce the variance, it is reasonable to drop extreme numbers for each risk. This is more practical when a large number of members assess each risk.

It is important in project planning that alternative views and representations of any given situation are ascertained. There are a variety of associated models, and the need to select the view which is the most appropriate for the particular circumstance is important. In the following paragraphs, we discuss approaches to find out what the various views are.

One of the main concerns of the project manager is to ensure that the project they are leading will be suitable for the organization in the long term. We know that we cannot assume that the conditions of today will prevail in the future. There are a number of techniques that can help us plan for future change. An obvious technique is forecasting, where we base our understanding of the future on present trends.

Risk	Member 1	Member 2	Member 3	Member 4	Member 5	Overall importance
Management support	95	90	88	98	94	93
Employee acceptance	85	82	90	88	90	87
Vendor timely delivery	50	60	55	65	80	62
Employee strike	98	95	96	91	95	95
Other	...	...	...	...	...	...

Figure 9.4: Assessment of risk importance by a five-member team

However, sometimes the future cannot be planned in this way – it is much more uncertain – and it is then that the project leader may turn to the **scenario planning** approach. Michael Porter defines scenario planning as *an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome*, whereas Gill Ringland suggests that it is *that part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future*. Assuming, then, that we cannot easily predict the future, how can we identify possible future outcomes?

One scenario planning technique for obtaining group response is the **Delphi method** that uses an iterative and interactive approach to generate consensus about a topic from among a group. This technique is used to solicit expert opinion (sometimes anonymously) and to generate consensus among a panel of experts. A Delphi approach might be used so that experts see the views of other experts and some general consensus is achieved. In the Delphi approach, people give their views in turns so that the next person can build on the previous assertions. Sometimes experts might suggest two or three possible scenarios. Some of these cannot be said to be ‘expected’, but they might be plausible and worth planning for.

**Morphological approaches** identify a number of future states that are built on different assumptions. These assumptions might relate to expected states for the economy, depletions or findings of natural resources, changes in people’s values or lifestyles, or changes in the political persuasion of a new government. Scenario analysis might consider different combinations of values for these key factors. The spreadsheet package Excel has a scenario manager tool that can show these different scenarios side by side. For each of these different scenarios, their implications can then be discussed. In Figure 9.5, we used Excel to assess the impact of doubling the cost of advertising and halving the cost of materials on the income forecast for 2008. We see that doubling expenditure on advertising has a negative effect on overall income in this example, while the reductions in materials costs have a major positive impact.



2008 Forecast		
<b>Gross Receipts</b>		
Sales		90,700
Distribution		11,444
<b>Total</b>		102,144
<b>Costs</b>		
Materials		38,760
Transport		799
Misc		187
<b>Total</b>		39,746
<b>Gross Profit</b>		62,398
<b>Expenses</b>		
Advertising		3,555
Commissions		5,677
Rent		980
Elec/water		258
Insurance		255
Telephone		266
Office Supplies		278
Interest		3,560
<b>Total</b>		14,829
<b>Income</b>		47,569

Scenario Summary	2008 Forecast	Double Cost of Advertising	Halve cost of materials
<b>Changing Cells:</b>			
Sales	90,700	90,700	90,700
Transport	11,444	11,444	11,444
Materials	38,760	38,760	<b>19,380</b>
Shipping	799	799	799
Advertising	3,555	<b>7,110</b>	3,555
<b>Result Cells:</b>			
Income	47,569	44,014	66,949

Figure 9.5: Using Excel to create different scenarios

The use of **cross-impact approaches** helps identify potential events, trends, and conditions that impact on the decision and on each other. Sometimes probabilities are assigned to each of them so that the likelihood of these impact factors can be estimated.

Having agreed upon possible scenarios, the organization then needs to assess the implications of present actions and alternative future decisions based on these scenarios. Scenario planning may also provide early warning and guidance so that potential problems can be detected and avoided before they occur. Further, strategy formulation can be proactively devised by considering the present implications of possible future events. Aspects of possible or desired future scenarios can also be seen and appropriately dealt with. Such scenario planning can ensure a greater likelihood of the project being appropriate in the long term despite environmental changes.

A **SWOT analysis** is another well-known technique that is often used for planning and could be useful in identifying project risks and challenges. SWOT is an acronym for *Strengths*, *Weaknesses*, *Opportunities*, and *Threats*, and items that fit into these categories and that apply to the project are identified. It can be used for a quick, ‘back of the envelope’, assessment or an in-depth, highly researched analysis. It is usually used as a group technique, rather than an individual task,

and frequently is employed in the initial stages of high-level brainstorming sessions.

**Case-based reasoning (CBR)** formalizes the process whereby managers make decisions based on their previous experience. A case reveals knowledge in its natural context. It represents an experience that teaches a lesson relating to the goals of the practitioner. This lesson can be useful in understanding a new project. Therefore, we may use this learning from previous cases to further understand the potential risks surrounding the project. For example, CBR may help us understand a solution that does not quite fit, warn us of possible failures, and assist us in interpreting a situation. CBR can therefore help solve what might be perceived as very new and difficult problems. It may speed up problem solving by reducing areas of difficulty and may help in new domains. Experience gained in previous cases can help in evaluating solutions and interpreting open-ended and ill-defined aspects of the project. Further, by drawing on less successful cases, the practitioner may prevent the risk of repeating the mistakes of the past.

### 9.3 Evaluating project risks

THE INFORMATION IN Figure 9.3 and Figure 9.4 can be used to generate a ranked list of potential risks. Figure 9.3 gives the probability of a risk happening and Figure 9.4 suggests the importance for each risk. The two numbers for each risk can be multiplied to generate a priority list of possible events. Figure 9.6 provides this calculation. The last column suggests how contingency funds and resources should be allocated in response to identified risks. Note that while management support has a very high importance, the likelihood of losing this support is lower than the failure of employees to accept the new application, which ranks first in the last column. Thus, the combination of likelihood and importance determines the position of a risk on the list. This list can be used by the project manager to plan for adequate response in the event that a risk event occurs.

Risk	Likelihood	Importance	Priority	Rank
Management support	.31	93	28.83	2
Employee acceptance	.41	87	35.67	1
Vendor timely delivery	.21	62	12.40	3
Employee strike	.12	95	11.40	4
Other	...	...	...	

Figure 9.6: Risk analysis and ranking for a project

There are other methods of risk analysis. For example, the same process described above can be carried out using the three levels of *high*, *moderate* or *low*. In this method, again, each risk is assessed by team members for likelihood and for importance. In order to arrive at numeric results that can be used to generate a ranked list, the three levels can be weighted as 3, 2, and 1 for high,

moderate, and low, respectively. The sum of the team’s assessments can then be used to assess the likelihood and importance for each risk. Figure 9.7 and Figure 9.8 illustrate this method using the earlier list of risks. Figure 9.9 shows how this information is used to generate a rank ordered list.

Risk	Member 1	Member 2	Member 3	Member 4	Member 5	Overall likelihood
Management support	L	M	L	M	M	8
Employee acceptance	H	M	H	H	H	14
Vendor timely delivery	M	M	M	M	H	11
Employee strike	L	L	L	L	L	5
Other	...	...	...	...	...	...

Figure 9.7: Assessment of likelihood using high, moderate, and low

Risk	Member 1	Member 2	Member 3	Member 4	Member 5	Overall importance
Management support	H	M	H	H	H	14
Employee acceptance	M	H	H	M	H	13
Vendor timely delivery	L	M	M	M	H	10
Employee strike	H	H	H	M	H	14
Other	...	...	...	...	...	...

Figure 9.8: Assessment of importance using high, moderate, and low

Risk	Likelihood	Importance	Priority	Rank
Management support	8	14	112	2
Employee acceptance	14	13	182	1
Vendor timely delivery	11	10	110	3
Employee strike	5	14	70	4
Other	...	...	...	

Figure 9.9: Risk analysis and ranking using high, moderate, and low

High scores in the priority column (Figure 9.9) warn project managers to plan for potential risks. Some organizations may have a cut-off point beyond which a risk may warrant contingency planning. For example, if a cut-off point of 150 is used for the risks identified in Figure 9.9, employee acceptance will be considered a high-risk event for this project. In this case, the project manager may need to consider arrangements that are expected to increase employee acceptance. For example, employee participation may need to be increased or training may need to be planned.

As shown in Figure 9.10, experienced project managers usually evaluate potential risks based on project characteristics that might contribute to risk.

- Estimated project duration
- Estimated number of people involved in developmental activities
- Number of people using the final product
- Number of divisions for the final product
- The level of external resources involved
- Number and type of technologies involved

**Figure 9.10: Project characteristics that could contribute to risk.**

Large projects may involve hundreds of people at different stages of developmental activities and are expected to affect a great number of employees (large projects are seldom developed for a small number of people). As a result, a great deal of planning and communication is required among the stakeholders; for example, sponsors, developers, and vendors. As the number of stakeholders increases, the risk for miscommunication and misunderstanding will also increase. The project manager must plan carefully for effective interaction and consider potential risks associated with large and complex projects. Extensive vendor involvement and the need for external resources may also increase project risk. The application of cutting-edge technologies, technologies that may not be mature at the time of application, is also associated with higher levels of risk. Experienced project managers are able to evaluate these risks and plan to respond accordingly.

Finally, it is important that the project manager keeps a record of events and activities and updates the records as they progress or are completed. Project progress reports can provide valuable information to the project manager and stakeholders about events that happened in the past, as well as what might happen in the future. If part of a project is completed ahead of or behind schedule, over budget, or with poor quality, then it is important to analyze reasons for that outcome, plan possible responses, and assess the impact on other portions of the project. Reasons for unsatisfactory outcome may relate to technology, people's expertise, project scope, external resources, and the like. It is important to record the frequency and the extent of these problems. These records must be accurate, consistent, and comprehensive. They provide significant help to the project manager in planning adequate responses.

## **9.4 Responding to project risks**

IDENTIFYING AND ASSESSING risks have little value unless they lead to a plan of action. The

most effective response to risk is to plan for it. Technology projects are considered high risk when compared with construction or housing projects, which over the years, have developed well-defined standards of measurement, practice, and control. In **planning a response to risk**, project managers must consider the *potential impact*, the *likelihood of occurrence*, and the *difficulty of response*.

Some risks may occur more often but are easier to address. For example, a poorly designed project may be less problematic if design issues are addressed in a timely manner, even though it will take additional resources. An analogy for this can be made with building a house. It is very easy and it costs next to nothing to add an additional telephone outlet in a room at the planning stage, when the blueprints are prepared or when wall structures are being put into place. However, such a minor modification to the original plan is costly and time consuming if it is done at a later stage, when that room is built and decorated. Therefore, timing is crucial to some modifications.

Some risks may occur very infrequently but are more costly, and it is more difficult to determine an adequate response. A poorly designed, developed, and implemented project is likely to result in sunk costs; it cannot be addressed through contingency funds. In such cases, a new project may be initiated with a new design, budget, schedule, and management. Consider again the above example of building a house. It is more costly and time consuming to alter floor plans or modify dimensions of a room once building has started. A yet more difficult modification would occur if you decided to alter the view orientation so that, for example, bedrooms get more sun during the winter. In that case, it might be less costly to plan a new house.

Preparing a response for risks that are imprecise or difficult to evaluate is challenging. For example, lack of agreement among experts on whether a risk will or will not occur creates a challenge for the project manager from two different perspectives. One is to determine whether to plan a response for this risk or not, and the other is to obtain additional support. A divergence of opinion makes it difficult to convince management. In such cases, it is prudent to obtain more expert opinions about risks.

The project manager must make sure that risks are defined clearly and accurately and that assessment methods are appropriate. Some experts may be thinking about risks from different perspectives or may have a different understandings of potential risks, based on their experience. It might be a good idea to ask experts to define each risk as they perceive it before assessment. It is also useful to brainstorm risks and their likelihood in a group setting. Interactive sessions provide opportunities for participants to clarify and define what they are evaluating.

## 9.5 Implementing response to risks

ONCE RISKS ARE identified and ranked, the project manager must plan to **mitigate and reduce the effect of each risk**. Additional resources are usually required, depending on the nature and extent of the potential risk. **Contingency plans** suggest the extent to which the project manager and team members are prepared to respond to risk. Reasons for contingency planning include the following:

- (a) *What action* is necessary when a risk occurs?
- (b) *Who is responsible* for handling the situation?

- (c) *What resources are available?*
- (d) *Who is authorized to release contingency funds?*
- (e) *How do you document progress and file reports?*

For example, if a risk is likely to delay a particular activity, the project manager should review the work breakdown structure and PERT diagrams to determine whether that activity is on the critical path or has slack. If the activity is on the critical path, then the project manager must determine whether the risk can be eliminated through overtime or additional human resources. If the activity is not on the critical path, then it must be determined whether the slack for that activity is sufficient. If a risk is associated with external vendors, the project manager must consider the possibility of using other vendors. Contracts with external vendors must be carefully drawn to include provisions for using other vendors in these, and some other, circumstances.

Responses to risk must be based on the impact on the project and thereby on the stakeholders. In other words, risks with high impact (significant cost and inconvenience) must take priority even when they are less likely to occur. Low impact risks are more tolerable even when they are more likely to happen. It is important that contingency plans are considered only when it is necessary. In other words, contingency funds are provided for out-of-the-ordinary situations. **Contingency funds** *are not provided to make up for bad management, poor performance, or inadequate control.* Repeated poor judgment, control, and performance may jeopardize a project manager's credibility and support of the project by top management. The authorization to release contingency funds is usually held by top management rather than the project manager.

Once a risk occurs, the responsible person must be supported with the necessary resources. The responsible person in turn must mitigate, monitor, and document progress. Documenting risks is useful in identifying the sources of risk and effective approaches to them. Sometimes, it might be possible to transfer risks but not risk impact. For example, it might be possible to transfer risks associated with equipment or fluctuating prices to external vendors. In such cases, terms of the contract may include additional charges to provide for risks, and vendors understand that they are responsible for controlling and mitigating risks. However, it might not be possible to mitigate the impact of all risks to the project.

There are potential **problems with risk analysis**. For example, it will be difficult to identify all the activities and risks, and estimate (accurately) the probabilities of risks. However, there is no limit on the amount of time that could be spent attempting to analyze risk and plan reactions to it! Indeed, complexity and uncertainty may be so great that any analysis of risk might, in some circumstances, be simplified. Analysis consumes resources, and this may lead to choosing the option that identifies 'general responses' to several problems rather than identifying, in detail, every source of risk. This reduces effort in dealing with uncertainty, and general responses are a natural first line of defense in coping with 'unforeseeable' threats or opportunities. An important result of more detailed risk analysis is that decision makers can gain an understanding of the trade-off between the expected risks and the costs of different alternatives, giving a firm basis upon which to make and compare decisions.

## 9.6 Focusing on the benefits

MOST OF OUR previous discussion has focused on such risks as not achieving our project on time, within budget, and with client co-operation and acceptance. In this section, we look more at the benefits side. Sometimes an ‘over-budget and over-time scenario’, although undesirable, can be offset if the important benefits are achieved. Here we look at critical success factors as a way of identifying the key benefits of the project and a benefits realization program to ensure that these key benefits are achieved. The first job is to identify the key benefits.

**Critical success factors (CSFs)** are the set of factors that can be considered critical to the success of the project (in our case – they can relate to the organization, department, or even a role, such as that of the CIO). It is best if only a limited number of factors are identified as critical. If too many factors are identified, they are probably not all critical. The focus is on the relatively few areas where things must absolutely go right to ensure the project’s success. The process thus includes a fundamental assessment and prioritization of factors. Where possible, CSFs should be measurable –indeed, not only measurable but actionable- and linked to perceived value. Strictly speaking CSFs themselves should not be prioritized or ranked because, as the term implies, they are all critical and thus equally important. If they can be ranked in terms of importance, as is sometimes seen, it implies that they are probably not all critical.

CSFs are used in our context to help ensure that projects in an organization support the overall business strategy. A typical CSF approach might first analyze the goals and objectives of the project for the organization and then identify the factors critical to achieving each of those objectives. About four to six CSFs might be identified for each major objective of the project. So, using the CSF technique helps identify those relatively few things that must be achieved to ensure success at a strategic level. Then it can be cascaded down to specific lower-level activities or elements that contribute to achieving the overall CSFs. From the project manager’s point of view, it is important to ensure that the overall CSF’s embody the major requirements of the key stakeholders.

**Benefits realization programs** are a means of ensuring that these CSFs have the highest possibility of being satisfied when the project is operational. It is important to distinguish here between provision and use in such programs. The recipient of a project outcome needs to understand not only the nature of the project but also its potential for contribution and, if necessary, change behavior in some positive way to realize benefits. This might be achieved, for example, by existing customers buying more services, by existing customers not transferring their allegiances elsewhere, or through improved service to attract new customers. Customers or potential customers must first be aware of the change and second perceive it as an improvement over the service that they currently use. So, the benefit realization process comprises at least two stages, first the provision or implementation of the project to provide benefit, and second, the effect of that benefit on the wider environment and any resultant behavioral changes. And it is only after the second stage is achieved that benefits will be realized. Many of the considerations discussed earlier, such as training and education of stakeholders, and top management support are therefore vital to benefits realization.

The fact that there are two stages to the process, unfortunately, provides greater opportunities for the potential benefits to get lost or become dissipated and makes the evaluation of such effec-

tiveness projects difficult. In the case of cost displacement, the organization is more in control of the realization of benefits, whereas in the improved services case (i.e. effectiveness justifications), the organization is in control of achieving the first stage but not the second stage. This is the impact on others; for example, suppliers, customers, and potential customers. This second stage has been the area where miscalculations are frequently made; for example, it is often assumed that the move from Stage 1 to Stage 2 is a logical and deterministic process: that an improved service will lead to more people buying that service, or that better information will lead to better decision making.

1. Stop: Halt all project development activities and assign the team to support the disentanglement effort.
2. Assign an evaluator: Recruit an external professional to lead the disentanglement process.
3. Evaluate project status: Establish the true status of the project.
4. Evaluate the team: Identify team problems that may have contributed to the project's failure.
5. Define minimum goals: Reduce the project to the smallest size that achieves only the most essential goals.
6. Determine whether minimum goals can be achieved: Analyze the feasibility of the minimum goals and determine whether they can reasonably be expected to be achieved.
7. Rebuild the team: Based on the new project goals, rebuild a competent project team in preparation for re-starting the project.
8. Perform risk analysis: Consider the new goals and the rebuilt team, identify risks in the project, and prepare contingency plans to deal with them.
9. Revise the plan: Produce a new high-level project plan that includes a reasonable schedule based on professionally prepared estimates.
10. Install an early warning system: Put a system in place that will ensure that the project does not slip back into catastrophe mode.

**Figure 9.11: The disentanglement process**  
(from Bennatan, E. M. (2006) *Catastrophe Disentanglement*, Boston: Addison-Wesley)

One of the main uses of a benefits realization program is that projects that are going wrong can be identified earlier because it will be evident that benefits will not be achieved by following the present path. Edwin Bennatan argues that projects are rarely impossible to turn around, and he suggests ways in which failing projects can be turned around via a process he calls the **disentanglement process**. This is shown as Figure 9.11.



## 9.7 Interview with a project manager

### Interview

**Q** WHAT specific roles, in your opinion, are important to a project manager?

“**I**t varies, but a great manager has three major roles to play. They are a planner, a provider, and a protector. As a planner, a manager has to take a long-term view; indeed, the higher you rise, the further you will have to look. While a team member will be working towards known and established goals, the manager must look further ahead so that these goals are selected wisely. As a provider the manager has access to information and materials which the team needs. Often he/she has the authority or influence to acquire things which no one else in the team could. Last, as a protector the team needs security from the vagaries of less enlightened managers. In any company, there are short-term excitements which can deflect the workforce from the important issues. The manager should be there to guard against these and to protect the team.”

**Q** WHAT procedures and/or tools do you use in order to keep team members informed and moving forward on the project?

“**I** have weekly status updates, and make sure the information in the meeting is documented. If I cannot physically meet with my team due to distance constraints, I use Net Meeting, which is a web-based software program that allows me to host my meetings. In the meetings, I usually discuss where we are in the

time scope and detail progress and future tasks. If someone is responsible for a certain task prior to the next meeting, I will make sure to log a reminder in Microsoft Outlook so I can give that person a follow-up call. Without Outlook I wouldn't get anything done! Organization is crucial for successful project management.”

**Q** WHICH phase of the project life cycle would you consider to be the most important?

“**C**oncept is the most important; if any problems arise they can all be rooted back to the source, which is the concept. Without a clean concise, understood concept there will probably be problems during the project.”

**Q** WHAT do you feel is your biggest challenge when working on a project?

“**T**he accessibility to resources and resource allocation is the biggest challenge. Almost every project manager that I have worked with, myself included, has complained about having access to certain resources.”

**Q** HOW do you feel project management for IT differs from project management for other industries?

“**W**ell since I've only been exposed to IT project management it

is difficult to say. As I think about it though it shouldn't be that much different, project management boils down to managing people to achieve a goal. The 10 basic steps should be involved, which are: Define Work, Build Workplan, Manage Workplan, Manage Issues, Scope, Communication, Risk, Documents, Quality, and Metrics.”

**Q** WHAT do you believe to be the most important skill of a successful project manager?

“**O**rganization and communication are the most important.”

**Q** GIVEN that you enjoy working as a project manager, what is the most rewarding part of the job?

“**S**eeing a project go through its life cycle and seeing its goals accomplished. Getting to see people use and benefit from the project.”

### Chapter summary

ALL REAL-WORLD PROJECTS involve risk. It is important to recognize that risks can happen and that there are ways of mitigating and preparing for them. Project managers are responsible for anticipating risks, assessing risk likelihood, evaluating the impact of risk on the project, and finding effective ways of responding to risks.

Project managers must consider risk management as a cost saving exercise that, if avoided, might result in significant budget overrun and delays. At the same time, risk management is a costly exercise and involves careful planning, assessment, resource allocation, monitoring, and

control.

The most effective way to respond to risks is to plan for them. Even for risks that are difficult to define, evaluate, and ultimately plan for, it is beneficial to brainstorm them and be aware that they may happen. It is important that team members are sensitized to the possibility of risks and are prepared in the event that risks occur.

Project managers and team members must consider risk analysis and risk management as an integral part of system development activities because of the impact that potential risks may have on the outcome of the project. Because of the negative impact that risks will have on a project outcome, the project team and the project manager must continuously monitor for and control potential risks.

Risk management planning and contingency fund plans are two important outcomes of risk management exercises. The risk management plan describes: what might happen, what is the likelihood that a risk might occur, what mitigating actions are feasible, who is responsible for implementing mitigating actions, and how to control and monitor the risk management plan. Risk management planning must describe whether a risk can be avoided, transferred, or reduced.

Contingency funds are predetermined and are released only when a risk event occurs. Their use must, therefore, be properly defined. Contingency funds must be directly linked with the significance of a risk and the likelihood of an event happening. Project managers usually initiate the need for contingency funds, but the authorization to release these funds usually rests with general managers.

Internal sources of risk relate to: top management support, organizational needs change, client acceptance, and the talent pool. Projects

closely aligned with organizational goals and objectives have a greater chance of continued support and acceptance. Client involvement in systems development activities is considered an important way of improving the likelihood of acceptance. Training programs are also critical for client support and to improve the talent pool.

External sources of risk relate to: vendors and providers, consultants, contract employees, government regulation, and market fluctuation. Probably the most critical source of risk involves vendors, and experience is the best resource for assessing that risk. Documentation and past records could prove useful to the project manager in evaluating risks associated with consultants

and contract employees. Project managers must stay current with regulations that may impact design, development, and implementation. A good example of this is the impact of the law on communications between countries that may affect offshoring project activities.

Some risks are easier to quantify, such as loss of equipment. Some level of risk is appropriate to evaluate qualitatively, such as the strength and level of the internal talent pool, inter-organizational communications and relations, top management style, and top management attitudes towards change. The appropriate use of methods is important to project managers in justifying their assessment and recommendations.

### Discussion questions

- a) What methods, other than the ones described in this chapter, would you suggest for identifying project risks? What other methods would you use to assess those risks?
- b) Which group of risks (internal, external) described in this chapter is more critical to a project? Why? What is the most critical risk for any project?
- c) Read and comment on the interview with a project manager presented in this chapter. What question or which response do you find interesting and why?
- d) Is client involvement important to risk management? How?
- e) What specifically is the risk and what are the risk mitigation deliverables?
- f) How is the risk going to be mitigated? (What risk mitigation approach is to be used?)
- g) Who are the individuals responsible for implementing the risk management plan?
- h) When will the milestones associated with the mitigation approach occur?
- i) How much is required, in terms of resources, to mitigate risk?

### Exercises

- a) This chapter describes two methods (probability and high, moderate, low) for identifying and assessing project risks. In your opinion, what are the advantages and disadvantages of each method?
- b) Ask a project manager (a) how they identify project risks, (b) how they prioritize risks, and (c) how they respond to risks.
- c) Assume you are the project manager for developing a large project that involves

different functional areas. How would risk management and assessment be different in this case compared with a project that is developed for a single department? Describe differences in your risk management plans for these two projects.

**d)** Search and find out more about the Delphi technique and assess its advantages and disadvantages for identifying project risks. Can you use it to assess the importance of each risk?

## Important Concepts

**benefits realization programs** (pg. 177)

**brainstorming** (pg. 167)

**case-based reasoning (CBR)** (pg. 172)

**contingency funds** (pg. 176)

**contingency plan** (pg. 175)

**contract employees** (pg. 166)

**critical success factors (CSFs)** (pg. 177)

**cross-impact approaches** (pg. 171)

**Delphi method** (pg. 170)

**disentanglement process** (pg. 178)

**employee acceptance** (pg. 165)

**employee attitude toward change**

(pg. 165)

**evaluating project risks** (pg. 172)

**external risks** (pg. 166)

**identifying project risks** (pg. 167)

**internal risks** (pg. 164)

**mitigating risk** (pg. 175)

**morphological approaches** (pg. 170)

**planning a response to risk** (pg. 175)

**problems with risk analysis** (pg. 176)

**risk assessment** (pg. 167)

**risk breakdown structure** (pg. 167)

**risk management** (pg. 164)

**risk of discontinued top management**

**support** (pg. 165)

**scenario planning** (pg. 170)

**SWOT analysis** (pg. 171)

## Bibliography

Avison, D., Fitzgerald, G. (2006) *Information systems development: Methodologies, Techniques and Tools*. 4th ed., McGraw-Hill.

Barki, H., Rivard, S., Talbot, J., 'Toward an Assessment of Software Development Risk,' *Journal of MIS*, 10 (2), 1993, pp. 203-25.

Bennatan, E. M. (2006) *Catastrophe Disentanglement*, Addison-Wesley.

Boehm, B.W. (1991) *Software Risk Management: Principles and Practices*, IEEE Software, 8 (1), January.

Chapman, C., 'Project Risk Analysis and Management-PRAM, the Generic Process,' *International Journal of Project Management*, 15 (5), 1997, pp. 273-281.

Checkland, P.B., *Systems Thinking, Systems Practice*, Chicester, England: Wiley, 1981.

Dhillon, G., Torkzadeh, G., "Value-focused Assessment of Information Systems Security in an Organization," *Information Systems Journal*, 16, 2006, pp. 293-314.

Ewusi-Mensah, K., Przasnyski, Z.H, 'On Information Systems Project Abandonment: An Exploratory Study of Organizational Practices,' *MIS Quarterly*, 15 (1), 1991, 66-86.

Jiang, J.J., Klein, G. (2001) *Information System Success as Impacted by Risks and Development Strategies*, *IEEE Transactions on Engineering Management*, 48 (1).

Keil, M., 'Pulling the Plug: Software Project Management and the Problem of Project Escalation,' *MIS Quarterly*, 19 (4), 1995, pp. 422-447.

- Keil, M. Cule, P.E., Lyytinen, K., Schmidt, R.C. (1998) A Framework for Identifying Software Project Risks, *Communications of the ACM*, Vol. 41(11).
- Kliem, R.L. Ludin, I.S., *Reducing Project Risk*, Aldershot, England: Grower, 1998.
- Lyytinen, K., Mathiassen, L., Ropponen, J. (1998) Attention Shaping and Software Risk: A Categorical Analysis of Four Classical Risk Management Approaches, *Information System Research*, 9 (3).
- Porter, M. E.(1985) *Competitive Advantage*, Collier-Macmillan.
- Ringland, G. (2006) *Scenario Planning: Managing for the Future*, 2nd ed., John Wiley
- Ropponen, J., Lyytinen, K. (2000) Components of Software Development Risk: How to Address Them? A Project Manager Survey, *IEEE Transactions on Software Engineering*, 26 (2).
- Wyatt, R., 'How to Assess Risk,' *Systems Management*, 23 (10), 1995, pp. 80-83.





# 10

## *Outsourcing and Offshoring IT Projects*

### **Themes of Chapter 10**

- What is the offshore outsourcing of IT projects?
- What are the main differences between outsourcing and offshoring?
- What are the benefits of offshore outsourcing?
- What are the consequences of offshore outsourcing?
- Is IT project offshoring different from other offshoring projects?
- Do all IT projects benefit from offshore outsourcing?
- How can project managers plan offshore outsourcing?

## Introduction

OFFSHORE OUTSOURCING OF INFORMATION TECHNOLOGY SERVICES has been growing rapidly in recent years and is likely to continue into the foreseeable future. The primary reason behind this trend is the economic cost advantages gained by offshore service procurement. Offshoring is not unique to the information technology function. Manufacturing and online customer services, for example, have been outsourcing their work to Mexico, China, Ireland, and other countries for some time. Information technology *outsourcing* has been widely adopted for more than two decades, but *offshore outsourcing* of information technology services is a relatively recent phenomenon. The significant growth in communication technologies and the increased demand in recent years for IT professionals in the United States and Western Europe have made offshore outsourcing of the IT function an attractive option. In addition, the availability of an educated work force in other countries, such as India and China, has made the offshore outsourcing of IT services a reality. The offshore outsourcing of IT services has implications for IT management. Information technology project management, in particular, is influenced by this trend in a variety of ways, including human resource issues, scheduling, relationships management, communications, quality control, risk, and evaluation. Information technology graduates need to be prepared for the challenges and opportunities presented by the offshore outsourcing of the IT function. This chapter will describe the origins of outsourcing and the reasons behind the offshoring of IT services. This chapter further describes the impacts of outsourcing on the individual and organization, and the skills that are necessary for the management of offshore projects. This chapter ends with discussion questions that highlight the multifaceted nature of the offshore outsourcing phenomenon in terms of culture, measurement, quality, and the like. But first, in the following exhibit we look at potential problems that might arise when offshoring.

### Managing Diversity

Diversity is the essence of reality. It exists in any group or team that we are associated with: the family, work place, society, and the like. Successful enterprises have greatly benefited from the diversity of work force, culture, and talent. The critical success factor in dealing with diversity is to understand the strengths and weaknesses in any situation. This assessment is more critical when we deal with global entities.

Success of international business depends, to a large extent, on the management of

diverse relationships. The trend to offshore outsourcing IT services is a relatively new development. In a short period of time, we have learned a great deal about the opportunities and challenges that come with offshore outsourcing decisions. There is still a great deal that we do not know. We need to learn more about the management of diversity and the new relationship in vendor-client situations.

Peggy Zhu is a database administrator with many years of experience. For the past several years, she has been responsible for the



management of a large integrated database system in a multi-state utility company in the southwest region of the United States. The database system is critical to the operation of this company. This utility company, like others, has been under competitive pressure, in recent years, to curb developmental, maintenance, and other costs of information technology services.

#### BACKGROUND

In recent years, there has been a rapid increase in demand for information systems professionals throughout the industrialized world, and that in turn has resulted in the increased cost of procuring human expertise in this field. Following a preliminary analysis, the utility company concluded that they must reduce their costs in order to remain competitive. It also became evident to them that a common practice for reducing costs was to seek talents internationally. In other words, to outsource information technology services offshore.

The company carried out an investigation of how best to offshore their information technology services and decided to go with a large service provider in Bangalore, India. They decided to negotiate with the Indian company for maintaining a significant portion of their database services. Following a year of intense planning, communication, and transition, the bulk of database maintenance was contracted out to the service provider in India. Peggy Zhu was one of the people involved at different stages of this transition. As a result of this

decision, her department and its resources were reduced by half. Several of the employees in her department decided to take an early retirement option that was offered by the company and several others decided to relocate.

#### RATIONALE

The logical deduction by Peggy Zhu was that the company will remain competitive and those employees that were retained will have more job security. Her job had become increasingly hectic, in recent years, due to frequent employee turnover and the difficulties in hiring experienced information technology professionals. She regularly put in extra time in order to maintain the system up-time that the company needed for its routine functions. She realized she had been working fifty hours a week for several months. Given the situation, she did not mind the offshore outsourcing decision by the company. In a way, she looked forward to a more normal pace of work and being able to spend more time with her family.

After a long year of frantic arrangements with the offshore service provider, Peggy Zhu planned a two-week vacation with her family in southern Nevada. She was looking forward to her vacation. She had accomplished what the company had planned to do and had successfully handed over to the new provider firm day-to-day responsibility for maintaining the database. She felt she really needed the time off.

#### PANIC CALL

In her second day of vacationing, Peggy Zhu was having dinner with her family and a few friends when she received a panic phone call on her cell from one of her colleagues at work. The colleague apologized for calling her late in the evening and went on to explain that the system was down and that they had not been able to sort things out with the new provider as to what had caused the problem and how they should respond to it. The colleague said that they recalled a similar problem a couple of years ago that Peggy Zhu had managed to diagnose, and she had brought the system back up quickly.

