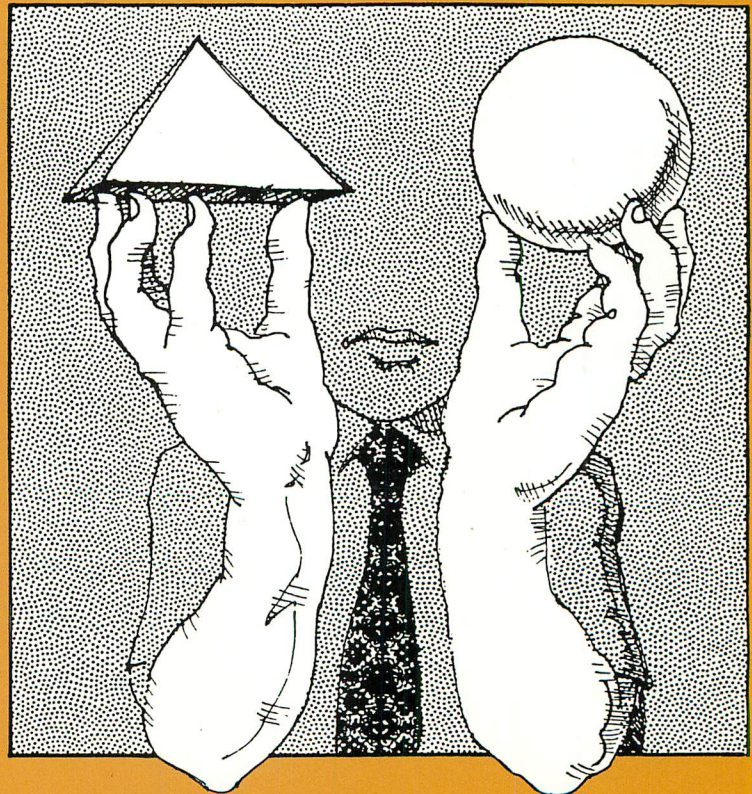# Project Management

Revised Edition

A Practical Guide for Success

- Learn the Four Phases of a Project's Life Cycle

- Planning for Quality, Time, and Cost

- How to Control Your Work in Progress

- Bringing Your Project to Conclusion and Evaluation

Marion E. Haynes

PROJECT MANAGEMENT
Revised Edition

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A FIFTY-MINUTE™ SERIES BOOK

PROJECT MANAGEMENT
Revised Edition

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PRINTED WITH SOY INK

LEARNING OBJECTIVES FOR:

PROJECT MANAGEMENT
REVISED EDITION

The objectives for *Project Management* are listed below. They have been developed to guide you, the reader, to the core issues covered in this book.
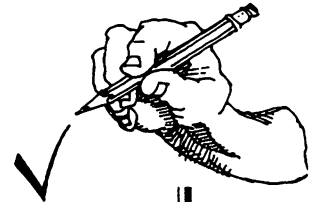
Objectives

- [ ] 1) To present basic principles of project management

- [ ] 2) To explain the tools of project management

- [ ] 3) To discuss the role of the project manager

Assessing Your Progress

In addition to the learning objectives, Crisp, Inc. has developed an **assessment** that covers the fundamental information presented in this book. A twenty-five item, multiple choice/true-false questionnaire allows the reader to evaluate his or her comprehension of the subject matter. An answer sheet with a chart matching the questions to the listed objectives is also available. To learn how to obtain a copy of this assessment, please call **1-800-442-7477** and ask to speak with a Customer Service Representative.

Assessments should not be used in any selection process.

PREFACE

Everyone manages projects from time to time. For example, a student manages a project as part of a class requirement. The do-it-yourselfer manages a project to fix or build something around the house. The host or hostess manages a social affair. These people can capitalize on the same theory of project management that engineers, superintendents, and contractors use. The principles are the same.

