Chapter 3: Project Management Basics

CHAPTER OUTLINE

The Project Management Life Cycle and Trade-off Triangle
Project Players
Functions and Expectations of IT Project Professionals
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Project Management Organizational Issues
Conflict Dynamics/Conflict Resolution
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Supplement 3.1: Using MS Project to Partially Automate Communication

LEARNING OBJECTIVES

After reading this chapter, you will be able to:
1. Explain the relationships among the five stages of the project life cycle.
2. Understand what project people do and what skills and competencies they must possess.
3. Explain the phases of team formation.
4. Identify and classify enterprise organizational structures.
5. Describe project management structures.
6. Understand conflict dynamics and know how to resolve conflicts.

Box 3.1: Projects and People

A national newspaper decided to construct a website from which to offer major news items as these events were in the process of unfolding. The firm appointed one of its own IT people to be the internal project manager. The firm had seven IT developers with some web-based experience and these people were assigned to work with the internal project manager. The company also contracted with its favorite IT consulting firm to assist with the construction of the site. The contractor named its own project manager and placed eight seasoned web-based developers under his supervision. The contractor's billable hours started immediately.

The firm had no idea what it wanted in terms of a website—things such as number of web pages; automated display of news content; automated web page formatting—all had to do with how the web pages would be delivered to the Internet. Neither had the firm given much thought to how many "hits" it would be receiving at its site and how much computing power it would take to support all of those hits.

The two project managers did not get along very well and did not communicate with each other or with the firm's management. In addition, stakeholders were never explicitly identified and requirements for the website were not created. The project managers had no idea what web page architecture would work best for this new site. Several architectures were possible. One possibility was CGI/perl. Another was ASP using Visual Basic 6.0 coupled with MS Visual Interdev, and the last was a system based on XML and an Oracle data base engine. The firm also had not made a decision about whether electronic subscriptions would be offered over the net or whether the site would provide its news free, assuming the reader was willing to put up with the usual flashy advertising boxes. No explicit requirements were drawn up that were acceptable to an identified body of stakeholders. Moreover, no project plan was put into place that would ensure the project would be completed on time and within budget. Nobody had any idea how much this project would cost, or how long it would take to complete. Given that no requirements were formally arrived at, how could the firm know these things?

Five months and $1.6 million of expenditure later, the contractor had a prototypical website up and running. They used CGI/perl—their area of expertise. The firm decided to "go live" with this site, only to discover that the site was hopelessly slow to accommodate the number of hits it received. After just a few days of trials, the firm decided to take the website down and re-think its strategy. Following discussions with other high-volume websites, the firm discovered that CGI/perl, combined with the hardware it was using, would never accommodate the large volume of hits now expected. Another architecture would have to be used. However, the only web-based technology with which the contractor was familiar was CGI/perl. At this point the contractor was useless and the firm dropped them.

The firm made another failed attempt like the one above using a different architecture and hardware before they finally hit upon the right combination of architecture and hardware. By this time the firm was 15 months into the project and had spent $5.4 million. In total, it took $7.6 million of expenditure and 23 months for the firm to finally arrive at the right combination.

As the firm closed out the project, it considered its failures as stepping stones to success. However, the project had cost $5.4 million more than it should have. Not identifying a set of stakeholders and proactively determining their requirements was one major problem. Not building a project plan based on those requirements was still another. Indeed, instead of immediately hiring their favorite IT contractor, the firm should have put the project out for bid using a request for proposal. It could have learned a lot from the bid responses it would have received and with very little expenditure on its part. Perhaps, it could have learned from the outset what architecture and hardware would have worked best and saved itself $5.4 million plus 15 months of lost opportunity costs. Using two project mangers, neither of whom communicated well, and failing to establish a cohesive vision for the project were also identified as problems.

In this chapter the fundamentals of project management are described. First, we discuss the five stages in a project's life cycle. We then move to a general discussion of project personnel, who the players are, and what they do. Next, we examine the skills and competencies that the various project professionals should have. Then, we discuss the three basic organizational structures as they relate to project management. We also describe the organizational structures that govern both small and large projects. Last, we turn to the subject of conflict and discuss why conflicts occur in projects and the most commonly used methods for resolving them. At the end of the chapter, we provide several brief, interactive cases which are followed by a supplement that explains how to use MS Project software to automate communication.

THE PROJECT MANAGEMENT LIFE CYCLE AND TRADE-OFF TRIANGLE

The **life cycle** of any project refers to the length of time required to take a concept that is nothing more than a glimmer in its conceiver's eye all the way through development and creation of the concept into a product, and then to termination of the project.

There are five stages[1] to the life cycle of any project: conceptualizing and defining, planning and budgeting, executing, monitoring and controlling, and terminating and closing, as illustrated in Figure 3.1. Within each stage, there are substages or phases. For example, within the conceptualizing and defining stage, consideration must be given to goals, then to scope (requirements), and finally to possible impediments. There is thus a goals phase, a scope phase, and an impediments phase. In the planning and budgeting stage, consideration must be given to duration, cost, and quality. In the executing stage, there is a startup phase, a middle phase in which work proceeds rapidly, and finally, a slow-down phase in which resources are smoothly transitioned from one project to another. At the end of each stage, the project team performs a check to ensure that all deliverables of that stage are completed. They then do an assessment. Finally, all of the project data are documented and stored for later use.

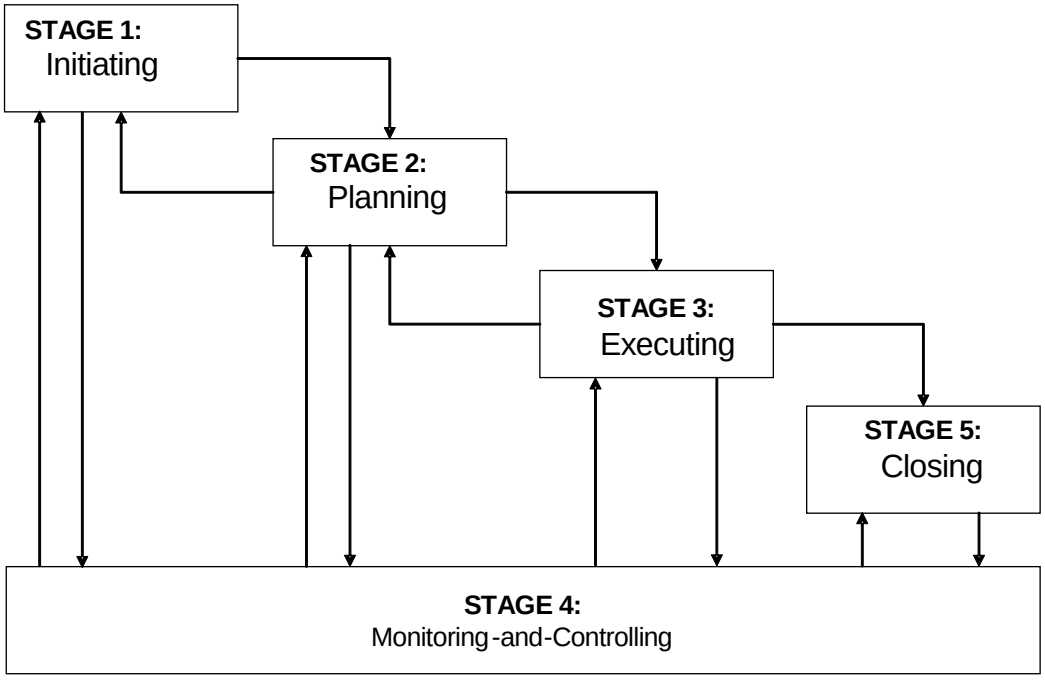


Figure 3.1: The Major Stages in the Project Life Cycle

[1] According to *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 4th edition, the five stages are: initiating, planning, executing, monitoring and controlling, and closing.

As stated above, project management actually consists of five separate phases or stages: initiating, planning (and budgeting), executing, project monitoring and controlling, and closing. We will briefly discuss each stage below.

Phase 1: Initiating

In this stage, project stakeholders[2] will conceptualize the product (or service) the project will produce and surround the project with a "boundary" to prevent various kinds of creep (scope, feature, methodology, culture, etc). Some organizational details are also taken care of at this time, such as establishment of a project manager, and determination of stakeholders. Organizational structure is decided upon. A **project charter** is created that announces the project, the project personnel, the purpose, and stated the rules of governance for the project. Project personnel may receive additional training to ensure a quality result. A requirements document is hammered out that describes the product (or service) the project is to produce. The requirements document is the most important deliverable of the initiating phase.

Phase 2: Planning

During this stage, the project manager and stakeholders produce a plan and budget for completing the project under consideration. This stage cannot begin in earnest until there is a well-conceived product as delineated by the requirements document mentioned above, sometimes called the 'product specifications.' The project manager is the lead player in this stage. The project manager creates the project plan and elicits support for and ownership in it from the project stakeholders. A Joint Project Planning and Budgeting Session (JPPBS), in which all stakeholders are brought together, can be of considerable assistance in putting the finishing touches on the project plan. The project plan and budget are the most important deliverables of the project planning and budgeting stage. During this stage, the project team is acquired and developed.

Project planning software such as Microsoft Project™, can be very useful during this stage. Project planning software will determine how much of each resource will be in use at each stage of the project, how much the total project will cost, and how much of that cost can be billed to the client. Project planning software can reveal time periods when personnel must wait for others to complete their jobs, provide dates when stages of the project will be completed, and offer helpful visual representations of the activities and milestones involved in a project.

Phase 3: Executing

The project execution stage is where the project team uses a project plan and budget as a guide. The project manager manages the project team, tracks team member performance, provides feedback and support, and resolves conflicts that might occur. By the means of communication, the project manager manages stakeholder expectations and works with stakeholders to meet their needs. The objective of this stage is to satisfy the project specifications. At the end of this stage, the work products (or services)are completed.

Phase 4: Monitoring and Controlling

This stage comes after Stage 3, executing, because the major purpose of this stage is to track, review, and regulate the progress and performance of the project which is mainly accomplished during the execution stage. However, monitoring and controlling is a continuous process. An on-going monitoring and controlling provides the project team the status of the project and identifies any areas deserving more attention. Therefore, it is appropriate to practice monitoring and controlling throughout the entire project effort.

[2] Stakeholders are people who have a vested interest in the project. They include the customer or end-user of the product (or service), as well as upper-level and line management.

During project execution, the project manager observes how a project is progressing in relation to the project plan and budget. Ideally, project managers should be able to determine, at any stage of a project, what percentage of the total project has been completed. If the project is running late or over budget, management should be able to obtain new estimates on the time and cost to complete the work. When unanticipated circumstances arise, the old project plan and budget must be updated to reflect the new developments. Conversely, if the project is running ahead of schedule or under budget, the project plan and budget must again be revised to reflect the new circumstance. This can be done through the change control process.

Through the monitoring and controlling stage, the project manager verifies that the progress of the project meets objectives defined in the project plan. A status report regard to scope, schedule, cost, resources, quality, and risk is produced in the stage to inform project stakeholders.

Phase 5: Closing

Here the project manager verifies that the project completed what it was supposed to deliver, that all stakeholders are satisfied, and that the project was paid for. Additionally, the project personnel try to assess how well they did. They document what tasks, policies, and processes went well, what did not do so well, and why so that they can pass on any lessons learned to future project personnel. The ultimate deliverable is completed and delivered to the customer and resources, including human resources, are released.

Figure 3.1 above depicts the major project stages. Note the cycle between Stage 1 and Stage 2. In Stage 1, a requirements document is specified; in Stage 2, a plan and budget is determined for those requirements. Occasionally, following thorough planning and budgeting, the stakeholders will de-scope a project. When stakeholders perceive the project as taking too long, costing too much, or both, the project manager and stakeholders return to the initiating stage and decide to reduce the original requirements. When the requirements are reduced, the project is said to be de-scoped; the process of eliminating requirements is called **requirements scrubbing**. The feedback loops between the first two stages, initiating, and planning, as shown in Figure 3.1 are there to allow the project players to return to the initiating stage once the duration and cost of the initially conceived product are known. Adjustments can be made to the proposed product to enable it to fit "targeted" duration and cost parameters.