Peggy Zhu had feared that this would happen. She was afraid that, even though they had outsourced responsibilities for maintaining their system, the company would find it easier to reach out for internal expertise. After all, she was the expert on trouble shooting. She was not happy about her intuition being so right so quickly. She had expected something like a list of things that needed sorting out when she returned from her vacation but not a panic call from her colleagues.

Peggy Zhu apologized to friends and family and went to a quiet corner to deal with the

problem. After a long conversation with the colleague over the phone, she realized that (a) it was difficult to clearly identify the source of the problem and (b) it was unclear which party, the provider or the client, was responsible for fixing the problem.

#### QUESTIONS

She returned to the table where her cold dinner was waiting for her. As she picked through her plate, a series of thoughts went through her mind. Did they not plan this right? Was the vendor the right choice? Was the communication a problem? Did they cover all issues in the contract and did they cover them clearly? Are they protected by the terms of the contract? Should they expect more of this to come?

She realized they were sailing on new waters and that they needed to know a lot more about how to map a new working relationship and how to manage that relationship. She also realized they needed to know more about the people they planned to work with, about their culture, their language, their habits, their values, and everything else. She thought about the offshoring phenomenon as a whole and realized that, if they could not avoid it, they should learn to gain from it.

## 10.1 Outsourcing IT activities

OUTSOURCING MAY BE viewed as a natural step in the evolution of a business. In the early days of computers, large firms developed and maintained their information technology. Gradually, as hardware and software costs declined and as universities and colleges developed more programs and graduated more information technology professionals, companies of all sizes developed and

maintained their information technology; they owned their systems. With the rapid growth of computer and communication technologies on the one hand and the increased innovation in technology use on the other, the need for IT grew at a faster pace than ever before. As a result, the IT industry outran other industries and over expanded itself to the point that it created a scarcity of talent. Hiring and retention of information technology professionals became a serious challenge for the management of technology. Outsourcing became an option.

**Outsourcing** occurs when information technology activities are carried out by a provider outside the organization. Outsourcing is not unique to IT services. Other industries, such as manufacturing and services, have outsourced their product and services to outside providers for some time. In the early part of the 20th century, car manufacturers made all parts for a car, assembled it, and sold it. In other words, the manufacturer carried out all tasks from design to production to the sale of a car. Gradually, manufacturing of certain parts, such as wind shield and seats, were outsourced to other companies that could produce them more cost effectively. Parts produced by these outside providers were often of higher quality because they focused on these core competencies. With the positive returns in cost and quality, auto manufacturers increased their outsourcing to the point that the majority of parts for a car were produced by outside vendors. Today, the primary focus of car manufacturers is assembling cars for distribution.

The outsourcing trend continued and was expanded by others, such as the airline industry, finance companies, and online service providers. Kodak outsourced its information technology services in 1989. Information technology outsourcing began with the hiring of external consultants to aid in areas where companies did not have sufficient internal expertise. Soon, every IT task was a candidate for outsourcing and vendors, such as Electronic Data Systems (EDS), could provide IT services of all types to companies of all sizes.

Information technology is going through similar sourcing phases as manufacturing did previously. The outsourcing of IT began with the hiring of external consultants to aid in areas where companies did not have sufficient skills to accomplish the range of necessary IT activities. As early as 1963, EDS contracted with Blue Cross of Pennsylvania to handle its data processing. In 1989, Kodak outsourced most of its IT to IBM and two other vendors. This was a large, prominent and comprehensive outsourcing contract that involved the hiring of many of Kodak's IT personnel by IBM. From that point, IT outsourcing became very visible, grew rapidly, and has evolved to include offshore outsourcing. Clearly, advancements in communication and computer technologies, in recent years, have made this option more viable and offshoring opportunities more feasible, particularly in the service domain.


Just as auto firms began outsourcing to achieve cost efficiencies, only to find that quality, and eventually delivery time, also improved, some argue that the same scenario will be played out in offshoring IT. Already, some companies that have outsourced call-center operations to India report that customer satisfaction has increased. Overall, the quality gap appears to be closing rapidly. Many software development teams in India use Six Sigma approaches to quality management that are equivalent to those in use in world-class firms. This is a set of quality practices, originally developed by [Motorola](#) but inspired by Edward Deming, to systematically improve processes by

eliminating defects. Given the abundance of skills at offshore sites as well as pressure on executives to drive down costs, there is little doubt that this trend to offshore will continue, and even increase, for some time, even if some firms have decided to return to home-based call centers as a result of some customer complaints.

While cost savings is often a primary reason for offshoring and the expectations are that significant savings will occur, the level and extent of these savings remains the subject of considerable debate. Quantifying costs and benefits may be complex even in the simplest case of manufacturing and assembling a physical product.

It is well recognized by academics and professionals that firms must focus their resources on their **core competency**, that is, they must spend their resources promoting the major aspects of their business. For example, if a firm is a retail business, its core competency will be the procurement and sales of products that they want to be known for. A company that is in the business of manufacturing certain household goods must develop its core competency for producing and selling that product. A company in the music business must be competent in signing up artists, producing, and distributing music. While these organizations need information technology for their operations, they do not need to be experts in developing and maintaining hardware and software. They can outsource these non-core services to an outside provider.

The reasons why organizations outsource their information technology services are varied. Some of the more important factors behind outsourcing IT are shown in Figure 10.1.

- 
- Cost economics
  - Inadequate internal expertise and talent pool
  - Rapid technology change
  - Poor chargeback systems for IT services
  - Emphasis on core competency
  - Top management discomfort with technology
  - Management innovation
  - Management imitation
  - Changing goals and objectives

**Figure 10.1: Outsourcing factors**

Today, almost all organizations outsource in one way or another to produce and provide services. Some companies are primarily responsible for ‘warehousing’ their outsourcing decisions. These companies do not produce any product or provide any services themselves: they manage communications and relationships and outsource all other operations. For example, a book publisher may only agree to the contract with the author internally and outsource the rest- editing, printing, binding, distribution, organizing copyright protection, and reprint management- to outside providers. High bandwidth and sophisticated computing facilities have made virtual organizations a reality. We can accomplish more in less time, with less cost, and with better quality.

While many organizations outsource their information technology activities, there are many others that decide on the in-house development option. For example, Wal-Mart, the giant US re-

tailer, develops and maintains its entire business-information technology projects internally. They rely on internal expertise and management for the full range of IT tasks, from coding to process reengineering to e-commerce applications. Every year, thousands of IT projects are developed and maintained centrally by Wal-Mart employees. Wal-Mart's unprecedented success in the retail industry is credited, to a large extent, to their innovative and aggressive use of information technology. (A similar story is reflected by the Tesco retail chain in the UK). The success of their supply chain management processes is primarily due to state-of-the-art technology application. Clearly, Wal-Mart considers IT function as a critical success factor, too important for their operations to be outsourced. Other firms are less convinced by the arguments for keeping the IT provision internal to the organization.

Although outsourcing has been practiced for a long time, there is still an **emotional reaction** to the phenomenon within and outside organizations. This is partly due to the way that the popular press and public officials have treated the outsourcing phenomenon. Reactions to information technology outsourcing have been extreme: some have considered it to be a panacea, others a source of all ills. Neither position is correct. Many of the earlier predictions about outsourcing and its consequences turned out to be premature. The numbers of IT jobs went through unprecedented growth and contributed significantly to economies of the US and Western Europe even during times of high outsourcing development.

There has been a great deal of interest on the part of academics and practitioners to understand issues of *whether* and *how* to outsource information technology services better. The sourcing issue is said to be among the top five agenda items for IT executives. This is understandable, since more than 50% of US firms were expected to use outsourcing in 2006. We need to understand the socioeconomic impacts of outsourcing better, on the individual and on organizations. The potential impacts are real, and organizations need to practice outsourcing with a clear understanding of what it implies to their short and long-term objectives. The need for the project and its outcome must be continually reinforced in the context of organizational goals and objectives.

Information technology managers and professionals continue to have the highest opportunities and challenges in modern organizations. In the 1990s it seemed like information technology had provided us with all that was possible. Yet, technology has continued to surpass expectations, and users have continued to explore new potentials and frontiers not imagined before. Information technology executives and professionals are afforded unprecedented opportunities for value-added offerings. Organizations of all sizes can reach out and benefit from talents beyond national borders. The economic and business logic of outsourcing has extended to include offshore sourcing of IT services. There are many IT providers in many nations. In effect, IT activities can be outsourced to providers outside the company and outside the country.

## 10.2 Offshoring IT activities

WHILE OUTSOURCING WAS caused by the emphasis on organizations sticking to their core competencies, offshoring was caused by scarce resources. **Offshore outsourcing** occurs when products and services are procured from locations in other countries. Offshore outsourcing of in-

formation technology services is, arguably, the most significant phenomenon to occur in recent decades. American Express has been offshoring their back-office processing services in India since 1994. GE Capital opened its GE Capital International Services (GECIS) in India in 1997. Given the abundance of skilled professionals at offshore sites as well as pressure on executives to drive down costs, it is very likely that this trend will continue and even increase for some time, despite negative public reaction.

Many of these outsourcing vendors are “offshore” in large part because of the lower costs that can be attained outside of countries in the industrialized West. This exploitation of international cost differentials has been termed “global arbitrage” as it is an extension of the classic economic arbitrage strategy.

Factors influencing offshoring decisions are somewhat different from outsourcing, as a comparison of Figure 10.1 and Figure 10.2 shows.

- 
- Bandwidth growth and telecommunication
  - Scarce human expertise
  - Increased demand
  - Available global talents
  - Routine tasks
  - Changing goals and objectives
  - Innovation
  - Imitation

Figure 10.2: Offshoring factors

Offshore outsourcing of information technology activities is broadly accomplished in one of two ways. *First*, the client or offshoring organization sets up units in other countries and hires local talent to develop, maintain, and provide services. In this case, the company maintains responsibility for training, supervision, quality control, and the like. These responsibilities can be managed locally or remotely. *Second*, the client or offshoring organization contracts out services to providers on location in other countries. In this case, responsibility for hiring, training, supervision, quality control, and the like rests with the provider.

An Association for Computing Machinery report (listed in references at the end of this chapter) describes six varieties of work related to information technology that are often offshored: (1) programming, software testing, and software maintenance; (2) information technology research and development; (3) high-end jobs such as software architecture, product design, project management, information technology consulting, and business strategy; (4) physical product manufacturing – semiconductors, computer components, computers; (5) business process outsourcing/IT Enabled Services – insurance claim processing, medical billing, accounting, bookkeeping, medical transcription, digitization of engineering drawings, desktop publishing, and high-end IT enabled services, such as financial analysis and the reading of X-rays; and (6) call centers and telemarketing.

While information technology outsourcing took jobs outside of the organization, offshoring transferred jobs and services to locations outside of the country. In the outsourcing case, the talent

pool was limited to national boundaries whereas, with offshoring, that limitation is lifted. Both client and vendors of services have access to the greater pool of global talent. The range of information technology activities that are offshored has increased to the point that all activities that were traditionally outsourced can now be offshored. The cost of information technology products and services provided by offshore vendors can be significantly lower and the quality of product and services, in some cases, has been considerably higher than through in-shore provisions.

Controlling information technology development and maintenance costs is necessary for an organization in general and the information technology function in particular. In the early days of computers, investment in hardware, software, and IT products and personnel faced little scrutiny. Information technology services were considered special and organizations felt they could not afford to fall behind in technology investment, even if they did not fully understand where the money went. Top management and senior executives readily provided and supported information technology investment. Today, information technology activities are still considered important to short and long-term objectives of organizations, but their costs and investment proposals are more carefully scrutinized. At the same time, expectations of information technology continue to rise.

Information technology stakeholders often develop and hold expectations of technology deliverables that are not always realistic. For example, there is a common perception that computers can do anything and everything. There is also a common perception that computers are responsible for whatever goes wrong in a work place or in serving customers. These unrealistic expectations present a challenge to information technology executives who need to continuously seek funding support from top-management. The extent and quality of systems use is influenced, to a large extent, by users' competency and self-efficacy.

Technology in and of itself does not create value. Technology users create value in the fusion of doing and learning. In other words, value is generated by human-computer interaction. These inherent characteristics of computer and information technologies have and continue to pose challenges and provide opportunities for management. The offshoring phenomenon expands the scope for interaction, and this adds new dimensions. Top management and information technology executives see, through offshoring, opportunities to reallocate resources and focus on innovative and new services that were not previously available or affordable. While many tasks are offshored, others are retained and expanded, and this may give firms a new edge.

### 10.3 Risks in offshore outsourcing IT activities

ANY BUSINESS DECISION involves risks, and that risk is greater in situations when there is increased *change* or *uncertainty*. The best option is, however, not to avoid decisions or to wait and see what might happen elsewhere. The pressure on CEOs and CIOs to reduce costs is real and there is no sign that it will be lifted any time soon. Good management practice suggests the careful assessment of potential risks for any decision. Although offshore outsourcing of information technology services has been going on for sometime now, our understanding of its impact is still evolving. The trend in offshoring has been rapid and there is little doubt that it will continue into the foreseeable future. It is critical that offshored projects are carefully studied and cost benefit analyses are carried

out to make sure benefits outweigh costs beyond a margin. Only significant cost benefits will warrant offshore outsourcing of information technology services. With only a marginal cost benefit of say 10 to 15 percent, most organizations are better off retaining their information technology activities in-house or in-shore.

The offshore outsourcing of information technology activities is primarily based on **transaction cost economics**. That rationale is narrowed down to the **cost of labor** to a large extent. There is an extant discourse among academics, professionals, and business leaders as to the exact nature of this cost advantage. In many cases, this cost advantage is evident. However, there is a risk in: (1) over-estimating the cost saving, (2) under-estimating the overhead costs that are necessary to get to the cost saving stage, and (3) discounting non-cost factors that influence offshore outsourcing outcome. The **tangible transaction cost** economics of offshore outsourcing is more readily measured by economics and cost accounting models. The **intangible costs or benefits** of offshore outsourcing include issues of organization, behavior, morale, social, strategy, and the like, and these require acute management skills and insight.

These issues, it can be argued, relate to most organizations, whether or not they practice offshore outsourcing. However, in the case of offshore outsourcing in general (and offshore outsourcing information technology activities in particular), these issues take on new dimensions and importance. For example, **organization intelligence** is a critical and volatile asset, particularly as it relates to activities such as new ventures and research and development. Organizations are highly protective of such information. Organization design, intelligence, and decision making have been formed and influenced by such information content. It is inconceivable to think that a large multinational corporation can function without timely, accurate, and relevant information. Decisions to offshore outsource information technology activities must be carefully deliberated for their potential impact on current and future operations of a firm. In this section, we will review important potential risks associated with offshore outsourcing decisions.

A recent study at Johns Hopkins University surveyed senior IT managers in North America and Western Europe to identify the benefits and risks associated with offshoring IT activities. Risks to offshoring, these managers believe, stem from: 'the political situation in a host country' (political unrest, wars, confiscations, nationalizations, and terrorism); 'enforcement of intellectual property rights' (legal processes, loss of intellectual property rights, proprietary design features, piracy, and trademark infringements); 'information vulnerability and security' (lack of regulation and different work ethics); 'immature business environments' (volatile exchange rates, weak national currency, high tax rates, high tariffs on imports and exports, rigid customs laws, and technological infrastructure); and 'socio-cultural problems' (misinterpretations and the population's attitude toward entrepreneurship).

King and Malhotra also identified a number of generic risks associated with IT outsourcing as compared with performing the same IT activities within the firm. They indicate that there is a growing awareness of the difficulties that are inherent in offshoring, pointing out that hidden structural, cultural, legal and financial risk, and costs can easily be overlooked.

Offshore outsourcing risks of information technology activities stem from the factors shown in Figure 10.3.



- Decline in employee morale
- Loss of innovation and know how
- Public reaction to corporate citizenship
- Regional instability of host country
- Quality control and standards
- Communications and culture

Figure 10.3: Risks of offshore outsourcing

One of the potential risks of offshore outsourcing information technology services relates to **employee morale**. The reaction to information technology offshoring by individuals has been greater than that of outsourcing. This is despite our experience with outsourcing of information technology services that ultimately resulted in the increased application and use of computers. It is difficult to assess and measure the risk related to employee morale. The impact can broadly be grouped in terms of reduced employee loyalty and diminished work quality. Individuals tend to explore job opportunities elsewhere as soon as it is apparent that services might be offshored. Skilled and valuable employees will find jobs more quickly, and their departure will impact the quality of work and services. This poses great challenges for the project manager.

Human expertise and innovation is the greatest asset that any organization can develop and retain. Thus, loss of **innovation and know-how** in technology applications due to offshore outsourcing of information technology services can pose the greatest risk to an organization. Many successful businesses such as Federal Express, American Airlines, Wal-Mart, American Hospital Supplies, and United Parcel Services owe their competitive advantage to the creative use of information technologies. It takes longer and costs more to develop savvy business employees who are technically competent. It is very expensive for a firm to build up its human expertise if it decides later to revert back to in-house services; it is difficult to re-hire back skilled employees who have taken up positions with other firms, possibly with the competition. It is difficult to buy back lost loyalty.

Public loyalty to a firm and its goods and services is influenced by how people perceive the role of a firm as a corporate citizen. Corporate CEOs and other senior executives cannot ignore **public reaction to corporate citizenship**. As mentioned earlier, there has been a greater reaction by the public to offshoring practices compared with outsourcing. This is partly due to the way that the popular press has treated offshoring practices, as mentioned earlier, and partly due to the fact that computer and information technologies have been considered as one of the greatest innovations ever to affect US and Western European economies. In other words, the offshoring of information technology activities is considered more than just sending jobs abroad. Some of the big corporations, such as IBM and Oracle, have been secretive about their offshoring practices and have, at the same time, increased publicity about their community and society contributions. All this suggests the potential risks of a negative public reaction to offshore outsourcing.

**Regional instability of the host country** is another risk associated with offshore outsourcing practices. For example, the threat of major disruptions arising from political upheaval or war in an offshore host country could pose a major risk to service continuity. A politically stable region

with higher wages is a better host site for business planning. It is difficult to evaluate labor economics when issues of potential instability are present. Businesses need to carefully examine the long term effect on their business plans from short term gains in wages. Back-up sites outside the region and careful security checks on contractors are sometime necessary and are added costs of doing business in locations in other countries.

Inadequate **quality control and standards** is another potential risk associated with offshore outsourcing of information technology services. Reliability and quality of services are crucial to computer and information technology. System down time affects all operations of a business and its competitive strength. Customer service and customer satisfaction are directly influenced by the reliability and timeliness of information technology services. At the end of the day, it is the responsibility of the information technology function in a firm to ensure steady and reliable services in support of operations. Compliance with standards and enforcement of quality may reflect the vendor's goals rather than the client's needs. Project managers must ensure that provisions of quality and standards are clearly outlined in contracts with offshore vendors and that they align with the goals and objectives of the client.

The role of **communication and culture** in the successful delivery of information technology services through offshoring cannot be overstated. Success of information technology project development in remote sites is heavily influenced by effective communications and clear understanding of local culture. Information technology project failure has often been associated with inadequate needs analysis, resulting from poor communications. This can be more of an issue in offshore outsourcing practices. Understanding organizational culture has also been a factor in the success of information technology projects. Communications are more complex and culture is more diverse for offshore development projects. There is a risk that project development teams may take these complexities too lightly in the interests of time and cost and, as a result, adversely impact on the quality and timeliness of information technology services.

## 10.4 Opportunities and challenges

INFORMATION TECHNOLOGY IS an evolving discipline with unique opportunities and challenges for the management of this function. These opportunities and challenges are closely linked with management strategies and responsibilities for the information technology function. Important responsibilities are listed in Figure 10.4. Information technology project management has also been evolving over time and in response to the growing needs for enterprise-wide systems. Organizations invest in and expect from information technology a great deal, and that, in turn, brings about tremendous responsibilities. Contract management adds important new dimensions to project management. These include negotiation, monitoring, and communications infrastructure. Managing cultural diversity is another important dimension added to project management. These are discussed in section 10.5.

The long term view of economic theorists suggests greater returns for offshore practice. Several important factors affect offshore practice decisions, including where to offshore, the infrastructure at vendor site, business conditions, potential risks, and so on. However, *low-wage* and *skilled labor*

have been the overriding factors that influence decisions to offshore information technology services. So far, offshoring white-color jobs to low-wage regions of the globe provides significant cost advantage to firms in the US and Western Europe. These gains may not be permanent.

- Develop a vision for the role and contribution of technology in the organization.
- Define an overall hardware and software architecture to include platforms and communications.
- Coordinate developmental activities across the organization
- Develop and implement security plans
- Develop and implement contingency plans
- Manage technology transfer and infusion
- Manage vendors
- Rationalize funding and manage expectations
- Manage turnover
- Promote innovation
- Support users
- Provide guidelines for information technology use and application
- Develop and mentor IT expertise
- Ensure alignment with organizational goals and objectives
- Ensure regulatory compliance
- Ensure security and privacy of personal information

Figure 10.4: Responsibilities

The adverse effect of offshore outsourcing information technology services has been primarily on the current **job market**. However, this effect is more complex than simply jobs leaving the US and Western Europe for other regions of the world. While some jobs currently held by information technology professionals will be lost to offshore destinations, new jobs that require different skills will be created in response to the increased demand for information technology services. Savings will enable firms to invest in newer technologies and innovative use of information services. This in turn will generate new higher-level jobs and higher turnover. New jobs will require greater expertise in *business knowledge, systems analysis, communication, integration, team work, quality control, risk assessment, and contingency planning*. As described in various chapters of this book, effective project management requires these skills.

There has been a great deal of discourse about the short and long-term effects of offshore outsourcing practice in academic and professional publications. Some of this discussion relates to the overall effects of offshoring while others, more specifically, discuss these effects in terms of core competency, firm size, and organization culture. Yet, others discuss these effects relative to the information technology job market or national employment (see also Section 6.8). These future trends and consequences have been summed up by Overby in an article that incorporates comments by several senior information technology executives, listed below in Figure 10.5.

There is little doubt that information technologies and those who know how to manage them will continue to play an important role in the success of modern organizations. The key is to retool

and stay current in order to be able to respond to new and evolving business needs. In this chapter and throughout this book, we have tried to describe and provide the kind of skill sets that are needed to prepare our information technology graduates for new and challenging jobs.

1. IT jobs will be lost to offshore companies.
2. U.S. IT staffing levels will never return to their previous highs.
3. IT work that remains will be more important to the business .
4. Firms will continue to offshore application development, legacy maintenance, call center operations, and the like.
5. U.S. companies will keep work that requires close contact with the business, such as strategy development, business process improvement, and actual application of IT in the business.
6. IT will become a core competency and economic engine in emerging economies, and these emerging economies will complement the U.S. IT industry.
7. U.S. IT executives look beyond the possible short-term offshore savings to the long-term impact on the nation's ability to remain innovative.
8. The higher-level IT positions that remain will require new skills.
9. U.S. IT degree programs should move more toward broader business education.
10. The IT cohort of the future has to be a good technologist but also be a savvy businessperson, a hybrid and versatile person.
11. Issues of infrastructure, security, communication and project management are important to onshore jobs.
12. There is a need to protect intellectual capital, especially when IT is integrated in business processes.

**Figure 10.5: Effects of offshoring on jobs**

Information technology is the third largest corporate expense category, and about 50% of U.S. capital expenditures by businesses are in IS/IT. This suggests that the potential for offshore outsourcing is huge. However, information technology offshoring is only one small part of a much broader phenomenon that has enormous implications for Western industrialized countries (whose firms are typically the offshoring clients) and for developing nations (whose firms are typically the offshoring vendors).

In an article (*Foreign Affairs*, Mar/Apr 2006), Princeton University economist and former Federal Reserve Board Vice Chairman, Alan Blinder, has identified the impact on the West by saying, "The world is now in the early stages of a third Industrial revolution – the information age. The cheap and easy flow of information around the globe has vastly expanded the scope of tradable services, and there is much more to come. Industrial revolutions are big deals. And just like the previous two, the third Industrial Revolution will require vast and unsettling adjustments in the way Americans and residents of other developed countries work, live, and educate their children."

In saying this, Blinder suggests that we must understand the growing offshoring phenomenon better and develop management practices that are appropriate for this new environment. It will not be possible to manage IT as we have done in the past, and it will be necessary for information

technology professionals to develop skill sets that are commensurate with managing in an offshoring-intensive context. Information technology offshoring is expected to expand the global use and application of information technologies. As described in this chapter, there are opportunities in this new era of global IT growth, and information technology professionals need to prepare in accordance with the new realities in order to better position themselves for the evolving job market.

Given this understanding, the nature and structure of information technology application and use in firms will change drastically in the future. The information technology function will shrink in many firms in the industrialized economies. The significance and the role of information technology in business will, however, remain strong. The type and level of information technology services will continue to proliferate and grow. Some information technology jobs will return onshore. Only a small fraction of total service jobs in the industrialized economies will go to offshore vendors. Information technology curricula will be revamped, and information technology programs will produce necessary cohorts for the new challenges. The service industry in the US and Western Europe will grow and trade surpluses in services will increase.

Given this reality, information technology professionals need to learn to cope with the accelerated pace of job change and turnover. This also means that information technology jobs will remain competitive and out of the reach of non-skilled workers. The use of technology has increased over the years due to more user-friendly software tools and applications. The scope and nature of jobs for the information technology professionals has also changed in spite of the increased role and responsibilities of the end-user. The changes created by the offshore outsourcing phenomenon will not diminish the role and significance of information technology services or of those with the know-how to manage them.

## 10.5 The management of offshore information technology projects

THE OFFSHORE OUTSOURCING phenomenon has had a wide-ranging effect on the management of the information technology function. The first wave of offshore outsourcing practice reduced hardware costs and in turn increased demand for software. The new surge in offshore outsourcing has reduced software costs and in turn increased demand for information technology applications and services. The international value chain has made information technology more affordable to firms of all sizes and types. It has expanded the global application and use of information technology and created opportunities for information technology professionals to respond to the specific needs of businesses.

Offshore outsourcing of information technology services has added new dimensions to the duties and responsibilities of project managers. Systems that are developed at remote sites in different countries are more difficult to manage due to differences in *culture, language, time zone, labor law, work habits*, and the like. These issues are relevant even to cases where a firm operates its own offshore practice. This section will describe the specific set of skills required for the successful management of offshore projects. These skills are listed in Figure 10.6 and discussed below. It is important to realize that many of these project management responsibilities are not new, but they assume increased importance in the era of offshore outsourcing.

- Contract negotiation and management
- Relationship management
- Risk assessment and management
- Planning and integration
- Business process redesign
- Enterprise needs analysis and testing
- Security and privacy planning

**Figure 10.6: Skills**

Project managers are often involved with **negotiation and management of contracts** with international vendors for the delivery of information technology services. Many firms have their legal division draw and finalize these offshore contracts. However, project managers play a crucial role in identifying and outlining information needs for these offshore contracts. In this process, project managers often interact directly with offshore vendors to negotiate and clarify responsibilities. Communication skills and clear understanding of the culture and language of offshore vendors are essential to successful negotiation.

Project managers are responsible for the development and **management of relationships** between their team members and offshore service providers. Routine and effective collaboration and interaction between client and vendor teams is heavily influenced by relationship management. While it is necessary to have responsibilities outlined in a contract, it is essential to establish a good relationship to facilitate effective collaboration. Relationship management is influenced by a clear understanding of culture, language, and the habits of offshore providers.

Chapter 9 describes the importance of risk assessment and management for information technology projects. Section 10.3 above outlines and discusses potential risks associated with offshore outsourcing of information technology activities. **Risk assessment and risk management** of offshore projects is more difficult. For example, risks associated with local politics, natural disaster, and communication and network infrastructure in offshore locations are more difficult to assess and manage. Project managers must plan for disaster recovery and back up provisions in locations outside the vendor country.

Systems **planning and integration** also takes on new dimensions in offshore outsourcing practice. This may turn out to be a critical problem if the outsourcing firm reduces internal expertise to the point that planning and integration of information technology services becomes dependent on outside vendors. Project managers must carefully assess and retain internal expertise in order to plan and integrate information technology needs in alignment with organizational goals and objectives. This includes expertise to **redesign business processes** in order to reap the benefits of offshore provision. Information technology innovation inherently requires careful analysis of business processes and often leads to the redesign of these processes.

Chapter 2 describes how important it is for project managers to realize and understand business goals and objectives. As mentioned earlier, there is a need to retain, mentor, and manage employees that are business savvy and have technical competency. That skill-set is always needed

for **enterprise needs analysis and testing** of information technologies that are developed by vendors outside of the organization. Some information technology needs analysis requires intimate knowledge of business operations and intelligence. Firms are sensitive about their business knowledge and intelligence, and the cost of retaining internal expertise for needs analysis and testing is well justified in the long term.

**Security and privacy** continues to be an important issue for the individual and organization. Issues of security and privacy have assumed greater importance in recent years on priority lists of information technology executives and project managers. These issues continue to pose challenges for management because the technology continues to grow and information technology applications continue to expand. That is true even in cases where a firm develops and maintains its entire information technology services. Offshore outsourcing of these activities will amplify challenges to secure the information technology and keep personal information private.

As mentioned earlier, the effect of offshore outsourcing information technology activities is wide ranging; for both the individual and the organization. The range of **effects for the individual** includes *career, skills, relationships, privacy*, and other considerations. The range of **effects for the organization** includes *intelligence, knowledge, human expertise, security*, and the like. A great deal of offshore outsourcing that has already taken place has been to English-speaking countries such as India. However, a common language does not mean common cultures, habits, procedures, laws, environments, and the like. Communications consist of a great deal more than language. Firms and organizations have begun to realize that a common language does not eliminate communication difficulties. That is why it is critical for management to develop and retain individuals who clearly understand the business and are competent in technology application.

In a recent article published in the *Journal of the Association for Information Technology* (cited in the bibliography at the end of this chapter), the authors suggest that management must always retain the ability to anticipate and monitor technological change. These changes are because of technology growth or those that a vendor makes to the technology applications. Many organizations have realized after offshoring their information technology practices that they need to monitor changes in technology and to evaluate new developments in hardware and software independently. Appraising new developments becomes more difficult as a firm increases its offshore practice and salespersons redirect their marketing and promotional efforts toward outside vendors. Salespersons have traditionally been a useful outside source for providing information about new developments in hardware and software. These outside links will gradually disappear because the offshoring client is no longer a potential customer.

Many of the issues associated with offshore outsourcing were not initially apparent to the management of information technology services. The opening case in this chapter illustrates some of the nuances presented by offshore outsourcing practice. The offshoring phenomenon is still at its early stage. Management must continuously monitor and observe experiences gained by the firm and by others outside of the firm. Information technology professionals have long realized the need for continuous improvement and self-learning. Management must encourage and support self-learning by employees.

Information technology curricula at universities increasingly emphasize the need for ‘learning to learn’. It is not possible to learn everything about the technology and its management in the classroom or through a degree. Information technology graduates need to continue developing their technical and managerial skills after graduation. Continuous improvement and self-learning provide opportunities for career enhancement. Information technology professionals must be able to retool quickly in order to take advantage of new developments and add value to their organization. Demand for skilled information technology people has been and continues to be strong. Figure 10.7 lists a few simple, but practical, hints in this respect.

- Make self-learning a hobby
- Observe to learn
- Listen to learn
- Ask others for input
- Learn from mistakes
- Take time to review your work
- Develop a network
- Learn about diversity

**Figure 10.7: Hints for career enhancement**

## 10.6 Interview with a project manager

### Interview

**Q** WHAT specific factors, in your opinion, are important to offshore outsourcing of information technology activities?

“**W**e need more time up front to study whether or not we want to go this route and then whom we might want to go with. If you end up outsourcing those applications that have taken your people a long time to get the kinks out and to get the users to be happy with, you may have a job on your hands. If you ask five different project managers about their experience with offshoring, you probably will get five different responses and that is because not all applications that have been outsourced are the same, and not all providers are

the same. When we outsourced our computer applications, it took us some time to get our communications straightened with the outside vendor. Now it will be a lot more complicated to outsource our applications to a vendor in another country. That is what I mean by putting time up front to make sure you know what you are doing.”

**Q** WHAT are the implications of offshoring for internal information technology skills and know how?

“**T**he first thing you will notice is that there are rumors among your staff that jobs are going to be lost and people are going to be let go, and that is a problem. Some of



the people will start looking for other jobs. Your skilled and experienced people will find jobs quickly. You may end up with a serious problem when you lose your experienced and skilled people. For example, if you plan to keep 50% of your people you may end up keeping the 50% you don't want."

**Q** WHAT is, in your opinion, the best strategy to avoid that kind of personnel problem? What is the best strategy to avoid losing good people in a situation like that?

**“I** don't know about the best strategy. Your skilled people are the most valuable resource that you have and you must do what you can to protect and keep them. Timely and truthful communication always helps. You need to let people know what decisions are being made and why those decisions are important to the long term goals of the information systems division. You also want to let people that you want to keep know that, in the event that some jobs are offshored, you intend to keep them. It all depends on how extensive your organization's offshore plans are.”