Project Management is written to help you carry out your projects successfully. It does not presume any prior knowledge of managerial or technical subjects. The book is divided into six parts to lead you logically through the life of a project. The parts are:

    Part 1: Introduction
    Part 2: Defining the Project
    Part 3: Planning the Project
    Part 4: Implementing the Plan
    Part 5: Completing the Project
    Part 6: Summary

Throughout the book are questionnaires, checklists, and exercises that emphasize the material presented. Work through them as you go along. They will reinforce the concepts you are learning. Successful project management is within your grasp. Simply read, understand, and apply the ideas contained in this book.

Good Luck!

Marion E. Haynes
Springdale, Arkansas

ABOUT THE AUTHOR

Marion E. Haynes is an adult educator specializing in management and supervisory training. He began his career in employee relations with a major oil company in 1956 and retired in 1991. He has published more than thirty articles in professional and trade journals, and eight other books on planning and management skills. He has presented management training workshops under the sponsorship of several universities in the south-central states and has been an invited speaker at several trade and professional association gatherings.

He also holds an MBA with distinction in management from New York University. Marion Haynes has specialized in the design, presentation, and evaluation of management training since 1968.

CONTENTS

CONTENTS (continued)

P A R T

1

Introduction

"WELCOME TO PROJECT MANAGEMENT!"

WHAT IS PROJECT MANAGEMENT?

Project management focuses on a project. A project is an undertaking that has a beginning and an end, and is carried out to meet established goals within cost, schedule, and quality objectives. Project management brings together and optimizes the resources necessary to successfully complete the project. These resources include the skills, talents, and cooperative effort of a team of people; facilities, tools, and equipment; information, systems, and techniques; and money.

How Did Project Management Develop?

The concept of project management as a discipline was developed for use in managing the U.S. space program in the early 1960s. Its practice has expanded rapidly into government, the military, and industry. Today you will find these principles being used under the names of *program management, product management,* and *construction management.*

How Does Project Management Differ from Other Management Principles?

Project management differs in two significant ways. **First**, it focuses on a project with a finite life span, whereas departments or other organizational units expect to exist indefinitely. **Second**, projects frequently need resources on a part-time basis, whereas permanent organizations try to utilize resources full-time. The sharing of resources frequently leads to conflict and requires skillful negotiation to see that projects get the necessary resources to meet objectives throughout a project's life.

THE PROJECT LIFE CYCLE

Each project moves through a predictable life cycle of four phases with each phase calling for different skills from the project manager. The phases of a project's life cycle are:

> • **Conceiving and defining the project**
>
> • **Planning the project**
>
> • **Implementing the plan**
>
> • **Completing and evaluating the project**

Each phase will be discussed in a chapter of its own later in this book.
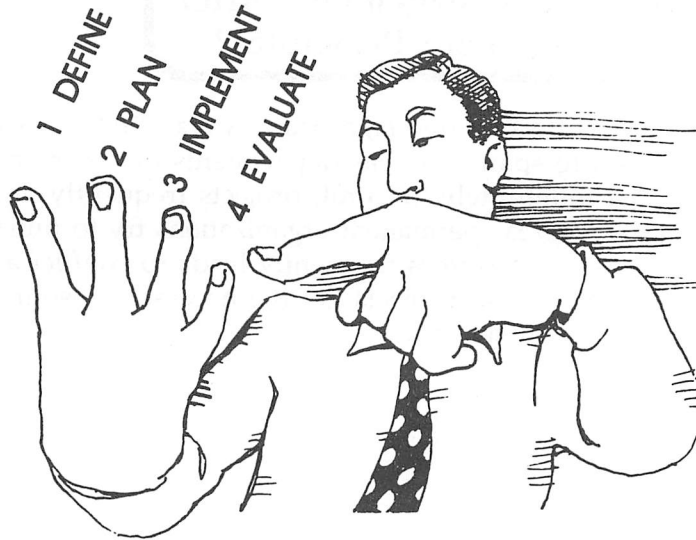
FOUR STEPS TO SUCCESS