Note also the cycle between the planning, and executing stages, Stages 2 and 3. When projects are started, tasks and their durations are not known with certainty. However, with the completion of each major milestone, more is known about what will be required to complete the project. It makes sense, therefore, to put this additional information to work by adjusting the project plan. This is called **Progressive Elaboration**. Schedules and budgets will then become more consistent with the current situation and with what is now known about the project. When project managers review and re-plan after every completed milestone, this is also known as **project integration management**. The planning and executing phases become integral to each other.

Stage 4, monitoring and controlling, mainly interacts with Stage 3, executing. However, as previously stated, the monitoring and controlling process is an on-going task. Therefore, Stage 4 interacts with all other stages in the project life cycle. The degree of monitoring and controlling applied on each stage varies depending upon the size and complexity of the project.

The stages depicted in Figure 3.1 provide opportunities for management to stop (or kill) the project. Each stage is generally concluded with a review of key deliverables for the phase and performance of the phase. The intent of this review is to determine if the project should continue into its next phase and to detect and correct errors cost effectively. Such stage-end reviews are often called stage exits, stage gates, or kill points.[3] These reviews are quality

[3] Project Management Institute, "A Guide to the Project Management Body of Knowledge," 1996.

assurance tasks that ensure the stage has properly completed its deliverable. Such reviews allow the project manager and stakeholders to stop or totally revamp a project when necessary.

Each stage can be thought of as its own sub-project with its own deliverables that are related to the project's primary deliverable. In information systems, sub-project deliverables can be a requirements document, a project plan/budget, a design document, constructed code, or test documentation. A requirements document is the ultimate deliverable of the initiating stage, for example. The project plan/budget is the ultimate deliverable of the planning (and budgeting) stage. The ultimate deliverables of stage 3, executing, are work products and the ultimate deliverable of stage 5, closing, is the ultimate or final product (or service) that the project was intended to produce.

Consider the following scenario regarding a project that has just completed the first stage, conceptualization and definition. The stage deliverable, the requirements document, is transmitted to all of the stakeholders by the project manager. The project manager convenes a meeting of the stakeholders a week later to discuss this document. At this meeting the project manager and stakeholders will decide whether to continue with the project. One possible outcome might be the following: because of the rapidity of change, stakeholders might decide that the requirements will change significantly (from those described in the requirements document) before the project is complete. The stakeholders might then decide to kill the project because of the costs associated with these anticipated changes.

Project Performance Measures

What are the performance measures by which project professionals gauge the performance of any project? The goals of any project manager are to complete the project within its cost and duration specifications, with the required functionality. All projects have deliverables, objectives that must be achieved by a certain time and within a certain cost.

Time-related Measures

Usually, projects must be completed by a **due-date**, the date set for completion of the final deliverables of the project. Projects always take time and therefore are said to have a duration. **Duration** is simply the length of time required to complete the deliverables of the project. Projects are typically a one-time initiative. Most projects have definite start and end dates. In addition, there can be dates at which deliverables are due, called milestones. **Milestones** are points (events) in time at which deliverables are completed. Each milestone will also have its own due-date.

Finally, projects consume a budget, require management, and use human and other resources, in addition to adhering to a schedule. Whether a project is on schedule is easily gauged by comparing actual progress with planned progress. Such comparisons are discussed at length in Chapter 10.

Cost-related Measures

During execution, project managers continually compare their actual expenditures with their planned expenditures at any given point in time. For further discussion on this topic, see Chapter 10.

People-related Measures

Projects are assigned human resources. Like any other resource, these resources must be measured. Measures of performance might include productivity, ability to work with others, quality of decision making, technical skills, attitude, initiative, customer's impressions and so forth. Using these measures, project managers report on the specific performance of each team

player. In some cases, this information is passed on to each team member's line manager, who files that information for later use in determining such matters as the team member's salary, year-end bonus, advancement, and so on.

The Project Trade-off Triangle

One of the fundamentals in all of project management is the trade-off triangle, as depicted in Figure 3.2 below. This triangle makes an important point about the dependencies among the product, cost, and schedule. The product or service being provided by the project subsumes the product's functionality (attributes, features), quality, complexity, usability, modifiability, and so on. If the product scope or functionality increases, so must cost and/or schedule. If the schedule or duration is decreased, while holding the product constant, then the cost must go up. If the cost is decreased while duration is held constant, then the product must diminish in some sense. These are the necessary adjustments in terms of tradeoffs required to keep the triangle balanced.

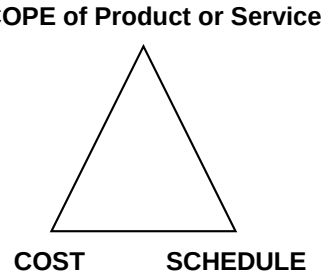


Figure 3.2. The Project Trade-off Triangle

Usually, two distinct parties come to the "trade-off table" with two distinct points of view. The customer wants to realize as much product functionality for as little cost and time as possible. The contractor wants to make a profit, so must maintain margins in regard to the level of effort required to produce the product. Neither customer nor contractor should be allowed to control and dictate all three corners of the trade-off triangle. If the customer is allowed to specify the product and the schedule, then the contractor must control the cost corner in response to the customer's specifications. Thus, one party might be allowed to specify two corners while the other party can specify the third in response to the specifications for the first two. Rarely does a project go smoothly when one party is allowed to specify all three. Such specifications result in an unbalanced triangle and one that may cause the project to fail.

PROJECT PLAYERS

Depending on the size of the project, there can be many participants or just a few. As mentioned in Chapter 1, Tom Peters (*In Search of Excellence, 1982)* maintains that the world's best products have been created by teams of less than seven people. Some projects are so large that hundreds of thousands of people may be involved. (Consider the great Pyramids in Egypt or more recently, the Apollo project that placed humans on the moon.) The system principle asserts that large projects can be broken down into smaller ones, as discussed in Chapter 1. Using decomposition, large projects can be reduced to smaller ones. Small projects will generally consist of the following players: a project manager, a team leader, and project team members arranged in the hierarchy exhibited in Figure 3.3.

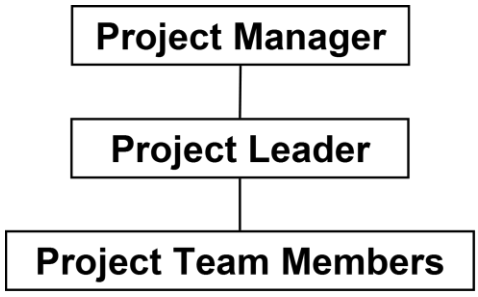


Figure 3.3: The Project Management Hierarchy

In addition to the team, team leader, and project manager, there are other project players who are not actual members of the project team. We refer to these people as **stakeholders**. Upper management decides whether or not to undertake the project. Line management decides what resources the project will use. The customer helps determine requirements, etc.

Figure 3.3 delineates the simple hierarchy of projects, a part of the corporate "ladder" of increasing responsibility. As players move up the ladder, managerial and interpersonal skills become more important, and technical skills become less important. This fact raises an important question: Is there a career path for the project professional who does not want to go beyond technical specialist, who wants to continue to hone and refine his/her technical skills without moving into the people side of project management? Some companies have developed a career path for this kind of professional as well, because there is a need for some technical professionals to continue to grow and enhance and improve their technical skills. Firms have also created career paths for project professionals that take them into more and more people-related responsibility, and that let them develop people-intensive competencies suitable specifically for project management.

The project manager must communicate to both the customer and line and upper management regarding the status of the project. A major portion of the project manager's work is communication to all parities involved, as shown in Figure 3.4 below.

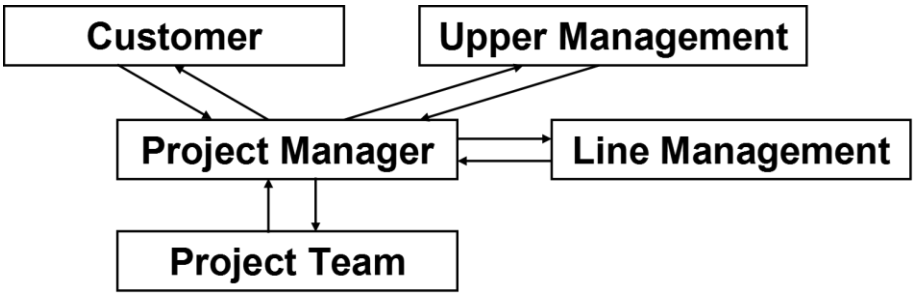


Figure 3.4: The Project Manager's Communications Hierarchy

Project players should be communicative, energetic people who can share ideas well and stand up for those ideas when the need arises. In addition to being competent, project professionals should be people of character, confidence, conviction, and perhaps some charisma as well. Moreover, project players should be people who are good listeners. In the language of Covey, project players should seek first to understand, then to be understood. Project players should be well-organized people who will take an assignment all the way through to its completion because project managers do not want a dozen tasks partly done. Project players should not be perfectionists. Perfection is never achievable in real time when there are deadlines to meet. A player's deliverable should be complete and defect free, able to do its job but not

absolutely perfect. Therefore, project players should focus on getting something out on time, and save perfection for the next release of the product. Finally, project players should possess the requisite technical expertise.

FUNCTIONS AND EXPECTATIONS OF IT PROJECT PROFESSIONALS

The project manager is the leader of the team. In addition to defining, planning, executing, monitoring and controlling, and closing the project, the project manager coaches, mentors, leads, negotiates, assesses, informs, and motivates. The project manager should be selected by upper management when the project begins to take shape in its first stage.

The Role of the Project Manager

Project managers have a responsibility to complete projects with minimal disruption to the rest of the organization. The organization's core work flow should not be disturbed. Likewise, the project manager normally should not deviate from the established norms of the organization's culture.

In some organizational structures, project managers are distinct from line managers. In a sense, line managers control the human resources and loan them to project managers. Specifically, project managers understand that line managers will make such important decisions regarding team members as salary, promotion, training, and various privileges. Therefore, project managers must negotiate with line managers for all human and other resources, such as capital equipment.

In many organizations, project management entails a kind of matrix management in which team members report vertically to their line managers and at the same time report horizontally to their project managers. Project managers are expected to have good working relationships with line managers. (In some cases, project managers actually work for line managers.) Because team members are generally loaned from several different departments and hence several different line managers, project managers must coordinate and integrate activities across multiple functional areas. Moreover, project and line managers have an interdependent relationship. When this relationship is healthy, everyone wins. When this relationship deteriorates, everyone suffers, as does the project.

As shown in Figure 3.4, the project manager (PM) is responsible for interfacing directly with the customer. Further, the PM must negotiate for resources with line management. The PM must also report progress to upper management; the PM is, after all, a surrogate for upper management. Team member performance must be reported by the PM to the team member's line manager, who usually has the authority to make all decisions affecting the team member including raises, bonuses, promotions, and so forth.

Project managers should have a good understanding of systems tools and models, the technology used in the project, organizational operations, and organizational structure and behavior. In addition, project managers must understand their own job descriptions, in particular, where their authority begins and ends. As Figure 3.4 suggests, the project manager communicates a great deal. Therefore, it is essential that the project manager have strong communication and interpersonal skills. For the PM, the ability to work with people is far more important than a strong understanding of the technology. A PM can always be taught the technology, but such skills as negotiating, coaching, encouraging, motivating, and generally dealing with people are far more difficult to acquire.

Project managers should be "all things to all people." Typical skills that good project managers should acquire include staying current with the technology of project management and the technologies being used in the particular projects for which the PM is responsible. The project manager must be a good judge of people. He should present a positive face to the team,

the customer, and all stakeholders. The PM should stay focused on the right measures of performance. Discussions of the "right" measures will appear in forthcoming chapters. The PM should be an excellent communicator/facilitator with a sense of humor. She should be committed to quality, and should set high standards for herself and others. He should be a person who takes initiative and completes jobs. She should be willing to take calculated risks to achieve the goals of the project. Knowing what information is important to making a decision and being able to obtain that information is a considerable asset. He should break large projects into collections of smaller, more manageable projects. She should be capable of translating corporate goals into project directives. He should be able to determine what upper management truly wants when he is given vague or ambiguous directives.