**Q** WHAT are the legal and procedural challenges posed by offshore outsourcing of information technology services?

**“I** f you are asking about the legal side of dealing with outside vendors that is a job for our legal department. There are a lot of details in writing a contract with outside vendors and it is best to leave that to legal people in the organization. As a project manager, you should be aware of the principles involved and you should be clear about responsibilities. You want to be clear about responsibilities of your

team and those of the vendor. That should be clear in the contract. Once we had a contract with an outside vendor and every time we had an issue and needed clarification from the contract it was difficult. Our main problem was about user support responsibilities. We lived through the contract terms but revised it next time it was renewed. It is important to keep records of issues as they come up.”

**Q** DO you think your users will blame offshore providers for information technology problems?

**“T** hat depends on how much the users think the outside provider is responsible for. That is why it is important to make things clear in the contract and also to let users know who is responsible for what. Ultimately, there are some responsibilities that you don't want to offshore. Whatever you pick up that others do not will gain you support among users.”

**Q** WHAT are those responsibilities that you do not want to offshore? Can you give an example?

**“T** hose are the kind of responsibilities that involve intelligence and the internal workings of the organization. For example, if your internal communication and information sharing is primarily done by email, you may not want to offshore your email services. People tend to say a lot by email and it accumulates.”

**Q** WHAT in your opinion are important differences in the evaluation of offshore versus in-house services?

“**T**he evaluation of offshore services is linked to the terms of the contract. You want to make sure what is contracted is delivered in good time and with quality. There is also the quality of interaction with employees of the offshore service providers. Development and management of those relationships are important and it is up to both sides to make it work.”

### Chapter summary

OFFSHORE OUTSOURCING OF information technology activities is based on transaction cost economics. Firms have always looked for ways to reduce the costs of producing goods and delivering services. Although some information technology costs such as hardware, software, and communications networks have steadily declined over the years, other costs such as human expertise, maintenance, and security have gradually increased. This has resulted in a net increase for the overall cost of information technology services. In response to cost pressure, firms have, in recent years, adopted two important strategies: (1) outsource information technology activities or, in some cases, the entire function, to national vendors; and (2) offshore information technology services to global vendors.

The outsourcing and offshoring phenomena have had important effects on the management of technology in general and on project management in particular. Probably the most important impact of outsourcing and offshoring for information technology professionals has been on the job market and skills. The outsourcing trend resulted in significant employee turnover. In most cases, laid off employees were hired by vendors in need of skilled workers. Ultimately, outsourcing increased the demand for information technology services and thus pro-

professionals. The need for information technology professionals grew to the point that there was a shortage of skilled workers in the United States and Western Europe.

The offshoring trend, on the other hand, has impacted job market and skills somewhat differently. Information technology jobs as well as services have been offshored to vendors in locations outside of the US and Western Europe. Many of the more routine information technology activities have been offshored and the number of current jobs has been reduced. The jobs that remain in the US and Western Europe require higher skills: increased business knowledge, systems analysis, project management, communication, and the like. As with outsourcing, offshoring has made information technology more affordable, once again increasing the overall demand for information technology services.

While outsourcing and offshoring have similar characteristics, they differ in several ways. Probably the most important distinction between outsourcing and offshoring stem from the role of culture in vendor nations. Understanding local culture as well as labor law, work environment, habits, and the like are important to the success of offshore projects. Negotiation and relationship management are important new responsibilities for information technology executives and project managers. Team development, communication, quality control, risk analysis, planning, security, and privacy assume a new emphasis in the project development process.

Offshoring has replaced many of the previous job and career opportunities with new ones, making it necessary for information technology professionals to retool in order to take advantage of new possibilities. Self-learning and continuous improvement that have been important

traits of information technology professionals assume even greater importance. Information technology professionals must quickly adapt to changing realities in order to add value to their organization. The 'learning to learn' idea has become more important than ever for information technology programs and students.

In summary: efforts to reduce costs will continue; many current jobs will be lost to offshore locations; higher paying new jobs will be

created that require higher skills; value added principles continue to be the key; new realities require new thinking and new expertise; negotiation, innovation, business knowledge, communication, analysis, and relationship and diversity management assume greater importance. Global needs for information technology services will continue to grow, creating opportunities and challenges for the information technology profession.

### Discussion questions

- a) This chapter has argued that technology, in and of itself, does not provide value and that human-computer interaction generates value. What do you think of this assertion? Would offshore outsourcing of information technology services alter the effect of human-computer interaction as we know it?
- b) Discuss the role and impact of offshore outsourcing on organizational innovation and know-how. Take a long-term view of this issue and describe the role of management in the outcome.
- c) The provision of information technology services continues to provide unique opportunities and challenges to the management of these technologies. Organization and user expectations are said to pose challenges and provide opportunities at the same time. Discuss how you would reconcile this apparent conflict. In what ways does offshore outsourcing of information technology services alter these challenges and opportunities?
- d) Search the web to find out more about some of the more successful offshore vendors, such as Wipro, Infosys Technologies, and Tata Consultancy. Prepare a short summary of your findings for class discussion.
- e) Assume you are the project manager responsible for the development of an integrated corporate-level database system. Top management in your company is concerned about your proposed costs to develop this system and has suggested that you consider offshore outsourcing some of the activities. Describe specifically what developmental activities you would offshore and what activities you would not.
- f) Consider the opening case to this chapter. What specific suggestions would you offer Peggy Zhu in her current situation? What is the first thing she should do? What changes should she make in her daily work? How should she go about measuring the success of their offshore decision?
- g) What risks, other than the ones described in this chapter, would you suggest might impact on the offshore outsourcing of information technology projects? What methods would you use to assess those risks?
- h) Is user involvement important to the success of offshore outsourcing information

technology activities? How would you involve users in the design and development of offshored information technology projects?

- i)** Consider the following scenario. You are the project manager for the development of a corporate level system, such as the one mentioned above under (d). You were not in favor of the decision to offshore those activities and neither were your information technology personnel. The contract is final and you have been asked by the top

management to facilitate user involvement with the development of this project. Describe your plans for doing that. What activities, if any, would you involve the users in and why?

- j)** This chapter suggests that common language does not mean common cultures, habits, procedures, laws, environments, and the like. It argues that communication is a great deal more than just the language and that common language does not eliminate communication difficulties. Discuss.

## Exercises

- a)** A widely-used method for measuring information technology success is that of user satisfaction. You have recently contracted the development of one of your projects with an offshore provider in India. You need to identify factors that are important to users of that system. Identify critical success factors that you see as important to the users of that system. What is a good method to (a) identify those factors and (b) verify them to make sure they are important?
- b)** Schedule an interview with a project manager who has been involved with offshore outsourcing of information technology projects. Prepare a set of questions that include expected and unexpected difficulties, risks, personnel issues, quality control, and user responses. Ask this project manager what is the one thing that they would do in any future offshore projects.
- c)** Search and find an article that argues in favor of offshore outsourcing information technology services and one article that argues against such decisions. Based on your

reading of these two articles, prepare a table to compare and contrast the points in favor and against offshore outsourcing of information technology activities.

- d)** Refer to the interview with a project manager at the end of this chapter and list two points that you strongly agree with in the interview? Is there a point that you strongly disagree with in the interview?
- e)** As described in this chapter, Wal-Mart, the largest retailer in the world runs its information technology operation entirely in-house. They also have an extensive training program that helps them develop and retain human expertise. Search and find information that describes Wal-Mart's information technology training strategy. What is unique about their training? How does it help them retain their information technology experts?
- f)** Offshore outsourcing of information technology services could potentially impact human expertise and organizational know-how. To what extent can organizations afford to lower internal expertise? This

chapter suggests that the human expertise necessary to plan and integrate information technology must be retained internal-

ly. Search and find articles that support or oppose that contention.

## Important Concepts

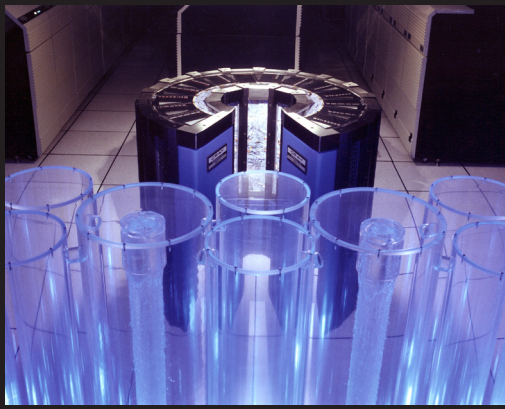
**business process redesign** (pg. 200)  
**communication and culture** (pg. 196)  
**core competency** (pg. 190)  
**cost of labor** (pg. 194)  
**effects for the individual** (pg. 201)  
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**management of relationships** (pg. 200)  
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**security and privacy** (pg. 201)  
**tangible transaction cost** (pg. 194)  
**transaction cost economics** (pg. 194)

## Bibliography

- ACM, 'ACM Task Force Sharpens Focus on IT Globalization,' Member Net, (4)1, March, 2005.
- Aspray, W. Mayadas, F. and Vardi, M.Y. (Eds.) "Globalization and Offshoring of Software: A Report of the ACM Job Migration Task Force," Association for Computing Machinery, 2006, <http://www.acm.org/globalizationreport>
- Blinder, A.S. "Offshoring: The Next Industrial Revolution?" *Foreign Affairs* (85:2), Mar/Apr 2006.
- Carmel, E. and Agarwal, R., 'The Maturation of Offshore Sourcing of Information Technology Work,' *MIS Quarterly Executive*, Vol. 1(2), June, 2002.
- Davis, G.B., Ein-Dor, P., King, W.R., Torkzadeh, G., 'IT Offshoring: History, Prospects and Challenges', *Journal of the Association for Information Systems*, Vol. 7(11), November, 2006.
- Dibbern, J., 'Information Systems Outsourcing: A Survey and Analysis of the Literature,' *The DATA BASE for Advances in Information Systems*, Vol. 35(4), Fall 2004.
- Djavanshir, G.R., "Surveying the Risks and Benefits of IT Outsourcing," *IT Pro*, published by IEEE Computer Society, Nov/Dec 2005, pp 32-37.
- Hirschheim, R. A. Information systems outsourcing: a survey and analysis of the literature, *ACM SIGMIS Database*, 35, 4 (2004).

- Hirschheim, R. A., Heinzl, A., Dibbern, J. (eds) *Information Systems Outsourcing: Enduring Themes, New Perspectives and Global Challenges*, Springer, (2006).
- King, W.R., 'Outsourcing and the Future of IT,' *Information Systems Management*, (21) 4, Fall 2004.
- King, W.R. "Strategic Outsourcing Decisions," *Information Systems Management* (11:4), Fall 1994, pp. 58-61.
- King, W.R. and Malhotra, Y. "Developing a Framework for Analyzing IS Sourcing," *Information and Management* (37:6), September 2000, pp. 323-334.
- Matloff, N., 'Globalization and the American IT Worker.' *Communications of the ACM*, Nov. 2004, Vol. 47 (11).
- Overby, S. "The Future of Jobs and Innovation," *CIO Magazine*, December 15, 2003.
- Rottman, J. and Lacity, M., 'Proven Practices for Effectively Offshoring IT Work.' *Sloan Management Review*, Vol. 47, Spring 2006.
- Wang, T.G., 'Transaction Attributes and Software Outsourcing Success: An Empirical Investigation of Transaction Cost Theory,' *Information Systems Journal*, Vol. 12, 2002.



# 11

## *Ensuring Project Quality*

### **Themes of Chapter 11**

- What is the importance of quality?
- What is the impact of quality on project management?
- What are the principles of quality management?
- What is the role of quality standards?
- Who are the quality pioneers and what are their contributions?
- What is the role of quality control techniques?
- How can we evaluate quality?

## Introduction

QUALITY MATTERS AND PROJECT MANAGERS MUST PLAN FOR IT. EXPECTATIONS of quality have significantly increased over recent years. Project managers are responsible for not only delivering the project on time and within budget but also *with expected quality*. Quality must be in the mind of the project manager throughout the project.

This chapter will describe the importance of quality issues. This chapter also describes ways of identifying quality issues and planning for them. We start with Exhibit 12.1, which discusses issues relating to choosing a computer system.

### What do you want from a computer?

People treat stereotyping with contempt but it seems they cannot resist it. We easily group people in terms of 'what they wear' or 'what they eat' or the 'type of car they drive' or the 'kind of work they do' or some other genre. We do the same when it comes to technology. For example, we group people as 'gadget users', 'high tech people', 'technophobes', 'Internet addicts', and so on. You probably can add several new groups to the list.

People also seem to have their mind made up when it comes to computer attributes. There are those who seem to care only about 'speed'. For example, the first thing they ask you about your computer is "what is the speed?" There are others who seem to care only about 'memory' size. For example, the first thing they ask you about your computer is "What's the Gig on your computer?" or "How many Gigs do you have on your computer?" Then there is the group of people who will first ask about software on your computer; audio, video, games, and the like. How did that happen?

In the early days of computers, information system textbooks often used 'speed' and 'memory' to group computers into three categories of 'mainframe', 'mini', and 'micro'

computers. For example, a computer with so much speed and so much memory would be considered a mainframe, a mini, or a micro computer. Of course this caused difficulty as computer speed and memory increased rapidly; soon a personal computer would have the same or even more speed and memory than earlier mainframe computers had. So describing computers in these terms was like hitting a moving target.

The same happened with computer software and applications. Increasingly, newer, more stable, more powerful, and more user friendly software applications were developed at a lower cost. Thus, the question of speed, memory, software applications, and the like became less of an issue from the perspective of the individual user. At the same time, software companies came up with applications that did not exist before and marketed their products in terms of new and better features, usually as a turn key system. In fact, most features imbedded in new software or computers are rarely if ever used.

Parallel to this, users grew more knowledgeable and less afraid of trying computers. Using a computer gradually required fewer



programming skills. Online as well as in-house computer training programs prepared an increasing number of users who could use a computer to tackle basic tasks. The combination of powerful hardware, user friendly software, declining prices, and savvy users created exceptional demand for computers and information systems. This all happened in a matter of a few of decades.

It is difficult to predict where the technology might take us next. Expert predictions about technology trends in the past have been by and large incorrect. We know that the technology will change and we know that those changes will impact our work life, but we do not know the nature and the extent of those changes. It is remarkable how quickly we adapt to new technology and how fast we apply it to our benefit. Some will argue that technology is developed to meet our needs. Others will argue that technology maps its own trend and we adapt our needs to what is offered.

The reality is that both sides have compro-

mised. Technology has been developed to meet our needs, and we have learned to take advantage of what it offers. Most people think deductively; that is they are good at defining a problem and then seeking a solution for it. Others think inductively; that is they see a tool and then look for problems it might solve. The latter approach to using technology has produced higher rewards as well as higher risks because it leads to the development of applications that are outside of the usual boundaries.

People need a machine that is easy to use, is reliable, and is inexpensive. What they get out of it, by and large, depends on their skill, their innovativeness, their willingness to experiment, and their level of motivation. Concerns about megahertz or gigahertz and megabytes or gigabytes are to a large extent irrelevant. The technology has matured to the point that its potential is limited only by the aptitude of the individual user. The bottleneck is our creativity not the power, speed, or memory of the computer.

## 11.1 Quality matters

IN THE PAST, many projects were completed with little or no consideration for quality control. Project managers were primarily concerned with deadlines and resource constraints; they were inundated with requests for new projects. Projects were expected to have problems and the results of the projects to be less than perfect. There are many examples in the news about quality-related problems, indeed, we have reported on many through the exhibits and case studies presented in this book.

Increasingly, quality has become a **critical success factor** and project managers have significantly increased their attention to quality. Sponsors of projects expect to see quality control as part of the project development plans. Project managers are responsible not only for delivering a

project on time and within the budget but also according to **quality standards**. Project quality, for example, must be:

- (1) Supported by all management.
- (2) Planned for during the design phase.
- (3) Understood and followed by all stakeholders, especially project team members.
- (4) Monitored continuously throughout the project development life cycle.
- (5) Documented for accountability and reference.

End-users of the project output have become more directly involved with defining the project by describing their expectations of the resultant product. Increasingly, user satisfaction with the end product of a project is recognized as an important measure of success. Users have a greater role in determining whether a project is successful. Users are concerned about content, accuracy, format, usefulness, ease of use, and timeliness, amongst other factors.

The American Society for Quality defines quality as follows:

*QUALITY IS the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs.*

Ideally, one would like to define and measure quality in terms of the product outcomes as perceived by the user. That means different groups will define quality differently. However, most people will agree that quality follows the criteria shown in Figure 11.1.

- It is developed in accordance with a written or stated specifications
- It meets industry standards
- It includes characteristics that correspond to user needs
- It is user friendly and can be used effectively by user groups
- It provides users with accurate output
- It is robust and reliable
- It is compatible and easy to integrate with related products

**Figure 11.1: Quality criteria for an information system**

Professionals in any field must believe that quality is important to their careers. It is important that all stakeholders in a project buy into the idea of quality and that they practice these ideas throughout the project life cycle. Emphasis on product quality has several advantages:

**Financial** – quality control reduces the need for rework and maintenance, and that translates into financial gain. It costs more in the long term to produce inferior products than to spend on quality control. Doing things right the first time is always more beneficial.

**Operational** – quality control streamlines processes and creates discipline in team work. Rework is often uninteresting for team members, and maintenance is normally less interesting than creating something new.

**Legal** – quality control reduces liability charges that may arise from inaccurate information, and security, safety, or privacy violations. In the long run, the orga-

nization, as well as team members, is better protected by developing quality products.

**Contractual** – quality control ensures compliance with contractual terms with suppliers and customers. The idea that poorly developed products will increase demand for professionals, and ultimately jobs, is a mistaken belief. Quality systems increase demand.

**Customer relationships** – quality control reduces customer complaints and helps build working/professional relationships. For example, customer relationship management (CRM) systems are effective only when they are properly designed and developed to address the unique needs of the customer in their entirety. Poorly developed products are likely to affect customer relationships adversely.

**Reputation** – a firm's reputation is inevitably linked to the quality of its products. In highly competitive industries it is important to focus on establishing and maintaining a reputation for quality. Inferior products damage a firm's reputation, which takes a long time to build. It is difficult to repair a bad image.

**Morale** – quality control enhances team morale. Team members respect and value what they do and they want others to respect and value their work. They can relate to quality value for the customer. Individuals want their name associated with a quality product that can help their career. Being involved with many projects gives team members experience. Being involved with well developed products also enhances their reputation.

**Appraisal** – quality can be a good measure of performance evaluation for team members. The ultimate success measure for any project relates to how well it supports customer needs. Teams that produce quality products directly influence the success of the product and customer satisfaction and thereby the business itself.

## 11.2 Quality Management

QUALITY IS PRIMARILY a management issue. If management does not believe in and support quality, it is unlikely that others within the organization will. But **quality management** must be planned for, implemented, and monitored.

**Planning** means identifying and applying appropriate quality standards to the project. It is important to design for quality and communicate important factors that directly contribute to meeting the customer's requirements. The design of experiments helps identify which variables have the most influence on the overall outcome of a process. Many scope aspects of projects affect quality like functionality, features, outputs, performance, reliability, and maintainability.

**Implementing** quality management means ensuring that the product performs in accordance with appropriate quality standards. Quality implementation includes all the activities

related to satisfying the relevant quality standards for a project. Another goal of quality implementation is continuous quality improvement. Benchmarking can be used to generate ideas for quality improvements. Quality audits help identify lessons learned that can improve performance on current or future projects.

**Monitoring** means making sure that specific project results are consistent with appropriate quality standards. Monitoring quality is a continuous process throughout the project life cycle. Monitoring may result in reworking and process adjustments as the project progresses. There are many tools, described in this chapter and elsewhere, for monitoring project quality and project progress.

The **quality pioneers** have provided practical guidelines that can help project managers. **Edward Deming** was one of the founders of the quality management principle. He was highly influential in helping the Japanese build quality into their products. The Japanese have established a quality award named the Deming Prize. Deming believed that the ultimate responsibility for quality must rest with management and that the importance of product quality must be recognized at the top. Deming suggests that quality must be considered at the design phase and must be built into the process rather than controlled at the end. He proposed guidelines that are broadly accepted and used by the manufacturing industry and that have become part of its quality standards. Deming's fourteen points on quality are presented in Figure 11.2.

Point	Statement
1	Innovate and allocate resources to fulfill the long-term needs of the company and customer rather than short-term profitability.
2	Discard the old philosophy of accepting nonconforming products and services.
3	Eliminate dependence on mass inspection for quality control; instead, depend on process control, through statistical techniques.
4	Reduce the number of multiple source suppliers. Price has no meaning without an integral consideration for quality. Encourage suppliers to use statistical process control.
5	Use statistical techniques to identify the two sources of waste: system faults (85%) and local faults (15%); strive to constantly reduce this waste.
6	Institute more thorough and better job related training.
7	Provide supervision with knowledge of statistical methods; encourage use of these methods to identify which nonconformities should be investigated for a solution.
8	Reduce fear throughout the organization by encouraging open, two-way, non-punitive communication. The economic loss resulting from fear to ask questions or reporting trouble is appalling.
9	Help reduce waste by encouraging design, research, and sales people to learn more about the problems of production.
10	Eliminate the use of goals and slogans to encourage productivity, unless training and management support is also provided.

Point	Statement
11	Closely examine the impact of work standards. Do they consider quality or help anyone do a better job? They often act as an impediment to productivity improvement.
12	Institute rudimentary statistical training on a broad scale.
13	Institute a vigorous program for retraining people in new skills, to keep up with changes in materials, methods, product designs, and machinery.
14	Create a structure in top management that will push every day for continuous quality improvement.

Figure 11.2: Edward Deming's 14 points on quality

In the United States a quality award was named after a former Secretary of Commerce and is called the Malcolm Baldrige National Quality Award. Several companies including Texas Instruments, Xerox, and Motorola have won this award. Other quality management pioneers include Genichi Taguchi, Philip Crosby, Joseph M. Juran, and Kaoru Ishikawa.

Taguchi and Crosby argued that the benefits of quality are far greater than its costs. **Taguchi** believed that quality should be considered in the design of a product and must be part of the process of product development. **Crosby** argues that what costs organizations is the lack of quality not the cost of quality.

**Juran** believed in top management involvement in quality management and implementation. He argued that management must continuously seek quality and ways of rewarding adherence to quality standards. **Ishikawa** proposed the fish-bone diagram that describes the cause-and-effect relationship between quality problems and responsible units (see Section 11.6).

Each of these quality pioneers has provided useful guidelines and methods for controlling and improving product quality. They provide a rich source of information for addressing quality issues. While these quality guidelines were developed and proposed primarily for manufacturing and operations, they can be of great help to project managers and professionals in general. Figure 11.3 lists important principles of quality management.

### 11.3 International quality standards

INTERNATIONAL TRADE AND global competition have made quality a world-wide issue. In 1987, over 90 countries, including the United States, collaborated and produced a series of standards known as **ISO 9000**. The purpose of ISO 9000 is to facilitate international trade by providing a single set of standards that is recognized and respected by all countries. ISO 9000 is increasingly recognized as the most important quality standard worldwide. Over one hundred countries have adopted ISO 9000. This standard is applied to all types of products and services and is used by large and small firms as well as public and private ones.

The International Organization for Standardization (ISO) also established an environment management standard called **ISO 14000** that specifically deals with the five areas of environmental management, auditing, performance evaluation, labeling, and life-cycle assessment. The

internet and global information exchange has brought world markets closer together. Products that are intended for international markets will need to follow international standards for quality and compatibility. Following international standards will also result in reduced liability and increased customer satisfaction. Multinational firms benefit from international standardization as new products and processes will thereby be easy to integrate with their existing technologies and operations. (The website [www.iso.ch](http://www.iso.ch) provides more information on international standards.)

- **Provide leadership for quality control:** top management involvement and support are critical. Quality must be an organizational concern. Memos and email messages alone do not ensure quality performance. The work force must see evidence of management's commitment to quality.
- **Start at design phase:** quality must be a part of the design. It is more costly to instill quality later in the project development life cycle. The later quality is addressed the costlier it will be to implement.
- **Make it part of the process:** quality control must be present at each stage of the project life cycle.
- **Keep it continuous:** the continuous improvement principle is critical to quality management. Developing products within the limits of 'acceptance' is a short-sighted approach; obtaining the highest standards must be the target.
- **Empower team members to manage quality:** plan for quality as part of the developmental process and assign individuals to monitor and report on aspects of quality. Empowering individuals helps quality control at the level where the task is being performed.
- **Train team members for quality control and assessment:** ensure understanding of the quality principle. Team members need to know what is meant by quality management, how to ensure quality, how to measure quality, how to respond to quality problems, and how to record it.
- **Reward teams for quality performance:** project deadlines and budget constraints have traditionally been used as criteria for performance appraisal. It is equally important to merit quality of performance. Individuals understand reward systems that affect them.
- **Promote free and open communication:** eliminate compliance through fear. Explore avenues to promote a willingness to manage quality; promote an environment that supports quality work.

Figure 11.3: Principles of quality management

## 11.4 Capability maturity model (CMM)

IN MOST OF this chapter we are referring to the quality of the product. However, the **capability maturity model (CMM)** refers to the maturity of the organization that produces the product. The implication is that a company that is more mature (measured on a scale of 1 to 5) is more likely to produce quality products. Thus the capability maturity model is a framework that can be used

for evaluating processes used in product development and project management. The CMM classifies the maturity of these processes in an organization into five levels, with Level 5 being the most mature. The CMM framework specifies the characteristics that the various levels should have rather than prescribing any particular processes. It also provides advice and guidance related to the improvements necessary to move from a lower maturity level upward. However, the CMM, although being a maturity framework and not prescriptive, does embody a certain philosophy concerning the way products should be developed.

CMM was created by the Software Engineering Institute (SEI) at Carnegie Mellon University for the US Department of Defense to help assess the software engineering capability of their suppliers and subcontractors. Its original goal was to 'advance software engineering practice' in light of the increasing dependence of the military on software and the increasing recognition that software was problematic in terms of its delivery, escalating costs, and customer dissatisfaction. CMM now aims to ensure the development and operation of systems with predictable and improved cost, schedules, and quality. Although intended for use only in software development, it has become a useful tool in gauging the maturity of other business processes, such as manufacturing, auditing, and project management.

According to Mark Paulk and his colleagues at SEI, CMM provides organizations with guidance on how to gain control of their processes and how to evolve towards an organizational culture with process and management excellence at its core. The CMM was designed to guide organizations in selecting process improvement strategies by determining current process maturity and identifying the issues most critical to quality and process improvement.

Since the early days, SEI has defined a number of other capability maturity models, based on the success of the original CMM for Software. These relate to wider areas and other issues than just software engineering, for example, they defined a People model (P-CMM), a Software Acquisition model (SA-CMM) and a Systems Engineering model (SE-CMM), among others. More recently they have focused their attentions on defining a new model that integrates these previously separate and individual models. This model is known as the CMMI (Capability Maturity Model Integration). This work attempts to integrate the existing models into a common meta model with common terminology, processes, and activities.

The P-CMM is designed to help organizations improve their workforce processes by providing a path for them to move from ad hoc management and use of human resources through to the more disciplined management of a skilled, knowledgeable, and motivated workforce in a staged approach. The CMM framework provides a context in which policies, procedures, and practices are defined and established that enable good practices to be repeated, transferred across groups, and standardized. CMM has five maturity levels shown in Figure 11.4 and characterized as follows.

**Initial: Level 1** – project management and use of human resources is characterized as ad hoc or possibly chaotic. Processes are generally not defined, and success or failure depends on the capabilities of the individuals involved. Typically project development lurches from crisis to crisis, tasks are frequently delivered late and over budget, and there is little effective management and control.

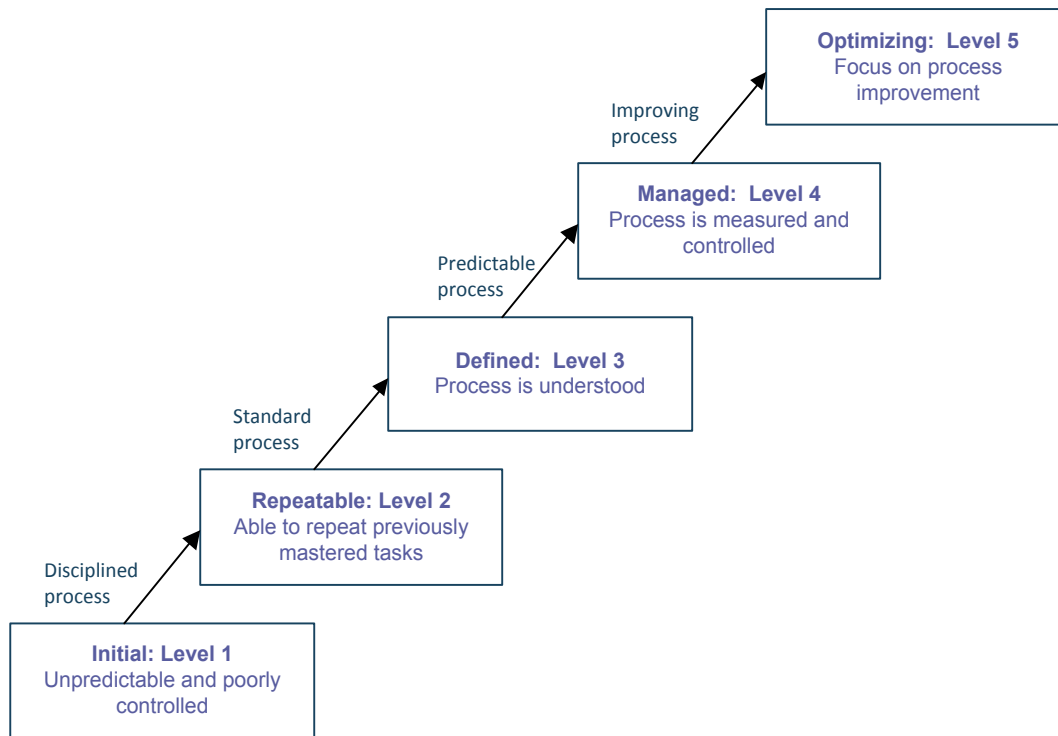


Figure 11.4: Capability maturity model

**Repeatable: Level 2** - policies for managing the project are identified and established based on experience. Project development is characterized by being practiced, documented, enforced, trained, measured and able to improve. Management process and controls are also established for planning, estimating, and tracking costs, schedules, functionality, etc. Project standards are defined and followed. For an organization to be in Level 2, projects and processes are essentially managed and under control with realistic plans based on performance of previous projects.

**Defined: Level 3** - the standard project and management processes are documented and form a coherent, integrated, and standard approach to project development for the organization as a whole. The processes are well defined, relatively stable, and recognized as the organization's approach to project development. A group exists that is responsible for maintaining and improving these standard processes, and an organization-wide training program for communicating and imparting knowledge and skills concerning the processes has been implemented. Overall, management should understand and be in control of quality and technical progress on each project.

**Managed: Level 4** - quantitative quality and productivity measures are established for key tasks and management activities across all projects and goals are set that will help ensure consistency, understanding, and improvement of the processes. The level is characterized as measured and predictable.



**Optimizing: Level 5** - the whole organization is focused on continuous process improvement on a proactive basis. The ability to identify strengths and weaknesses, to assess new technologies and process innovations, and to take action to improve things on these bases is in place. The level is one of continuous process improvement on a planned and managed basis as a standard activity.

Each Maturity Level (except Level 1) contains a number of Key Process Areas that need to be focused upon in order to achieve a particular Capability Maturity Level. These are shown in Figure 11.5.

Process categories Levels	Management Project planning, management, etc	Organizational Senior management review, etc	Engineering Requirements analysis, design, testing, etc
<b>Optimizing: Level 5</b>		Technology change management Process change management	Defect prevention
<b>Managed: Level 4</b>	Quantitative process management		
<b>Defined: Level 3</b>	Integrated management Inter-group co-ordination		quality management
<b>Repeatable: Level 2</b>	Requirements management Project planning Project tracking Subcontract management Quality assurance Configuration management	Organizational process definition Training program	product engineering Peer reviews
<b>Initial: Level 1</b>	Ad hoc processes		

Figure 11.5: Key process areas grouped according to CMM level and process category

## 11.5 Quality planning

QUALITY SHOULD BE planned for and not seen as an afterthought. Project managers need to identify the attributes of the project that relate to quality so that the quality standards for these attributes can be measured conveniently when the project is up and running. Discussions with the stakeholders will have identified particular attributes of the project output that are seen as key features.

These features may relate to the *functionality* of the resultant product. Is the product of the project that which was expected (and which was promised) in terms of detail and range? In other

words the product outcome should conform to requirements. One aspect of this will relate to accuracy - is the product produced *accurate* (or at least accurate enough for the intended use)? Is the *performance* of the product as predicted? If the product produces output, is data throughput as expected, in the hoped-for volumes, is the load on the technology as predicted, and is the information produced in a *timely* fashion?

Other sets of issues relate to fitness of purpose, for example, is the *interface* suitable? Are there different interface options for users with different levels of sophistication with technology? Does it therefore have a flexible interface? If the product has outputs, do the users find the outputs easy to interpret? In general terms, is the product *easy to use*? Is the product *reliable* so that *maintenance* will not be a major problem and the users believe the product will not fail frequently?

The quality plan should be a written document and provide the above measurements and details within the context of sections on requirements, project organization, responsibilities, and quality control techniques. It should also provide a timetable showing when the quality tests will be made, and so on.

The above suggests some of the quality features that the project manager should plan for, ensuring that data is collected about these features during the project and as part of project closure. Much will depend on good relationships with the users, customers, and other stakeholders so that key features can be identified and be given measures of quality that can be used as markers. Quality control techniques can help the process of planning quality control, measuring the required standards, and assessing the quality of the project's product.