Typical Activity Levels During the Phases of a Project's Life

| Defining the Project | Planning the Project | Implementing the Plan | Completing the Project |
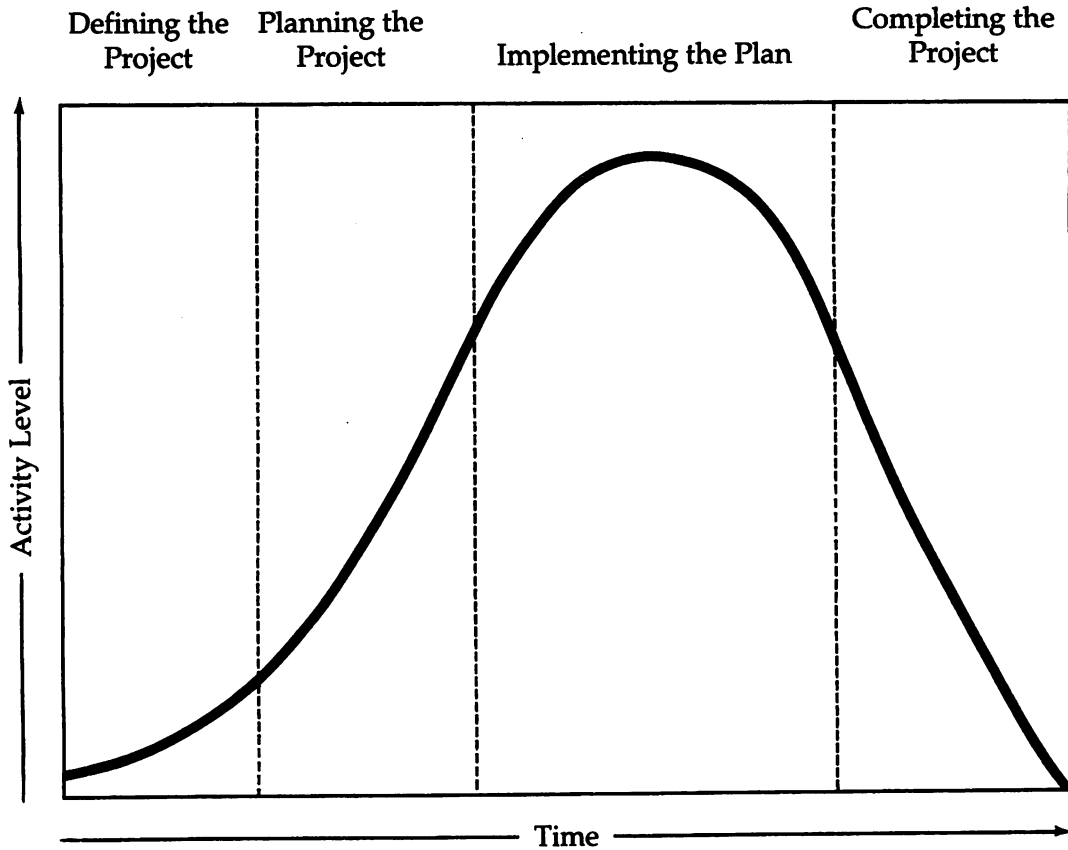
TO FULLY UNDERSTAND THE PHASES OF A PROJECT, DO THE EXERCISE ON THE NEXT PAGE.

EXERCISE

Think of a project you have completed within the last two or three months. It may have been a weekend project at home or something at work. Now, respond to the following questions:

1. When did you first get the idea for the project? How much time elapsed and what steps were involved between the first idea and a clear understanding of what you were going to do?

_____

_____

_____

_____

_____

_____

_____

2. How did you go about planning the project? Did you determine what tools, equipment, and supplies you would need, and where to obtain them? Did you plan for extra help if you could not handle the project alone?

_____

_____

_____

_____

_____

_____

_____

3. Once you got under way, did everything go according to plan? Did you stay within budget? Did you finish on time? Did you meet your quality standards? Did any unanticipated problems occur? If so, how did you deal with them?

_____

_____

_____

_____

_____

4. When the project was completed, were there people to be released and reassigned, tools and equipment to be returned, and surplus material to be disposed of?