To be effective within projects, professional people need both skills and competencies. For example, project managers must be able to use MS Project or a similar project scheduling, costing, and control tool. Knowing how to use a tool such as MS Project is considered a skill. Project managers must also be good problem solvers, good at resolving conflicts among people, and good at negotiating. The latter are called "competencies" and while skills can be learned, competencies are acquired. People can learn skills in relatively short periods of time, such as a three-credit course, whereas acquiring competencies may take much longer.

One of the project manager's most significant responsibilities is to plan and re-plan the project. Before project execution, the project manager is a key player in the production of a project plan. This plan should be submitted to a Joint Project Planning and Budgeting Committee (JPPBC) for scrutiny and assessment. The plan should also be submitted to the entire team for consideration, although the PM has the last word. Once the plan has the approval of the requisite people, the project can begin. However, after the completion of each major deliverable or milestone, the project manager may want to re-plan the remainder of the project and adjust the original plan, depending on how far off the original schedule and budget the numbers are at completion of the deliverable. Project managers must determine project goals and deliverables, define activities, understand resource requirements, and define precedence and subordinate relationships. The project manager should anticipate possible risks, prioritize these risks, and develop contingency plans for the most probable and most severe. (See Chapter 6 for a discussion of risk management.)

The PM is affected by external influences, corporate objectives that sometimes suggest the firm is more interested in market share or visibility than whether the project is doable within budget. The organizational structure and culture, the project's technological tools and requirements, the personnel resources and training, and the management style all have an impact on the PM and her success in executing and completing the project. Table 3.1 below lists the major skills and competencies a project manager should have. Table 3.2 lists the responsibilities of a project manager.

Table 3.1: Skills and Competencies of a Project Manager

Skills	Competencies
Manages time well	Is a good leader
Understands project management	Encourages growth in subordinates
Is able to use a PM tool	Is a good motivator
Understands the technology	Is effective in interpersonal situations
Can solve problems	Is able to handle stress
Can execute and control projects	Is a good communicator
Can delegate responsibility	Manages change effectively
Is proficient at goal-setting	Can negotiate successfully

Table 3.2: Responsibilities of a Project Manager

1. Articulate the vision
2. Conceptualize and define all project deliverables
3. Manage stakeholder expectations and gain consensus
4. Assess project feasibility
5. Evaluate risks
6. Plan the entire project
    a. Determine tasks
    b. Determine task durations
    c. Acquire/negotiate for human resources
    d. Determine budget
    e. Prepare contingency plan
7. Track critical tasks, milestones
8. Regularly report project status
9. Manage changes
10. Re-plan, adjust budget, schedule as necessary after completion of deliverables
11. Close project, release resources, gather lessons learned

The PM may be called upon to manage several projects at once. The contributions of the PM are most important during the definition and planning stages of the project life cycle and during the startup and shut-down phases of a project's execution stage.

The Role of the IT Project Leader

The IT Project Leader is a technical person whose technical skills and experience exceed those of team members. In addition, the IT Project Leader (PL) participates in some of the planning and control of the project. The toughest technical problems become the focus of the IT PL.

Usually, the PM picks the project leader. Often, the PM must negotiate with upper management for the PL's services, then convince the PL to join the team. The PL should be signed onto the project before the proposal is written (early in the planning and budgeting stage) because the PL can help with much of the proposal work.

The major goal of the PL is to produce a quality product that is consistent with the requirements. Whereas the PM directs her attention outward to the projects' constituencies (upper management and the customer), the PL's focus is inward toward the team members. In the absence of the PM, the PL leads all meetings, reviews, and walkthroughs concerning the team. The PL is also the primary leader in all technical activities regardless of the presence or absence of the PM.

During the definition stage, the PL assists with much of the project plan, particularly the lower levels of the WBS. Later, in the analysis phase, the PL assists with the functional specification. During the design phase, the PL is the head of the design team. In the design phase as well as in the subsequent construction and testing phases, the PM may be mostly in the background while the PL provides the technical leadership. The person responsible for the day-to-day activities of the team members is the PL. The PM is the administrative leader, while the PL is the technical leader.

The Role of the IT Team Leader

For moderate-to-large projects, there may be many team leaders who report to a single project leader, who reports to the project manager. A group of five to seven developers (called team members) is subordinate to each team leader. Team leaders should be aspiring project leaders who have good communications competencies and technical skills that exceed those of team members. Such people should develop a good rapport with each team member and should be

well acquainted with the state of each team member's work at any given point in time. These people should be able to establish culture and standards for the group with respect to work ethic, work standards, meeting times, timeliness of deliverables, and so forth.

The Role of the IT Team Member

In the previous chapter, we discussed the importance of alignment and goals, among other topics. Project team members must align themselves with the goals of the project. Their greatest challenge is completing their assigned tasks on schedule.

Specific traits that PMs look for in a team member include an organized person with good communication and listening skills. While the team member should be technically competent, she should not be a perfectionist. Perfectionists are unable to complete a project because they are never satisfied with the quality of any part, deliverable, or phase of it. At some point the team has to stop analyzing or designing the product and get on with the construction and testing of it.

Box 3.2: People and Projects
Interactions Between Customers and Team Members

A customer was discussing a particular feature with a project manager. The feature had not been included in the requirements document or the functional specification. The project manager explained that the feature could not be integrated because it would run up the cost of the total project significantly. Later that same customer was having the same discussion with one of the project manager's developers. The developers' response was, "No problem. I can include that feature in a heartbeat…" He then added the feature to the code he was writing. Unfortunately, when the acceptance test plan was run, the PM asked, "What are these fields and how did you generate the data in them?" The developer responded, "Oh that was the additional feature that the customer requested." Visibly annoyed, the PM responded, "Don't you realize that now all the output is out of synch?"

What happened here? The developer obligated himself to provide a feature at no cost, and the developer's firm lost the opportunity to sell that feature to the customer. He also cost the firm the opportunity to demonstrate a bug-free program at acceptance time. Additionally, the cost of integrating the feature into the existing program could have been substantial. Nevertheless, the firm had to provide it free of charge. And, the customer might lose confidence in the PM, since developing the feature was not expensive although integrating it was. This scenario is called "feature creep" and it should be avoided. Clearly, team members should not respond to requests for feature additions from the customer if they have not been approved by the PM.

Team Dynamics: One for All and All for One

How do project managers put together teams that really percolate and sizzle? Needless to say, this takes considerable forethought. Good teams do not just happen. Simply putting a group of people together and calling the group a team will most likely not produce the expected result. Too often, teams fail because the participants do not have a clear understanding of the group's structural development.

Team integration, as expressed by the phrase "one for all and all for one" is not a new concept. In fact, it is a concept emphasized by the USA's founding fathers. We see the concept on every dollar bill: *E Pluribus Unum* translated from Latin means "Of many, one." Our country is a team, a very large team with great diversity. Its common goals are peace, security, protection, an infrastructure, and the pursuit of life, liberty, and happiness.

Stakeholders expect the team, working as a whole, to provide quality, timely completions in response to specific requirements. Moreover, stakeholders expect the team's project manager and team leader to ensure effective teamwork. In spite of the fact that both the team and its leaders have similar objectives, a group's success primarily depends on the interaction and working relationship of its participants because a team begins with one person, expands through the one-to-one working relationships of the participants, and evolves as the many become one.

Team participation requires that members put their egos on a shelf. There must be an understanding among members that each participant will on occasion act as both a leader and a follower. In other words, participants are both recipients and providers of mentoring and coaching skills as well as contributors of unique abilities and skills. Furthermore, each participant is expected to be open minded about other participants' proposals or solutions, and, at the same time, have a personal goal of making a contribution that achieves the defined objective.

The team becomes a cohesive unit capable of achieving excellence via individual and group training, mentoring, sharing of skills, and open communication—up, down, and across the group. Occasionally, groups are taken through various exercises, such as being challenged to overcome obstacles in an unfamiliar, treacherous environment, to build bonds between the members, and to accustom team members to working together. Team members learn a lot about themselves and the team as a whole from such exercises.

A team expands through one-to-one working relationships. A team member is not expected to work alone or do everything herself. Teams succeed as a group, not individually. Unfortunately, mean-spirited, individualistic activities, initiated by a jealous or threatened participant, can severely disrupt an otherwise productive group. Fortunately, such activities can be identified and managed by competent team leaders who remind participants to follow the ethic of reciprocity: "Treat others as you would like to be treated."

Team members work on a one-to-one basis until the many evolve into one. A team's success depends on the identification and development of each participant's unique contribution. To ensure successful group dynamics, a leader must first analyze the team environment by identifying the team's short and long range goals, and understanding the team's mission, constraints, role, and unspoken rules. Second, a leader must develop accurate perceptions of each participant's strengths, weaknesses, biases, and reactions to events and dynamics both external and internal to the team. Third, a leader must use a style that meshes with the team's expectations. For example, if a leader is working with a self-directed team, the leader should reward cooperation and collaboration, not competition. Teamwork, carried out in an environment that promotes sensitivity to others, ensures integrity, establishes honesty, avoids surprises, encourages trust, supports open communication, and avoids blame, will encourage each participant to make changes that are beneficial to each individual member, to the team, and to the community at large.

How do project managers put together good teams? They do so one person at a time, by considering whether there is a "fit" between that person and the people who are already members of the team. They do so by a careful consideration of the potential team dynamics.

The Phases of Team Development

Throwing people together into a collection of adjacent cubicles and calling them a "team" does not make them a team. B. W. Tuckman (1965) has defined four phases of team development required to actually create a team: forming, storming, norming, and performing. Later in 1977, Tuckman and a doctoral student included an additional final stage to the model, adjourning, developed the five-stage model. We discuss each phase below.

Forming

In this initial stage of team development, people make the transition from individual to team member. Team members begin to get acquainted and understand who has what responsibility relative to the overall goals of the project and why. Little actual work is accomplished in this phase because of the high level anxiety that individuals have about the work itself and their relationships with each other. Therefore, in this stage, people need time to adjust to their new roles as team members.

Individuals do a lot of soul-searching in this phase as they seek to find answers to such questions as, "What are our purposes? Who are the other team members? Why wasn't I selected to be team leader? Why wasn't I assigned the data communications component? Will I be able to work with these new team members, especially that new man who got the assignment I wanted, data communications?"

In this phase the PM must be quite active in defining roles and providing overall structure and direction. The PM must clearly communicate the project structure and create a vision of the project as it will be when it succeeds and the benefits it will provide. Constraints in the form of project budget, schedule and duration, scope, and functionality must be explicitly communicated by the PM. Next, the PM must discuss the team members themselves. She must explain why specific team members were selected, what their areas of expertise and competencies are, why they were assigned certain tasks, and who will work closely with whom. Further, the PM must define organizational structure and rules. Initial processes and procedures are delineated by the PM, for example. Finally, the PM should explain his expectations and management style to alleviate any anxiety team members may have about "the boss."

Storming

This second phase of team development, known as storming, is tough on all team members. This phase is characterized by team members experiencing feelings of frustration, anger, and hostility. As the team begins to perform some initial tasks, members tend to feel increasingly dissatisfied with having to depend on the direction or authority of the project manager. Expectations are not being accommodated for whatever reason. For example, a project manager may ask a team member to finish a task sooner than that team member feels it can be completed. Or, a team member may not feel comfortable with policies and procedures, such as only 30 minutes for lunch. Such a team member may test the project manager's ability to enforce such a policy. Still, other team members may be unclear in regard to the policies for interaction with other project team members and stakeholders. In short, problems with authority will surface. In this storming phase, team members have many questions about their roles and responsibilities with respect to other team members. The project manager must provide direction and diffuse possible conflicts, but not suppress discontent. The PM must address the source of disgruntled team members' discontent, or it will build up and result in dysfunctional behavior later.