Achieving quality does cost the organization in a number of ways. Some **costs** are for *prevention*; the cost of planning for quality throughout the project life cycle to ensure that the end product meets acceptable standards. Some costs are for *evaluation*; the cost of testing and evaluating the product and the processes throughout the project life cycle. Some costs occur *before release*; the remedy cost to correct imperfection in the product before it is released. Some costs occur *after release*; the remedy cost for post-release or after sale problems. Some costs are for *facilities*; the cost of *procurement* and *maintenance* of testing equipment and facilities. However, the cost of nonconformance, for taking responsibility for failures, or for not meeting quality expectations can be even greater to the organization than the cost of ensuring quality.

## 11.6 Quality control techniques

### *FISH-BONE DIAGRAM*

The **fish-bone diagram** or **Ishikawa diagram** helps to identify the source of quality problems. It is called a fish-bone diagram because entities that influence quality are connected in a way that resembles the skeleton of a fish. This method is also called a cause-and-effect diagram because it helps link quality problems with the responsible sources. Figure 11.6 shows an example of a fish-bone diagram for an IT system. Quality problem sources for each heading (hardware, software, team, vendor) are identified by arrows. For example, possible sources of quality problems that relate to hardware such as memory, platform, and power are identified by arrows pointed at the heading labeled 'hardware'.

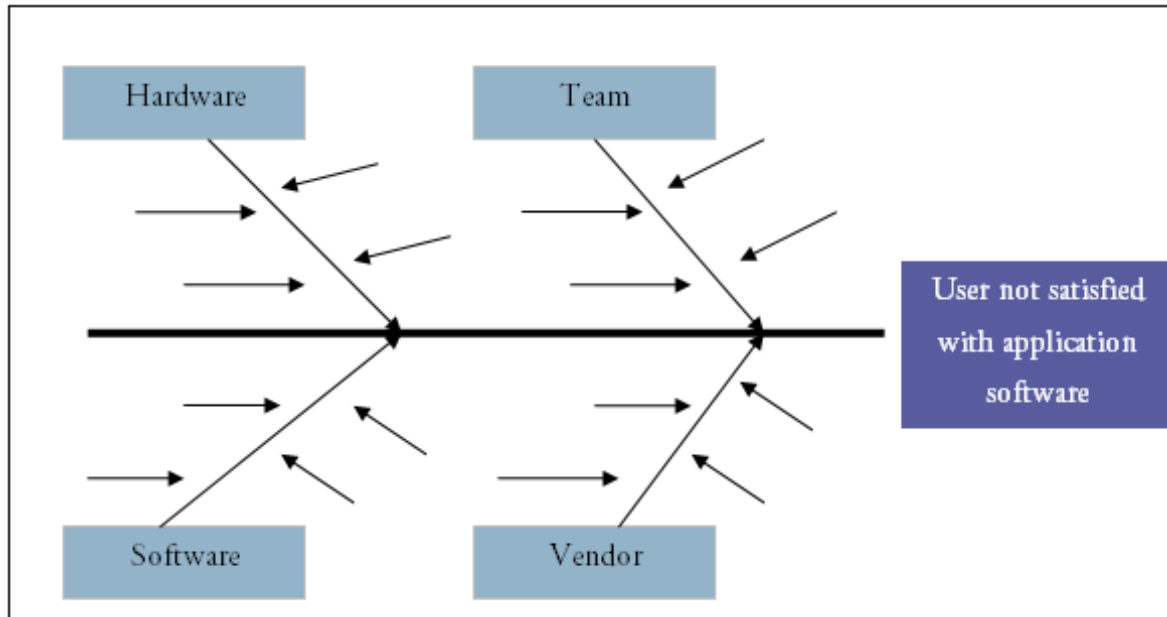


Figure 11.6: Example of fish-bone diagram

Once a problem is identified it is possible to work backward and trace the sources of the problem. Fish-bone diagrams enable us to focus our efforts and resources on a relatively small area rather than having to evaluate all possible sources of a problem. You could also consider the work breakdown structure as a tool that enables project managers to narrow sources of quality issues.

### **PARETO CHARTS**

**Pareto charts** or diagrams are useful in organizing and prioritizing problem areas. A nineteenth century economist, Vilfredo Pareto, developed these charts. As quality management tools, these charts readily identify problems that have the greatest effect on the success of a project. Juran suggests that 80% of problems stem from 20% of the possible sources. Pareto charts help us identify those few causes that result in most of the quality problems in a product.

To create a Pareto chart, the frequency of events is used to draw histograms to show how often a problem occurs. For example, assume user complaints for a newly installed information system are grouped into the five categories of 'content', 'accuracy', 'interface', 'ease of use', and 'timeliness'. For each problem area, Figure 11.7 provides the number of complaints collected over a period of time. In grouping user complaints, it is important to capture the real source of dissatisfaction and to use labels that can be linked to functions. In other words, it must be possible to link user complaints to system attributes. For example, complaints about system accuracy are expected to relate to data collection, data entry, or data analysis.

Figure 11.8 provides cumulative percentages of user complaints for the newly installed system. This tally of user complaints suggests that nearly 74% of the problems are caused by either system 'interface' or 'ease of use' aspects. This is close to the **80-20 law** (sometimes referred to as the **Pareto optimum**). In the case of the newly installed information system, the project manager must focus remedial efforts on making the system easier to use and to improving the interface since these two problem areas account for the majority of the complaints. This does not mean that the proj-

ect manager should ignore other quality problems raised by the users. All these problems must be checked. However, a Pareto chart provides a way of prioritizing quality problems and enabling the project manager to address the majority of complaints quickly.

Problem category	Frequency of complaints	Percentage
Content	12	13.0
Accuracy	4	4.3
Interface	28	30.4
Ease of use	40	43.5
Timeliness	8	8.8
Total	92	100%

**Figure 11.7: Statistics for user complaints of a newly developed application**

The project manager must also consider the nature and type of each problem. Sometimes, you may get very few complaints about a particular feature, but that might be because very few users use that feature. Some problems are serious even though few users complain about them. Consider, for example the problem with accuracy. Although the number of complaints in the preceding example for accuracy problems is only four out of 92, it still requires attention because of the nature of the problem. Given the small number of people complaining about accuracy, the project manager might well interview those individuals in order to understand the nature and severity of the problem more fully before proceeding to develop a solution to the problem.

Problem category	Percentage	Cumulative %
Ease of use	43.5	43.5
Interface	30.4	73.9
Content	13.0	86.9
Timeliness	8.8	95.7
Accuracy	4.3	100.0

**Figure 11.8: Cumulative percentage of user complaints**

It is possible that complaints about the product are due to a deficiency in user skills rather than features. If so, it might be more effective to plan a user training program to address these problems. In other words, it is important to identify the real source of a problem, but that may not always be easy because sometimes a user’s description of a problem may be misleading, vague, or inaccurate. In such cases, the project manager must try to understand the true nature of the user’s concern rather than discard the report as inaccurate or irrelevant. The ultimate test of a good product is closely tied to user satisfaction and how well it can help users accomplish their goals.

**CONTROL CHARTS**

**Quality control charts** help project managers to see the pattern of change in product qual-

ity. These charts describe occurrences rather than detect quality problems and therefore help the project manager control for quality. Control charts show whether or not events progress in a normal trend. In a normal situation, quality problems occur randomly rather than in a pattern. *If events occur in a non-random fashion then there is a quality problem.* The project manager needs to determine therefore whether events happen randomly or if there is a pattern. Further, the project manager needs to determine a range within which an event is considered normal. For example, if past experience suggests that testing should take between 8 to 12 hours then any case outside that range can be considered out of the ordinary. The acceptable range is usually built around the mean score for the event. For our example, the mean score for testing should be around 10 hours and we consider 'acceptable' two hours above or below the mean.

Therefore, the main question that control charts provide answers for is whether events happen within an acceptable range and, if not, whether irregularity is a random occurrence with no particular pattern or not. Plotting the values for occurrences shows whether events happen outside the 'acceptable' range as well as the pattern of these violations.

The **seven run rule** suggests that if events happen in the same direction (upward or downward) for seven times in a row then there is a problem. You may also determine a range around the mean for events to be considered normal. If events occur too far from the mean, upward or downward, then a violation has occurred that requires recording and attention.

### **BENCHMARKING**

**Benchmarking** happens when the project manager uses a standard (a case) as a guide and compares productivity, accuracy, timeliness, cost, and other indicators of quality with that standard. The selected standard provides a target for the project manager to work toward. It is similar to having an ideal case that you would want to repeat. Consider a project that has been completed within budget, on time, and that has earned the best possible response from the users. In other words, everything about this project went smoothly and according to the plan. This project can be considered a target or an example for the project manager and the team to repeat. Therefore, benchmarking is about comparing our current performance with something we have done before or something others have done before. As shown in Figure 11.9, benchmarking has a number of issues associated with it.

- The target project must be comparable with the current project to avoid comparing 'apples and oranges'
- Technology used in the target project must be comparable with what is needed for the current project to make the comparison realistic
- The target project must have been developed under normal conditions; exceptional circumstances do not provide appropriate examples
- Recent projects are more appropriate as targets since major changes may occur in tools and methods

Figure 11.9: Benchmarking

## **TESTING**

Whereas many professionals think of **testing** as a stage that comes near the end of product development, testing should be done during almost every phase of the product development life cycle. There are different levels of testing. For example in software development, a unit test is done to test each individual program module to ensure it is free of bugs; integration testing is necessary to test how well a group of programs are integrated and how well they work as an integrated system; system testing is an overall system test for all components included; and user acceptance tests how well potential users in the organization perceive and accept the new system.

## **11.7 Statistical quality control**

DECISIONS ARE MADE based on a **qualitative or quantitative analysis** of a situation. Sometimes, a combination of these two approaches is used. A qualitative approach relies primarily on the analysis of intangible and subjective factors. A case study might be an example of a qualitative approach. A quantitative approach, on the other hand, involves data analysis. A survey design is an example of a quantitative approach. There are pros and cons to each of these approaches. Some decision makers are better at using the qualitative approach while others are more comfortable with using the quantitative approach. Further, some decisions are better supported using a qualitative approach and some decisions are better supported through data analysis. Not all situations provide an opportunity for data collection and not all situations can benefit from a subjective approach.

An effective **qualitative** approach requires intuition, impartiality, consistency, broad knowledge of a given situation, and the ability to synthesize findings. An effective **quantitative** approach requires the knowledge of statistics, study design skill, the ability to use an analysis tool, and the ability to interpret results and relate them to the original decision problem. The important question about the appropriateness of an approach is directly linked to the effectiveness of the results and the confidence that the decision maker has in those results. There is little value in results that are not understood.

**Statistical quality control** is based on the analysis of data that are collected about specific situations. Statistical quality control is frequently used to set standards as well as detect and correct errors in product development. When possible, data must be collected and analyzed to help decisions regarding quality and performance. Mean score and standard deviation are used to determine the range for quality acceptance. Occurrences outside an acceptable range are detected and actions are taken to remedy the situation. The accuracy and reliability of statistical analysis and results are directly linked to the quality of data collected. The project manager must, therefore, pay close attention to what data are collected and how they are analyzed.

The reliability of data analysis results also depends on the **sample size**. A sample size that is too large will be more costly and time consuming. A sample size that is too small may result in inaccuracy. One approach is to select a certain percentage (for example, 5%) of the total population. While a percentage approach may work for some problems it may not be appropriate for all situations. For example, for a population of 100 a sample of 5 may be too small whereas for a population of 1000 a sample of 50 may be good. Therefore, a constant percentage may not work in all cases.

A more popular approach to determine sample size is based on:

- 1) The degree of confidence we want to have in the outcome,
- 2) The number of errors we are prepared to tolerate, and
- 3) The standard deviation of the population.

As you can see, this sample size selection approach relies heavily on variance rather than the size of the population.

The **level of confidence** frequently used corresponds to 1, 2, or 3 standard deviations about the mean. Standard deviations of 1, 2, and 3 cover 90%, 95%, and 99.7% of the area under the normal distribution curve, respectively. The higher the confidence level, the greater the areas under the normal distribution curve. Standard deviation is represented in statistics by the Greek symbol (sigma). The z value or **confidence factor** for 1, 2, and 3 standard deviations is 1.645, 1.96, and 2.96, respectively. See Appendix F, normal distribution table, for other values. The information for these three levels of confidence are:

Confidence level	Standard deviation ( $\sigma$ )	z value
90% or 0.90	1	1.645
95% or 0.95	2	1.96
99.7% or 0.997	3	2.96

**Figure 11.10:** provides the standard distribution curve table

The **error factor** that we are prepared to tolerate can be determined by creating a range about the mean. Assume that your company has leased a broadband communication line from an outside vendor to link your financial applications to a remote server. Your outside vendor has guaranteed that this communication line will be up 99.7% of the time. This means the system will not be down for more than 43 minutes in a given day [24 x 60 x .03]. In order to determine whether the system is as reliable as your vendor suggests, you want to collect data on the **system reliability**. You have determined that the total error in predicting the system down time should not exceed 5 minutes. That means if the population mean for down time is 43 minutes in a day, you want to select a sample size (n) that assures you the down time mean is in the interval between 38 and 48 minutes [43 - 5 and 43 + 5]. In other words, the error factor that you are prepared to tolerate for this experiment is 5 minutes.

The third component you need to determine for your sample size is the **standard deviation** of the population. You need to estimate the variation in the population. This can be accomplished through a pilot survey based on say, three weeks of observation. You can monitor the system and collect down time data for three weeks to calculate the standard deviation. You could also use the mean score of this survey to determine your error factor described earlier. Assume you have conducted a pilot survey based on three weeks of data and have found the sample standard deviation to be 7.5 minutes. You can use the following formula to determine sample size n for your study:

$$n = \text{sample standard deviation} \times (\text{confidence level/error factor})^2$$

or

$$n = [(z \times s)/e]^2$$

**where:** n is the sample size, z is the z score associated with the confidence level, s is the standard deviation of the sample, and e is the error factor.

Using this formula, sample size n for our problem will be:

$$n = [(2.96 \times 7.5)/5]^2$$

$$n = (4.44)^2$$

$$n = 19.7 \text{ (or 20 days)}$$

Notice that 2.96 is the z value or confidence factor associated with 99.7% guaranteed up time. The sample size of 20 days may or may not provide the project manager with the estimate of true mean of down time for the new communication line with plus or minus 5 days. This is because the standard deviation of sample size is an estimate; we do not know the true variance of the population. However, this approach is often used to determine the sample size for survey studies.

## 11.8 Interview with a project manager

IN THE OPENING exhibit for Chapter 7 we recalled a conversation with a student in which the student suggests different reasons why he wants to extend the deadline date for coursework, whereas the professor seems to be sticking to her guns. We have previously interviewed project managers in business, industry and not-for-profit organizations. Here we interview a professor of information systems about his experiences of supervising student projects over many years.

### Interview

**Q** HOW many student projects have you supervised?

“**H**undreds! The most common are undergraduate projects. In order to achieve their qualifications there are lots of examinations, but I feel the most important assessment is the project as it is truly the student’s own work. It simulates what they might do in their future work. It can last for anything up to a year and normally carries the equivalent marks of one course of three hours per week throughout the year. The student does some empirical work (often including software development) and produces a written project report. And normally the student enjoys doing the project.

Often it is the sole extended topic of conversation between a student and his potential future employers. “

**Q** ARE there other sorts of student projects?

“**O**f course. There is normally a practical project as part of a Masters’ program and this may be connected to a company requirement. Then of course there is the much more demanding PhD project which can take over three years or more to complete. There are also group projects in some universities, similar to conventional projects but carried out by a group of 4-6 students.”



**Q** FROM the point of view of the professor which are the best students?

“**W**ell teachers differ as do students, but I like students who are enthusiastic about their project, are well organized and do not need to be told about planning (and their plans are realistic), and see me when they have a genuine question to discuss (not simply either to say ‘hello’ or ask ‘what is the next thing I should do?’). With good students we have conversations, not question-and-answer sessions and I am enthused and interested at the end of meetings. They give me some notice – at least a few days – to read material beforehand. They always turn up on time (I expect them to inform me if they cannot make it – and of course I will inform them if I will be late or unavailable). They write well and talk well. Meetings with project students enable me to discuss other issues with them including general progress on the course as a whole and their integration in university life. And, one more thing, they are polite, pleasant and interesting to be with. You will be surprised, perhaps, that many students (but not all of course) conform to this apparently idealistic picture”.

**Q** HOW often do you meet your students?

“**F**or most projects, either once a week or once a fortnight. As I said, I prefer it if there is an agreed topic for the next meeting, be it to address a particular student’s concern, to discuss a chapter that the student has written (for use of English as well as content), agree that the student’s plan is appropriate or discuss a paper that the student has read.”

**Q** WHAT are the most important lessons for the student?

“**M**ost universities lay down ‘house rules’ for the project report. They concern things like the maximum and minimum number of words, styles for layout, ways of referencing, and so on. It is surprising how many students don’t follow them. This is stupid as it is sacrificing marks and sometimes may actually lead to a project mark of zero. Secondly, there is no substitute for good planning – and some gaps should be left in the plan in case things do go wrong (they inevitably do). Allow time especially for revising the drafts. Most students don’t like writing and find it difficult. They are less practiced at it. But they need to communicate their work and their ideas – otherwise, what is the point? Also, if students have a genuine problem, discuss it with their supervisor as soon as possible – don’t leave it as it won’t go away and it will be easier to solve earlier on. Surprisingly, as most projects are challenging, the least problematic aspect tends to be the empirical work as students tend to love doing the practical work and feel confident about it.”

**Q** YOU put a stress on problems that they have with ‘writing up’. What guidelines have you to help the student?

“**T**he structure of the report, which could consist of a variation on the following - title page, abstract/executive summary, table of contents, introduction, literature review, research method, research completed, results, conclusion, references – is sometimes ‘dictated’ by the ‘house rules’ but is always important. The number of words is usually a problem. At the beginning, the student thinks ‘how

can I write 20000 words (or whatever)? At the end, the student thinks ‘how can I write only 20000 words about this? So the student must be very selective, choosing only those aspects that are directly relevant to the project in hand. Sacrifice those papers you have read and things that you have done, which are not directly relevant. The material may be organized in different ways, for example, by chronological ordering (by time the data was collected); order by space (describing each part in turn and the relationship between the parts); by increasing importance, which adds weight to the most significant findings; general to particular – oh there are lots of ways but choose an appropriate one and be consistent, Oh and very important, don’t cheat! Always acknowledge your references. Copying material, for example from the Internet, can be spotted. The reader notices changes of style, uses of English, and terminology. Further, there are organizations, which many universities use, that will look for examples of copied material in projects. The penalties can be very high, including immediate expulsion from the university”.

**Q** YOU have said that the structure of the report is important – can you give more details?

**“ O** K – this is what I tell my students, but I also say this can be varied according to the particular project. First get the title right. Make it less than 10 words. To do that, write down every word related to the topic then select a minimum number that gives the essence of your report. It must be accurate, must capture the true essence of the report, be easy to understand and easy to remember.

In the abstract you tell your readers about your report in a nutshell. Make it in one para-

graph if possible, expand the title and state early why this study is important, state what you did and what you found. Point out why your findings are useful, mention follow up opportunities, make it attractive for the reader to continue and remember, busy people, for example the external examiner, may only read the abstract.

In the introduction you establish that this topic is important and it needs to be addressed, what has been done in this area and what you know about it, what has not been done in this area that needs to be done, and what this study does that links to the above. Tell the reader what to expect in your report.

In the background chapter give a thorough review of the literature on this topic, relate to prior works in this area and describe how the prior cumulative work helped the current study, identify the gap that exists in our current understanding for this topic, provide the rationale for the current study and don’t promise what you cannot deliver.

In the methods chapter, describe fully the methodology used in the study, present your methods in a logical sequence and think about how appropriate they are, and provide evidence that other similar studies successfully used the same methods.

In the analysis and results chapter, describe your analysis with every result that you plan to give, sequence the results for a cumulative effect, use tables and figures and refer to them in your text, make tables and figures self-explanatory by providing headings and labels and be factual, minimize opinions on results, as your opinions can come up under discussions later.

In the discussions and conclusions chapter outline the contributions of your work, interpret results as you see them, discuss your results in the context of other findings, describe oppor-

tunities for follow-up studies, describe the limitations of your work and describe what else you would have liked to do but could not under the current study design.

In the bibliography house rules may well apply but whatever format or style you use, be consistent. Make sure the information is complete. Include only references that you used and cited in your report. Make the source (journal) clear - use italic, bold, underline – and list all authors' names.

As I say, this is general advice and can be adapted according to the house rules of a particular university or project”.

**Q** AND use of English?

“**Y**ou are not writing a literary masterpiece. You are communicating what you have done in your project! So keep it simple – short sentences, short words (unless a technical term is appropriate), avoid flowery language, one topic per paragraph, avoid vagueness and take care with spelling, punctuation and grammar. All obvious things! Use illustrations to break up the text and make it easier for me (the reader) to enjoy reading your project. Make the report look good with a consistent layout.

**M**ANY thanks for discussing your experiences with me

“**B**ut can I please add something else. I am sometimes disappointed by the behavior of students during seminars, in terms of their attendance and listening span, and in their examination performance, where they seem to be confused or forget the most basic material at times, and I cannot pretend that every project

supervision experience has been wonderful nor every project groundbreaking. However, during many years as a project supervisor I have never failed to be amazed by the quality of so many projects each year. Frequently I am surprised by what has been achieved in so short a time, the quality of the student's presentations, sometimes to the whole class and sometimes with a poster. Some report writing has been of outstanding quality, indeed publishable in a good journal or conference. Supervising project students has been the highlight of my academic life.”

### Chapter summary

QUALITY MATTERS AND project managers are responsible for it. Quality was often compromised in the past because of high demand for project output and time constraints. Users need to be more directly involved with the design and development of the product and in influencing the quality of the outcome. Quality products are developed when the project manager, team members, and users understand and apply quality throughout the project life cycle. Quality must be:

- 1) Supported at the organizational level by the top management.
- 2) Planned for at the design phase.
- 3) Understood and adhered to by all stakeholders.
- 4) Monitored continuously.
- 5) Documented for reference and accountability.

Quality saves costs in the long run because it reduces rework and maintenance. It helps organizations with standards and reduces legal problems due to security, safety, and privacy violations as well as compliance with contractual agreements. The most important benefit of

quality relates to customer satisfaction and relationships. A poorly developed product damages the reputation of the project manager as well as the team. It takes a long time to build a good reputation. A damaged reputation adversely affects individual morale reducing enthusiasm and interest. Measures of success and customer satisfaction inherently include quality appraisal.

Quality pioneers include Deming, Juran, Crosby, Ishikawa, Taguchi, and Crosby. They provide relevant guidelines and suggestions for management and professionals to improve quality. International standards include ISO 9000 and help trade and global competition world wide. Another international standard is called

ISO 14000 that deals with specific areas of auditing, performance evaluation, labeling, life-cycle assessment, and environmental management.

Important quality control techniques include the fish-bone diagram, which helps to identify the source of quality problems; Pareto charts, which help to organize and prioritize problem areas; control charts, which help to see the pattern of change in product quality; benchmarking, which provides the project manager with a model for comparison; and statistical quality control, which uses data analysis to detect and analyze problem situations.

### Discussion questions

- a) Describe three factors that influence quality. How would you plan for quality control? Does statistical quality control make sense in all situations? Do you find quality charts useful to your monitoring of quality. Does the seven run rule make sense to you?
- b) Discuss the relationship between efficiency and quality. Is there a tradeoff between efficiency and quality? Are more efficient systems more effective?
- c) It is suggested that quality control is different from inspection. Discuss whether this statement is true or not and why. What do you consider to be important quality issues for any product?
- d) What did Taguchi believe about quality? Crosby? Juran? Ishikawa?
- e) Describe how quality products might lead to reduced costs.
- f) Which five points of Deming's 14 points do you feel are most important to quality product development?
- g) What would you say are the 3 most important principles that nearly all quality pioneers described in this chapter recommend?

### Exercises

- a) Review Deming's fourteen points on quality and describe how these points may help the quality of products. These guidelines were originally developed to help the manufacturing industry. However, the concepts behind many of them apply to all products. Do you agree?
- b) Figure 11.6 shows an example of a fish-bone diagram that enables you to trace back quality problems to their causes. Four variables are described that are the main causes of quality problems for customer

dissatisfaction with an application. For each arrow suggest a title that describes the cause of the quality problem.

- c) Use a spreadsheet to plot numbers provided in Figure 11.7 and Figure 11.8. Use a histogram to depict the frequency for each of the five quality problem areas. On the vertical axis, give information about the number of complaints as well as the cumu-

lative frequency for them.

- d) Chris Hong, the network manager at a state university, feels flooded by the number of complaints he receives about a new system that was installed about six months ago. The following table shows the type of complaints that he received within the last six weeks. Use a Pareto chart to analyze his data and make recommendations.

Week	Response Time	Downtime	Unwanted Mail	Web Connectivity	Ease of Use
1	9	2	33	12	15
2	8	3	30	11	13
3	6	3	25	9	12
4	7	4	34	11	11
5	9	3	32	12	10
6	10	2	28	11	8

- e) Draw a quality control chart using hypothetical numbers. Make sure there are seven run rule violations. Comment on your results.
- f) The office of Computer Services and Facilities at your university has asked you to help them determine how many computer workstations to study. There are 4200 computers on the campus and CSF wants to estimate the average hard disk capacity for these computers without having to check every one. Hard disk capacity for

these stations range from 10 to 100 Gigs. The CSF wants the mean score to be calculated within plus and minus 5 Gigs of the population mean. They also want you to use .95 degree of confidence. The standard deviation of a small survey they carried out is 25 Gigs. How many workstations should be surveyed?

- g) Describe the pros and cons of each quality control technique described in this Chapter.

### Important Concepts

**80-20 law** (pg. 221)

**benchmarking** (pg. 223)

**capability maturity model (CMM)**

(pg. 216)

**confidence factor** (pg. 225)

**critical success factor** (pg. 211)

**Crosby, Philip** (pg. 215)

**Deming, Edward** (pg. 214)

**error factor** (pg. 225)

**fish-bone diagram** (pg. 220)

**Ishikawa, Kaoru** (pg. 215)

**ISO 14000** (pg. 215)

**ISO 9000** (pg. 215)

**Juran, Joseph M.** (pg. 215)

**level of confidence** (pg. 225)

**pareto charts** (pg. 221)

**pareto optimum** (pg. 221)

**principles of quality management**

(pg. 216)

**product quality advantages** (pg. 212)

**qualitative analysis** (pg. 224)

**quality** (pg. 212)

**quality control charts** (pg. 222)

**quality costs** (pg. 220)

**quality criteria** (pg. 212)

**quality management** (pg. 213)

**quality pioneers** (pg. 214)

**quality planning** (pg. 219)

**quality standards** (pg. 212)

**quantitative analysis** (pg. 224)

**sample size** (pg. 224)

**seven run rule** (pg. 223)

**standard deviation** (pg. 225)

**statistical quality control** (pg. 224)

**system reliability** (pg. 225)

**Taguchi, Genichi** (pg. 215)

**testing** (pg. 224)

## Bibliography

American Society for Quality see [www.asq.org](http://www.asq.org).

Avison, D., Fitzgerald, G. (2006) *Information systems development: Methodologies, Techniques and Tools*. 4th ed., McGraw-Hill.

DeMarco, T., *Controlling Software Projects: Management, Measurement and Estimation*, Yourdon Press, New York, 1982.

Deming, W. E., (1988) *Out of the Crisis*, Cambridge, MA, MIT.

Fowler, A. and Walsh, M., 'Conflicting Perceptions of Success in an Information Systems Project,' *International Journal of Project Management*, 17 (1), 1991, pp. 1-10.

Juran, J., (1999) *Juran's Quality Handbook*, McGraw Hill, New York, NY.

Kerzner, H., (2003) *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, 8th ed, Wiley.

Lackman, M., 'Controlling the Project Development Cycle', *Journal of MIS*, February 1987.

Lewis, J., *Project Planning, Scheduling and Control*, Irwin Professional Publishing, USA, 1995.

Lyytinen, K. and Hirschheim, R., 'Information Systems Failures: A Survey and Classification of the Empirical Literature,' *Oxford Survey of Information Technology*, 4, 1987, pp. 257-309.

Oz, E., 'Information Systems MIS-Development: The Case of Star\*Doc,' *Journal of Systems Management*, 45(5), 1994, pp. 30-34.

Paulk, M. C., Weber, C. V., Curtis, B., Chrissis, M. B. (1995) *The Capability Maturity Model, Guidelines for Improving the Software Process*, Addison-Wesley.

Phan, D. D., George, J.F., and Vogel, D.R., 'Managing Software Quality in a Very Large Development Project,' *Information & Management*, 29, pp. 277-283, 1995.

SEI, Software Engineering Institute, Carnegie Mellon University see <http://www.sei.cmu.edu>

Turner, J. and Cochrane, 'Goals and methods matrix: Coping with projects with ill defined goals and/or methods of achieving them,' *International Journal of Project Management*, IV(2), May 1993.



# 12

## *Measuring Project Success*

### **Themes of Chapter 12**

- What is project management?
- How do we assess whether the project is a success or a failure?
- How do we assess the impact of a project on employee performance?
- How do we assess the impact of a project on the organization's competitive strength?
- How can we justify technology investment?
- Does the project empower or alienate staff?
- Does top management support the project?
- Are all of the above measurable?

## Introduction

PROJECT MANAGERS HAVE SIGNIFICANT CHALLENGES AND OPPORTUNITIES in modern organizations. Project managers and senior executives face the critical issue of assessing the impact and influence of a project on employees' performances and the organization's competitive strength. For example, technology projects are expected to empower employees to improve productivity, service quality, work planning, communication, and so on. Increasingly, executives are expected to justify technology investment in terms of its impact on employees and their work. But the success or failure of a project is not merely a matter of agreeing with whether or not the project was on time and on budget. We discuss a number of factors which should be taken into account. To the extent that a project outcome satisfies customer needs and accomplishes project specifications within time and budget constraints, it can be considered successful. This chapter describes reasons for project failure and factors that influence project success. This chapter also describes widely-used instruments to measure clients' satisfaction with a technology, to measure the level and type of client involvement in projects, and to measure impact and usefulness of project outcome. These instruments are useful tools that assist project managers in evaluating success as it is perceived by the client. But first, we look at the exhibit below that suggests that the issue of success and failure is more complicated than we may have thought! Most projects, like this one, are partial successes and partial failures!

### Sydney Opera House: Success or failure?

**Point-of-view 1:** Of course the Sydney Opera House is a disaster. Building started in 1959 and by 1961 it was already 47 weeks behind schedule.

Disagreement with a new government meant that Utzon, its original designer, left the project in 1966, due to a lack of payments and a lack of collaboration, and he later famously described the situation as "Malice in Blunderland". The designs changed for the worse in terms of the cladding to the podium and the paving; the construction of the glass walls; and the interior, where Utzon's plywood corridor designs and his acoustic and seating designs for the interior of both halls were scrapped completely.

What a laugh - the major hall, which was originally to be a multipurpose opera and concert hall, became solely a concert hall and the minor hall, originally for stage productions only, had the added function of opera to deal with, and two more theatres were also added. This completely changed the layout of the interiors. More importantly, Utzon considered acoustics from the start of design. These designs were subsequently modeled and found to be acoustically perfect. As such, the current internal organization is sub-optimal with clients' criticizing the acoustics. Surely a basic necessity, you might think! The plastic rings that hang from the ceiling in the concert hall are intended to improve acoustics, but sound is always a problem. Under Utzon's original design, they would have not been needed.



The Opera House was formally completed in 1973, at a cost of \$102 million. The original cost estimate in 1957 was \$7 million. The original completion date set by the government was 1963. ‘On time: On budget’ what a joke! And it is not even to specification. What a disaster!

**Point-of-view 2:** The Sydney Opera House is one of the most distinctive and famous modern buildings and an excellent setting for the performing arts. It is one of the architectural wonders of the world, perhaps the best known building of the 20th century, with its design

and construction involving countless innovative design ideas and construction techniques. It is an iconic Australian image and a major tourist attraction, yet is a superb venue with a Concert Hall, Opera Theatre, Drama Theatre, Playhouse, and Studio Theatre. The basic design that was accepted in 1955 of Jørn Utzon, was fantastic, and the changes made have not detracted from this excellence. It was a wonderful logo and emblem for the Sydney 2000 Olympics. Surely no one but the coldest hearts can deny that the Sydney Opera House is a most magnificent success.

## 12.1 Project failure

IT MIGHT SEEM odd to start a chapter called ‘Measuring Project Success’ with a section entitled ‘Project failure’. But not all projects are successful, and it is important to learn from failure so as to make it less likely to make the same mistakes in the future. The Standish Group published a 1995 study entitled ‘CHAOS’ that has made a major impact on managers. Following a survey in the United States of 365 IT managers of over 8,000 projects, their study reported that only 16% of projects could be deemed successful. Success was defined as ‘on time and on budget’. Further, 31% of projects were canceled before completion. Happily, a follow-up report published in 2003 suggested that project success rates had improved by over 50% and the number of canceled projects reduced to 15%. This ‘good news’ still meant, however, that two-thirds of projects were unsuccessful, even in 2002 when the survey was taken.