_____

_____

_____

_____

_____

5. After the project was completed, did you spend any time reflecting on the experience to see where improvements could be made in the management of the project? If not, take a few minutes now and write down some ideas for improvement.

_____

_____

_____

_____

_____

PROJECT PARAMETERS

During a project's life, management focuses on three basic parameters: quality, time and cost. A successfully managed project is one that is completed at the specified level of quality, on or before the deadline, and within budget.

Each of these parameters is specified in detail during the planning phase of the project. These specifications then form the basis for control during the implementation phase.

```
                        ┌─────────────────────┐
                        │  Project Parameters │
                        └─────────────────────┘
                                   │
         ┌─────────────────────────┼─────────────────────────┐
         │                         │                         │
   ┌───────────┐             ┌───────────┐             ┌───────────┐
   │  Quality  │             │   Cost    │             │   Time    │
   └───────────┘             └───────────┘             └───────────┘
         │                         │                         │
         ▼                         ▼                         ▼
   ┌───────────────┐       ┌───────────────┐       ┌───────────────┐
   │ Specifications│       │    Budget     │       │   Schedule    │
   └───────────────┘       └───────────────┘       └───────────────┘
```
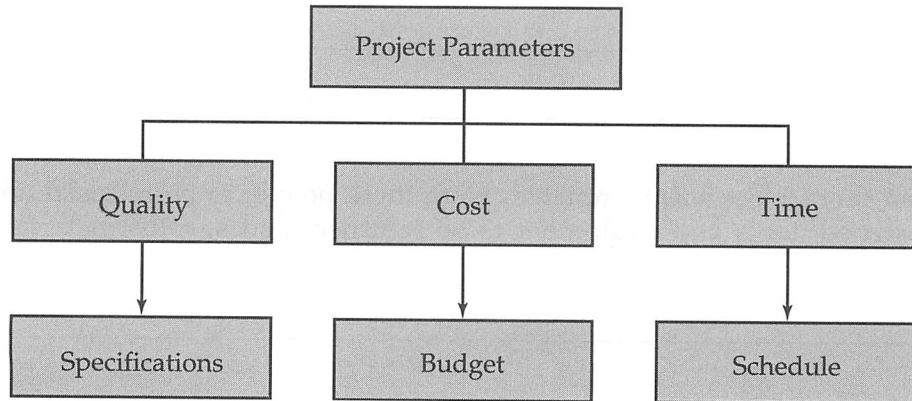
Negotiating Specifications with the Client

If there is a client involved who must accept the project upon completion, the specifications that define a successful outcome must be negotiated and agreed to by the client, and included as part of the contract.

A client may be either internal or external. Also, there may be more than one "client," especially when the project is internal to the company. For example, the case study in this book is a construction project for more space within a company. The clients in this case may be the department that will use the space, and management, who must agree to the budget and scheduling specifications.

In the course of a project, specifications may change. The project manager has a responsibility to make sure the client—external or internal—agrees to the revised specifications. If there is a written contract, it needs to be revised and signed off by all involved parties, so that when the final inspection is done, the project team and the client agree on what acceptable parameters are.

Rate Yourself As a Project Manager

Rate yourself on each of the following skills required to be a successful project manager. Place a check mark (✓) in front of each skill you feel you can handle. When you're finished, the ones not checked represent opportunities for development.

My project management skills:

- ❏ Organizing a project from beginning to end.

- ❏ Structuring a plan that will stand up under pressure.

- ❏ Getting people to accept my plans and support them.

- ❏ Setting measurable project objectives.

- ❏ Motivating team members.

- ❏ Helping team members solve problems.

- ❏ Utilizing available resources.

- ❏ Eliminating waste of time and money.

- ❏ Measuring project performance.

- ❏ Using information systems that respond to project needs.