Norming

After struggling through the storming phase, the team moves into the norming phase. Here relationships between and among members have stabilized and the level of conflict is lower than in the previous phase. There is also less dissatisfaction as peoples' experiences align with the reality of the situation—the work to be done. Project procedures are improved and streamlined. Acceptance grows and the team begins to synergize. Trust increases as team members begin to confide in each other. The PM, however, takes on a more passive role that is supportive, but less assertive in terms of giving directives. The PM acts as a facilitator when team members discuss and establish a common working rules and style. Work throughput increases as does productivity.

Forming, norming, and storming must take place within the planning and budgeting stage of the project life cycle. The team must be assembled early in the planning and budgeting stage so that it can work through its initial disruptive dynamics. Also, the team should participate in the various aspects of project planning, especially the parts that relate to work for which they will be

responsible. Each team member should have a voice in what specific tasks he will be responsible for and should let the PM know how much time he expects each task to take. Among other things, this participation gives the team member some ownership in and commitment to the project plan. The next phase of team development, performing, must take place within the execution stage of the project life cycle.

Performing

In this phase of team development, the team is past the interpersonal conflict stage. Project team members have a clear understanding of what and why they are doing. Team members know each other and develop loyalty towards each other. They are able to work well together and get the work done smoothly and effectively. Everyone is equally goal-oriented and people-oriented. Disputes might occur during this stage but the team can resolve them constructively. The team has developed a sense of unity and pride; confidence increases and communication is open and frank.

In this phase, the PM fully delegates responsibility and authority, empowering the project team to achieve the goals of the project. The team members are finally allowed to begin execution of the project in accordance with the project plan.

Adjourning

Unlike other formal teams, project teams disband after the project they are working on is finished. At this stage, the project tasks are done and the project's goals are accomplished, hopefully. Project people can be released from the project and might be assigned to the new project. Some project team members might enjoy a sense of achievement while other people might feel insecure as uncertainty about the future begins to set in. The PM should recognize what they have done and emphasize valuable lesson learned in team dynamics. Project people now have experiences in team dynamics and should be prepared for future projects and team efforts.

Team Types

Teams are managed through a variety of team types. Democratic teams, chief developer teams, and expert teams are among the many varied team types. In democratic teams, technical decisions are made in a democratic fashion. The team leader deals only with administrative duties while delegating technical responsibilities to the rest of the team. All team members take part in the decision-making process and assume responsibility for the results. Such teams are appropriate for groups of senior, experienced developers. This type of team is inappropriate for teams of junior developers or for teams of people with varied backgrounds and skills. In the latter instances, strong leadership is required from the team leader.

Chief developer teams are appropriate when the team is comprised of junior developers or of diverse individuals with varying levels of experience and expertise. In these teams, junior developers provide support to the senior developer and learn from her. Strong leadership is required from the chief developer to make certain the junior developers are completing their tasks on time and within budget.

Expert teams are created to address specific technical problems that might arise during the course of the project. Specific technical problems that are mission-critical can be addressed via expert teams, especially when there is no need for team commitment to or ownership of a specific project. For example, a client/server network may have a client team and a server team, but no team that is specifically responsible for the network and data communication between them. An expert team may be assigned to handle this interface. After the communications problem between the two subsystems is resolved, the expert team can be disbanded. In some respects, independent test teams and quality assurance teams can be viewed as expert teams.

Independent test teams function during the integration and system testing phases of the total project only.

ENTERPRISE ORGANIZATIONAL STRUCTURES

Firms throughout the world must cope with ever greater complexity. One way they have adapted to growing complexity is by simplifying business processes. Another is through the use of projects. By using projects, firms have been able to flatten their organizational structures. Flattened organizational structures lead to firms that are flexible and adaptive to the needs of the marketplace. In addition, firms with flattened organizational structures have eliminated non-value adding positions within middle management. These positions did little but filter and relay information up and down the management hierarchy and were based on the archaic concept that one person could only manage roughly seven other persons[4]. The latter rule is a "sacred cow" that has been slaughtered as companies allow their managers to manage upwards of several hundred people. Clearly, when managers have a hundred or so persons to be responsible for as opposed to a mere seven, there are far fewer managers and the management hierarchy is flattened.

Project management is a way to get organizational energy and effort to flow horizontally toward the customer and across departmental barriers. Too often in the past, energy and effort would flow up and down the departmental stovepipes, as the vertical columns illustrate in Figure 3.5. From the customer's perspective, such effort does not result in added value, and hence does little to encourage the customer to buy the firm's goods and services.

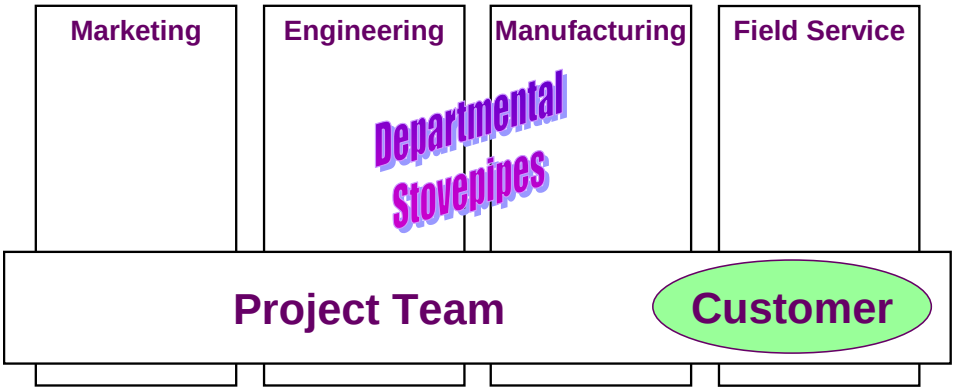
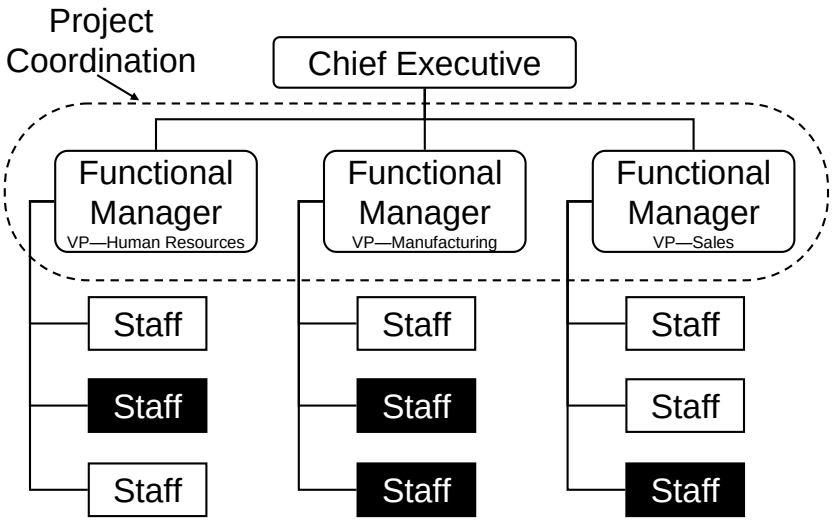


Figure 3.5: An Illustration of Departmental Stovepipes

Frequently, software projects create structures that cut across departmental stovepipes (the vertical columns in Figure 3.5) and cause integration to take place both within and across firms, as illustrated in Figure 3.5. One reason for this is the software itself is intended to facilitate integration of the departments involved in any process.

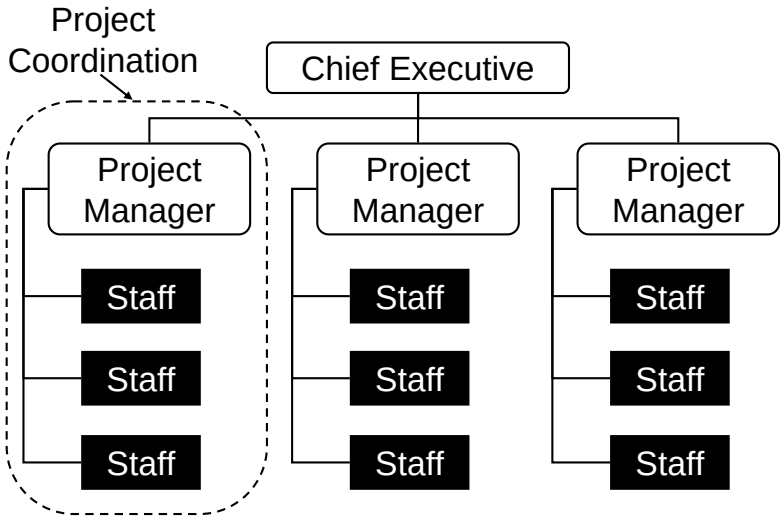
Three basic organizational structures are used in relation to projects. Projects can use functional structures, projectized structures, or matrix structures. These are illustrated in Figures 3.6, 3.7, and 3.8.

[4] The one to seven rule created a management hierarchy in which one high-level manager managed seven mid-level managers who each managed seven low level managers who, in turn, each managed seven workers. Problems with this structure were myriad—high cost, non-value adding. These managers did little more than filter information as it moved up and down the stovepipe and increased inflexibility. Too much management hierarchy created a structure that was rigid and incapable of responding to changes in the marketplace.



(Black boxes represent staff engaged in project activities.)

Figure 3.6: Functional Organizational Structure[5]



(Black boxes represent staff engaged in project activities.)

Figure 3.7: Projectized Organizational Structure[6]

Figures 3.6 and 3.7 represent the two extremes in terms of organizational structure. Between these two extremes is an array of so-called matrix structures. Clearly, all of these structures exhibit a trait called "hierarchy" in which the lowest levels of the firm report to the next level which in turn reports to the next level until the highest level of reporting authority is reached, typically, the firm's chief executive officer. We will examine the functional structure first.

Functional Organizational Structure

[5] Adapted from the PMI's PMBOK Guide, 4th edition, 2008.
[6] Adapted from the PMI's PMBOK Guide, 4th edition, 2008.

The most traditional and conventional of the organizational structures is the functional structure in which a separate silo, as depicted in Figure 3.5, exists for each and every department. Universities and colleges are examples of strong functional organizations in that, for example, biology professors do not teach courses in business, and anatomy professors do not teach courses in accounting. Hence, the vertical silos represent a clear separation of departments. In the private sector, a company might have separate departments for manufacturing, engineering, sales, distribution, and field service. Small projects can exist within a single department, but in such situations the department hires outside experts to complete the project and after the project is finished, those people are released. For example, a sales department may decide to give its sales people Internet-enabled network computers so that the sales force can enter customer data and sales directly into the system from any location. To achieve this goal, the department hires a group of IT professionals to create the network, set up the hardware, and write the software. What is the sales department to do with all of this expertise after the project is complete? This is precisely what team members start asking themselves after they are well into the project. They may worry about what the future holds for them once the project is complete.

Occasionally, there is inadequate human resource expertise inside the organizational unit to support a project. In such instances, functional project structures give rise to **distributed project teams** in which many team members come from outside the organization and are hired by the organization from a system integration firm. In this way the organization can avail itself of expertise it does not have within the functional unit itself. At the same time, the organization in question does not have a long-term commitment to these contract professionals coming in from outside the firm. When the project is complete, they will go on to another project in contract with another firm.

The advantages of the functional organizational structure are: flexibility is good in the use of resources within the functional unit; the functional organization is traditional insofar as traditional lines of reporting authority are concerned; continuity in terms of procedures, policies, technology and administration is maintained.

The disadvantages of the functional organizational structure are: a focus on the activities of the functional unit rather than the customer, a tendency to focus only on the interest areas of the functional unit and to give short shrift to interests outside the functional area, and a project manager as well as team players who are assigned only part-time. The motivation of people assigned part-time to the project tends to be weak, and the structure may not facilitate a holistic approach to a project with impacts on several functional units.