**Project failure** is rarely attributed to a single factor; often several factors interact and cause a project to fail. Some projects fail so badly that the company goes out of business. Some projects fail and hardly anyone in the organization notices it. In most cases projects are successful in some aspects and fail in other parts. We would hope that the successful aspects are greater and overshadow the failed parts. A project is normally considered a failure if it runs over budget, if it completes beyond the projected time, or if it does not meet specifications. The easiest way of comparing the project plan with the project outcome is by checking that the measurable outcomes were achieved. Nevertheless, as we saw in Chapter 3, not all specifications are easily measurable.

Kalle Lyytinen and Rudy Hirschheim suggest four general categories of failure:

**Correspondence failure.** This is based on the idea that design objectives are first specified in detail and then an evaluation is conducted of the project in terms

of these objectives. If there is a lack of correspondence between management objectives and the evaluation, the project can be regarded as a failure.

**Process failure.** This type of failure is characterized by unsatisfactory development performance. It may occur, for example, when a technology project cannot produce a workable system or when the development process produces a system, but the project runs over budget in terms of cost or time.

**Interaction failure.** Here, the emphasis shifts, from a mismatch of requirements and the project or poor development performance, to a consideration of usage of a system. The argument is that if a project is heavily used, then it constitutes a success; if it is hardly ever used, or there are major problems involved in using the system, then it constitutes a failure.

**Expectation failure.** Lyytinen and Hirschheim describe this as a superset of the three other types of failure, as it is a more encompassing, politically, and pluralistically informed view. They characterize correspondence, process, and interaction failure as having one major theme in common: a highly rational image of technology development, which views the outcome as mainly a neutral technical artifact. In contrast, they define expectation failure as the inability of a project outcome to meet a specific stakeholder group's expectations. Failure, in this case, signifies a gap between some existing situation and a desired situation for members of a particular stakeholder group.

Following analysis of the One.Tel project, David Avison and David Wilson suggested another type of failure:

**Business ethos failure.** This type of failure is defined as the inability of a project to meet requirements because of organizational culture. This may reveal itself, for example, in the lack of standards, such as an audit, a development methodology, formal documentation, and specifications. This lack of formalism is seen by some companies as very positive, to be lauded and championed as excellent examples of company ethos. But as the company grows, such values may be inappropriate. Thus the company ethos needs to align with the requirements of good project management practices. This suggests moving up a CMM level.

The above information shows that the issue of project failure and success is a much broader and more complex issue than is sometimes assumed. Although failure is often thought to be caused by technological failure of some sort, *failure is usually due to organizational and people factors*. Indeed, a study by Anne Parr and her colleagues suggested that **success and failure factors** can be due to numerous criteria and are frequently due to a fortunate or unfortunate combination of them. Some of these factors are listed in Figure 12.1.

A useful technique that can be used at any stage of the project to ascertain views is the **structured walkthrough**. This is a formal review of aspects of the project, and can be held at various stages of the life cycle. Structured walkthroughs are intended to be team-based reviews of a product, but are not intended to be management reviews of individuals or their performance. If used at this

stage, the overall quality of the project and its impact can be assessed, though it is also used to assess individual deliverables at any stage. It is also an opportunity to inform; if there have been hiccups in personal communications.

- Availability of skilled staff
- Champion supporting the system
- Management support
- Client satisfaction
- Client participation
- Project management
- Understanding of corporate culture
- Communications
- Multi-skilled project manager
- Balanced team
- Methodology
- Appropriate training
- Commitment to change
- Project team empowerment

Figure 12.1: Potential failure (and success) factors

Structured walkthroughs have been identified as being of considerable value in the development of projects, and they should be held on completion of certain phases of the development. It is impractical to hold formal walkthroughs too often, as it causes unnecessary administrative overheads. The best approach is to maintain the spirit of the concept by having team members discuss all decisions with others, without necessarily calling formal meetings. It is intended that the approach will normally promote discussion and exchange of ideas within the team.

As we have already suggested, technology is rarely a major factor, indeed it might be the easiest type of problem to detect and put right. Contingency factors related to the cultural, organizational, and people aspects of project development are much more important and fundamental than technological ones. Success is related to the experience and knowledge of those undertaking the change and in using this effectively in the context of the organization where the change is taking place.

## 12.2 Evaluating projects: A broader view

THE ABOVE DISCUSSION might give rise to a broader view of **evaluating projects**. We have previously stressed the theme of 'on budget and on time', but there are other ways to assess a project. One of the concerns we have is that managers often take a too narrow view of costs and benefits. The risk is that managers rely on the measurable to make (or break) the case for and against a project because otherwise it is seen as a nebulous decision – one based more on total guesswork than hard fact. This seems a sensible approach, but it is unlikely that critical projects will come from such a defensive strategy. Further, most gains are made from efficiency-oriented projects and the real potential is in effective-oriented projects. We suggest, therefore, that management may provide a multiple-perspective view on projects, using broader views of costs and benefits as well as the more

traditional ones of dollar costs and benefits. These are briefly described in the following section and some are further developed later in the chapter:

**Impact analysis:** The potential impacts of a project are of many types and include effects on the operation of the organization, its finances, and its staff. Approaches such as event logging, attitude surveys, or measuring the performance of the target project, all of which assess the effects of an organizational change, are most helpful when used with periodic measurements or before/after comparisons. This would suggest that post-implementation evaluation and evaluation during project development should both be carried out, as well as the more conventional feasibility study, and these should be pre-planned.

**Measures of effectiveness:** A discussion of effectiveness implies that a project is expected to have some desired outcome outside of itself. However, effectiveness is subjective and is seen differently by different people. Assessments of a project and expectations of it will differ, and it is not a directly measurable quantity. Substitute measures have included economic effectiveness; satisfaction of project objectives, which will need to be taken into account; and the extent of project applicability for clients.

**Objectives:** Assessment based on the extent to which the project satisfies its objectives has been widely accepted as a means of measuring effectiveness. The setting of detailed objectives and attainment targets for a wide range of aspects of a project is central to this approach and must be planned well in advance. Various stakeholder groups can have different objectives, and a range of measuring techniques will be needed.

**Client satisfaction:** Client assessments of projects have been a popular surrogate measure of project effectiveness for some time, and client satisfaction derives from a match between the perceived importance of the factors assessed and the project's outcome on these factors. The assessments cover a variety of subjects, ranging from opinions of individual benefits to direct perceptions of project effectiveness and value.

**Utility:** The concept of utility is taken from decision theory, where it represents subjective assessments of worth to stakeholders. Techniques such as hierarchies of weighted criteria and summing the results have been used. But this cannot take into account the value of different combinations of criteria. One approach to overcome the problem allows the stakeholder to consider the utility value of each option, making any trade-offs between criteria.

**Standards:** This quality view is based on the achievement of satisfactory standards, as opposed to the attainment of objectives. Standards are set to ensure quality, but they vary in type. For example, there must be a statement of requirements in order to assess a project's specific outcome; or a defined set of procedures for an organization; standards formally imposed by legislation or relating more to

‘good practice’.

**Flexibility:** This is variously used to describe the inherent properties of a project, the nature of a change or implementation process, or a property of the project strategy. The term is also used in distinct senses, such as in describing projects that can respond effectively to planned or unanticipated changes either where the response does not lead to changes in the nature of the project (flexibility is ‘designed in’) or where the response involves the organization changing or transforming itself (a characteristic of an ‘organic’ rather than a ‘bureaucratic’ organization). Flexibility is nearly always seen as a ‘good thing’. First, it improves the quality of internal processes in ways that may offer a variety of performance improvements. Advantages accruing might include higher staff morale. Second, it may give firms a competitive edge, for example, through the speed of response to an unexpected increase in demand, which other firms could not meet. Third, it is part of the ‘survival kit’ of an organization. It may be that a measure of flexibility is necessary in a turbulent world: ‘be flexible or cease operating’. As a number of writers have noted, the acquisition of flexibility is not without costs, and these need to be compared with the likely benefits.

## 12.3 Causes of failure

EVERY ORGANIZATION WILL have a profile of projects. Figure 12.2 provides a summary of some potential failure events for an organization.

Project Event	Likelihood
Cancellation	High
Late delivery	Medium to high
Over budget	Medium to high
Quality problems	Medium to high
Vendor issues	Low to medium
Management issues	Low to medium
Employee turnover	Low to medium
Technical issues	Low

**Figure 12.2: Failure events profile**

Depending on the circumstances, some project failures may be more acceptable than others. For example, some projects are mission critical so the project manager can go slightly over budget to make sure it is done in time. The tradeoff here between extra cost and reduced time depends on organizational needs and management assessment. Having the new project up and running one week ahead of schedule may be worth a lot more than the additional cost associated with quicker delivery. In situations like this, the project manager will work closely with the project sponsors, customers, and top management to determine the best decision for the organization.

A project may fail for a variety of reasons. Specifications may change so rapidly that the developmental activities could not keep up. Rapid turnover of key and talented team members can cause project failure, especially when recruitment cannot keep up with demand. This is a more challenging task for some project managers when demand for certain talents and expertise is high. Some projects fail simply because human expertise does not match project complexity. As the number of phases in a project increases, so does the complexity of the project and its developmental activities. Large projects involve complex testing that requires metrics for all possible test conditions. Testing by itself may become a major task. Even if a solution is correct, it must be demonstrated that it is correct; that is not always easy. As Figure 12.3 shows, there are many potential causes of project failure.

- Human issues
  1. Employee turnover
  2. Conflict
  3. Motivation
- Technical limitations
  1. Incompatible technology
  2. Limited local or regional capacity for technology support (bandwidth)
  3. Inadequate history or experience with new technology
- Political game play
  1. By the individual to gain rewards
  2. By the team to create rivalry
  3. By the project manager to control
- Funding issues
  1. Erroneous estimates
  2. Poor budgetary control
  3. Runaway costs (raw material)
- Leadership issues
  1. In dealing with people
  2. In dealing with partners
  3. In dealing with processes

**Figure 12.3: Potential causes for project failure**

Project managers who have experienced different types of problems can readily come up with a possible solution for a given situation. Figure 12.4 provides a list of typical problems and possible solutions. Often management can detect when a project might fail.

Typical problem	Possible solution
Clients cannot agree on business needs; usually happens in the early stages of the project development.	Document all communications. Use a prototype to allow clients to see the impact of their decisions.
Clients and team members do not communicate.	Provide guidelines for communication. Encourage open communication.

Typical problem	Possible solution
Clients want a solution without fully understanding the ramifications.	Facilitate meetings to take clients through various levels of the project. Share details with all parties to assist understanding.
Stakeholders resist change.	Document changes and assign priorities for them, involve stakeholders, and continuously monitor the change list.
Employee turnover, new hire with insufficient expertise.	Have team members learn skills. Provide training. Have technical 'gurus' to go around helping.
Stakeholders have unrealistic expectations; they want to fulfill a dream.	Clarify project scope and avoid scope creep. Explain difficulties of making changes and the impact on cost and delivery date.

Figure 12.4: Examples of problems and possible solutions

## 12.4 Project success

EVALUATING PROJECTS IS always a complex process and multiple criteria are relevant. There are at least two perspectives for evaluating projects:

- The first perspective calls for evaluating projects relative to defined specifications or client expectations. Client satisfaction is typically defined as the extent to which the project meets the client's needs. This definition assumes that client needs are accurately described, documented, and understood by the development team. Even so, catering to situations where client views differ (almost inevitable in large projects) will be difficult.
- The second perspective calls for performance-related evaluations and focuses on processes and activities. This perspective assumes that the project focus and work units are clearly defined and appropriately assigned to team members. Again, real-world situations tend to be more complex.

These two perspectives are related in that customer needs and satisfaction are linked with team effectiveness and performance. However, there are several important management and leadership skills, such as communication, coordination, conflict resolution, and interaction, that influence this relationship and the outcome of any project development activity. There are several critical success factors that influence both perspectives (client satisfaction and team performance) and, in turn, the outcome of projects. These **critical success factors** include client involvement, business knowledge, expectation management, and the management of changing requirements. Discussion of each of these factors follows.

**Client involvement** – client involvement in the design and development of projects is considered one of the essential principles of effective project development. Clients must be involved in all phases, especially during the specification and design phases of the project.

The project manager must ensure the involvement of clients from the entire organization and include individuals that are directly or indirectly impacted by the project's outcome. Research studies suggest a strong relationship between the client's participation and their satisfaction with the resultant outcome. One of the priorities of the project manager might be to establish a training and education program that involves a discussion of what the project can and cannot do, that is, the limitations as well as the potential. In that way, it is hoped that client expectations will be realistic.

Client involvement in project development is expected to improve the quality of design decisions, improve client skills for utilization, develop client abilities to define their own requirements, and enhance commitment to and acceptance of the outcome. In situations where clients are only consulted regarding their needs with no other direct involvement, satisfaction with the resultant outcome is less likely.

The client population is characterized by great diversity in needs and motivation. Some clients enjoy getting involved, while others, concerned about the complexity of the project activities or their ability to contribute, show little interest. Sometimes it is argued that client involvement will delay project development because of the client's inadequate domain knowledge. This is a short-term outlook at project development and utility. The project manager should create involvement arrangements that enable client input and contribution to the process of project development as well as assessment.

Client involvement should mean much more than agreeing to be interviewed by the project team or project manager. This is 'pseudo-participation' because clients are not playing a very active role in determining specifications. With a low level of participation, satisfaction is likely to decrease, particularly if the new project outcome changes the way work is done. The result may be absenteeism, low efficiency, and a higher staff turnover.

There are three **levels of participation**.

**Consultative participation** is the lowest level of participation and leaves the main design tasks to the technologists, but it tries to ensure that all clients are consulted about the change. The project managers are encouraged to provide opportunities for increasing satisfaction when designing the project. It may be possible to organize the clients into groups to discuss aspects of the new project and make suggestions.

**Representative participation** requires a higher level of involvement of clients. Here, the 'design group' consists of client representatives, the project team, and proj-



ect manager. Clients have an equal say in any requirement specification. It is to be hoped that the representatives chosen do indeed represent the interests of all the clients affected by the new project.

**Consensus participation** attempts to involve all clients throughout the design process, indeed this process is client driven. It may be more difficult to make quick decisions, but this form of participation has the merit of making the design decisions those of the clients as a whole. Sometimes the sets of tasks in a project can be distinguished and those people involved in each task-set make their own design recommendations.

Even with the best will of the project manager, individuals may be reluctant to get involved because it will take time away from jobs that they perceive to be more important to their career development. Individuals may also be reluctant to get involved because of their beliefs about the benefits and outcome of the project. They perceive little personal benefit for their efforts. The project manager must think of adequate rewards and incentives to facilitate client involvement. Lacking motivation, client involvement may be dysfunctional for some individuals. Research studies suggest three **involvement episodes** that provide a useful perspective to the project manager.

**Involvement equilibrium** – this situation exists where perceived involvement equals (or roughly corresponds) to the level of desired involvement. Thus, in this situation there is congruence between how much the client wants to be involved and the extent to which the client is required to be involved. Several factors may influence this equilibrium, such as individual skills and competency, career and promotional opportunities, and learning opportunities. Within this frame of reference, perceived involvement, whether low or high, is expected to have a positive effect on the client. In such situations: (a) involvement is viewed by clients as a means of getting what they want from their environment; (b) clients are more receptive to learning about the project, improving their understanding of how to benefit from the outcome, and making suggestions that might improve quality; and (c) involvement enhances trust and contributes to a sense of ownership and control, improving acceptance and commitment.

**Involvement saturation** – this occurs when an individual's perceived involvement exceeds desired involvement and the client's frame of reference regarding the value of involvement is altered. Thus, the individual desire or motivation to get involved plays a key role in creating the feeling of too much involvement or saturation. Other factors such as individual characteristics, opportunities for higher responsibility, and the nature and form of involvement may influence whether, or at what point, saturation occurs. In such situations, involvement may be viewed as a time-consuming interference with other activities; an impediment to other opportunities to enhance. The more valuable clients regard their other activities, the greater the likelihood of saturation; involvement in project activities might be viewed as an imposition. Where clients are more

involved than they want to be: (a) involvement is unlikely to increase trust or a sense of control; (b) clients might be less receptive to learning about the project, improving their understanding of how to benefit from it, or making suggestions that might improve its quality; and (c) client satisfaction is less plausible as clients see little or no value in being involved.

**Involvement deprivation** – this occurs when an individual's involvement substantially exceeds perceived involvement and the client develops a sense of alienation. Thus, the individual has a high level of desire and motivation to be involved in project development activities but does not get nearly enough chances at participating. Individuals in such situations feel either that there is little regard for their talents and energy or there is insufficient use of them. It is difficult to determine the exact point where an individual's perception regarding their level of involvement is altered to high deprivation. This might happen even when there is a level of involvement but the client perceives it as too little or of inconsequential effort. Clients often expect meaningful involvement that gives them opportunities for self-expression, respect, influence, and contribution. Clients may resent nominal involvement, considering it as an act of manipulation. In such situations: (a) clients are unlikely to be receptive to learning about the project, improve their understanding of how to benefit from it, or make suggestions that might improve its quality; (b) resistance is increased and acceptance is reduced; and (c) satisfaction is reduced.

These involvement episodes create opportunities and challenges for the project manager. Opportunities exist for identifying individuals who are motivated to be involved and providing them with the right level of involvement through appropriate arrangements. Opportunities also exist for avoiding dysfunctional situations, such as creating high involvement deprivation or involvement saturation scenarios. Challenges exist for the project manager in evaluating the individual's competency, matching the individual's talents with task difficulty, creating appropriate involvement arrangements, and determining involvement rewards. Ultimately, individuals want to benefit from involvement arrangements and enhance their career opportunities.

The project manager must seek avenues for providing client benefits through the involvement process and the organizational context. For example, in the area of information technology, research studies have suggested eight activities in which clients may be involved in projects. Figure 12.5 provides these activities and suggests a 5-point scale for measuring the client's level of desired involvement. The scale reflects a range from not at all (1) to a great deal (5). The project manager can use this survey instrument in preparation for selecting team members. This instrument also provides information on the types of involvement that the client may feel confident or prepared to undertake.

**Business knowledge** – business knowledge and understanding is another critical success factor for projects. There are at least two perspectives for this business knowledge.

Developmental activity	Desired involvement
1. Initiating the project?	1 ----- 5
2. Determining system objectives?	1 ----- 5
3. Determining the client's information needs?	1 ----- 5
4. Assessing alternative ways of meeting the client's information needs?	1 ----- 5
5. Identifying sources of information?	1 ----- 5
6. Outlining information flows?	1 ----- 5
7. Developing input forms/screens?	1 ----- 5
8. Developing output format?	1 ----- 5

**Figure 12.5: Measures of client participation**

The *first* perspective relates to the understanding of what the business is about, what the organizational mission is, and what its goals and objectives are. This perspective involves a focused understanding of the business over and beyond an understanding of the industry. For example, while it is useful to distinguish clearly between service and manufacturing industries or healthcare and the insurance industry, it is critical to understand the business of the organization within a given industry. The project could, for example, be developed for a business that is in the healthcare, insurance, or manufacturing sectors. Project managers must have a good understanding of the industry that their business is in and a really good understanding of their organization.

The *second* perspective relates to the understanding of the organizational culture and processes. Organizations are run differently, even within the same industry, and much of that depends on the culture of the organization and the top management decision-making style and viewpoint. The project manager must have a good understanding of effective ways for getting things done within the existing organizational culture. Two crucial questions are: 'What is the level of organizational understanding and appreciation for the project?' and 'How can good inter-organizational relations be implemented in support of project activities?'

**Expectation management** – managing client expectation is a critical success factor for projects. There are two levels at which this client expectation is influenced.

The *first* level relates to the congruence between the expectations of project owners, sponsors, and clients on the one hand and those of the project manager and team members on the other. Project owners express

their expectations through the project proposal and the initial interaction with the project manager and developers. Understanding business issues as well as communication skills is important in creating the necessary congruence between expectations of the two groups; sponsors and developers.

The *second* level relates to managing expectations relative to the original understanding between the project sponsors and developers. Project owners, sponsors, and clients alter their expectations as the project progresses. The project manager must communicate expectations clearly to the project team and update sponsors and clients through progress reports and periodic feedback. It is important that project progress is communicated with respect to the scope statement and in the context that the sponsors and clients can see their original expectations being realized. In other words, progress is expressed in terms of deliverables, milestones, and other indicators established through the project plan.

**Management of changes in requirements** – managing changes in requirements is also an important success factor for projects. Such change can also alter outcome expectations. Some changes can be significant and, as a result, can alter the overall project outcome. This, in turn, may lead to change in the original expectations of owners, sponsors, and clients. Project change may be perceived differently by different stakeholders. Some may see change as a useful development that improves the situation and some may see change as having a significant negative impact on the outcome. Some changes are proposed primarily to improve the developmental process, while others are proposed with the intent to alter the outcome.

It is important to assess whether a change will alter the outcome of the project. It is critical to evaluate the effect of change on owners' expectations.

It is important that project managers establish and communicate the change process. Forming a requirements change management committee is an appropriate way that accomplishes several objectives:

- (a) To encourage useful and innovative change proposals
- (b) To establish a review and approval process for change proposals
- (c) To create a mechanism for administering approved changes
- (d) To establish a communication channel for keeping stakeholders up-to-date with changes and progress

The requirements change management committee can therefore become an effective means of managing expectations. The establishment of such a change management process through an organization-wide committee has practical benefits that relate to receiving additional support

to implement a change in requirements or to release contingency reserve funds. Expectations are often linked with due dates. Some change proposals may delay project completion. The requirements change management committee can play an important role in informing stakeholders about possible delays and in providing them with a rationale for such delays.

## 12.5 Client satisfaction

Ideally one would like to evaluate projects in terms of the degree of their impact on market expansion, productivity, innovation, customer service, management control, increased competitive advantage, and the like. However, this **impact analysis** approach is generally not feasible. Client satisfaction is a potentially measurable surrogate for project impact. Client satisfaction is typically defined as the extent to which the project meets the client's needs and expectations.

In a voluntary situation, the utility of project outcome can also be a surrogate measure of its success. In other words, how do people affected by project outcome feel about it? In such situations, perceptual measures of satisfaction may be appropriate. Research studies have also shown that client satisfaction leads to increased utility, making it a critical factor for measuring success. Researchers in areas such as technology have dedicated significant efforts to developing reliable and valid measures of client satisfaction. One of these instruments measures client satisfaction with different dimensions of information technology and is widely used in research and practice. This instrument measures client satisfaction with respect to *content*, *accuracy*, *format*, *ease of use*, and *timeliness*. These five factors capture features of information technology that are important to the client and that influence client satisfaction.

Figure 12.6 presents recommended measures for these **five factors of client satisfaction**. More than one measure is used to capture client beliefs about each factor. These factors collectively reflect the overall client satisfaction with a specific system. A 5-point scale is also recommended for these measures that ranges from not at all (1) to a great deal (5). This instrument could be a useful tool for project managers in assessing client satisfaction with the resultant product. Mean scores of responses to these questions will provide the extent of satisfaction. This instrument is also helpful in determining areas of strengths and weaknesses for the system.

These five factors are intuitively appealing and seem relevant to the majority of information technology projects. However, additional questions may be added to these measures to evaluate unique features of a technology project. For example, if a technology project involves online database access through the web, additional questions that relate to the communication channel and speed may be added to measure retrieval effectiveness. Similarly, one or more of these recommended factors may be dropped from a given survey if they do not seem to be relevant to the focus of the system.

This is a short and easy-to-use instrument that can be administered at multiple points in time to all clients to study the pattern of change in the level of satisfaction as well as in the areas of concern. For example, the level of satisfaction for the ease-of-use factor may increase as clients are

better trained, while the level of satisfaction with content or accuracy factor may remain the same, suggesting the need for modification of the system. In other words, this instrument can be used to compare client satisfaction with specific factors *across* projects. Multiple administrations of these measures at different times and for different projects will provide a framework for comparative analysis.

Measures of client satisfaction	Satisfaction level
<b>Content</b>	
Does the system provide the precise information you need?	1 ----- 5
Does the information content meet your needs?	1 ----- 5
Does the system provide reports that seem to be just about exactly what you need?	1 ----- 5
Does the system provide sufficient information?	1 ----- 5
<b>Accuracy</b>	
Is the system accurate?	1 ----- 5
Are you satisfied with the accuracy of the system?	1 ----- 5
<b>Format</b>	
Do you think the output is presented in a useful format?	1 ----- 5
Is the information clear?	1 ----- 5
<b>Ease of use</b>	
Is the system user friendly?	1 ----- 5
Is the system easy to use?	1 ----- 5
<b>Timeliness</b>	
Do you get the information you need in time?	1 ----- 5
Does the system provide up-to-date information?	1 ----- 5

Figure 12.6: Measures of client satisfaction

In the following example, the sample data that were used to develop this instrument represented diverse respondents from 44 firms. The sample also represented a diverse set of technology applications for analysis, decision-making, engineering, planning, and control from 618 respondents. This cross-organizational aspect of the sample and its characteristics made it appropriate for the development of tentative standards. Percentile scores for the 12-item satisfaction instrument are presented in Figure 12.7. The possible total score for the 12 items is 60, given the 5-point scale used with this instrument. These statistics can be used as a benchmark to evaluate client satisfaction with a specific project outcome.

Percentile	Value
10	37
20	43
30	46

Percentile	Value
40	48
50	51
60	53
70	54
80	57
90	59

Figure 12.7: Percentile scores for 12-item satisfaction instrument

## 12.6 Perceived impact

EXECUTIVES ARE INCREASINGLY required to justify investment in terms of its impact on and usefulness for the individual and his or her work. This perspective goes beyond design features to evaluate benefits in terms of outcome. The success of projects from this perspective is measured through the impact on work at the level of the individual. Organizations that spend millions of dollars on projects are primarily concerned about how their investment will influence organizational and individual performance.

Researchers in many areas have shown increased attention to measures of impact and usefulness. One research study in the information technology area has produced an instrument that measures perceived usefulness of technology application for the individual. It is argued that the impacts of technology are quite varied in their nature and their levels, not only across different types of settings, but also across different computing contexts within comparable settings and even across different individuals. The set of questions presented in Figure 12.5 relate to information technology usefulness through perspectives of *task productivity*, *task innovation*, *customer satisfaction*, and *management control*. A five-point scale was used to develop this instrument where 1 = not at all, 2 = little, 3 = moderately, 4 = much, and 5 = a great deal. The instructions ask respondents to indicate the response that reflects their current belief rather than their expectation.

Measures of usefulness	Level of use
<b>Task productivity</b>	
This application saves me time	1 ----- 5
This application increases my productivity	1 ----- 5
This application allows me to accomplish more work than would otherwise be possible	1 ----- 5
<b>Task innovation</b>	
This application helps me create new ideas	1 ----- 5
This application helps me come up with new ideas	1 ----- 5
This application helps me try out innovative ideas	1 ----- 5

Measures of usefulness	Level of use
<b>Customer satisfaction</b>	
This application improves customer service	1 ----- 5
This application improves customer satisfaction	1 ----- 5
This application helps me meet customer needs	1 ----- 5
<b>Management control</b>	
This application helps management control the work process	1 ----- 5
This application improves management control	1 ----- 5
This application helps management control performance	1 ----- 5

**Figure 12.8: Measures of technology application usefulness**

Individuals responding to these questions describe the extent to which a technology impacts their work relative to these dimensions. This instrument enables the project manager to study a technology’s usefulness and the areas of concern relative to the four dimensions. There may be different levels of interest for each dimension depending on project focus. For example, if a technology is developed to help employees improve customer satisfaction, then the factor that measures this dimension will be more relevant to measuring technology success and may be given more weight when analyzing data. This instrument can also be used to compare perceived usefulness across time, across client groups, and across projects. The project manager can develop a frame of reference for comparing different project outcomes by administering these measures at different times.

By identifying unique aspects of the client perception regarding a project’s outcome, the project manager can allocate human and other resources to improve project success more carefully. The two success instruments presented in this chapter for client satisfaction and perceived usefulness provide good tools for the project manager to use to gather data from the client and study strengths and weaknesses of the project. The involvement instrument is also useful in assisting the project manager in assigning clients as team members and understanding the extent to which these clients might be able to help with the project activities. The project manager can develop other measures that are more closely related to a specific project outcome. However, these instruments have been developed using widely-accepted research methodologies for instrument development. They have high reliability and validity that makes them appropriate for decision making analysis. The results of survey analyses can be documented for future reference as well as for communication with stakeholders. The use of instruments such as these suggests a systematic approach by the project manager in obtaining feedback from the clients. The advantages of using a structured approach to evaluating project success, such as a measurement instrument approach, include those listed in Figure 12.9.

The above discussion assumes these evaluation techniques will be used with individuals, most likely through use of a questionnaire in a survey study. Interviewing individuals might be more revealing and offer a real opportunity to gain in-depth feedback, but interviewing a number of clients separately will be much more expensive. An alternative approach is to interview people in **focus groups**. These do give an opportunity to develop concerns in more depth, though the project manager needs to be aware of the possibility of ‘group-think’, where all participants attempt to



give the impression of a consistent view (which may not truly be held by all), or the domination of powerful participants (based on position in the hierarchy or other factors). Again, this might give a misleading picture of what people actually feel about the project.

- Provides historical data for comparative analysis
- Enhances confidence in stakeholders
- Provides confidence in the reliability of the results
- Provides ease of documentation
- Can be used as additional means of communication
- Helps client acceptance of the project outcome
- Provides evidence of project success
- Provides useful information to design training programs
- Provides useful information to evaluate team performance
- Maintains top management support

**Figure 12.9: Advantages of using a structured approach for evaluation**

A final question concerns ‘when should evaluation of a project occur?’ Many assume that it is a concern only at the end of a project. In fact, *evaluation should be a concern throughout the life of a project*. Of course, evaluation starts to be on the agenda at the beginning of a project as we define our objectives and requirements. These form the basis of the evaluation process. Further, the project is justified on the basis that benefits exceed costs. But evaluation should also play a role during the development of a project, as an integral part of the development process, to ensure benefits are going to be met.

**Pre-development evaluation** can take two forms: as planning for projects and as a feasibility study. Planning aims to ensure that project provision supports the objectives and needs of the business. It includes some form of project selection process to identify the most suitable projects for development in terms of organizational objectives. Feasibility studies, in contrast, assess the needs of a single project, identify the initial framework for the project, and propose alternative solutions. They will be assessed in terms of human, technical, operational and financial feasibility. The use of one of the feasibility options is recommended. The project selection process and the feasibility study are two ‘filters’ at the beginning of the project development life cycle. This is by far the most common evaluation practiced and the literature abounds with the techniques and examples of their application.

**Post-implementation studies** are often confined to monitoring costs and performance, and feasibility decisions can be based on cost-justification, but as we have seen, the scope of an evaluation can be much wider than this. Concentration on the economic aspect of a project may cause organizational and social factors to be overlooked, yet these can have a significant impact on the effectiveness of the project outcome. Evaluation carried out following implementation may allow problems of various types to be identified, and can provide input to long and short-term planning. Opportunities to expand the use of the project, or to gain further advantages through extending the facilities provided, may be identified. Other possible beneficial effects of evaluation are an improved

understanding of the project, greater utility, and better communication between clients and developers. In general, more favorable client opinions are likely. Valuable lessons for the future may also be learned and absorbed into the organizational culture. However, the measures for evaluation need to be appropriate. The particular benefits of these measures are listed below:

- Historical data for comparative analysis
- Improves confidence in stakeholders
- Confidence in the reliability of results
- Ease of documentation
- Meaningful communication
- Improves client acceptance of project outcome
- Useful to evaluate project success
- Useful to design training programs
- Useful to evaluate team members
- Helps maintain top management support.

## 12.7 Interview with a project manager

### Interview

**Q** WHAT is/are the job description/duties as applied to Project Management?

“Duties include the estimation and bidding of public and private funded infrastructure projects. Upon award of work, duties include organization of materials, subcontractors, and scheduling of work. Upon notice to proceed, duties include day to day office supervision of field operations, preparation of claims, updating schedules, etc.”

PLEASE list any tools (computer programs, PERT, Gantt charts, etc.) which assist you as a Project Manager and describe their use to you:

“I have utilized the Primavera Project Planner for scheduling and the Quest Estimator 5.0 for estimating. I generally rely on

an Excel spreadsheet that I helped formulate some years ago for estimating most work.

**Q** WHAT has been your biggest challenge as a Project Manager?

“My biggest challenge is to control my personal feelings on any particularly sensitive matter, and always take the best position for the company’s future. There are many instances where a project manager must defend the actions of the company even though the company may not always be right”.

PLEASE list other challenges (if any) regarding project management:

“Project managers must be on call 7 days, 24 hours to handle emergencies. There have been times where I have worked 16 hour days, such as during the time I

supervised recovery crews cleaning up the City of Homestead after Hurricane Andrew struck Florida.”

**Q** CAN you give me an example of how the quality of the work (from one of your projects) has directly affected your job as a project manager?

“**I** was involved in a project where the soil conditions were different than those that were indicated at time of bid. After a great deal of letter writing and meetings, the firm I represented was awarded a \$300,000.00 Change Order”.

**Q** HOW do you strike a balance in managing all the individuals on a project and trying to hold them together as a team?

“**B**y delegating responsibilities and constantly giving credit and not taking credit, a project manager will gain the respect of the people that are involved with the project.”

**Q** HOW do you keep people energized on a project that lasts for long time periods?

“**B**y giving them different tasks. By challenging them to find a better way to do a task.”