P A R T

2

Defining the Project
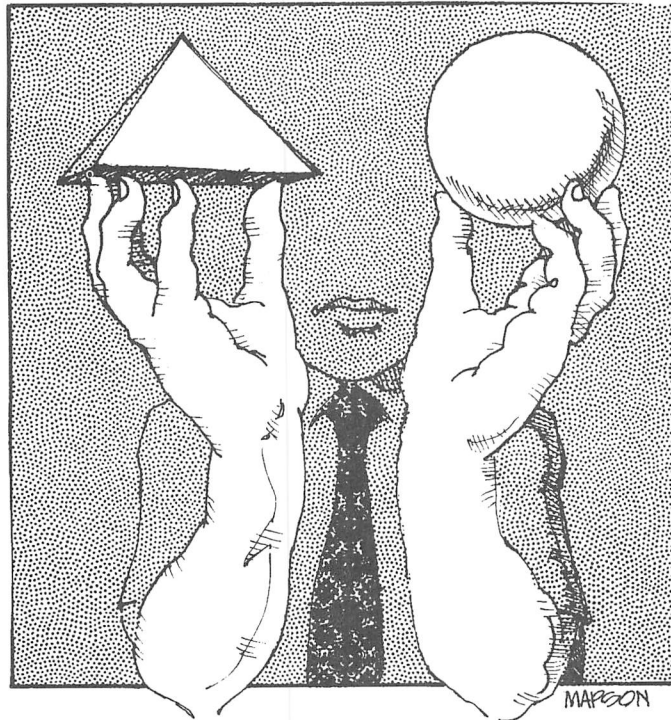
THE ORIGIN OF PROJECTS

Projects grow out of problems or opportunities. At work, they can be initiated by higher management, clients, or staff members. At school, they may be initiated by either teachers, students, or administration; at home, by yourself or other family members. A project is born when someone reacts to the level of frustration surrounding a problem or someone sees an opportunity to move into a new venture. When a decision is made to do something about the problem or opportunity, a project exists—and, typically, someone is given the responsibility of carrying it out. That person becomes the project manager.

What Are the Pitfalls, and How Can They Be Avoided?

A project's initiator is almost always unclear about important aspects of the project. Project personnel tend to stress their own points of view during the stage of defining and structuring the project. If this set of personal biases and interests is left unchecked, disaster can result. However, such disaster can be avoided by full discussion between the project manager, client, and staff at the project's inception. With a clear understanding of what is expected, the project manager is now ready to begin defining the project.

GETTING UNDER WAY

GETTING UNDER WAY

When the nucleus of the project team is assembled, its first order of business is to clarify the project and arrive at agreement among team members about the project's definition and scope, as well as the basic strategy for carrying it out. There is an orderly process that can guide you through these steps. The following sequence of activities will get your project smoothly under way:

1. Study, discuss, and analyze.

2. Write the project definition.

3. Set an end-results objective.

4. List imperatives and desirables.

5. Generate alternative strategies.

6. Evaluate alternatives.

7. Choose a course of action.

1. It is critical for the team to spend adequate time at the beginning to *study, discuss,* and *analyze* the project. This establishes a clear understanding of what you are dealing with. It may be necessary to research how similar projects structured their approach, or what other patterns of past experience can contribute to project planning. The purpose of this activity is to be sure you are addressing the *right* problem or pursuing the *real* opportunity.

2. When you are confident that you have a firm grasp of the situation, work up a *preliminary project definition.* This preliminary definition will be subject to revision as additional information and experience are acquired.

3. Now, using this project definition, state the end-results objective of the project. (Guidelines follow.)

4. Then, list both the *imperatives* and *desirables* to be present in the end results. That is, list the outcomes that must be present for the project to be considered successful, and list the outcomes that are not essential but that would add to the project's success.

5. Now you are ready to *generate alternative strategies* that might lead you to your objective. To generate these alternatives, try brainstorming with your project team (see technique on page 17).

6. Next, *evaluate the alternative strategies* you have generated. Be sure that your criteria for evaluation are realistic and reflect the end-results objective.