Projectized Organizational Structure

At the other extreme is the project organizational structure (also known as the *projectized organization*) as depicted in Figure 3.7. Construction and aerospace companies frequently use this kind of organizational structure, as do some IT consulting firms. In a structure of this type, most of the team members on a project are in the same department. For example, suppose that the first project (the one on the left in Figure 3.7) needs a network specialist in Microsoft NT. The firm might hire such a person for that specific project. The question then becomes, “What happens to that person after the project is over and her expertise is no longer needed?” For that matter, what happens to all of the project personnel once the project is over? Typically, the firm has to search for other projects within the firm that match well with the expertise of these idled project personnel, and assign them to these other projects. While the use of resources may not be optimal in this example, the simplicity of the organizational structure is compelling. And, as we shall see in Table 3.3, project managers have the most authority in a pure project structure.

Advantages of the pure project organizational structure include a simple organizational structure, a project manager that is full-time and has real and substantial authority, shortened

lines of communication, a strong project identity, full-time team players that have one and only one boss (the project manager) and a focus that is directed toward the customer.

The disadvantages of the pure project organizational structure include possible duplication of effort and expertise when several projects are taken on in parallel. Additionally, equipment and human resources tend to "hang around" longer than needed; they may show up before they are needed and still be around after they have made their contribution as a "just in case" precautionary measure. Finally, this type of project structure creates anxiety regarding the future for players who have made their contribution and are now "dispensable."

Matrix Organizational Structure

In a matrix organizational structure, firms attempt to avoid the idleness of once used resources through resource sharing. The matrix organizational structure is depicted in Figure 3.8. The basic idea is to create "centers of excellence" in such areas as client/server development, Internet development, network design and administration, enterprise resource planning implementation, and so forth. While these are silos, projects run horizontally across the department silos, as depicted in Figure 3.5. With this structure, Internet developers are borrowed from the Internet development center, an ERP[7] interface specialist is acquired from the ERP center, a network specialist is loaned from the Network center to the project. When the project is complete, these people return to their respective centers of excellence for reassignment to another project. In the meantime, they can pick up some additional training within the center, observe and learn from their peers about other projects. It is even possible for a person to be on loan to two projects at the same time.

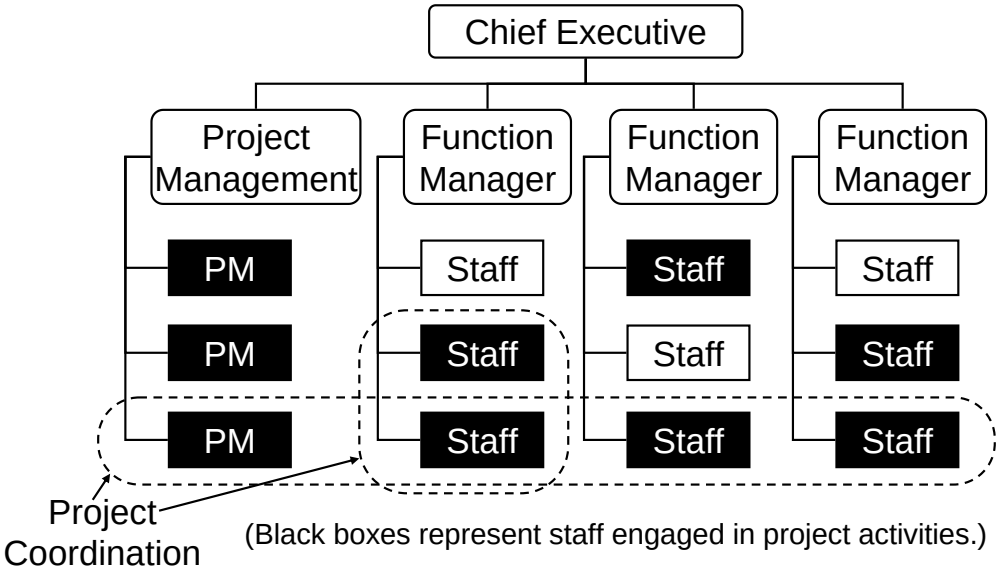


Figure 3.8: Matrix Organizational Structure

One problem with the matrix organizational structure is that each project professional must report to two people: a line manager and a project manager. However, only one of those people has authority to approve raises and decide on promotion. Usually, the line manager within the center of excellence makes all promotion and merit raise decisions. The project manager is, however, more familiar with the work being performed by the persons in question, but because he communicates his perception of the value added by each team member to the line manager, his

[7] Enterprise Resource Planning

authority is indirect and team members may not regard it as important. Nonetheless, the matrix organizational structure affords much better opportunity for sharing human resources.

Matrix organizational structures can lead to high levels of conflict because of the shared, *virtual* nature of these structures. When functional and project managers share responsibility executing project tasks and for rewarding team members, conflict inevitably follows.

Table 3.3 illustrates the relative authority a project manager has within each of these organizational structures. (Note that the matrix structure is broken into three parts – weak, balanced, and strong – because there are so many variations in matrix organizations.)

Table 3.3: How Projects are Influenced by Organizational Structures

Organization Structure / Project Characteristics	Functional	Matrix			Projectized
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who controls the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

Source: A Guide to Project Management Body of Knowledge (PMBOK Guide), 4th edition, p. 28.

The strong matrix organizational structure is most like a project structure, while the weak matrix organizational structure is most like the functional organizational structure. As shown in Table 3.3 above, personnel working in a weak matrix organizational structure suffer from dilution and a lack of focus as they are mostly part-timers. Between the two extremes is the balanced matrix. A software development team working closely with manufacturing might take on a balanced matrix structure in which the development team members are on loan from other functional areas. The impetus might be to develop a world-class manufacturing planning and control system. Another example of a balanced matrix structure might be an ERP implementation, test and training team working within human resources. The focus would be to install a human resources module as part of the larger ERP system.

If you are a student who is finishing school and preparing to begin a job, you will want to know what type of organizational structure the firm that hires you uses. As an IT person seeking employment with a sales department of a company that uses a functional organizational structure, you should be concerned about the long-term stability of your job with that department or firm. Usually, short-term employment means that the person in question is a "contract laborer." Short-term contract personnel are usually paid more in return for having less job security and less employment benefits, such as comprehensive health care.

Box 3.3: Projects and People
The Basics of the "Starting Your Career" Project

As you complete your schooling and head out for that job, you should know that your first three to six months on the job will be most scrutinized ones and will set the pace for your entire career. Just ask Molly Buchholz what her first months were like at advertising giant Foote Cone & Belding. "I spend a lot of time worrying about how I act and react in different situations," she

says. "I feel like I'm under a microscope." How you conceive of (your mental model) and define your job will largely determine your performance on the job and the evaluation that your superiors will give you. You must unearth the written and unwritten values in your work environment, and learn the rules by which your performance will be judged.

Previously, firms gave their new-hires a grace or probation period of several months. Today, that period is likely to be two months or less. "The biggest mistake that a new-hire can make is to lose a sense of urgency," comments Linda Seale, head of an executive coaching firm whose roster includes clients from an A-list of companies. Cheryl Dahle[8] put together the following agenda for your first two months on the job.

1. *First two weeks: Get to know four new people*. When you show up for your first months of work, lose the fantasy that your success depends exclusively on your work. "The combination of your performance and your personality determines how you're viewed," says Seale. "Probably 95% of firings are the result of failing to fit into a company's culture. If people don't know you, they can't trust you," according to Seale. Make a list of the people you will be working with and begin having lunch with them. Set aside two days of each week to have lunch with these people. Your purpose in these meetings is to learn what the real values of the firm are, what people really care about, and what the unwritten rules of behavior are in the culture.

2. *First four weeks: Write your job description*. If you're one of those new-hires lucky enough to be given a job description when you are hired, you will most likely discover within your first four weeks how wrong it is. If you weren't given a job description, you need one. Write it yourself after you've been on the job a few weeks. And take it with you into your "how am I doing" meeting with the boss. Let the boss know what responsibilities, tasks, assignments, and activities have come your way and what your priorities are in terms of getting these done. This exercise will help to align you with the priorities and needs of the larger organization.

3. *First six weeks: Have a "how am I doing" meeting with your boss.* Often new hires and managers or supervisors do too much assuming. Your manager may give you an assignment that lacks necessary details. You will then have to fill in the missing pieces in a fashion that enables you to deliver a "product" that is consistent with your manager's expectations. If you guess wrong, both you and the manager will look bad. Therefore, don't assume anything. Managers assume that you're doing what they expect even if they haven't told you what their expectations are. You must seek them out and tell them what you're assuming. According to Molly Buchholz, "People who expect others to come to them spend too much time waiting around. I want to be more aggressive. I want people to know I'm here." Not talking to your boss because of possible negative feedback is like not going to the doctor because you fear hearing bad news about your health.

4. *First eight weeks: Get something done.* Look for the low-hanging fruit and pick it. Find those tasks that are easy for you to complete and that the organization wants done quickly.

5. *First twelve weeks: Re-assess*. After twelve weeks, it's time to re-asses your situation. Now is the time to extend your networking and relationship goals beyond your company to your industry. You may be able to turn your personal job description into a plan for your entire team. Figuring out your place on each team and aligning yourself with the needs of the project through feed-forward and feedback should be ongoing activities.

During this initiation period, more so than at any other time in your career, you will be scrutinized in terms of your potential value to the firm. Give it your best shot. Take a couple weeks off after graduation to travel, sightsee, or do whatever you like. Reward yourself for all of the hard work of getting that diploma. Then begin your career with a vengeance.

[8] Adapted from "Fast Start – Your First 60 Days," by Cherl Dahle, (http://www.fastcompany.com/magazine/15/first 60.html

PROJECT MANAGEMENT ORGANIZATIONAL ISSUES

People are managed through the use of an organizational structure. The structure is based on the four cornerstones of management: delegation, authority, responsibility, and supervision.

A simple organizational structure chart for a small project is shown in Figure 3.9. For obvious reasons, the project manager is positioned at the top of the team. The project manager is the leader, the person ultimately responsible to the rest of the stakeholders and the person who "buffers" the team members from the distractions of the outside world. Note that there is only one project manager in Figure 3.9. Using two project managers, especially for small projects, is not wise because of the potential for confusion about who is responsible for what. If there will be two project managers, there should be two distinct projects.

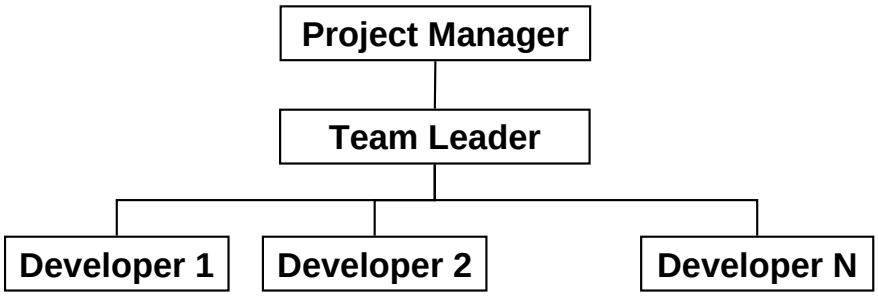


Figure 3.9: Small Project Organization Chart

Larger projects may assume an organizational structure like the one shown in Figure 3.10 in which the organization is broken down into still smaller sub-projects, each with its own team leader. The figure also shows the placement of the project leader and the team leaders within the hierarchy.