**Q** REFLECTING on your own experience, what do you think are the best ways to train younger project managers?

“**T**o have them start working under the guidance of a senior project manager that has the patience to teach and lead. They should also spend a lot of their time in the field in order to get the “feel” and learn to recognize the particularities of their work.”

**Q** ANY additional comments?

“**I**n my opinion, there is nothing more satisfying than being able to proudly observe the finished project and marvel that you are the individual who was chiefly responsible for its completion. As a project manager, you also unknowingly gain the foresight to handle your own personal activities in an orderly fashion.”

**S**YNOPSIS of Project Manager Interview by the interviewer:

According to the interviewee, the skills necessary to become a project manager are mostly acquired through hands-on experience and practice. Good training and leadership are essential when starting out in the field. A new project manager should first have a good grasp on the functions of the business, the day-to-day activities, and the way it is organized before beginning a project.

A project manager must be accustomed to recognizing and working within the “knowledge areas” of a project endeavor. In addition, a holistic view of the organization must be applied in order for the venture to be successful. A project manager must understand this concept and realize that integration of knowledge areas is essential.

The interviewee stresses that interpersonal skills are absolutely essential to project manage-

ment! Communication, delegation, and clarification of needs and facts are skills that embody the main theories behind Project Management. Without the ability to communicate efficiently and effectively, the integrity of the project is compromised.

## Chapter summary

Measuring project success has been and remains one of the challenges for project managers and executives. Organizations increasingly evaluate project investments in terms of their impact on work, at the individual as well as the organizational level. The project manager must consider project success from both perspectives. Experience suggests a high rate of failure for projects in terms of cost, time, and focus. Projects fail because of human, technical, organizational, or leadership issues. Projects may also fail because client expectations are dramatically altered. The project's success is greatly influenced by issues of client involvement, client satisfaction, client expectation, business knowledge, and the management of changes in requirements.

## Discussion questions

- a) Regarding Sydney Opera House, which argument are you most sympathetic to? Why?
- b) Evaluating project success is a complex task that involves knowledge of business as well as problem domain. Projects can be evaluated from the perspectives of the client or the developer. What are some specific success features from the developer's perspective? The client's perspective?
- c) Review items in the client satisfaction instrument presented in Figure 12.6. Why

It is critical to evaluate and assign individuals carefully to tasks that they can best perform. It is equally important to evaluate and assess client expectations regarding the project outcome. Client satisfaction as a surrogate to success must be carefully measured and assessed. Research studies have developed instruments that can be used to evaluate potential client involvement, client satisfaction, and perceived usefulness. These instruments are described in this chapter and can be used as examples by project managers in developing project-specific instruments to gather data from clients in order to

- (a) Improve client involvement arrangements in project development activities.
- (b) Understand better the extent and dimensions of client satisfaction with a project.
- (c) Evaluate the usefulness and impact of project outcome as perceived by the client.

The use of these instruments for data collection and analysis helps project managers in their problem solving and decision rationalization.

do you think there are multiple questions for each factor (content, accuracy, format, ease of use, and timeliness)?

- d) Review items in the client satisfaction instrument and propose factors that you think are important to clients of a different project.
- e) Review items of the client involvement instrument and discuss them in terms of the project development life cycle. Do you see a pattern that fits the project development life cycle?

- f) Review items of perceived usefulness and suggest additional factors that you think are important to improving work. Do you think that the recommended factors are

applicable to most projects?

## Exercises

- a) Studies of successful projects indicate several success factors:
- Client involvement
  - Top management support
  - Clear project mission
  - Good project plan
  - Good project change management
  - Proper project schedule
  - Clear scope and requirements
  - Effective communication with stakeholders

How would you rank these? What other factors would you add to this list?

- b) Discuss the role of project management in project development and success?
- c) Complete the forms given in Figure 12.6 and 13.8 for another project that you are familiar with. Give reasons for the low scores and suggest ways that the project leader developing an improved system can address these weaknesses in the project.
- d) Conduct a survey using the form given in Figure 12.6 for an application (e.g., spreadsheet) that you all use. Present your results and discuss the strengths and weaknesses of the application as found in your results.

## Important Concepts

**business ethos failure** (pg. 236)

**business knowledge** (pg. 244)

**client involvement** (pg. 241)

**client satisfaction** (pg. 238)

**consensus participation** (pg. 243)

**consultative participation** (pg. 242)

**correspondence failure** (pg. 235)

**critical success factors** (pg. 234)

**evaluating projects** (pg. 237)

**expectation failure** (pg. 236)

**failure events** (pg. 239)

**five factors of client satisfaction**  
(pg. 247)

**flexibility** (pg. 239)

**focus groups** (pg. 250)

**interaction failure** (pg. 236)

**involvement deprivation** (pg. 244)

**involvement episodes** (pg. 243)

**involvement equilibrium** (pg. 243)

**involvement saturation** (pg. 243)

**levels of participation** (pg. 242)

**management of changes in**

**requirements** (pg. 246)

**measures of effectiveness** (pg. 238)

**measures of impact and usefulness**  
(pg. 249)

**objectives** (pg. 238)

**perceived impact** (pg. 249)

**post-implementation studies** (pg. 251)

**potential causes for project failure**  
(pg. 240)

**pre-development evaluation** (pg. 251)

**process failure** (pg. 236)

**project failure** (pg. 235)

**representative participation** (pg. 242)  
**standards** (pg. 238)  
**structured walkthrough** (pg. 236)  
**success and failure factors** (pg. 236)

**two perspectives for evaluating projects** (pg. 241)  
**utility** (pg. 238)

## Bibliography

- Avison, D. and Wilson, D. N. (2002) IT Failure and the Collapse of One.Tel in Traunmuller, R. (ed.) Information Systems: The e-Business Challenge. Kluwer.
- Cash, C. and Fox, R. (1992) Elements of successful project management, Journal of Systems Management, September.
- Davis, F.D., and Herron, D. (1989) Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology, MIS Quarterly, Vol. 13(3).
- Doll, W.J. and Torkzadeh, G., "The Measurement of End-User Computing Satisfaction," MIS Quarterly, Vol. 12, No. 2, June 1988, pp. 259-274.
- Doll, W.J. and Torkzadeh, G., "End-User Computing Involvement: A Discrepancy Model," lead article, Management Science, Vol. 35, No. 10, October 1989, pp. 1151-1172.
- Ewusi-Mensah, K. and Przasnyski, Z. (1994) Factors contributing to the abandonment of information systems development project, Journal of Information Technology, Vol. 9.
- Johnson, J., (1995) Chaos: the dollar drain of IT project failures, Application Development Trends, Vol. 2(1).
- Lyytinen, K. and Hirschheim, R. (1987) Information systems failures: A survey and classification of the empirical literature, Oxford Surveys in Information Technology, Vol. 4).
- Lyytinen, K. and Robey, D. (1999) Learning failure in information systems development, Information Systems Journal, Vol. 9.
- Mumford, E. (1995) Effective Requirements Analysis and Systems Design: The ETHICS Method, Macmillan.
- Parr, A. N., Shanks, G. G., Darke, P. (1999) Identification of Necessary Factors for Successful Implementation of ERP Systems. In: Ngwenyama, O. K., Introna, L., Myers, M. D., DeGross, J. I. New Information Technologies in Organizational Processes : 99-120
- Torkzadeh, G. and Dhillon, G. "Measuring Factors that Influence the Success of Internet Commerce," Information Systems Research, Vol. 13, No.1, 2002.
- Torkzadeh, G. and Doll, W.J., "The Development of a Tool for Measuring the Perceived Impact of Information Technology on Work," Omega, Vol. 27, No. 3, 1999.



# 13

## *Closing the Project*

### **Themes of Chapter 13**

- When can we close a project?
- What happens if there has been a premature ending of the project?
- What jobs do we do before closure?
- What is performance appraisal?
- How can we apply lessons towards organizational learning as well as individual learning?

## Introduction

A PROJECT FORMALLY BEGINS WITH THE APPROVAL OF THE PROJECT PROPOSAL and the appointment of a project manager. Developmental activities begin with scope definition and continue through implementation of planned activities until goals and objectives are obtained. A project must be administratively closed once the product of its outcome is successfully delivered to the customer. The scope statement describes when a project is expected to end. Administrative closure is necessary even for cases where there is a premature ending or a failure to complete the project. This chapter describes the importance of closure for projects through three sets of activities: (a) administrative closure of contracts and accounts, personnel issues, and documentation, and release or transfer of equipment and facilities; (b) performance appraisal and individual evaluation; and (c) conducting a project audit to review lessons learned and evaluate the overall project's success. This chapter provides guidelines for planning a project closure and audit. But first, we look at the exhibit below that discusses an issue that we may think is simple: How do we tell people the project is done?

### How do you tell people the project is done?

Project managers come up with creative ideas to let everyone know that they have reached the closing phase of the project and to make sure that everyone understands that. Sometimes they don't even need to mention closure. For example, often project managers organize a big party to 'launch' a new software product and invite stakeholders and others to attend the event. This serves as an announcement to everyone that the project they have been working on is complete and that they will be moving on to other projects.

When is a project complete? The simple answer to this question is that a project development is *not complete until it is closed* and until all stakeholders recognize that the process has ended and team members have moved on to the next project. This is not a trivial matter because it will impact the current schedule as well as future projects. At some point, every project, big or small, must be properly closed and documented and team members must

move on. Remember, *all projects are temporary*.

Some people on your project team, as well as on the end-user side, will drag their feet and come up with all kinds of odd reasons to continue with the project. Some of your team members may drag their feet because of their *psychological involvement* with the project and the fact that they have developed a *sense of ownership* for the project, and they do not want to let go of it. The users and owners of the project may drag their feet because they want to add new features to the project or because they want the project to help them with new tasks that were not present when the project was initially designed.

Regardless of whether these reasons are valid or not, the end result of them is likely to delay delivery. Project managers are responsible for handling the situation and keeping the project on schedule for delivery and, to the



extent possible, maintaining a positive relationship with stakeholders. It is tempting sometimes to listen to the user and continue making changes in order to increase their satisfaction. That may not necessary be a good idea for the project and the user group as a whole. It is important to realize that you cannot satisfy everyone all of the time. The project charter acts as a contract between you and the user and, in that sense, defines the *boundaries of your responsibilities* - including the deadline for delivery. It is important that the project manager maintains focus and pursues the key objectives of a project.

Project closure is important because it helps register with the user that they can take up 'full use' of the system, and it helps them to realize that the team members have accomplished their task. That, in and of itself, could be a *source of satisfaction* to the user because it will tell them that the project team has completed what they agreed to do and has done what they could to bring the project to a satisfactory close. Remember, users are often eager to have their system delivered because information system projects are notorious for being late. And, we are not talking about projects that are dysfunctional or seriously mismanaged. That will obviously generate the expected dissatisfaction.

It is also important to realize that closure does not happen in a vacuum. It is not like the project manager wakes up one day and decides to close the project. Closure is a phase in the system development life cycle that begins at some point and ends at some point. The process of closing a project involves a *steady*

*stream of communication* to key stakeholders as well as to the collective users. It starts well before the project ends; how long before depends on the scope and size of the project.

This communication must ultimately accomplish two objectives: (a) to provide *information* and documentation for the project development activities that will act as supporting evidence of responsibilities being carried out and (b) to help develop a realistic *expectation* among stakeholders regarding the project delivery date. The project manager must ensure that the information is disseminated to all stakeholders by using appropriate means, such as email, memos, intranet, and so on. Not everyone uses email or reads memos. The project manager can reach the intended audience by using a variety of communication modes.

Effective *habits* that help your communication:

**Listening** – a good communicator is a good listener. A good listener is a person that listens with the intent to understand the message. Words could inadvertently be misused and, as a result, may not convey the real intent. A good listener develops the habit of going beyond words to understand the real intent. Taking notes for later review is also helpful.

**Observing** – a good communicator is also a good observer. A good observer is a person that notices small changes, moves, and gestures that a speaker or an audience makes. Not everything can be put into words; thus the saying, 'a picture is worth a thousand

words.' A good observer benefits from what cannot be put into words or even pictures.

**Reading** – a good communicator is also an avid reader. A good reader makes reading into a hobby and enjoys the learning process that reading enables. Develop enthusiasm for reading by thinking of it as a hobby not as a task that you have to do; like habitual walkers and habitual surfers. Develop the habit, it will stay with you. It is the best way to expand your vocabulary.

**Reaching** – good communicators choose their words carefully. They show empathy for their listeners while, at the same time, getting their points across. Keeping the right balance in this respect is a talent that is gained by habits of *listening*, *observing*, and *reading*. One word here or one word there can make a difference. Keep a proactive and responsive posture in your communication; avoid being reactive.

**Spanning** – Most people resent the 'talk down' communication style, where the subject matter is watered down or, as some would call it, 'dumbed down'. It is important to educate yourself about your audience; their background, their interests; their demographics. Use that information to outline the scope and the level of your message as well as to choose your words, your examples, and your tone. It is difficult to keep the right balance when you have a mixed audience; it is useful to let your audience know the situation and adjust their expectations.

**Timing** – new technologies, like email, have created the habit of hasty response. We often tend to click on the 'reply' and 'enter' buttons too quickly. That may be okay in many cases, but there are times when we need to curb our urge for a quick reply; when we are emotional about an issue. In fact, most people will tell you after the fact that they should have waited, or as they say, 'count to three' before responding to a message. We are talking about waiting one day in most cases, or as they say, to 'sleep on it' before rushing to respond. How many cases can you think of that could not wait a day?

Finally, you have read elsewhere in this book that, for information to be effective, it must be *timely*, *accurate*, and *relevant*. That applies to communication content as well.

You don't remind people that the project will be complete six months in advance; it is like reminding people to attend a department meeting two weeks in advance, it is not *timely* and it won't grab attention.

You don't conjure up a report or give fancy exhibits, graphs, and tables if the data you have used for your report are unreliable; it is not *accurate* and it won't be good.

You don't refer to 'work breakdown structure' when giving a progress report; it is like giving a detailed computer print out to show the sales trend, it is not *relevant* and it won't help.

## 13.1 Administrative closure

THREE BROAD ACTIVITIES are carried out at the closing stage of the project: administrative closure of contracts and accounts; performance appraisal and individual evaluation; and project audit.

An information system project must be **administratively closed** once its product is successfully delivered to the customer. Even a failed project must be administratively closed. Sometimes the project is said to be **deadlocked**. This might be due to a drastic change of focus, support, personnel, executive decision, etc. In any case, the deadlocked project must be administratively closed.

The project manager is responsible for planning project closure. The **project closure plan** must address the following activities:

- a. **Identifying tasks necessary to close the project** – important tasks involved in project closure include:
  - **Project accounts closure** – most projects involve contracts with outside vendors, partners, professionals, temporary workers, and the like. These accounts must be properly closed and contracting parties duly informed. This includes closing of accounts for the individuals and professionals who are hired for the duration of the project. It is also necessary, at this point, to evaluate outside participants. Vendors should be evaluated for responsiveness, reliability, service quality, adherence to contract terms, and the like. Partners and professionals should be evaluated for their conduct, relationships, competency, added value, and so on. Other outside individuals involved with the project, such as temporary staff, should be evaluated for professionalism, reliability, and the like. These evaluations are important sources of reference for future contracts and vendor management.
  - **Delivery acceptance** – there is a potential for projects to continue adding new features, modifying existing features, providing new or additional training, and so on. Project customers often consider these activities to be a part of the original plan or their expectations. This is partly due to the nature of information technology and its potential growth. As users learn about the technology and its capabilities, their expectations alter. While this is a positive development for the organization and should lead to better and increased use of technology, it does provide a challenge for the project manager in concluding the project. Administrative closure of the project provides the project manager the opportunity to bring customer expectations and requests to a satisfactory ending. Formal acceptance of the project from the owner or the customer is necessary to accomplish that. The acceptance document should refer to the final product, the delivery date, and the end of the project.
  - **Equipment and facility release** – once the project is delivered, equipment and facilities that are assigned to the project's activities must be released. These are resources that were allocated to the project for a specified duration. Some-

times, these facilities are in demand by other projects and their formal release will allow others to utilize them. If equipment and facilities are not released when their use is ended, others may unofficially start using them, and that leads to inaccurate accounting. The timely release of project equipment will avoid that and indicates the proper use of organizational resources by the project manager.

- **Project personnel release** – project team members must move on to other projects, or go back to their departments, once the project is completed. Like customers, team members sometimes develop a psychological link with the project and might want to continue their involvement with the project indefinitely. While this may suggest that the work on the project has been rewarding and enjoyable, it should not lead to resources being extended unnecessarily. Team members must realize that all assignments are temporary and will end once the project is completed. That also means performance evaluations should be done for the duration of the project and for activities that relate to the project.

- **Acknowledgements and awards** – it is important to acknowledge and reward individuals, departments, or centers that supported the project and directly or indirectly influenced the success of the project. This provides the project manager an opportunity to build strong relationships for future projects while recognizing contributions. Considering giving awards for unique and significant contributions may be appropriate at the closing stage of the project. Organizing a social event provides the project manager with the opportunity to recognize and reward individuals for their contributions and announce the project's closure. This social event can be formal and elaborate or informal and modest, depending on the impact of the project outcome on organizational goals and objectives. Sometimes organizations use such events to promote and publicize new services and for the benefit of employees or customers. Usually, projects that are closely aligned with organizational goals and objectives are delivered through formal social events that also publicize the project's closure.

b. **Assigning individuals to carry out closure tasks** – individuals must be assigned to carry out project closure activities. At this stage, the project manager is familiar with the competency and effectiveness of each team member. This knowledge can be useful to the project manager in assigning project closure tasks to individuals. The project closure plan should identify activities that are necessary for closing the project, timelines for each activity, and the individual responsible for carrying out each activity. Key individuals who helped the project manager during team formation are good candidates for closure activities. While most activities can be delegated, the project manager must take the primary responsibility for performance evaluation. Activity and progress reports prepared by key individuals can be used by the project manager for performance evaluation.

c. **Monitoring implementation** – once closure tasks are defined and individuals are

assigned to carry them out, the project manager needs to plan for monitoring the progress. Key individuals are good candidates to carry out these monitoring tasks. In many cases, the project manager monitors the implementation of closing activities. Given the fact that most projects are over budget and behind schedule, the project manager must ensure timely closure of accounts, termination of contracts, release of personnel, and transfer of equipment and facilities. The project manager may want to develop a priority list for monitoring the closure of high budget items such as personnel.

- d. **Ending closure process** – even closure needs an ending. The project manager must ensure that project creep does not happen in the closing phase of the development life cycle. The customer or the end-user can still expect upgrades or changes, since the project is not yet formally closed. The primary intent for ending the closure process is to communicate the post-closure date to team members and the customer. The post-closure date could begin with the social events, where awards are presented and contributions are acknowledged.

## 13.2 Performance appraisal

THE CLOSING STAGE is an appropriate time for **performance evaluation** of the project team members. The project manager is responsible for evaluating each team member for their contribution to the project. This is an important responsibility, since it can influence team members' development and careers. The evaluation must be limited to activities that directly relate to the project and for the duration of that project. Most organizations have established standards for performance appraisal. These standards are helpful in guiding the project manager and providing consistency across individuals and over time.

Sometimes, **end-users** are partially involved with the project while they continue working for their functional areas. The project manager is not in the position to appraise these individuals for work done outside the scope or duration of the project. In many organizations, these individuals are appraised by their functional managers only. In that case, the project manager may be asked to provide input to the functional manager for an individual's performance on the project. As described in Chapter 8 on developing project teams, this approach may influence the loyalty of those members; people tend to respond to what influences their rewards. However, having a single source of performance evaluation simplifies the process. As seen in Figure 14.1, in appraising team members, the project manager must consider a whole range of criteria.

- Innovation and creativity
- Responsiveness
- Team work
- Customer relations
- Learning and adaptability
- Adherence to the triple constraints of time, cost, and focus
- Overall contribution to project goals and objectives.

Figure 13.1: Criteria for appraising team members

The project manager must arrange a one-on-one meeting with each team member to discuss their performance. It is appropriate for the project manager to ask the individual for a **self-appraisal**. This will give project managers the opportunity to compare and contrast their appraisal of a team member with the individual's self-evaluation. It will also help the project manager to prepare for the ensuing discussion with the individual; it provides a timely warning for the project manager in cases where significant differences exist between the two appraisals. The gap between the two appraisals is minimized when the project manager continuously and effectively provides feedback to team members about their performance and the project's progress.

In this meeting, the project manager should limit the discussion to the individual's performance appraisal relative to communicated responsibilities, expectations, and standards and avoid comparisons with other team members. Such comparisons tend to be dysfunctional in these meetings. The project manager should deal with the strengths and weaknesses of each individual, relative to specific project activities. It is important for individuals to see their contribution, or lack thereof, in the context of the project goals. The project manager must be consistent in his or her appraisal; individuals become resentful when they find out different standards are used to appraise them. The project manager must also discuss ways in which individuals can improve performance and make progress toward their career goals.

### 13.3 Project audit

PROJECT AUDITS PROVIDE valuable feedback to the project manager and the organization. There are two types of project audits. One is an **on-going audit** that is carried out during the project development life cycle. Another is an **end of the project audit** that is carried out during the project closure phase. In other words, audits are done during project development activities and after the projects are complete. There are similarities and differences in the goals and objectives for these two types of audits. An on-going project audit benefits the project management of projects currently under development more directly, while an end of the project audit benefits the steering committee and subsequent projects.

Although there are stages in the project when control procedures and a formal audit are particularly stressed, control and audit should be seen as a continuing process and be always on the mind of the project manager. A periodic project audit is necessary *during* the development process in order to provide timely and necessary feedback to the project manager, the project team, and management. The outcome of such an audit must be a report that responds to three important questions regarding the project at that stage of the project's development (see Figure 14.2).

- Are we doing the right thing? The audit can be at each milestone or at the completion of a phase, such as requirements analysis or systems design.
- Are we doing it right? The outcome at the time of audit must be evaluated relative to specifications and user needs.
- Are adjustments necessary? The outcome at the time of audit can be reviewed in terms of time, cost, and focus to see if improvement can be made.

Figure 13.2: Crucial audit questions

The audit feedback helps the project manager to correct the course of the project early in the process and avoid negative consequences. Early warnings can save significant time and effort in addressing problems that, if ignored, would later result in serious costs. A periodic audit also helps the project manager to assess other personnel and organizational issues that influence the ultimate success of the project (see Figure 14.3).

- Are we making adequate progress? Can performance be improved?
- Are stakeholders and top management still supportive of the project?
- Is the project team functioning as expected? Are there any major personnel issues?
- Are there significant internal, external, morale, and similar issues that may impact the project's outcome?
- Have organizational priorities changed? Has this affected project priorities? How serious are the changes? Is closure necessary now?

**Figure 13.3: Assessing organizational and personnel issues**

The audit report may provide complete or partial answers to these questions. For some of these questions, the audit report will provide a timely warning so that the project manager can address the issue. For example, a response to weakening support for the project may include increased communication with top management and improved relationships with functional managers. The audit report may provide an early warning about an issue that does not currently require any action but should be carefully monitored.

The outcome of an audit that is carried out *after* the project is complete must be a report that responds to the important questions shown in Figure 14.4.

- Was the project the right choice? How is the project outcome aligned with the organizational goals and objectives?
- Was the project developed right? How is the project outcome aligned with the original specifications?
- Did the project meet customer satisfaction?
- What are the lessons to be learned for future projects?
  - Leadership lessons?
  - Team interaction lessons?
  - Organizational lessons?
  - Top management support lessons?
  - External entities and vendor lessons?
- Did the project meet cost and time constraints? What were specific reasons for the project running over or under time and/or over or under budget?

**Figure 13.4: Questions to be addressed by the audit report**

Despite clear benefits, most projects are not audited. Project audits require planning, take time, take resources, and influence individuals' behavior and emotions. However, if planned and

implemented properly, project audits have short and long term benefits for the organization in general and for the project manager in particular. The **audit plan** is shown in Figure 14.5.

- The scope – what can and cannot be audited.
- Tasks to be carried out – progress reviews for each activity in terms of time, cost, and specification. The content of the final report.
- Timetable – when the audit begins, how long it should take, and when the final report is due.
- Audit team – most organizations have policies regarding membership of audit teams. These organizational policies provide consistency and must be followed. Audit activities must be independent of project activities. The project audit report must not be influenced by the project manager or team members; only external people should be involved with audit activities. The project manager and team members should be available to provide information for the audit process. Sometimes, specific team members or key individuals are appointed to cooperate with the audit team, especially for audits that are carried out during the project development.
- Audit leader – the success of the project audit depends, to a large extent, on audit leadership. Several individual characteristics influence the leadership of the project audit:
  - Independence
  - Integrity
  - Business knowledge
  - Information system project knowledge
  - Understanding of business processes

**Figure 13.5: The audit plan**

The idea of an audit creates anxiety in most situations and can lead to behavioral change. However, such consequences are minimized when organizations have audits as a rule rather than as an exception. Every project should have audits during and at the end of development activities. The project manager must welcome audits and prepare team members to understand their benefits. Figure 14.6 lists criteria on what these audits are (and are not) about.

The idea of the project audit must be a part of the project plan and considered beneficial, by team members, for the successful completion of the project. Audits provide timely and important feedback to the project manager in monitoring and controlling progress. Audit reports have the potential to protect team members and enhance management support. For example, an audit report may reveal problems that relate to unclear definitions, poor decision making, poor coordination, low commitment, poor leadership, inadequate personnel, outside interference, lack of responsibility or accountability, tight schedules, staff turnover, and the like. An audit report of an on-going project provides timely warnings that enable management to address many of these issues in a timely manner. An audit report of a completed project provides relevant information that enables the management to prevent these problems from happening in future projects.



- Project audits are not about:
  - Finger pointing
  - Who did what wrong
  - Judging
  - Retribution
- Project audits are about:
  - Prevention
  - Learning from mistakes
  - Continuous improvement
  - Measuring project success

**Figure 13.6: The characteristics of a project audit**

The audit plan can be seen as part of the toolkit of the **reflective practitioner**. The project manager needs to learn from what went right and from what went wrong in order to guide future work. Similarly, an organization where people learn from experience, so that future projects are done better, is a **learning organization**. It is obvious, but still worth stating, that reflective practitioners and learning organizations are likely to be stronger than those that do not reflect and learn. Many organizations have a comprehensive database of project lessons learned, and the potential of this to support future projects is itself a critical success factor.

## 13.4 Interview with a project manager

### Interview

**Q** WHAT is the difference(s) between a general manager and a project manager?

“**W**ell, if we limit this to IT management, a general manager can be one of several things. For example, a general manager could manage a team that does more maintenance and enhancements of current systems and/or applications, or a general manager could manage operations like the print area or a large IT shop.

An IT project manager typically focuses on new IT initiatives or “major” enhancements to a current system. A project manager may work

with resources from many areas within an IT organization, or in some instances, may have a staff of dedicated resources reporting directly to him/her. Typically projects are managed differently than small enhancements in terms of structure and reporting.”

**Q** WHAT do you enjoy most about your position?

“**W**hat I enjoy most is that, where I work, I have total decision-making abilities and I am seldom questioned about the way I manage projects. Another piece of my job that I find very rewarding is to watch people

under my direction grow and develop. I get a sense of accomplishment in knowing that I am helping others with their careers.”

**Q** WHAT is most challenging about your job?

“**W**ell, there are several things, but I guess the main challenge I have is that I am not allowed to pick the technical or business resources for some of my projects (I do get to pick for some of them). I prefer to work with a very self-motivated, self-directed staff that is not afraid to provide input, very willing to share information, and a team with a good attitude and willingness to get the job done on time no matter what it takes. Sometimes I get stuck with much less than that.”

**Q** WHAT is unique about your job?

“**E**very project is different. For the projects I manage, each team is different, the technology is different, the project goals are different, etc. It is constant variety.”

**Q** WHAT are the tools that you use on a daily basis?

“**M**icrosoft Office (Excel, Access, Word, PowerPoint), Microsoft Project or Project Central, Visio, and I use other tools since I have maintained a very technical background and assist in data modeling, design, and every once in a while still troubleshoot source code.”

**Q** HOW do you motivate your team?

“**R**ather than have just a couple of technical leaders working on my projects, I actually assign everyone a leadership role – even if it is a small one. I also have a couple of people on the team maintain a project website and I purchased a digital camera so that we can have a project photo album on the site. The site makes it easier to navigate and find technical documents, requirements, time sheets, etc.”

“I always give everyone a chance to provide input and generally reward those that come up with ideas that significantly benefit the project. Also, my team truly knows I care about them and try to help them out (particularly the ones that want to move on to positions that required added responsibility). Also, my team knows that I shoot straight and do not play the political games and hide information that some project managers do. You have to earn your team’s respect, and you can’t do it unless you are straightforward and sincere.”

“Also, I have events. For example, depending on the age and overall personality of the team, I pick from several things. One project team I am currently managing (this is a small team of 12 people) meets the 1st Monday of each month during the lunch hour. Sometimes we bring bag lunches, and sometimes we decide to all bring something like Mexican food. We scheduled on Mondays so that people would be able to put something together over the weekend, if need be. Anyway, then we go to this conference room and play a game (Pictionary, Gestures, or something like that). Pictionary is great to break the ice with a new team. Someone on the project team coordinates the event each month (whether we are going to bring snacks or bring our own lunches, or order in from Quiznos or whatever) and which game we’re going to play.”

**Q** WHAT keeps you motivated?

“I like what I do. I find my position very satisfying and I have always been self-motivated. I guess my main motivation is I feel personal senses of responsibility in ensuring everything is running smoothly and quality work is being produced.”

**Q** WHAT is your typical day at work like?

“On any given week, I have vendors in to demonstrate something we are interested in, I have meetings with both my direct management and project status meetings with our executive management, and team meetings for projects. I also take time to visit with some of our stakeholders face to face each week. And...I review the project constantly to see if one area is getting behind and determine the best approach to catching up. It's hard to describe a typical day because every one is very different.”

**Q** WOULD you consider this a position that you would be able to learn “on the job” or through an academic institution?

“I would never put someone in a project management position for an IT project that has not had years of hands-on development experience (actually coding experience) and a strong background in systems analysis. Our company does not have anyone in a project management role that does not have these 2 qualifications along with strong insurance industry knowledge and at least 2 years of management (systems maintenance management). I think you have to prove capabilities as a man-

ager before you can prove yourself as a project manager. Some people disagree with this, but I network with project managers from many companies and have never found one willing to hire without several years of experience outside of project management.”

**Q** WHAT are some of the success factors that you would recommend?

“I can provide you with a ‘top ten’ list of success factors:

1. Keep an open mind: Things change, you may be wrong, so don't appear stubborn and unchangeable.
2. Listen to your team: This is an extension to the first point. If you can keep an open mind, your team will suggest improvements – knowing that they will not be fobbed off due to your inflexibility.
3. Do not take on a project where you cannot understand, in detail, the technical components, technical architecture, and the business driving the project.
4. Read constantly – much of what we learn is through reading
5. Discuss constantly - courses can also help as can conferences through talking to colleagues with more experience. Talking to those with similar levels of experience can also be helpful as they can act as ‘walls’ to bounce ideas off.
6. Be meticulous, organized, and bring structure to the projects you manage.
7. Be committed to quality and be a role model for your project teams.

8. Document well. No-one will know about your achievements if they are not communicated, and this includes documentation.
9. Keep everyone abreast of project information (do not think your team doesn't need to know things, they may want to know everything). Even when doing presentations for executive management, distribute copies of the material to everyone on the project team.
10. Praise your team and your project – if you don't, no-one else will!

**Q** WHAT advice would you give to a recent graduate that would like to pursue the position of a project manager in the near future?

**“**Expect a career in which you will not have 8-5 working hours. Gain some experience in general management – it's important before managing project teams. Also, if you ever plan to manage IT projects, then you will never have the respect of your technical staff if you do not have a technical background. Get one!”

## Chapter summary

PROJECT MANAGEMENT INCLUDES administrative closure of the project and formal delivery of the final product to the customer. Project closure prevents scope creep. Primary activities at the closing stage for a project include administrative accounts closure, performance evaluation of team members, and a project audit. Contracts and accounts must be properly closed, including those of professional employees hired for the duration of the project and equipment and facilities transferred to the project for use. Team members must be appraised for their contribution to the project. The project manager must evaluate each team member with the intent to assess individual contributions to the project as well as to provide constructive feedback to the individual regarding career development. Project audits should be carried out during the development as well as at the end of the project. Audits during project development provide timely warning to the project manager to address potential problems and avoid serious consequences. Audits at the end of project development provide useful feedback for future projects and help management avoid costly mistakes. Project audits are not always carried out, and individuals sometimes react with anxiety to them. However, this anxiety factor is minimized when audits are carried out regularly and with the intent to learn and to improve project outcome. All projects must include project audits as part of their plans.

## Discussion questions

- a) Comment on the following statement: “We cannot afford to terminate the project now. We have already spent more than 50% of the project budget.”
- b) It is suggested that project audits create anxiety among team members, may lead to internal politics among departments, and in turn, make the whole process dysfunc-

tional. Describe the benefits of a project audit and suggest ways of implementing it that avoid these problems.

- c) What are the main differences between auditing a marketing project versus auditing a project? What are the similarities?
- d) How would you justify cost, time, and efforts spent on auditing an on-going project? A completed project? If you had a choice of only one, which audit would you think the most useful, during or after? Why?
- e) Comment on the following statement. “You cannot manage what you cannot measure.” Is this statement true in the case of project management?
- f) Why is it difficult to perform a truly independent and objective audit?
- g) What personal characteristics and skills would you look for in selecting a project audit leader?
- h) Do you agree with our project manager’s ‘top ten’ critical success factors for the role?