7. Evaluation allows you to choose a course of action that will meet both your project definition and end-results objective.
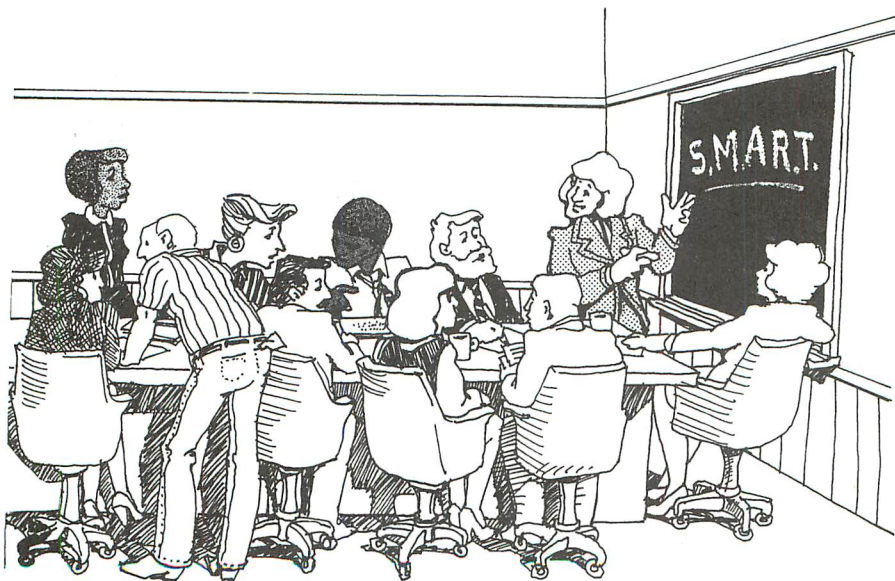
GETTING UNDER WAY (continued)

Good Objectives Are SMART

- **Specific**—A good objective says exactly what you want to accomplish.

- **Measurable**—Being specific helps make your objective measurable.

- **Action-Oriented**—When writing objectives, use statements that have action-tense verbs and are complete sentences.

- **Realistic**—Good objectives must be attainable yet should present a challenge.

- **Time-Limited**—Set a specific time by which to achieve the objective.

> **EXAMPLE: Complete landscaping by May 31, 1997 at a cost not to exceed $2,500.00.**

Write an objective statement for your project:

_____

_____

_____

_____

_____

_____

Brainstorming

Brainstorming is a free-form process that taps into the creative potential of a group through association of ideas. Association works as a two-way current: when a group member voices an idea, this stimulates ideas from others, which in turn leads to more ideas from the one who initiated the idea.

Brainstorming Procedures

❑ List all ideas offered by group members.

❑ Do not evaluate or judge ideas at this time.

❑ Do not discuss ideas at this time except to clarify understanding.

❑ Welcome "blue sky" ideas. It's easier to eliminate ideas later.

❑ Repetition is okay. Don't waste time sorting out duplication.

❑ Encourage quantity. The more ideas you generate, the greater your chance of finding a useful one.

❑ Don't be too anxious to close the process. When a plateau is reached, let things rest and then start again.
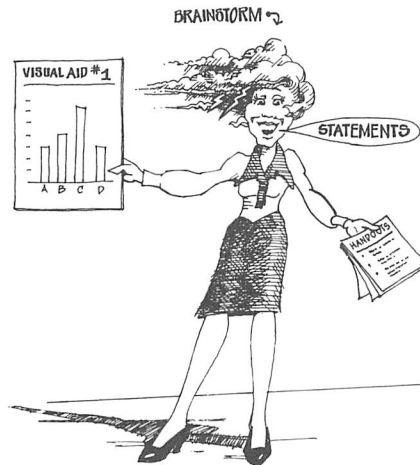
TESTING YOUR PRELIMINARY STRATEGY

Before moving to a full-scale project, a feasibility study must be carried out to test your preliminary strategy and answer the basic question: "Will it work?" Depending on the nature of the project, one or more of three alternatives will help answer this question. The choices are to do a *market study, pilot test,* or *computer simulation.*

The amount of money and other resources that are invested in feasibility studies must be in proportion to the amount of money that the project will put at risk. For example, a company that is going to invest $450 million to retool a factory to manufacture a new appliance will probably consider a $250,000 market study an excellent investment if it clarifies the design of the appliance before the major investment is made. On the other hand, a franchised cookie company that is planning to add a new kind of cookie to its line could simply mix up a batch at one store, sell them for a week, and look at sales results—all for a modest investment in local advertising and special ingredients.