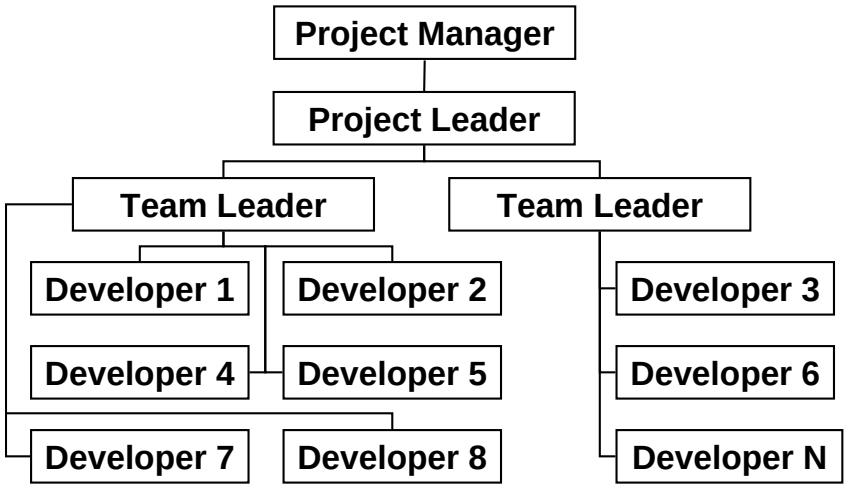


Figure 3.10: Medium Project Organization Chart

Project Staffing Considerations

Team members are always eager to prove themselves worthy of the tasks assigned to them. Therefore, it is important that team members be assigned tasks that are appropriate for their skill level. Highly challenging tasks should go to the team's best developer while less challenging

tasks should be assigned to people with less experience or expertise who want to learn and grow. These principles are supported by G. Weinberg, who, in his book *The Psychology of Computer Programming* (1971), states that a developer is highly motivated when she is in a position to learn new concepts, tools, or aspects of a language. According to principles stated by Weinberg, team members should be assigned tasks that are somewhat challenging but not too challenging. This will depend on the team members' willingness to take on challenging tasks, of course.

As stated above, the PM should assign the most challenging and difficult tasks to his best, most reliable developer, especially if that developer indicates a willingness to take on tough work. Tasks that are related should be assigned to the same person, assuming that person has the time to complete all of the related tasks without causing a delay in the overall project. The reason for assigning tasks in this fashion is to cut down on the communication overhead, but a strict adherence to this policy could result in *all* tasks being assigned to the same person, causing a significant delay in the total project. This is where judgment comes into play. The PM wants to minimize the communication overhead, while not delaying the project.

CONFLICT DNYAMICS/CONFLICT RESOLUTION

Conflicts generally occur as a result of misunderstandings. Therefore, the PM must communicate well-defined project objectives not only to the team but to upper management and the customer. Clear communication is the best way to avoid misunderstandings that can stop a project in its tracks.

It has been said that project management is conflict management. In truth, while conflict management is only one part of project management, it is a very important part. It is the responsibility of every team member, but especially the project manager and team leader, to understand how to detect, diagnose, and resolve conflicts. Conflict resolution should aim for more than mere tolerable compromises; indeed win/win strategies should be sought, agreed to, and implemented.

Sources of conflict include misunderstandings about goals and scope, misalignments relative to vision and mission, misunderstandings about roles and assignments, and fundamental differences in values. Project managers and team leaders make an important contribution to the overall success of a project if they create a common vision, values, and goals for team members.

Good conflict resolution entails project managers and team leaders scrutinizing, understanding, and responding to conflicting views. In this regard, these leaders must be good listeners and in the words of Covey, "seek first to understand, then to be understood." The leaders must create a team culture that fosters respect for opposing viewpoints and allows these to co-exist until a kind of synthesis with the more prevalent views can be reached. According to Singer[9], two views of the problem should be expressed: thesis, and antithesis. Out of these views, there should develop a synthesis. The synthesis should result in a win/win strategy for all parties.

Some conflicts are not due so much to differences in the mindsets of team members as they are to scheduling, the use of specific resources, the costs involved, or the assignment of tasks to specific individuals. When conflicts about these issues arise, the project manager must demonstrate political acumen and excellent negotiation skills to resolve them.

Conflicts can arise when team members do not feel they are adequately rewarded for their individual contributions. They may feel that their specific contributions are masked and incapable of being discerned by the line and project managers who determine such issues as salary, recognition, and promotion. Or, they may feel that even though the "system" recognizes their individual excellent performance, the system will not reward it. PMs must find ways to

[9] See Churchman, C. W., *The Systems Approach*, 1966.

reward exceptional individual performance without encouraging the "heroics behavior syndrome[10]."

Within systems thinking, there is a collection of archetypes—standardized structural paradigms that occur again and again and within all disciplines. One of those is the SHIFTING THE BURDEN archetype. Illustrated below is a paradigm that says project managers tend to be taken in by short-term fixes that ultimately erode the team's ability to construct a long-term legitimate solution.

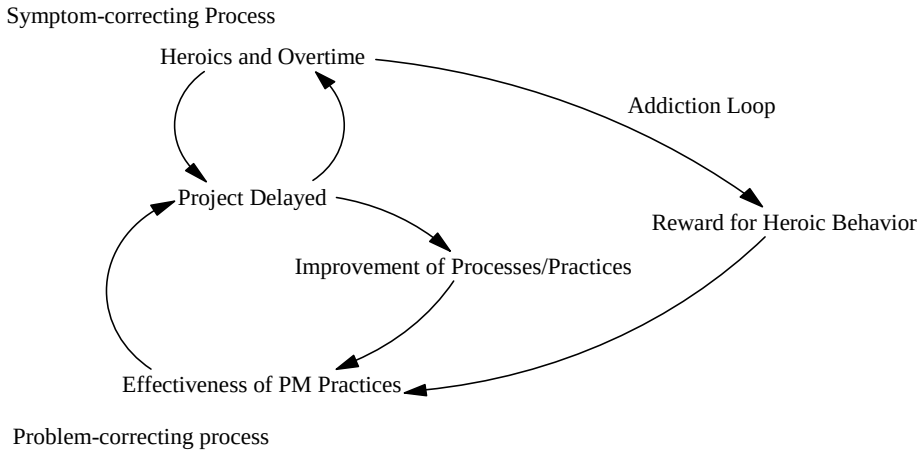


Figure 3.11. The Causal Structure of the SHIFTING THE BURDEN Archetype

This model exhibits the project manager's penchant for resorting to heroics as a way of overcoming the obstacles that are delaying the project. After several projects, this project manager, even the stakeholders, becomes addicted to the use of heroics, making it impossible to implement a fundamental solution, which is a change in scheduling and controlling strategies. The well-intentioned easy fix of rewarding those who work overtime to bring the project to completion on time tends to remove the symptoms, but leave the underlying problem unaltered. Consequently, the underlying problem grows worse, as the system loses whatever abilities it had to solve the underlying problem.

To minimize conflicts, PMs must, (1) show respect and consideration for all employees as members of the team, (2) make sure each team member understands his job responsibilities and performance standards, (3) establish good communication with team members, (4) develop and communicate unambiguous group and individual goals, (5) properly reward team work and team building efforts, and (6) demonstrate loyalty to the team. If there is a sign of conflict, the PM should try to resolve it early, before it spreads. The more people that become involved, the more difficult it is to resolve.

It is important that project professionals be familiar with the three basic strategies for managing conflict: avoidance, confrontation, and collaboration. Avoidance usually results in less robust outcomes as one polite individual gives way to stronger voices with inferior solutions. It is the least desirable of the conflict management strategies. At the same time, confrontation, if used consistently, begins to wear on the patience and good will of the team. Stress and tension as

[10] Heroics behavior syndrome is when one person gets rewarded for doing nearly the impossible—namely bringing a late project to completion on time through extraordinary individual effort. By rewarding this kind of behavior, a PM can expect to see this behavior over and over again. Instead, better planning up front should prevent projects from being consistently late and over budget.

well as hurt feelings take their toll. PMs should pick their fights carefully, and save them for the important issues. The collaborative approach is generally the most effective. Here the conflicting parties, without becoming emotionally taxed, seek first to understand the opposing view and then to be understood. Using a Singerian style[11], there is a thesis, an antithesis, and finally a synthesis that results in a win/win strategy that everyone can buy into.

Eli Goldratt (1992, 1994, 1997) has long been a proponent of win/win strategies. He has developed a diagram called an "Evaporating Cloud" that is essentially a conflict resolution scheme. In a sense the Evaporating Cloud evaporates the conflict. An example of such a diagram is shown in Figure 3.12 below. The purpose of the diagram is to bring to the surface any spurious or untrue views, assumptions about the problem and to scrutinize these. Eventually, people realize that a particular view is incorrect. By letting go of this view, all parties can find and buy into a win/win strategy that results in positive outcomes for everyone. The purpose here is not to find tolerable compromises, but to find breakthrough solutions, to verify and document that the conflict actually exists, and to facilitate resolution of the conflict. The conflict actually appears between the two requirements and is represented by the lightning rod between the two prerequisite boxes.

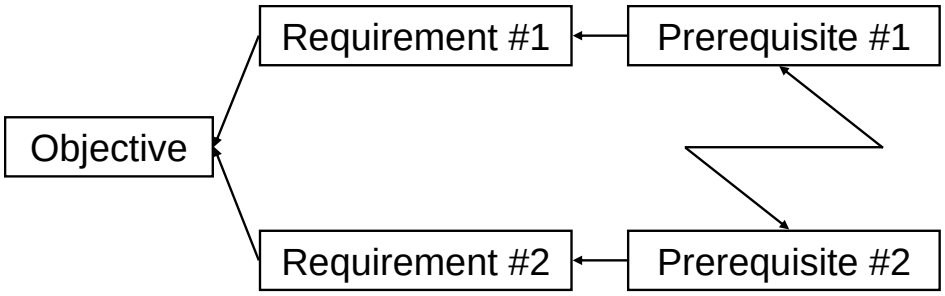


Figure 3.12: A Conflict Resolution Diagram (Evaporating Cloud)

In Figure 3.12 above, each requirement is itself necessary to achieve the objective. However the requirements are not themselves in conflict. We have to take another step backward to find the conflict—in the prerequisites. The prerequisites are necessary to the achievement of the requirements. The prerequisites usually demand actions on our part that are better defined and more specific than the requirements. It's at this level that conflicts involving time, money, systems, resources occur. The actual conflict itself is represented by the jagged arrow between the two pre-requisite boxes.

A specific example of a conflict resolution diagram is shown in Figure 3.13 below. This is the same conflict we mentioned earlier between software engineers who want to spend more time on development to get the requirements right and managers who need the software now, however well it fits.

[11] In Churchman (1966) an approach to scientific inquiry called the Singerian approach or style.

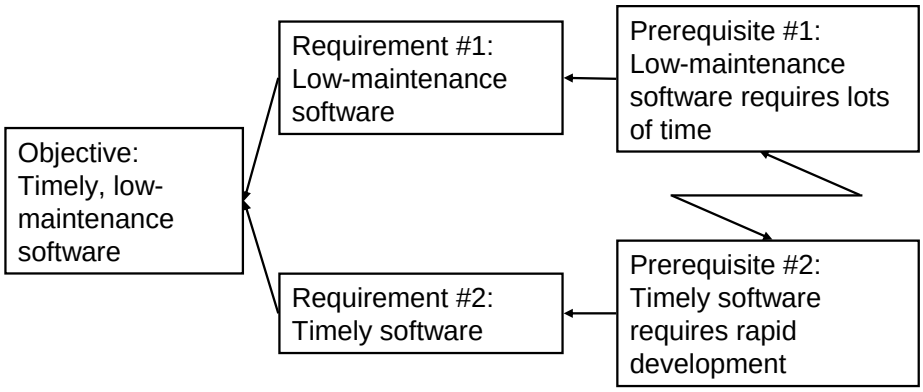


Figure 3.13: An Example of a Conflict Resolution Diagram (Evaporating Cloud)

The approach that is taken here is to examine every arrow in the diagram and list the underlying assumptions. In this case the faulty assumption underlies the arrow between the prerequisite #1 box and the requirement #1 box. Timely, low-maintenance software can be obtained rapidly through the use of client/server (N-tier or multi-tier architectures[12]) architectures, convergent engineering, agile development and extensive reuse. Also, software product lifetimes are shorter than they used to be, so maintenance costs are less simply because the product is replaced sooner. For example, lifetimes used to be 20 years for some software products in use through 1995, whereas today the lifetimes are more like 5-10 years.

Another approach to conflict understanding and resolution is to use left-hand, right-hand column analysis.

Left-Hand, Right-Hand Column Analysis

The left-hand column details what one was thinking, while the right-hand column details what was actually said. Consider the following example in Table 3.4. Jim is an R&D project manager. Jim assumes his supervisor Todd is critical of him. Jim just had a conversation with Todd. Jim writes the conversation with Todd in the right-hand column and writes his thoughts at the time in the left-hand column.