## Exercises

- a) Design a survey questionnaire for measuring team performance. Include in this survey:
  - Who should respond to your survey.
  - The instructions for respondents.
  - A scale.
  - Six questions.

Describe your rationale for the way you designed your survey. For example, why did you choose the scale that you did? Why did you choose the set of questions that you did? Hint: use the reverse of ‘input– process– output’ model for designing your survey.
- b) Prepare a table with two columns. In the first column, list four individual characteristics and skills that you would look for in selecting a project audit leader. In the second column, provide your reasoning for each of those individual traits.
- c) Performance review of team members is an important activity that, if done properly, will improve member behavior and be a base for reward and promotion. List what, in your opinion, are important characteristics of an effective performance review. What would you not include in your performance review list; things that, in your view, would be counter effective?
- d) Describe performance evaluation of information system projects from the following two perspectives. (a) You as a team member being evaluated. What approach would be most beneficial to you? What approach would you find least beneficial? (b) You as an information system project manager evaluating your team members. What approach would be most practical to you? What approach would you find least beneficial?

## Important Concepts

**accounts closure** (pg. 261)

**acknowledgements and awards**

(pg. 262)

**administrative closure** (pg. 261)

**assigning individuals to closure tasks**

(pg. 262)

**audit plan** (pg. 266)

**characteristics of a project audit**

(pg. 267)

**deadlocked** (pg. 261)

**delivery acceptance** (pg. 261)

**end of the project audit** (pg. 264)

**end-users** (pg. 263)

**ending closure process** (pg. 263)

**equipment and facility release** (pg. 261)

**learning organization** (pg. 267)

**monitoring implementation** (pg. 262)

**on-going audit** (pg. 264)

**performance evaluation** (pg. 263)

**personnel release** (pg. 262)

**project audit** (pg. 264)

**project closure plan** (pg. 261)

**project closure tasks** (pg. 261)

**reflective practitioner** (pg. 267)

**self-appraisal** (pg. 264)

## **Bibliography**

Gray, C.F., Larson, E.W. (2003). *Project Management: The Managerial Process*, McGraw-Hill/Irwin.

Gray, Clifford & Larson, Erik, *Project Management: The Managerial Process* (2003), McGraw-Hill Irwin, New York.

Jones, Gareth & George, Jennifer, *Contemporary Management* (1998), McGraw-Hill Irwin, New York.

Kerzner, H. (2003) *Project Management: A systems Approach to Planning, Scheduling, and Controlling*. Wiley.

Lemberg.com, *Seven Ways to Be Unreasonable* (2003), Paul Lemberg at: <http://www.lemberg.com/unreason7.html>

ProjectManagement.com, *The Five Ws of Project Management* (2003), Tim Arthur at: <http://www.projectmanagement.com/article/1,2462,91268,00.html>

Rankos, J. (1990) *Software Project Management for Small to Medium Sized Projects*. Prentice Hall.



## *Codes of Behavior*

### **Appendix: Codes of Behavior – Discussion questions**

1. Regarding the ‘code of ethics’ provided in the Appendix, prepare a short report that outlines your opinion and comments on the subject. Does it make sense to you? Which part of this code do you agree with and which part do you question?
2. Search the web for other examples of codes of conduct relevant to any of the stakeholder types mentioned in this chapter.
3. Suggest a code of ethics for students. Are you and your colleagues consistent with your code of ethics?

## APPENDIX: CODES OF BEHAVIOR

AS WE SAW IN CHAPTER 1, PROJECT MANAGERS ARE EXPECTED TO BEHAVE in an ethical way. Indeed, they are expected to behave in accordance to good standards generally. Many of these standards are obvious, and represent good codes of behavior in all walks of life.

The Project Management Institute (PMI) is a professional organization dedicated to the development and promotion of the field of project management. Its website is <http://www.pmi.org>. Its *Member Code of Ethics* can be found at [http://www.pmi.org/prod/groups/public/documents/info/ap\\_memethstandards.pdf](http://www.pmi.org/prod/groups/public/documents/info/ap_memethstandards.pdf), and it attempts to define and clarify the ethical responsibilities for present and future PMI members.

The code begins with the statement: ‘In the pursuit of the project management profession, it is vital that PMI members conduct their work in an ethical manner in order to earn and maintain the confidence of team members, colleagues, employees, employers, customers/clients, the public, and the global community.’ It goes on to ask members to pledge to uphold and abide by the following:

- I will maintain high standards of integrity and professional conduct.
- I will accept responsibility for my actions.
- I will continually seek to enhance my professional capabilities.
- I will practice with fairness and honesty.
- I will encourage others in the profession to act in an ethical and professional manner.

Following these pledges, there are sets of member standards of conduct. These are more detailed. We will pick on a few of these for discussion. For example, for professional behavior, it asserts: ‘*PMI Members will fully and accurately disclose any professional or business-related conflicts or potential conflicts of interest in a timely manner.*’ *Is it reasonable to expect project managers to disclose all potential conflicts? What happens if the disclosure is against the interest of the company or the department where the person is working?* PMI Members are asked to ‘*refrain from offering or accepting payments [which] may provide unfair advantage for themselves, their business or others they may represent.*’ *Is this reasonable if they work for a consulting firm – are they not looking for further work for their business (at the cost of work for other businesses)?*

THESE GUIDELINES ARE rather general. Start to construct additional pages to this guide, where you provide clauses which give more specifics and examples for project managers. You can add to this as you read further chapters of this book.

*Can you ascertain what happens if the PMI member fails to carry out one or more of the codes?*

Along with professional societies for project managers in general, project managers developing information technology projects might be expected to belong to one of the professional associations related to computing and information systems. The most well known are the Institute of Electrical and Electronics Engineers (IEEE) <http://www.ieee.org> which describes itself as the ‘the world’s leading professional association for the advancement of technology’ and the Association of Computing Machinery (ACM) <http://www.acm.org> ‘the world’s first educational and scientific computing society’ in North America; with their equivalents elsewhere, for example, the British Computer Society



(BCS) ‘the leading professional body for those working in IT’ at [www.bcs.org](http://www.bcs.org) and the Australian Computer Society (ACS) [www.acs.au.org](http://www.acs.au.org), which describes itself as ‘the public voice of the ICT profession and the guardian of professional ethics and standards in the ICT industry, with a commitment to the wider community to ensure the beneficial use of ICT.’

The IEEE/ACM have a joint code of ethics and professional practice for software engineers; who are described as ‘those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.’

The Code contains eight Principles related to the behavior of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession. The Principles identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer’s humanity, in special care owed to people affected by the work of software engineers, and in the unique elements of the practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

LOOK CAREFULLY THROUGH the Code and address the same questions that we suggested for the PMI code. In your view, does the statement “ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations” provide an opt-out to good practice?

The first ‘public’ principle asks that software engineers ‘accept full responsibility for their own work’. What happens if the member was following the orders of his/her manager who required the work to be done in this way, even if that way conflicted with the individual’s way?

With regard to the second principle on the relationship between the client and employee, the client is asked to provide ‘service in their areas of competence, being honest and forthright about any limitations of their experience and education.’ Are all consultants honest in this respect? Would they get work if they were ‘totally honest’?

On the fourth principle, about product, the engineer is asked to ‘strive for high quality, acceptable cost and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.’ Why is it, then, that so many projects fail in some way?





# *An Introduction to Microsoft Project*

## **Appendix: An Introduction to Microsoft Project - Instructions**

Follow the instructions set out in the Appendix

(if you do not have Microsoft Project available, you can download a trial version, valid for 180 days, from the Microsoft website [www.microsoft.com/downloads](http://www.microsoft.com/downloads))





## *How to Transform a Failing Project*

### **Appendix: How to Transform a Failing Project - Discussion questions**

1. Why do you think it is particularly difficult to turn around projects that seem to be heading for failure?
2. Do you think the problems were put right by getting the ‘people problems’ or the ‘technical problems’ solved or a mixture of both?
3. Discuss the role of the E-envoy as ‘champion’ for the project.
4. Search the web for references to the Denver International Airport project and discuss similarities and differences with regard to this case.
5. Was one of the users ethically correct to ‘blow the whistle’ on the project?

## APPENDIX: HOW TO TRANSFORM A FAILING PROJECT

The case looks at an issue that has bedeviled projects for many years. It concerns the situation when a project seems to be failing and it is vital to get the stakeholders to somehow change direction to a more positive course. This is particularly difficult because the norm is for the 'ball to run on in the same direction' even if it is the wrong direction. Stopping a project is a difficult enough task, but it is even more difficult to restart it on a different and more successful course. Yet IS projects are complicated and tend to have frequently changing requirements, even as the project develops, that cause the project scope to change frequently. Projects that exhibit such volatility are especially difficult to manage and control. Organizations frequently react by investing additional resources in failing IS projects in an attempt to make them work, and consequently, these 'runaway' projects are continued even though it may make more economic sense to stop them. Here we discuss aspects of an electronic government application in a local UK metropolitan borough council where the project was out of control originally but was turned around to be a successful project. A similar example which illustrates this is the baggage handling system at Denver International Airport, a troubled IT project, which was 16 months behind schedule and close to \$2 billion over budget, but was eventually turned around. Actions to turn such troubled projects around might include redefining the project, improving project management, changing the project leadership, and adding and/or removing resources.

This UK municipal borough has an elected council that serves a local population of 221,000 residents and provides a large range of services. The idea of e-government originated from the UK central government's 1999 white paper, *Modernizing Government*, which challenged all public sector organizations to achieve 'citizen-centered services', by integrating policies and programs, 'joining-up' delivery, harnessing the power of IT, and getting the best out of staff. The white paper committed the government to the 'use of new technology to meet the needs of citizens and business and not trail behind technology development'. The overall champion for the e-government initiative was the cabinet deputy of the council, who was assigned a special post known as the 'E-envoy'. His main responsibility was to propel the e-government initiative and he had several key responsibilities: to deliver the existing Cabinet Office target for electronic service delivery (e-government agenda); to define and drive implementation of a government-wide IS strategy to support the public sector reform agenda; and also to provide leadership and guidance for the e-government initiatives.

In 2000, there was a need to revamp the existing purchasing function in order to meet the target set within the e-government strategy plan that 100% of the goods purchased by the council had to be purchased electronically by 2005. Besides that, there were other considerations for the council to implement the e-procurement system. These reasons included improving purchasing efficiency, setting up a cost control mechanism, and a strong desire to be the first local council in the United Kingdom to purchase goods and services electronically. The council head gave full support for the project and the 12-month project was launched in January 2001 with an initial estimated cost of £150,000. The project was headed by the IS manager, who was supervised by an e-procurement committee formed by a group of senior managers within the council. An external software vendor,

selected through a bidding system, helped to develop the software. Other key stakeholders included the internal users of the system, such as the chief procurement officer, corporate service manager, corporate affairs manager, technical service manager, and the e-business manager. External users included goods and services suppliers.

The project faced several problems during its early stage of development. The main problem concerned conflicts among project managers, the users, and the IS contractor over design issues. On the one hand, internal users complained about the low quality of the software prototype and the failure of the contractor to understand their requirements. On the other hand, the IS project manager and the IS contractor were dissatisfied with the indecisiveness of the users and pinpointed their frequent requests for design changes as the main reason for delays in project development. The project initially stalled because of a disagreement between the users and the IS contractor. The disagreement started when the IS contractor demanded an additional £150,000 for 'redesigning the software again'. Their reason was that, because the contract price was 'fixed', any changes to the software after the users signed off on the earlier versions of software prototypes were chargeable. The reason why the IS contractor asked for 100% of the original cost for the cost of redesign was that it had anticipated that the users would make many more rounds of modifications to the requirements. However, the users disagreed with the contractor's claim because they viewed those changes as alterations resulting from the contractor's mistakes, rather than additions requested by them. Eventually, the e-procurement steering committee intervened and agreed to make the additional payment.

After the committee's intervention, the project continued for another 2 months before it finally collapsed. The same problems resurfaced and the users refused to continue participating in project development. Instead, they proposed the purchase of e-procurement packaged software. At the same time, the IS project manager seemed to lose control of the project and was busy haggling with the IS contractor over the issue of which requests were categorized as 'additions' and which were 'alterations'. Despite this dire situation, the e-procurement committee did not intervene directly, except for insisting to the users that the project had to be continued. However, they did promise more resources. While the users were resolute about project abandonment, the IS project manager insisted that they should continue. He explained: 'How could we give up? With all the resources invested, the option of reverting back to buying packaged software was unimaginable.' At that stage, the project had already exceeded £300,000 and was 6 months behind schedule. Apparently, the IS contractor was billing for changes made on an ongoing basis plus the fees for engaging a subcontractor who specialized in system integration.

Refusing to continue with the troubled project, one of the users decided to 'blow the whistle' on the project by reporting to the E-envoy. She explained why she blew the whistle: 'I believed the involvement of the E-envoy would resolve the entanglement. The committee and the project manager were too optimistic and irrational from my perspective.' In December 2001, the E-envoy was informed and was surprised at the problems facing the project. He explained why the news came as a surprise to him: 'I had delegated the project manager and the e-procurement steering committee to lead the project. Besides, even at the bimonthly management meetings over the past few months, the committee members did not inform me of any problem arising.'

Immediately, he delayed the development project indefinitely until a decision had been made. To resolve the problems, he gathered relevant internal and external stakeholders, including the Council Cabinet representative, the strategic management director, the head of IS services and the project development team that consisted of the IS project manager, an IS analyst, users representing several business functions, the goods and services suppliers and the IS contractor.

The E-envoy had to send emails to these stakeholders requesting them to attend the meeting. In some cases, he even had to convince them of the importance of the meeting by conducting numerous rounds of telephone conversations. To reconfirm his commitment to the project, he stated a strong desire for the project to be continued rather than abandoned and was very confident of a project turnaround. He commented: 'It was important for everyone to understand my standpoint, especially in that state of confusion. Besides, those problems could be easily resolved as long as everyone was committed to turn the troubled project around.'

Once everyone had agreed to continue the troubled project, the E-envoy organized a focus group meeting with the e-procurement steering committee, the IS project manager, the user managers, and the IS contractor to re-examine their previous problems. With the E-envoy's presence and participation, everyone showed great enthusiasm in the meeting. At the beginning of the meeting, the E-envoy delivered a speech to explain the significance of the meeting: 'I simply assured them that no individuals would be punished in this project. I also stressed that turning around the failing project was our utmost priority in order to salvage our reputation and the confidence the external stakeholders had in us.'

The assurance from the E-envoy was well received by everyone present in that meeting as they began to discuss their differences openly. They were unafraid of highlighting their mistakes. In that meeting, several problems were identified. Sensing the E-envoy's determination to succeed, all relevant stakeholders arrived at a multilateral consensus to attempt to turn the project around. The IS project manager explained the change of attitude: 'Basically, he [the E-envoy] banged all our heads together. All he wanted was to try and get the cohesion of the team back. We promised him that we would get together and work out the differences.' Despite the successful turnaround of the attitudes, the IS project manager did admit that it was a very difficult phase: 'We felt relieved that the E-envoy accepted our apologies for the earlier mess and it also took several of us quite a while to restore our confidence that a turnaround was indeed possible.' Furthermore, it was also discovered later that any packaged software would need a large degree of customization, which supposedly might take up to 6–9 months. The chief procurement officer admitted: 'It was unsuitable for the council as the customization process would be too long for the project.'

Having identified the problems, the whole team started to explore alternative courses of action. For the first time, with the participation of the E-envoy and the e-procurement steering committee, the three groups (the user managers, the IS project manager, and the IS contractor) started to co-operate and work towards a common goal. Sensing the E-envoy's determination to succeed, all relevant parties arrived at a multilateral consensus to draw up a list of turnaround tactics. The team proposed the adoption of a partial abandonment strategy, which was to reduce the original scope of the project without causing significant changes to its original specification. For that reason, three



user departments were short listed as the pilot sites, hence allowing the IS project manager to deal with the needs of only three user departments rather than the eight departments formerly required. Furthermore, the project had been separated in three stages. Instead of implementing full-scale procurement functions all at one go, the first stage would now focus on the 'front purchasing process', which included ordering, issuing of purchase orders, and delivery of items.

In February 2002, the E-envoy ordered a stakeholder analysis before carrying out the action plans. The purpose was to find out whether relevant internal and external stakeholders fully supported the devised turnaround strategies. The new stakeholder analysis was seen as necessary because actors involved in the development process could still be strongly committed to the prior, failing course of action. The e-procurement steering committee members carried out the stakeholder analysis. Many project members and users still had doubts, but because the E-envoy was personally involved in the turnaround effort, they did not put up a strong resistance for fear of upsetting him. The E-envoy and the committee members had spent considerable effort to convince the project group and the users. Project members were also encouraged to discuss among themselves whether the exit strategy was the best available option.

All the changes were implemented immediately and they produced remarkably encouraging results. The corporate service manager commented positively: "This time, we started to thrash out what the problems were with the IS contractor and found out what we needed. We drew up a timescale and everybody had to stick to it. The turning point was that we were able to communicate with the IS contractor directly. Everything was so easy after that." The IS project manager also commented: "With fewer users, things seemed to progress smoothly and quickly. I would think that every one of us was determined to make this work. Even the IS contractor came to meetings two or three times a week. The new team seemed to show more enthusiasm and responsibility. In addition, the E-envoy's close monitoring kept all of us on our toes."

When the first phase of the e-procurement system finally went 'live' in August 2002, the project was 8 months behind schedule and close to £500,000 (US\$950,000) over its original budget. However, the relatively smooth implementation after the adoption of the new strategy meant that the crisis concerning the project was finally over.

*This case study is adapted from Gary Pan, Shan L. Pan, Michael Newman and Donal Flynn, Escalation and de-escalation of commitment: a commitment transformation analysis of an e-government project, Information Systems Journal, 16, 1, 2006.*





## *A-Bank Part 1*

### **Appendix: A-Bank (Part 1) - Discussion questions**

1. What did the first project manager, Smith, do that was correct, in your view? What were his main mistakes?
2. What did the second project manager, Bond, do that was correct, in your view? What were his main mistakes?
3. How would you have done the task of generating a comprehensive command list for Techsource? What specific steps would you take?
4. Discuss (a) leadership role at A-Bank, (b) employee morale at A-Bank, and (c) relationship building with Techsource throughout the project.
5. Assume you are the project manager at A-Bank responsible for developing a similar organization wide system.
6. Looking back at the experiences with 'receipt imaging' system, summarize major lessons learned from that project and how you would benefit from them.

## APPENDIX: A-BANK (PART 1) - IMPLEMENTATION

THIS CASE IS AN EXAMPLE OF HOW THINGS CAN GO WRONG IF THE PROPER steps are not taken during a project. This is a real case about a 'receipt imaging system' at a mid-size credit union bank in the United States. However, anonymous names are used throughout the case to protect the identities of the firm and individuals. This case is presented in two parts: Part 1 (implementation) and Part 2 (evaluation), which is found in Appendix E. In this two-part case, specific emphasis is placed on project selection, project portfolio management, project plan development, inter-organizational relations, leadership, project risk management, project scope, and post project audits.

A breakdown of A-BANK's corporate history as well as some of their IT projects will be described. In-depth analysis will be done on one of these projects, namely their *receipt imaging* implementation project. This analysis will include information on how the project was chosen, resources were allocated, implementation was handled, and follow-up evaluations were done (Part 1). A detailed hindsight evaluation will then discuss what was done well and what could have been done better. With this in mind, recommendations will be given on how A-BANK, and other organizations, can improve their project management in the future (Part 2).

### D.1 Background

IN THE EARLY 1950s a feeling of general dissatisfaction with banks was spreading across the United States. The root of the problem was that banks put stockholder satisfaction ahead of customer satisfaction. They were making business decisions based primarily on their financial bottom lines without giving much consideration to how their customers felt. In addition to not being very service oriented, banks had to pay high corporate taxes and substantial dividends to stockholders. These expenses led to higher loan rates and lower dividend rates; exactly the opposite of what their customers wanted. As a result of these factors, a large credit union movement was started. Credit unions functioned much like a bank but were organized and owned by their members and paid no taxes. This opened the door to better customer service and more favorable interest rates. A-Bank is one of these credit union banks and was established in 1951. It now has more than 350 million dollars in assets and over 30,000 members. It serves its customers through five branches and 30 ATMs. From the day they were organized, their mission has been to help their members earn and keep more of their own money. To achieve this mission, they strive to give their members the best possible service at the lowest possible price.

### D.2 IT at A-BANK

AS COULD BE expected in the 1950s, A-BANK ran their business through a general ledger book in the beginning. However, throughout their history they consistently implemented any cutting edge technology that their board of directors deemed cost beneficial through a payback analysis. In general, if a project could pay for itself within 2 years through lower expenses or higher productivity, it was approved. One of these IT implementations was a revolutionary mainframe-based

accounting and transaction system implemented in 1981 by the outsourcing supplier EDS. This system served as their main IT system until 1990 when a new information system replaced it. This new system offered several important new modules, including a collection system and loan approval system. It was also capable of working with several powerful third-party software products.

Big changes came once again during the technology boom in the late 1990s. Adding to the power and flexibility of their system; they replaced all of their dumb terminals with PCs. This expansion allowed users to continue to do everything they could do before and a lot more. It opened the door to using Microsoft Office products, internet applications, email, paperless reporting and much, much more.

Today A-BANK continues to be innovative while keeping their expenses very low. One of the reasons for their success is that they continue to implement only IT projects that will pay for themselves in a short period of time. For example, in early 1999 A-Bank was faced with having to build additional offices to house their growing phone centers. To counter this huge expense, the CIO proposed that they implement a remote access system that would allow remote connections to both their computer network and phone system. This would enable phone center employees to work at home. Although this was a very expensive proposition, it was over a million dollars cheaper than building new offices. This 'out of the box' idea was accepted by the board of directors and implemented with huge success. Workers liked the flexibility of working at home and the new offices were never built. Other technology implementations that have been very successful at A-BANK include an internet banking and bill payment system, an in-house Debit/ATM card production system, a document imaging system, an integrated phone/fax/email system, a real estate document system, and many more.

### **D.3 Receipt Imaging**

IN LATE 2000 there was a buzz regarding receipt imaging. The concept was simple. When a receipt was printed for a member, an image of that receipt and the member's signature would be captured and stored in a database. During the capture process certain parts of the receipt, such as name, account number, and date, would not only be captured but also be converted into searchable index fields in the database. This database could be readily accessed later via a search engine and a copy of a receipt and signature could be printed from the previously captured image.

At the time, most credit unions, including A-BANK, used multi-page carbon receipt forms and stored physical copies of every receipt. Boxes of these receipts would be organized by date and stored in warehouses. Research under this system was extremely slow. In order to find a specific receipt, an employee would have to sift through a day's worth of receipts. If it was not known exactly what day a transaction took place, the search could take weeks. With a database searchable by dates, teller IDs, transaction amounts, and names, this search time could be reduced to seconds. In addition, because all of the data was captured electronically, only a single form receipt for the member would need to be printed at the time of the transaction. The imaging solutions had the potential to increase productivity and drastically cut storage and research costs.

Because A-BANK had a reputation for being on the front end of the technology curve, several

venders of receipt imaging systems approached them. Some even wanted A-BANK to beta test their products. As a result, the CIO and other executives decided to analyze the idea to determine if it was right for A-Bank. Information systems personnel, lead tellers, service center managers, and all the executives were consulted in the process and a report of pros and cons was produced.

It was concluded that a receipt imaging system would fit perfectly within the business process of A-Bank and would have several positive effects. First, it would reduce research times for past transactions from days to seconds. In the case of divorce or suspected fraud, it was not uncommon for A-BANK to get requests or subpoenas for all signed receipts on a given account for a specific time period. These requests could take weeks to fill. For example, suppose a subpoena was received for copies of all signed transaction receipts on an account for the last year. The first step would be to create a list from the host database of all the transaction done on the account over the last year. Then, a request would be sent to the warehouse to retrieve the daily box of receipts for every day a transaction was done. This could be dozens of boxes. When the boxes were received, they would be sifted through until all the receipts were found. Photocopies of these receipts would be made and the boxes would be returned to the warehouse. Assuming the same scenario under a receipt imaging system, a single query could be run on an account and images of all signed receipt copies could be pulled and printed in minutes. This would obviously be a major step in turn-around time, as well as a reduction in labor costs.

Second, it would eliminate organizing, packaging, warehousing, and the destruction of receipt copies. This step currently required a great deal of coordination and effort from several departments. Tellers would bundle all of their receipts at the end of each day, bag them as a branch, and send them to headquarters. Back office personnel would then sort the bags by branch and box them up. These boxes were labeled and stored in-house for 2 months. At the end of 2 months, vault workers would ship the boxes to a warehouse. They would be warehoused for a minimum of seven years. After seven years they were destroyed. The cost of organizing, packaging, shipping, warehousing, and destroying these receipts was very high. All this would be eliminated under a receipt imaging system.

Finally, because multiple copies of receipts are not needed under a receipt imaging system, it would not be necessary to use multi-page carbon receipt forms and impact printers. This would allow A-Bank to use cheaper receipt forms and laser printers. Currently, dot matrix impact printers were being used. These printers were old, loud, temperamental, and expensive to fix. It had been the desire of the IT staff for some time to eliminate the impact printers in favor of laser printers. Receipt imaging would allow such a conversion to take place.

The only apparent negative to implementing a receipt imaging system was the need to train employees on yet another new system. Because of the many IT changes that had taken place in the past few years at A-BANK, this was not a huge concern. It was believed that the employees would adapt to this system quickly, much as they had done with all the other recent IT changes.

## **D.4 Receipt Imaging Vendor Selection**

ALTHOUGH NO SPECIFIC comparative analysis was done, in light of the many benefits that

would come with a new receipt imaging system, the project was moved to the top of the priority list. Therefore, the CIO had to decide quickly which vendor had the best product, the best value, and the best ability to work with his project manager for implementation. In addition, before approval would be given, he would be required to present a favorable cost benefit analysis of the chosen product to the board of directors.

His search for the best system was quickly narrowed down to three companies: Vendor, Techsource, and Techlogic. The first company, Vendor, was an immediate favorite because A-BANK used them for their main transaction system. In fact, their receipt imaging solution was specifically designed to work with their existing infrastructure. This product had been heavily tested and would bring few, if any, implementation headaches. Because the same company would support both the receipt imaging and the transaction systems, support would be centralized. All problems would be filtered through Vendor's help desk. However, this solution carried a huge price tag; nearly double that of the other companies.

Techlogic operated as a third party solution to Vendor's transaction system. A-BANK was currently using Techlogic for other document imaging such as checks and loan documents. They had been very reliable and user friendly. If they were chosen, the new interface would be blended with their existing imaging system. This would allow copies of receipts, checks, signature cards, and loan documents to be retrieved from the same place. However, they were in the very early stages of development of their receipt imaging system and their cost was rather high. The CIO was hesitant to jump in before Techlogic had implemented their product at a few more credit unions.

Techsource also operated as a third party solution. However, they were by far the most established and inexpensive choice. They had a solid track record of success with nearly a hundred credit unions already running their system. Their customer references checked out well and their price tag was very low. However, they had never implemented their software in conjunction with the host system at A-Bank. This was a huge concern for A-BANK, but they were assured that the system would need only minor enhancements to function well with the host system.

After doing a cost benefit analysis on these three companies, Vendor was eliminated due to its high cost. Vendor did meet the board of director's criteria but was much more expensive than the other two companies. With Vendor out of the picture, a comparison of Techlogic and Techsource was done. It was determined that the only advantage to Techlogic was its integrated interface. Management felt that this feature was not worth the larger price tag. Therefore, it was decided that Techsource was the best choice. However, management was still not convinced that they should move forward. They were concerned that Techsource had never implemented their product with the A-Bank host system. Therefore, further investigation of Techsource Systems was done.

A-BANK obtained several Techsource references and followed up on them. All of the companies they spoke with were having a great deal of success with the Techsource's receipt imaging system. They were happy with the functionality and service and all but one reported no problems with the implementation. The bank that had a problem reported that after implementation some of their receipts were not recognized by the system. However, Techsource developers remedied the situation within 48 hours. Even with these references, there was concern about being the first to run

this system with the A-Bank host.

Techsource assured A-BANK that working with a new host system was not a problem. It was simply a matter of configuring their software to know the format of a host receipt. This could be done in a short time by providing Techsource with a copy of each type of receipt. They would be able to make the modifications to their software in a short period of time. Under these assurances from Techsource sales representatives, A-BANK signed a contract with Techsource solutions. The nearly \$110,000 balance of the contact was paid up front, and a maintenance contract was signed for 5 years at \$3000 per month plus a nominal charge per receipt. The monthly billing was set to start immediately.

## **D.5 Receipt Imaging Implementation**

THE CIO BELIEVED that the implementation project would deal mostly with installation of software and training of employees. Therefore, the CIO handed the project over to Skippy Smith to be the new project manager who would be overseeing the receipt imaging implementation. Smith was the network administrator at A-BANK and his skills were primarily technical. However, he had successfully completed a real estate document system implementation recently and had shown a great deal of ability to work with other departments in order to complete the difficult project. Smith was instructed to coordinate the implementation with the other members of the IS team and assist HR in employee training. He would be given whatever human resources were necessary to complete the project in a timely manner.

Smith's first step in the implementation process was to provide Techsource with a list of all Vendor commands that produced receipts. They also wanted copies of each type of receipt. He approached the vice president of service for assistance in creating this list. After a brief meeting, they sent a list of 18 commands and a copy of each type of receipt generated by those commands to Techsource. This was extremely critical for Techsource because these receipts would be stripped for data to populate their database. Therefore, the location of certain information on these receipts was critical.

Next, Techsource informed Smith that, in order for the new system to work, each workstation had to have a static IP address. Currently, A-BANK used a DHCP server that would assign a temporary address every time a PC logged onto the network. Assigning static addresses to all of the workstations at all of the branches was a big job but not unreasonable. However, A-BANK had several people working at home via a virtual private network. Under the current setup, it was not possible to configure these people with static IP addresses because they were using standard internet service providers to connect. They would all need to be upgraded to static connections. This was an expense and effort that was not planned for. However, it had to be done. Smith and his staff devised a system of address numbering and reconfigured all the workstations at all of the branches. His team also worked with local phone, DSL, and cable companies to get static IP addresses assigned to all workstations at employee's homes.

About six weeks after sending Techsource the list of commands, Smith received word that the receipt imaging software had been adapted for the system previously developed by Vendor and was



ready for testing and implementation at A-BANK. Techsource generally sent out a specialist for two days to a site to do product implementation. One day was used for software and hardware installation and a second day was used for training and 'hand holding' during the first day of use. However, because this was the first time their software had been run with a Vendor system, Techsource agreed to have one of their developers accompany their specialist. In addition, the team scheduled an extra day so that testing could be done before training started.

Two days before the implementation was to take place, all of the impact printers at A-BANK were replaced with laser printers. The IT staff had a good reason to wait until the last possible time to make this change. In order to replace the multiform carbon paper, the laser printers had to be configured to print two receipts for every transaction until the imaging system was up and running. This would slow down the tellers and also be more expensive. However, since it would only be for two days, the impact was acceptable.

When the Techsource team arrived at A-BANK they immediately ran into problems installing their application server. The security of A-BANK's network was much more advanced than other credit unions they had worked with. It took them several hours to get the proper properties and permissions set so that their software could run on A-BANK's network. By late afternoon, they had their server installed and their software loaded on the first client workstation. They began testing immediately.

Minutes after testing began more problems occurred. There were at least 12 commands done by testing employees that were not on the original list provided to Techsource. The system did not recognize these commands or the receipts that they produced. Therefore, the database was not being populated correctly. To make matters worse, it was soon discovered that the format of several receipts changed depending on how a command was executed. This was also news to Techsource and causing even more errors.

The Techsource developer immediately went to work trying to fix all of these problems, but the situation continued to get worse. Because the original list of commands was made with the tellers in mind, all of the accounting, collection, and real estate commands were not included in the original command list. By the end of the first day, a list of 83 possible commands was compiled, far more than the 18 originally given to Techsource. The task was growing increasingly difficult, and after two full days of work, it was decided to postpone the implementation until all the bugs could be worked out. Since the developers did not have access to a Vendor system, Smith agreed to coordinate testing of any new versions of the software at A-BANK. Techsource would work on all the issues at their office and email updated software to Smith for testing.

The A-BANK staff and the Techsource developers worked for several weeks to perfect the software. Because the Techsource developers had many other projects besides this one, they did not work on the project as much as Smith would have liked. Finally, in early September they were ready to try again. However, just as they were scheduling a time to do the implementation, Smith received word that a Vendor system upgrade would be coming in the next few months. This upgrade would change the current format of their receipts. This was yet another blow to the implementation. All of the formats for the 83 different command types would have to be revised and tested.

The upgrade to the Vendor system was done in early December and by the end of February Techsource was once again ready to start testing. A-BANK employees began testing the software and found several issues of concern. A few of the commands still didn't work when executed in certain ways, and occasionally, the built in balancing function didn't work properly. Using the same system as before, A-BANK emailed Techsource with descriptions of the problems. Techsource worked on them and sent back updated versions of the software.