Table 3.4. Left-Hand Column Analysis

Jim's Thoughts	Actual Conversation
We're two months late and I don't think he knew. I was hoping we could catch up.	Todd: Jim, I'd like to come down there next week. We're a few weeks behind, and I think we might all benefit from a meeting at your office.
I need to make it clear that I'm willing to take responsibility for this, but I don't want to volunteer for more work.	Jim: I've been very concerned about these deadlines. As you know, we've had some tough luck here, and we're working around the clock. But of course, we'll squeeze in a meeting at your convenience.
He never offers this help in the planning stages, when I could really use it. It's too late now to bring that up.	Todd: Well, its occurred to me that we could use better coordination. There are some ways I could help.
The changes he keeps making are the real reason we're late. He must have another one.	Jim: Well, I'm happy to talk through any changes you have in mind.

[12] These are architectures in which the application is spread across several network computers.

	Todd: I don't have anything specific in mind.
It's a shame I can't tell him that he's the cause of the delays. If I can hold him off two more weeks, I think we'll be ready.	Jim: If you would be willing to wait two more weeks, we should have our prototype finished by then.

How is this table useful? By thinking about the two parts – Jim's thoughts and the actual conversation – people in subordinate positions can learn a lot about how they can improve their communication with their supervisors. After writing down their thoughts and feelings, they can also ask themselves questions such as, "What really led me to think and feel this way? What was my intention? What was I trying to accomplish? Did I achieve the results I intended? Did my comments contribute to the difficulties?" In this fashion, the table above serves as a tool for learning about one's motivations and effectiveness. Additionally, it suggests further stipulations that should be applied to Todd's visit, like limiting the visit to no longer than an hour and denying any further proposed changes to requirements.

SUMMARY OF LEARNING OBJECTIVES

1. Explain the relationships among the five stages of the project life cycle.

A feedback relationship exists between the first two stages of a project's life cycle because occasionally, duration and cost, once formally calculated within the planning and budgeting stage, become more than project planners originally expected. In this situation, planners must "de-scope" (crunch the numbers again) a project so that project duration and budget are within realistic expectations. Figure 3.1 illustrates this feedback relationship.

Similarly, the second and third stages of the project life cycle are in a feedback relationship. Here the planning and budgeting stage and the executing stage loop with one another. The process of aligning the stages is called project integration management. The key idea here is to review the remaining phases of the project after each phase has been completed. With the completion of each phase, more is known about the possible duration and cost of the project. To ensure that the additional information is used to determine the accuracy of the schedule, the project's duration, and the cost in the project plan, the remaining project needs to be reviewed and re-scheduled/re-budgeted as necessary.

Projects have a way of breaking down departmental barriers and creating integration across enterprises. With projects, organizational energy is focused on the customer. The project life cycle is seen as consisting of five stages. There must be a good opening stage in which the scope and deliverables are well defined, a good second stage in which the project is thoroughly planned, a good third stage in which the project is executed, and a good final stage in which the project is terminated and closed out. The goals of any project team are to complete the project within its cost and duration specifications, with the required functionality, using the assigned resources.

2. Understand what project people do and what skills and competencies they must possess.

Project professionals are good technical people who listen first and share their views second. They love being creative and appreciate tasks that challenge them. They are resourceful, independent, and reliable. They are enthusiastic; they work well with others. They are driven more by the clock than by a desire to create the perfect product.

Project and team leaders are the best technical people on the project. They can solve the toughest technical problems. Occasionally, they are called upon to facilitate and direct team meetings.

Project managers must coach, mentor, lead, negotiate, problem solve, plan organize, monitor and control. In addition, they must be able to facilitate meetings among high-level people. At such meetings, they are able to bring the stakeholders to a state of consensus and cohesion when required to do so. Definition, conceptualization, planning, and budgeting are among their strengths. Project managers must have excellent time management, problem-solving, and project planning abilities. In addition, they should have a number of competencies such as strong interpersonal skills, stress management and leadership skills, the ability to motivate people and help them grow, and strong communication skills.

Project management entails being focused on the goals and objectives of the project. Project personnel are team-oriented, flexible, energetic, confident professionals who subscribe to the five disciplines discussed in Chapter 2. Their attitude is at least as important as their skills. Project personnel, particularly project managers, must be able to effectively communicate with team members, upper-level and line managers, and the customer.

As players move up the ladder, managerial and interpersonal skills become more important, and technical skills become less important. This fact raises an important question: Is there a career path for the project professional who does not want to go beyond technical specialist, who wants to continue to hone and refine his/her technical skills without moving into the people side of project management? Some companies have developed a career path for this kind of professional as well, because there is a need for some technical professionals to continue to grow and enhance and improve their technical skills. Firms have also created career paths for project professionals that take them into more and more people-related responsibility, and that let them develop people-intensive competencies for project management.

3. Explain the phases of team formation.

According to Tuckman, teams undergo five phases en route to being productive. Initially, they must get acquainted (forming). Then, they must work through disagreements, and conflicts (storming). Next, they must familiarize themselves with the tasks and assignments they have received (norming). The fourth phase of team formation, according to Tuckman, is performing (as a team). During this phase, team members take energy from the synergy that exists among them. The last phase is adjourning, where the team gets the work done and moves on the another project.

4. Identify and classify enterprise organizational structures.

The three most common project management structures are; functional, project, and matrix. A matrix management structure is the least risky for the project professional, because it affords an opportunity for that professional to become a shared resource across the enterprise. Project structures are the most risky, because the firm may not have a place for the project professional once the project is complete. Project managers have the most authority in project structures because they are also the people who give raises, award bonuses, and hand out perks. Project managers have the least authority in weak matrix structures because line managers make all personnel decisions relative to wage increases, bonuses, and promotion.

5. Describe project management structures.

Three organizational structures were described: functional, matrix and projectized. The project manager has the most authority in the projectized structure, the least authority in the functional. Team players might feel the least secure in a functional organizational structure, because there is no guarantee the firm will retain them once the project is finished. A matrix organizational structure is the most secure environment for IT team players because, upon completion of a project, they will be loaned out to the next project to follow.

6. Understand conflict dynamics and know how to resolve conflicts.

The problems associated with conflict are usually attributable to misunderstandings, misunderstandings about goals, scope, roles, assignments, about values and alignments. The most important thing a project manager can do to minimize conflicts is to be a good communicator and be available to answer questions and address project personnel's concerns.

A tool called an "Evaporating Cloud" was presented that may help to resolve conflicts. Invented by Goldratt, the idea behind the device is to bring all underlying assumptions to the surface in effort to create a win/win solution for all parties.

DEFINITIONS

Conflict Resolution Diagram—a diagram for bringing to the surface all of the relevant issues and assumptions regarding a conflict

Evaporating Cloud—a conflict resolution diagram

Functional Organization—an organization organized around traditional departmental functions like marketing, engineering, manufacturing, accounting, and field service

Joint Project Definition Session (JPDS)—a session in which interested stakeholders define the scope and content of a project

Joint Project Planning and Budgeting Session (JPPBS)—a session involving project stakeholders and project team members in which project schedule and budget details are hammered out

Kill Point—a point at which the project will be reviewed to determine whether to it should continue

Matrix Organization—an organization in which project personnel report to both a project manager and a line manager

Progressive Elaboration—The custom of planning and executing, then re-planning the next phase, then executing it and so forth.

Project Charter—a document that announces a project, its name, purpose, project manager, and rules of governance

Project Closure—the steps taken at the end of a project to bring it to completion and termination

Project Control—comparing project progress with plan and making adjustments as necessary; part of the third stage of the life cycle of a project

Project Conceptualizing and Defining—the first stage of a project in which the project deliverables are conceptualized and requirements for them are determined

Project Integration Management—the practice of reviewing/restructuring the remainder of the project after a major deliverable or milestone has been completed

Project Life Cycle—the stages that comprise the entire project from beginning to end

Projectized Organization—an organizational structure that is organized around projects rather than functions

Project Planning and Budgeting—the second stage of the project life cycle in which a detail project schedule and network is determined

Request for Proposal (RFP)—a document transmitted to IT contractors that allows them to create a proposal and then to bid on the anticipated project

Requirements Scrubbing—a technique in which some features, content in the original requirements are removed in order to reduce scope and hence cost and time required

Stage Exit—a point at which the project will be reviewed to determine whether to continue with it

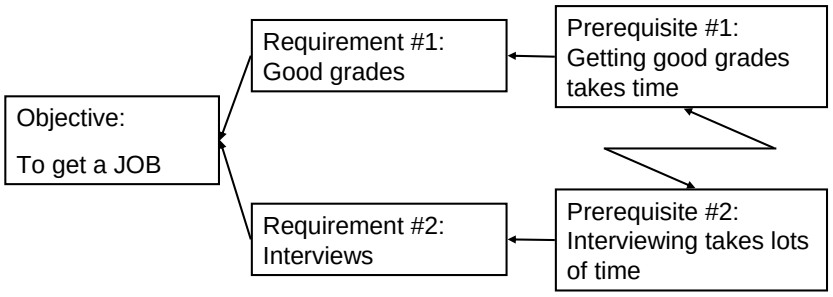
Stakeholder—any person who has an obvious vested interest in a project and its outcomes

Statement of Work (SOW)—a one-page description and justification for a possible project that is merely being contemplated

Trade-off Triangle—a simple triangle that shows the relationships between scope, schedule, and cost

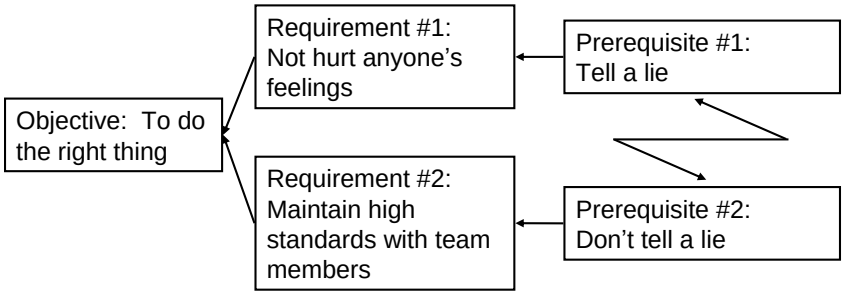
EXERCISES

1. How many team leaders might there be on a project? Project leaders? Project managers? Would there ever be a case in which it would make sense to have two project managers for the same project?
2. For the trade-off triangle, write-out all of the permutations of corner controls that are possible in terms of a customer and a contractor. For example, the customer might get to specify the product and cost corners, while the contractor specifies the schedule corner. Which of these permutations makes the most sense?
3. What went wrong in terms of how the project described in the opening box got started? What should the two project managers have done at the very beginning of the project? Should the project managers have started spending money on web development right away? How might the project have been better structured?
4. List the important traits, characteristics, competencies of the project manager.
5. List the important traits, characteristics, competencies of the project leader.
6. List the important traits, characteristics, competencies of the team leader.
7. List the important project traits of a team member.
8. Using Table 3.1 and 3.2, compare the skills and competencies of a project manager with the responsibilities of a project manager. Specifically, map the skills and competencies of the project manager onto the responsibilities of a project manager. One way to do this is by drawing arrows from skills/competencies to responsibilities.
9. What are the five stages of any project? Which of these is concerned with creation of a project charter? In which of these is budgeting accomplished? In which of these does re-planning occur? In which of the phases are lessons learned identified and documented?
10. List the steps you will take now to ensure that you are "ready" for the most intense six months of your life as you begin your working career as an IT professional.
11. Explain why during the first six months of your employment, it is especially important that you apply yourself with extreme diligence?
12. What are the five phases of team formation? Briefly explain each indicating the order in which they occur.
13. Whose responsibility is it to alleviate conflicts? Why?
14. What must team leaders and members do to maximize their contributions to the project?
15. What specific traits do PMs look for in team members?
16. Take a conflict that you are aware of and diagram it using an evaporating cloud. Now write down all of the assumptions underlying each arrow in the diagram. Question each assumption. A faulty assumption usually leads to a breakthrough injection. Determine an injection that you believe will solve the conflict.
17. How do project managers differ from line managers? Which person directly controls salary and promotion decisions for project players?
18. What is the project manager's most significant responsibility?
19. Develop a left-hand, right-hand analysis of a conflict situation that you are personally aware of. What did you learn about your responses that may be contributing to the problem?
20. Consider the following Evaporating Cloud:



The conflict depicted above may be one you are experiencing at this moment. The time needed to interview for jobs conflicts with the time needed to get good grades. List the underlying assumptions associated with each arrow and attempt to find a breakthrough injection (solution).

21. Consider the following Evaporating Cloud:



Bring at least one assumption associated with each arrow (edge) to the surface, and come up with a simple breakthrough solution to the conflict.

22. To what extent do you believe the logic of the heriocs diagram (Figure 3.11)? Does rewarding heroics undermine the need for the project manager to improve his effectiveness? Why or why not?

TEAM EXERCISE—fallout shelter[13]

In this exercise you will divide into groups of 10 to 15. You are to imagine that you are a committee of individuals charged with rebuilding civilization after a just-declared nuclear war. As far as you know, you are the only survivors of the first wave of nuclear missiles. However, other waves of hydrogen bomb-tipped ballistic missiles are coming. It will be eight months before it will be possible to leave the fallout shelter and return to the earth's surface. The fallout shelter you presently occupy has sufficient food and water for only seven people. You must collectively decide who stays and who must go out into the unprotected world of nuclear flashes. Each of you is to take a number between 1 and 15. You will be given a list of numbered occupations: Your occupation corresponds to your number. You have 10 minutes to make a unanimous decision about which seven can remain in the only available fallout shelter. The list of occupations follows below.

1. Accountant
2. Architect
3. Attorney
4. Banker
5. Cook
6. Data/voice communications specialist
7. Dentist
8. Farmer
9. Financial consultant
10. Management consultant
11. Marketing/sales representative
12. Nuclear scientist
13. Nurse
14. Nutritionist
15. Pharmacist
16. Physician
17. Project manager
18. Realtor
19. Stock broker
20. Teacher

This exercise is a good example of how an "event" changes the values of those involved. These values change the relative importance of the role players. For example, management consultants, data communications specialists and marketing/sales representatives might have been considered "important" before the event; now these persons might be considered "dispensable."

[13] This exercise was invented by Southwest Airlines to determine which among a group of applicants they actually wanted to hire.

CASES

Each of the cases presented below is patterned after a real-world situation that actually occurred. The purpose of these cases is to provide some insight and perspective into the real world of project management. In responding to the questions within each case, use what you have learned so far together with your common sense, personal experience, and good judgement. These cases should enable you to role-play a real-world scenario and to thus learn from it.

BRIEF CASE 1: Software Development for DoD

In the early 1980s, a major American defense contractor submitted a hastily prepared proposal to the US Department of Defense (DoD). The proposal was to develop software pursuant to DoD specifications. As it turned out, the contractor won the award. When learning of the contract award, the development team, after an initial celebration, set about planning the launch of the project. At that point, they discovered that the projected development cost they used in their proposal was based on their original estimate of 100 work years, while their new calculations produced an estimate of 150 work years. This increase could cause a budget overrun of 50%. With a fixed price contract, this situation could cost the firm millions.

The company estimated that they would be at least $5 million over budget if they actually undertook the project. While this amount would not bankrupt the company, it could cost a number of software engineers their jobs.

The firm's management sent a letter to the DoD informing them that the cost of developing the software product had been miscalculated. In the letter, they requested that they be permitted to resubmit a corrected proposal. If the request was to be denied, they stated in the letter that they would be willing to withdraw and permit the contract to be awarded to the company that had submitted the next best proposal. The answer they received from DoD stated that not only would they not be permitted to resubmit their proposal, but should they try to withdraw, the DoD would take legal action against the company that would cost them considerably more than their anticipated loss, possibly preventing them from ever being a viable candidate for a major government software contract again. This proposal was one of a number of major contracts that the company had with the US DoD. **What suggestions would you make as possible solutions to this problem? How would you prevent this type of thing happening in the future?**

BRIEF CASE 2: Network Integration

Systems Integration, Inc. (SII) was founded in 1995 and specializes in large LAN software and hardware. Financial results for SII were flat in 2010. Profit was $1 million on $80 million sales. SII had finally completed testing of the software in their only large program. There had been numerous schedule delays and a substantial cost overrun in the software development, which severely affected profit. Fortunately, SII would continue hardware production for two years, providing a stable, profitable back-up business.

By December 2001, it was apparent that the decline in IS budgets within major Fortune 500 firms would take a heavy toll on systems integration firms. SII had successfully completed work on several new programs. However, subsequent budget reductions had delayed start-up of these programs indefinitely. During December 2001, SII was notified by a Fortune 100 firm, that they were the winner of the Automated Logical Interoperation Area Network System (ALIANS). This system would inter-operate a number of diverse but popular broadband and baseband networks.

During the bidding competition for ALIANS, SII determined that they must be the integrated developer for both the hardware and software components of the total system. That

competition was successful. The hardware development component was straightforward and consisted mostly of off-the-shell hardware components. The software development component was thought to be straightforward because the company had ten years of experience building commercial LAN software. Further, the company had more than fifty software components ready for integration when needed.

However, the scenario changed dramatically when SII hired a new software project manager with a background of developing large military communications software but no familiarity with commercial LANs. He was not familiar enough with the LAN module repository in relation to the requirements specification to perceive the vast amount of software rework that was necessary. After two months he left the firm, realizing that his original estimates regarding cost and schedule were hopelessly wrong. Members of the software team also left as work was completed and new employment opportunities presented themselves.

Kathy Kelly was software Project Leader (PL), and was appointed to take over as software PM. **Under what circumstances would you take over a project that was failing and in which the existing PM had resigned or had been removed? How would you assess the risks involved?**

Kathy worked long hours, weekends, and late nights. In some instances she did much of the work herself, especially when the work packages required modifications to modules she had written and deposited in the repository months ago. She was able to upgrade these rapidly. She was able to keep the last of the development group together long enough to integrate the re-work of the existing modules and to deliver a "product" on schedule. The raw product was able to meet the customer's raw requirement minimums in terms of performance--speed and crash resistance. Kathy saved the project and the company.

The customer, having determined that the product did conform to stated requirements, paid SII for its work. But the customer quickly realized that the product was not exactly what it wanted and competition was heating up in markets where the customer needed to use the product. It quickly prepared an RFP and sent it to SII. At this point, Kathy had already been promoted to software program manager for all of SII. **What should she do?**

BRIEF CASE 3: Enterprise Resource Systems, Inc.

Jack Jones was project manager for a project that required transitioning a bank consortium (a collection of small banks) from mainframe/glass house computing to N-tier distributed computing using SAP and ORACLE. Jack had never served as project manager before. The project was a large one that used twelve people. Five team members and a team leader were provided by the bank consortium, while five team members and the project manager were provided by the outside contractor, Enterprise Resource Systems, Inc. The project was expected to take approximately twelve man-years to complete. (**How many months will it take to complete the project?**)

Five months into the project, the bank consortium pulled three of its people off the project because another software system had failed and needed their attention. At the time the people were removed, Jack's project was under budget and behind schedule. **What should Jack do?**

BRIEF CASE 4: Decision Support and Data Warehousing

Dick has been asked to serve as project manager on a project that will replace an old decision support system with a new one that supports multi-dimensional databases and data warehousing. Dick has been told that the project will take six months and cost $2.3 million. A staff of seven developers will be provided. While well versed in decision support systems, Dick has no data warehouse experience and this will be Dick's first experience as PM. **Should Dick accept the assignment? Under what circumstances should Dick accept?**

BRIEF CASE 5: Development of Web-based Interfaces

Suppose that you are "on the beach" (presently between projects or between a training session and your next project) and I am an upper-level manager—your line manager's boss. I invite you to my office. I say, "Helen, I have a terrific opportunity for you. George (your boss) has told me about your ambition to manage your first project before you reach the age of 25. This is it. We have a client who needs a web-based interface for all of their gas customers. The basic idea is to provide an XML (eXtended Markup Language—an extension of HTML) interface that will work with any browser. These customers use our client's gas line to ship their gas up to the Northeast. With this web-based front end, it will be possible for our client's customers to monitor their gas as it moves out of the storage tanks in Corpus and McAllen and up the Eastern seaboard in real-time. And our client's customers will be able to monitor consumption of their gas in real time. This deliverable must be complete by February 15. A budget of $250,000 has been allocated for resources to complete the project. Helen, this is your opportunity. I am pleased to offer you this appointment." **Will you serve as the project's manager? Under what circumstances?**

REFERENCES

de Latt, P. B., “Matrix Management of Projects and Power Struggles: A Case Study of an R&D Laboratory,” *IEEE Engineering Management Review*, Winter 1995, reprinted from *Human Relations*, Vol. 47, No. 9, 1994.

Churchman, C. W., *The Systems Approach*, New York: Wiley, 1966.

Goldratt, Eliyahu, *The Goal: Second Revised Edition*, Croton-on-Hudson: North River Press, 1992.

Goldratt, Eliyahu, *It’s Not Luck*, Croton-on-Hudson: North River Press, 1994.

Goldratt, Eliyahu, *Critical Chain*, Croton-on-Hudson: North River Press, 1997.

Kalu, T. Ch. U. “A Framework for the Management of Projects in Complex Organizations,” *IEEE Transactions on Engineering Management*, May 1993.

Meredith, Jack R., and Samuel J. Mantel, Jr., *Project Management: A Managerial Approach*, Fourth Edition, New York: John Wiley & Sons, 2000.

Peters, Tom, and R. Waterman, *In Search of Excellence*, New York: Harper & Row, 1982.

Senge, Peter, *The Fifth Discipline: The Art & Practice of the Learning Organization*, New York: Doubleday Currency, 1990.

Taylor, David, *Business Engineering with Object Technology*, New York: John Wiley, 1995.

Tuckman, B. W., “Developmental Sequence in Small Groups,” *Psychological Bulletin*, Vol. 63, pp. 384-399, 1965.

Weinberg, G. *The Psychology of Computer Programming*, New York: Van Nostrand Reinhold, 1971.

SUPPLEMENT 3.1: USING MS PROJECT TO PARTIALLY AUTOMATE COMMUNICATION

MS Project has an e-mail workgroup feature that enables progress to be reported among the workgroup members and the workgroup manager. Essentially, three types of messages can be transmitted: *TeamAssign, TeamUpdate*, and *TeamStatus* messages. Each team member receives workgroup messages in his or her *TeamInbox*. This website is specifically set up to receive Microsoft Project workgroup messages. The workgroup manager and members exchange task information by sending, receiving, and replying to workgroup messages. The sequence works roughly as follows: the project manager sends a *TeamAssign* request to a team member, requesting a task assignment. The team member sends the project manager a reply to the *TeamAssign* request that indicates acceptance or rejection of the task assignment. If there is a change in a task's schedule, the project manager notifies each team member assigned to the task by sending those members a *TeamUpdate* message. A team member who receives a *TeamUpdate* message can send a *TeamUpdate* message to the workgroup manager to explain how the changes affect him or her. A team member can send a *TeamUpdate* message to the project manager at any time, without having to receive a *TeamUpdate* message from the project manager first.

Periodically, to gather progress information about each task, the project manager might send each team member a *TeamStatus* message, requesting actual information about tasks. Each team member responds to a *TeamStatus* message by sending a *TeamStatus* message with the requested task status information. A *TeamStatus* message must be received by a team member before that person responds to the workgroup manager with a *TeamStatus* message. Of course, team members can exchange ordinary e-mail at any time.

To use the MS Project workgroup messaging system, each team member's e-mail address must be entered when that person is defined as a Resource to MS Project. On the **View Bar***,* click on **Resource Sheet**. On the **View** menu, point to **Table**, and then click **Entry**. In the **Resource Name** field, select a resource whose e-mail address you want to add. Click **Resource Information**, and then click the **General** tab. In the **e-mail** box, type the e-mail address for that resource, and then click **OK**.