Several issues slowed this process down to a crawl. The developers at Techsource were very frustrated about how the project had progressed, especially with the fact that they had been given incorrect information about the number of Vendor system commands. They also had several other demanding clients to worry about. Therefore, they were reluctant to spend a lot of time debugging A-BANK's software. It was also obvious that Smith's counterpart at Techsource was not entirely dedicated to the project. She constantly tried to press for a final implementation, even with a sub-standard product, just so that she could move on with her other clients. Employees at A-BANK were also frustrated that so many things had gone wrong. Therefore, they were being very critical of the software and refused to allow another implementation attempt until everything was perfect.

Eventually progress came to a halt. Both organizations were working on other projects and blaming delays on the other company. In November of 2005, Smith's employment at A-BANK came to an end and a new project manager was assigned, Matt Bond. Like Smith, Bond had a great deal of technical experience. However, in addition to his technical expertise, he also had accounting and business experience. He had managed several IT projects successfully and was well respected by the management of all departments at A-Bank. Bond was hesitant to accept this project because he felt that much of it was out of his control. He agreed to do it with the understanding that the project would be terminated and the contract with Techsource broken if implementation were not successful in less than 3 months.

Bond began improving the spirit of those involved with the project at A-BANK. He promised them that it would all be over soon, one way or the other. In order to help with motivation to succeed, Bond received approval for monetary bonuses for his team if the project was completed successfully. Soon, everyone at A-BANK was ready to try again and Bond began to pursue results from his counterpart at Techsource aggressively. Within two weeks, he began to hit major roadblocks. Due to lack of cooperation from Techsource, the project was getting bogged down again. Bond made several phone calls to senior management at Techsource and informed them that if things didn't change soon, A-BANK would pull out of their contract. Within days, a few employees at Techsource were terminated and new people were assigned to the project.

With a detailed project plan in place and a new level of confidence and teamwork, both sides worked over the next few weeks to perfect and test the product. Although several issues arose, solutions were reached quickly and a final attempt at implementation was scheduled in a few weeks. Throughout the intervening period, every employee that would be using the product went through a full day of training. Not only did this prepare the employee for the new system, it helped to test the product thoroughly. More issues were discovered but all were fixed before the implementation date.

Finally, two years after the contract was signed, the first of A-BANK's branches began using the receipt imaging product. Because of the previous issues, nerves were high for everyone involved that day. However, the day went by with very few problems and within 3 weeks all of A-BANK's branches were using the new system. Although the end result was a success, this had been one of the biggest fiascos in recent A-BANK history. The project, which was supposed to take less than 2 months to complete, had taken over 2 years. In addition, they had been paying \$3000 per month in maintenance without realizing any benefits. Therefore, the payback period that should have already been realized was at least 2 and half years away.

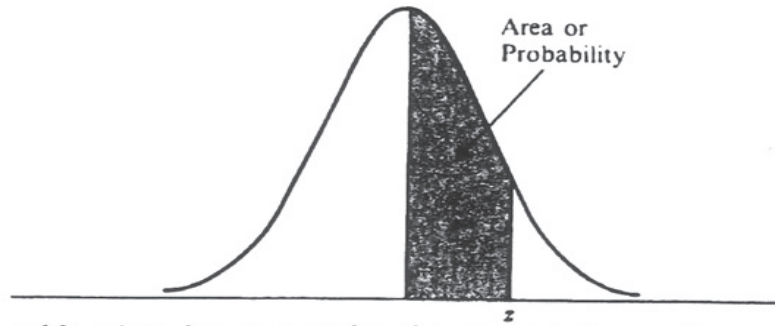


## *Standard Normal Distribution Table*

### **Standard Normal Distribution Table**

- Please see the reverse side of this page for the standard normal distribution table

## AREAS FOR THE STANDARD NORMAL DISTRIBUTION



Entries in the table give the area under the curve between the mean and  $z$  standard deviations above the mean. For example, for  $z = 1.25$  the area under the curve between the mean and  $z$  is 0.3944.

$z$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4986	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

# Glossary

## **accounts closure**

Contracts with outside vendors, partners, professionals, temporary workers, and other parties are closed and the performances of these parties are evaluated based on relevant criteria. This evaluation is used as a source of reference for future contracts and vendor management.

## **acknowledgements and awards**

A relationship building activity that rewards individuals, departments, or centers that supported the project and directly or indirectly influenced project success.

## **acquaintance**

Team members must get to know each other as a team and appreciate the different styles, abilities, and work habits of the individual members before they actually start to work on the project. The project manager can facilitate this through a brainstorming session, where the project scope is discussed and ideas and input are solicited.

## **administrative closure**

Formal closure and documentation of the project.

## **appointment**

The final list of individuals must have the depth and breadth necessary to carry out all activities of the project and to satisfy objectives in a timely manner. That means appointing sufficient numbers of people with necessary expertise.

## **benchmarking**

Comparing current productivity, accuracy, timeliness, cost, and other indicators of quality against an historical standard.

## **best case scenario**

Represents the best possible estimate of the time and cost needed to complete a work unit. Depending on the priorities of the project, this may represent the shortest time, the lowest costs, or a combination of both.

## **bottleneck**

A situation that occurs when the input of resources is not sufficient to produce the desired output in a timely manner.

## **bottom-up approach to project estimates**

A cost and benefit estimating technique that starts at the level of individual work units and moves up through the WBS hierarchy.

## **bottom-up approach to a WBS**

Less structured than the top-down approach, this method builds from the work unit to higher-level activities through an iterative process. This may be the more effective of the two approaches on projects involving new systems and processes.

## **brainstorming**

A team activity aimed at generating a cross-stimulation of ideas. This technique is often used in a semi-formal setting.

## **business ethos failure**

A type of failure defined as the inability of a project to meet requirements because of organizational culture. This may reveal itself, for example, in the lack of standards, such as an audit, a development methodology, formal documentation, and specifications.

## **business intelligence software**

Decision making tools that use predictive models and consider uncertainties and constraints in their solutions. These tools are particularly useful in situations where there is uncertainty and the need to forecast.

## **business knowledge**

An understanding of what the business is about, what the organizational mission is, and what its goals and objectives are beyond a simple understanding of the industry. It also involves understanding the organizational culture and processes.

## **business process re-engineering (BPR)**

Involves a re-engineering of business processes based on an analysis of all aspects of the company. The changes in the company resulting from BPR are often quite extensive.

### **capability maturity model (CMM)**

A framework for evaluating processes used in product development and project management that refers to the maturity of the organization that produces the product. The implication is that a company that is more mature is more likely to produce quality products.

### **case-based reasoning (CBR)**

A formalization of the process whereby decisions are based on previous experience. A case reveals knowledge in its natural context and represents an experience that teaches a lesson relating to the goals of the practitioner. These lessons can be useful in understanding a new project.

### **common purpose**

Team members relate, understand, and work towards achieving the same set of objectives, as described in the project plan. This important characteristic helps channel collective efforts towards the ultimate goal of the project.

### **competency**

The pool of talents that includes diverse knowledge and skills and that provides the capabilities for performing the range of activities described in the project plan. The team competency can be broadly defined through technical skills and managerial skills.

### **contingency funds**

Funds provided for out-of-the-ordinary situations. Contingency funds are not provided to make up for bad management, poor performance, or inadequate control.

### **contingency plan**

Plans that indicate alternative methods for responding to project risks.

### **critical success factors (CSFs)**

Are the set of factors that can be considered critical to the success of the project.

### **Delphi method**

A method that uses an iterative and interactive approach to generate consensus about a topic from among a panel of experts.

### **change management**

Responsibilities, processes, and requirements change over time and in response to strategic initiatives. Mitigating the risks associated with change requires a strategic plan for handling change, negotiation skills, and the communication of timely, accurate, and relevant information to (and from) project stakeholders. Inadequate attention to change management is the primary reason for project failure.

### **client satisfaction**

A measure of project success that is derived from a match between the perceived importance of the factors assessed and the project's outcome on these factors. These assessments cover a variety of subjects, ranging from opinions of individual benefits to direct perceptions of project effectiveness and value.

### **closing stage**

The customer formally accepts the project deliverable, project-related contracts are terminated, project documents are archived, and project audits and other tasks are conducted to administratively close the project.

### **codes of conduct**

A set of behavioral rules intended to guide individuals in making decisions that comply with the ethical standards of a company, profession, or organization.

### **collaboration suites**

Computer software that supports group or team decision making through shared documentation, storage, access to information, and communication.

### **conflict management**

Conflicts are likely to occur relating to scheduling, staffing, money, technology, procedures, and personalities and project managers should confront and deal with the conflicts rather than withdrawing from them.

### **consensus participation**

A client driven process that requires all clients to be involved in making design decisions throughout the design process.

### **consultative participation**

This lowest level of client participation leaves the main design tasks to the technologists, but tries to ensure that all clients are consulted.

**content management system (CMS)**

Computer systems that enable the storage, modification, and sharing of documents. Wikis are an example of a simple CMS.

**contingency funds**

Funds set aside for use in case of extraordinary or extreme situations that may delay or derail a project unless additional funds are allocated to the project. These funds are not usually directly accessible to the project manager and must be released to the project by management or a project committee.

**control phase**

See implementation stage.

**control points**

Are points used to monitor and assess the progress of the project. Work units defined at the lowest level of the WBS are control points for assessing the project for time, quality, and costs.

**core competency**

The unique combination of knowledge and technical capabilities that is central to the organization and hard to imitate.

**correspondence failure**

Objectives are specified in detail and then used as evaluation standards. A lack of correspondence between management objectives and the evaluation is regarded as a failure.

**cost of labor**

The sum of wages, salaries, and bonuses paid to employees.

**critical path**

The longest path of activities in a network. These activities have zero slack time.

**critical path analysis**

A method used to determine the critical path and the presence of slack time on other paths.

**Critical Path Method (CPM)**

A time estimation technique that uses earliest start, earliest finish, latest start, and latest finish to determine the critical path.

**Crosby, Philip**

A quality management pioneer who argued that what costs organizations is the lack of quality not the cost of quality.

**deadlocked**

This situation occurs when a disagreement or difference in opinion or perspective prevents further progress.

**delegation**

A method for empowering and motivating colleagues by assigning them additional responsibilities.

**deliverables**

Are tangible or intangible products of the project that will be delivered to the client. Every deliverable must have a time, cost, and specification associated with it.

**delivery acceptance**

A part of the formal closure of the project in which the client accepts the final deliverable as a signal that the project is complete.

**Deming, Edward**

One of the founders of the quality management principle. Deming believed that the ultimate responsibility for quality must rest with management and that the importance of product quality must be recognized at the top. Deming suggests that quality must be considered at the design phase and must be built into the process rather than controlled at the end.

**development stage**

All physical and mental activities necessary to reach the point of delivery of the project are executed during this stage.

**diminishing returns**

A law that states that, beyond a certain point, additional time and energy is unnecessary and, if continued, can be counter-productive.

**direct costs**

Are costs easily associated with a work unit. A portion of the project manager's time is also directly associated with the work unit and is a direct cost.

**direct overhead costs**

These costs are incurred for the entire duration of the project and are prorated to individual work units. Examples include management costs, facility expenses, and rental agreements.

**discount factor**

The present value of one dollar.

**earliest finish (EF)**

Is calculated by adding the activity duration to the earliest start time for that activity.



### **earliest start (ES)**

Is determined by considering the latest of the earliest finish times for all preceding activities. The earliest start time for activities with multiple predecessors is the largest finish time among all preceding activities.

### **effective team**

A team that seeks to exceed customer expectations by completing the project ahead of schedule and below budget.

### **80/20 law**

80% of any outcome is determined by 20% of the input.

### **empowerment**

Involves giving the responsibility of doing a job to individual team members.

### **end-stage assessment**

A control point, which if successful, signifies acceptance of the deliverables promised for that stage and provides authority to go on to the next stage.

### **equipment and facility release**

Formal release of the resources that were allocated to the project for a specified duration to allow others to utilize them.

### **estimating activity duration**

Relies on experience, documentation, and input from experts. When uncertain, project managers may obtain multiple estimates for each activity and take the weighted average of the estimates. A popular approach for estimating activity duration involves using the weighted average of three estimates: optimistic, pessimistic, and most likely.

### **executing phase**

See development stage.

### **exemption clauses**

Are additional statements added to the project scope to limit the project manager's responsibilities to within reasonable boundaries. These exclusion or exemption clauses also help the customer develop realistic expectations for the project. These clauses are similar to disclaimers that communicate to the customer what should or should not be expected from the project.

### **expectation failure**

The inability of a project outcome to meet a specific stakeholder group's expectations. Failure, in this case, signifies a gap between some existing situation and a desired situation for members of a particular stakeholder group.

### **expectation gap**

The difference between expected and actual benefits.

### **first meeting**

In this meeting the ground rules are set and team members are given clear guidelines for their conduct within the team. It should be well organized, prepared, and conducted so as to accomplish the required objectives.

### **fish-bone diagram**

A diagram that helps to identify the source of quality problems. It is called a fish-bone diagram because entities that influence quality are connected in a way that resembles the skeleton of a fish. This method is also called a cause-and-effect diagram because it helps link quality problems with the responsible sources.

### **flexibility**

Responding effectively to planned or unanticipated changes.

### **force field analysis**

A change management approach involving the identification of the forces working for and against the success of the change through analyses of the point of view of stakeholders, resources, time, external factors, and corporate culture.

### **free time**

See slack time.

### **goals and objectives**

Clearly defined, measurable, and achievable statements of what specifically needs to be done in order to accomplish the organization's mission. Conceptualizations of the mission statement.

### **governance**

The patterns of authority for key project activities in firms as well as in project management.

### **groupthink**

Occurs when the group seems to over-estimate the potential of the group and under-estimate the potential of the world outside of that group. This situation is usually not conducive to obtaining the best decisions.

**groupware**

See collaboration suites.

**human resources**

Refers to the talent and skills of the project team members. The project scope must describe special talents that are required for project success.

**implementation stage**

The product is delivered to the customer and any necessary testing, training, and integration is done during this stage. Project team members and other resources are released from the project.

**incremental change**

A gradual change that allows time for training, adaptation, and consolidation.

**indirect costs**

These costs are not easily associated with a work unit or project. These costs include overall organizational costs that are incurred by all activities of the organization. These costs are often prorated and subjectively allocated.

**information overload**

A situation in which a high volume of information exchange reduces the quality of communication. Information overload can be avoided by using discretion in disseminating information among team members and stakeholders. Not every piece of information needs to be shared with everyone.

**initiation stage**

A problem or need is identified and a project is proposed as a solution. If a sponsor gains managerial support for the project, a commitment is made to the project. A project manager may be appointed to the project during this stage or the planning stage.

**intangible costs and benefits**

Are costs and benefits that are not easily quantified or assigned a monetary value. Examples are gains or losses in knowledge, control, security, and satisfaction.

**interaction failure**

If the product of a project is hardly ever used, or there are major problems involved in using it, then it is a failure.

**involvement deprivation**

Occurs when an individual's involvement substantially exceeds perceived involvement and the client develops a sense of alienation.

**involvement episodes**

See involvement deprivation, involvement equilibrium, and involvement saturation.

**involvement equilibrium**

Exists where perceived involvement equals (or roughly corresponds) to the level of desired involvement.

**involvement saturation**

Occurs when an individual's perceived involvement exceeds desired involvement and the client's frame of reference regarding the value of involvement is altered.

**Ishikawa diagram**

See fish-bone diagram

**Ishikawa, Kaoru**

A quality management pioneer who proposed the fish-bone diagram as a method for depicting the cause-and-effect relationship between quality problems and responsible units.

**ISO 14000**

An environment management standard that specifically deals with the five areas of environmental management, auditing, performance evaluation, labeling, and life-cycle assessment.

**ISO 9000**

An international quality standard applied to all types of products and services and used by public and private firms of all sizes.

**job specification**

A specification that includes specific duties, skills, knowledge, and experience required to fulfill a project role.

**Juran, Joseph M.**

A quality management pioneer who believed in top management involvement in quality management and implementation. He argued that management must continuously seek quality and methods for rewarding adherence to quality standards.

**latest finish (LF)**

Is calculated by using the smallest value of the latest start time for all activities leaving that activity.

**latest start (LS)**

Is calculated by subtracting the activity duration from the latest finish time for that activity.

### **leading by example**

Delivering work of the highest quality yourself and neither making excuses nor blaming others for your own mistakes.

### **learning organization**

An organization where people learn from experience, so that future projects are done better

### **long-term planning**

A planning stage involving the consideration of project objectives and the creation of a mission statement for the project group that is reflective of the organization's mission statement. Project details are kept minimal.

### **management through conversation**

A management style that focuses on creating relationships where serious issues can be worked through in a friendly, conversational way and through exchanges of ideas. Setting up such a relationship requires taking the time to get to know people informally, perhaps away from the work setting.

### **marketing the project**

A necessary activity from the beginning of the project, when looking for funding and commitment from team members and other stakeholders, to the end, when the project becomes operational.

### **measures of effectiveness**

A subjective measure of the degree to which objectives are achieved and problems solved by a product.

### **medium-term planning**

A planning stage involving the detailing of potential projects that meet the long-term needs of the organization. Projects are planned and prioritized based on the overall strategic objectives of the organization.

### **meeting length**

A meeting must be just long enough to accomplish what is intended. Long meetings are not necessarily more productive.

### **meeting management**

Ensuring that meetings are only as long as required, that the agenda is known to participants in advance, and that only those people to whom the meeting is relevant are invited. Meeting notes should be taken and conversation facilitated.

### **mid-stage assessment**

Occurs if the stage is of long duration, problems have been identified such as deviation from the plan, or there have been requests for change.

### **milestones**

Are major events in the project development life cycle that occur when a significant piece of work has been accomplished. They serve as aids to the project manager in determining whether necessary progress is being made to complete the project on schedule.

### **mind mapping**

Developed by Tony Buzan, mind maps provide a holistic method for note-taking and memory recall and assist in the identification of relationships between concepts

### **mission statement**

A widely communicated statement expressed in broad terms that defines the purpose of the organization, guides decision making, and sets the direction for the entire organization.

### **morphological approaches**

These approaches identify a number of future states that are built on different assumptions. These assumptions might relate to expected states for the economy, depletions or findings of natural resources, changes in people's values or lifestyles, or changes in the political persuasion of a new government.

### **most probable scenario**

Represents the most likely time and cost needed to complete a work unit.

### **most likely estimate**

Is based on a reasonable assumption of normality, somewhere between the optimistic and the pessimistic estimates.

### **negotiating**

Seeking an agreement where all parties feel satisfied with the outcome.

### **net present value (NPV)**

Is used to evaluate the expected monetary gain or loss of a project. It is based on the calculation of expected cash flow. This approach uses a rate of interest to calculate the present value of the future cost and benefit for a project. The rate of interest used is based on the cost of capital.

### **network diagram**

A diagram of the PERT/CPM network.

**normal conditions**

Are conditions free from extreme case assumptions. An example would be using the number of hours worked in a normal (non-overtime) workweek to calculate work unit time estimates.

**openness**

A situation in which team members do not hesitate to get input from each other and to seek help when it is needed.

**operational strategies**

Facilitate the implementation of goals and objectives. Projects are implementation tools for strategies.

**optimistic estimate**

Is based on the assumption that everything is under control and that the activity will progress according to an 'ideal' plan.

**organic organizations**

Are organizations in which change is the norm and eagerly embraced.

**organizational chart**

Are hierarchal charts that detail the number of divisions or departments that exist in an organization, the hierarchical relationship between those divisions (divisions and subdivisions), the title and responsibility of each division, the person in charge of each division, and the size of each division (number of employees).

**organizational resources**

Are resources available to an organization including human, financial, physical, knowledge, and skill resources.

**paralysis by analysis**

This happens when an individual has spent too much time looking at an issue. Looking at the issue afresh, after a short period, may well enable the individual to make a reasonable decision or take a positive action.

**Pareto charts**

A type of diagram that is useful in organizing and prioritizing problem areas and that are intended to help identify the few causes that result in most of the quality problems in a product. See 80/20 law.

**Pareto principle**

See 80/20 law

**path**

A sequence of connected activities that extends from the starting node to the completion node.

**payback analysis**

Payback analysis is used to determine how long it will take before the investment in a project results in positive cash flow. Payback occurs when the cumulative benefits are greater than cumulative costs.

**payback period**

The length of time that it takes for a company to recover the amount of money invested in the project.

**personnel release**

Formally releasing team members so they can move on to other projects, or go back to their departments, once the project is complete.

**PERT/CPM network**

A network that consists of activities connected by arrows. Each activity is labeled by a number or a character and has a beginning, duration, and ending time.

**PERT**

See Program Evaluation Review Technique

**pessimistic estimate**

Is based on the assumption that whatever can go wrong will go wrong.

**phase estimating**

An estimating method that assumes that the cost and time for subsequent phases depend upon the outcomes of earlier phases. Because of this, detailed estimates are only made for one or two cycles at a given time as the project progresses, and only rough estimates are generated for subsequent cycles.

**planning**

Provides a structure or framework for thinking about a project. It focuses thinking into those areas that are relevant and helps in making decisions at the appropriate time and justifying decisions once they are made.

**planning a response to risk**

A planned response to risks based on consideration of the potential impact of the risk, the likelihood of occurrence, and the difficulty of responding.

### **planning stage**

The project scope, objectives, and activities are defined; team members and other resource needs are identified; communication modes are established; project costs and time requirements are estimated, work schedules are determined; quality control methods are established; and risk analyses are conducted by the project manager.

### **policies**

Are used as general guidelines for decision making and problem solving.

### **probability of project completion date**

Uses activity duration estimates to calculate the variance in the estimates and thereby the probability that the project will (or won't) be completed by a given date.

### **procedures**

Detailed descriptions of approaches to implement policies.

### **process failure**

A failure characterized by unsatisfactory performance. It may occur, for example, when a technology project cannot produce a workable system or when the project runs over budget in terms of cost or time.

### **Program Evaluation Review Technique (PERT)**

An application of the CPM that shows the sequence and duration for each activity as a network and enables the project manager to determine which tasks may become bottlenecks.

### **programs**

Are like projects but tend to be much more long-term (a project might take a few months, whereas the whole of a program may take five years or more to implement), and are large (consisting of the scale of a number of projects) and very complex (because the projects need to integrate).

### **project**

A non-routine, one-time job limited by time and budget to meet a specified need of the customer.

### **project audit**

The process of formalizing and documenting the lessons learned and the experience gained during the project. The goal of the project audit is to increase organizational learning by reviewing the successes and failures of the project and suggesting ways to improve future performance. The project audit is not intended to promote finger pointing. Periodic audits conducted during the project can assist in monitoring progress and detecting problems.

### **project charters**

Are used as the basis for the project scope statement. A project charter includes the title of the project, the names of the project sponsors and project manager, the project start and end dates, and the objectives, costs, and resources needed for the project.

### **project closure plan**

A plan that identifies activities that are necessary for closing the project, the timelines for each activity, and the individual responsible for carrying out each activity

### **project closure report**

A report that lists the project's achievements in terms of deliverables completed, performance in terms of comparisons of actual against forecasted duration, cost and resource usage, and quality in terms of errors or exceptions. It provides information to assist with organizational learning.

### **project committee**

A committee formed to evaluate projects and recommend project proposals.

### **project constraints**

The critical constraints include time and budget. A project starts and ends on specific target dates.

### **project failure**

A project that runs over budget, beyond the projected time, or that does not meet specifications is generally considered a failure.

### **project initiation report**

A report that outlines the business case, defines a high-level plan, formally initiates the project, lists overall objectives for the project and defines personnel responsibilities.

### **project life cycle**

The five distinct stages a project progresses through before it is complete. These stages involve initiating, planning, developing, implementing, and closing the project. Progress through these stages may be linear or may require iterations and jumps between stages.

### **project management**

The Project Management Institute defines project management as the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.

### **project manager role**

Primarily involves managing all aspects of a project from the beginning to the end and delivering the project as specified, on time, and within budget. Successful project management relies on both soft (communication) skills and technical skills.

### **project milestones**

Clearly defined events with significant importance to the customer and the project development life cycle that can be used to measure progress. A milestone is typically associated with a deliverable that can be defined, measured, developed and demonstrated.

### **project phases**

The division of large projects into manageable components. Phases should be linked to deliverables which are the products or services that the project will achieve.

### **project plan**

A living document that must be adhered to by all stakeholders, especially the project manager and team members.

### **project requirements**

Requirements must be closely linked and described through business needs. The project manager must analyze and understand business needs as well as project needs and make sure that they support each other.

### **project resources**

The critical resources for a project include human resources as well as materials and equipment. The talent and skills of the team members and their interaction is critical to the success of a project.

### **project scope**

A definition of the project boundaries. The scope is intended to limit the size of the project to a finite and defined set of objectives, deliverables, milestones, and resources. The scope determines where the project is going.

### **project scope statement**

See scope statement

### **project team**

The unit that undertakes project activities that are defined and described in the project plan and in the work breakdown structure. The project team members must not only be competent at their tasks but also be able to complement each other to create the right synergy.

### **projects in controlled environments (PRINCE)**

A structured and standard approach for project management originally designed for IT projects of the UK government.

### **qualitative analysis**

An approach that relies primarily on the analysis of intangible and subjective factors.

### **quality**

The American Society for Quality defines quality as the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs.

### **quality control charts**

Charts that give a visualization of the pattern of change in product quality. These charts describe occurrences rather than detect quality problems and help with quality control by showing whether or not events progress in a normal trend.

### **quality planning**

Identifying the attributes of the project that relate to quality and setting standards for these attributes so they can be measured easily.

### **quantitative analysis**

A quantitative approach involves data analysis.

### **reflective practitioner**

A project manager who analyzes what went right and what went wrong in order to guide future work.

### **representative participation**

Individuals are chosen to represent the interests of all the clients during the design decision-making process.

### **requirements**

Are important because they determine what the project will do and, to some extent, how it will do it. They are also important because of the costs in both time and money of getting requirements wrong. Issues associated with identifying, gathering, analyzing, documenting, and communicating requirements are at the heart of project management

### **requirements change committee**

A committee that usually includes stakeholders from the entire organization that is responsible for ensuring that proposals for change are consistent with the overall goals and objectives of the organization and project, are feasible, and can be handled in a timely fashion.

### **requirements definitions**

Are a balance between everything that relevant stakeholders want from a project and what can reasonably be delivered based on cost, time, and other resource constraints. Requirements will often change throughout the course of a project, so project managers should be prepared to be flexible and manage requirements changes efficiently.

### **resource allocation**

The scheduling of available resources for use in a manner that is efficient and in accordance with the constraints of time and cost.

### **resource smoothing**

Leveling the use of resources throughout the project to avoid large spikes and valleys in resource usage. The purpose of this action is to use resources with consistent efficiency.

### **resources**

Consist of three main components: human resources, facilities and equipment, and organizational resources.

### **return on investment (ROI)**

An estimation method in which discounted benefits and costs are used to assess investment value. These financial analyses are used to compare project proposals and to determine which project to fund. Estimates of cost and time can be obtained based on experience, documentation, and expert opinion.

### **risk analysis**

Is part of a careful process for obtaining estimates. The purpose of risk analysis is to identify possible risks, predict the likelihood of risks, estimate the potential impact of risks, and prepare alternative responses. It is a useful method for communicating possible delays to the stakeholders and helping them form realistic expectations.

### **risk management**

A process that involves understanding potential problems that might occur for a project and how these problems might impede project success. Project risk management helps project managers to identify, evaluate, and respond to potential project risks and increases chances of project success.

### **risk mitigation**

A process involving calculated measures taken to reduce or eliminate project risks.

### **scenario planning**

A planning method that looks at different views of what the future might be and enables the factoring in of many potential outcomes and estimates.

### **scope creep**

May occur during the execution of the project as stakeholders realize new or changing wants and needs and request modifications to the project requirements. These requirement modifications can cause the project scope to creep past its original boundaries and increase the time and resources required to successfully complete the project.

### **scope statement**

A document that specifies project outcomes as they relate to client expectations and serves as the source for developing the project plan. The scope clearly defines project goals that are realistic, obtainable, and measurable. It makes clear what is expected, when it is expected, and at what cost and specifies the deliverables, milestones, and resources needed.

### **sense of trust**

Team members feel they can rely on each other for support. They feel comfortable discussing mistakes for the benefit of everyone without concerns for chastisement.

### **seven run rule**

A quality rule that suggests that if events happen in the same direction (upward or downward) for seven times in a row then there is a problem.

**sharing**

A process that can lead to better decisions and enable colleagues on the team with expertise to feel valued. A decision reached by consensus is also more likely to be supported than one arrived at through coercion.

**short-term planning**

Covers the next 12 months of operations with a focus on providing additional details on the control measures, resources required, and specifics for each stage in the project life cycle.

**simulation programs**

Decision making tools that enable decision makers to formulate and build a decision model and to be able to analyze results and outcomes. More complex computer simulations include probability estimates for variables that are included in the model.

**slack time**

The difference between the latest start time and the earliest start time, or the difference between the latest finish time and the earliest finish time. Activities on the critical path do not have slack.

**sponsors**

Are the owners of the project and the chief liaisons between the project team and the executive management. Sponsors drive the project by gaining and maintaining management support, facilitating access to resources, mediating conflicts, and keeping the project in line with company objectives.

**spreadsheets**

Are one of the most popular decision tools because they enable decision makers to ask 'what if' questions and to be able to change and modify variables in a decision model in order to evaluate the relative impact of each variable on the resultant outcome. Spreadsheets are easy to use, readily available, and often included in software suites.

**standards**

Rules intended to ensure quality.

**stakeholder analysis**

Methods aimed at prioritizing stakeholders' needs, determining risks associated with stakeholders, and making explicit the claims of all stakeholders.

**stakeholder map**

A method of stakeholder analysis in which stakeholders are listed in tables or in interconnected circles based upon their individual power/influence and interest/attitude toward the project.

**stakeholders**

Include all individuals who have interest in the project. These individuals may be internal or external to the project and company. Top management, employees, project team members, suppliers, and customers are all examples of stakeholders.

**statistical quality control**

A quality control method based on the analysis of data that are collected about specific situations. It is frequently used to set standards as well as detect and correct errors in product development.

**strategic planning**

Requires a clear and honest understanding of what the company is, what it is about, and where it is at. A strategic plan sets a road map that suggests where the company wants to be and how it can get there. Projects should be aligned with the company's strategic goals.

**structured walkthrough**

A technique that requires project team members to participate in formal walkthroughs of the project. These walkthroughs assist with detecting potential problems with the project as early as possible and increasing the sense of responsibility and task ownership in the team members.

**SWOT analysis**

SWOT is an acronym for Strengths, Weaknesses, Opportunities, and Threats. During the analysis, items that fit into these categories and that apply to the project are identified.

**synergy**

The team identifies itself as a unit that exhibits high levels of coordination. The communication among team members is frequent, open, and effective. The collective efforts of team members is greater than the sum of individual efforts.

**Taguchi, Genichi**

A quality management pioneer who believed that quality should be considered in the design of a product and must be part of the process of product development.



### **talent pool**

Individuals with the potential to contribute to the project.

### **tangible costs and benefits**

Are costs and benefits that are easily quantified or assigned monetary value. Examples are gains or losses in equipment, revenue, and costs.

### **task pool**

A comprehensive list of the possible activities and tasks required to achieve project goals and objectives that is based on the scope and specification of the project.

### **technical competencies**

Include detailed activities such as scheduling, estimating, and quality control as well as hardware and software issues.

### **transaction cost economics**

Reducing the costs of producing goods and delivering services.

### **transformational change**

A quick and dramatic change that may be met with greater resistance because of these qualities.

### **triple constraints**

Are scope, time, and cost. These constraints directly and proportionally affect each other like three sides of a triangle.

### **types of organizations**

Charles Handy suggests that there are four types of organizations based on the distribution of power within the organization: centralized, bureaucratic, individualistic, and team oriented. These orientations influence the means by which projects gain sponsorship and “buy in” and the methods for implementing and managing change.

### **time**

Time is a resource if it is managed correctly, otherwise it is a constraint.

### **time management**

An effective and experienced project manager should be able to evaluate, with reasonable accuracy, how long the project will take and how many staff hours are available for the project (leaving some margin of error for unexpected interruptions). Repeated delays and prolonged overtime are signs of poor time management.

### **top-down approach to a WBS**

This approach progressively breaks down project activities into smaller and more detailed units until it reaches the level of work units. This approach is effective when the project manager can visualize the big picture and is able to identify key components to start the breakdown process.

### **utility**

A subjective assessment of the worth or usefulness of a product.

### **value of a project**

The balance of benefits over project costs.

### **variance**

The square of the standard deviation.

### **WBS**

See work breakdown structure.

### **WBS coding scheme**

A method for displaying the hierarchy of a WBS in a numerically prefaced outline form. Decimal points are used to separate the levels for activities, tasks, and work units within the overall WBS hierarchy. For example, item 3.8.6 is the sixth item listed at the third level for the eighth item specified at the second level of the third first level item.

### **work breakdown structure (WBS)**

The WBS breaks down the entire project into manageable pieces. Each piece is a work unit assigned to an individual or individuals to be done within the allocated time and budget. It provides a hierarchical overview of the project and is used to monitor and evaluate cost, time, and quality.

### **work package**

A group of related tasks at the same level in the WBS.

### **work units**

Are defined by duration, required resources, and the person responsible for the work. Each project phase is divided into work units that are linked to a single deliverable. A work unit is the lowest level in the WBS and should be designed to be easy to assign to an individual and to evaluate.

### **worst case scenario**

Represents the worst possible estimate of the time and cost needed to complete a work unit. Depending on the priorities of the project, this may represent the longest time, the highest costs, or a combination of both.

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80-20 law. *See* Pareto principle

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