Market Study

If your project is to bring a new product to market, you must determine its market potential. Market research asks customers whether your product satisfies their current or potential perceived needs. You can also examine similar products to determine how your product is differentiated from those that are currently available.

Pilot Test

A pilot test is a small-scale tryout of your project. It could be a limited-area market test of a product or a working model of a construction project. Sometimes referred to as "field testing," a pilot test gives you the opportunity to observe your project's performance under actual conditions.

Computer Simulation

Current technology permits many different types of projects to be modeled on computers. For example, the market potential of a product can be predicted by analyzing demographic data of the target users along with certain assumptions about current and potential needs. The load-bearing potential of buildings, bridges, vessels, etc. are analyzed through mathematical calculations.

Computer simulation is used in such diverse fields as aerodynamics, thermo-dynamics, optical design, and mechanical design. In some cases, the computer is used to assist with the actual design of the project. The major purpose of simulation is to identify potential problems before the project is built.

Using the Study Results

If the results of a well-conceived and executed feasibility study indicate that the project should proceed, you can move confidently into detailed planning and implementation. If the results are discouraging, the data are used to do a project redesign, followed by another feasibility study, and so on until a successful project concept is identified.
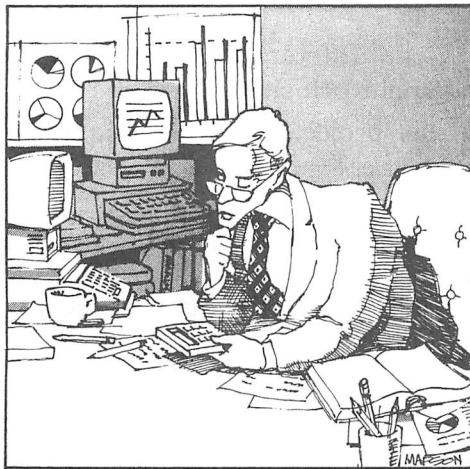
FEASIBILITY STUDIES SHOULD
BE WELL-CONCEIVED

PROGRESS REVIEW: PARTS 1 AND 2

Check either *True* or *False* in response to each of the following statements.

		True	False
1.	A project is an ongoing venture or activity.	☐	☐
2.	Projects are initiated by whomever is in charge.	☐	☐
3.	Anyone can be a project manager.	☐	☐
4.	The project manager is responsible for carrying out the project.	☐	☐
5.	Quality is not important in projects.	☐	☐
6.	The project's initiator usually has a clear idea of all important aspects of the project.	☐	☐
7.	Completing a project on time is one important parameter of project management.	☐	☐
8.	The project team needs to spend time clearly defining the project before getting under way.	☐	☐
9.	Brainstorming has nothing to offer to project management.	☐	☐
10.	Completing a project within budget is not important.	☐	☐
11.	Your basic strategy for completing a project needs to be tested before moving ahead.	☐	☐
12.	A pilot test can be used to evaluate your strategy.	☐	☐
13.	Computer simulation can help determine the feasibility of construction projects.	☐	☐
14.	Project management is no different than any other application of management principles.	☐	☐
15.	The temporary nature of projects leads to unique challenges for project managers.	☐	☐

Score Your Responses

1. F	4. T	7. T	10. F	13. T
2. F	5. F	8. T	11. T	14. F
3. T	6. F	9. F	12. T	15. T

Total Score: _____

12 to 15   *Excellent:* You're ready to move on.
9 to 11   *Good:* A quick review would be helpful before you proceed.
0 to 8   *Poor:* You must have dozed off. Reread Parts 1 and 2.

P A R T

3

Planning the Project
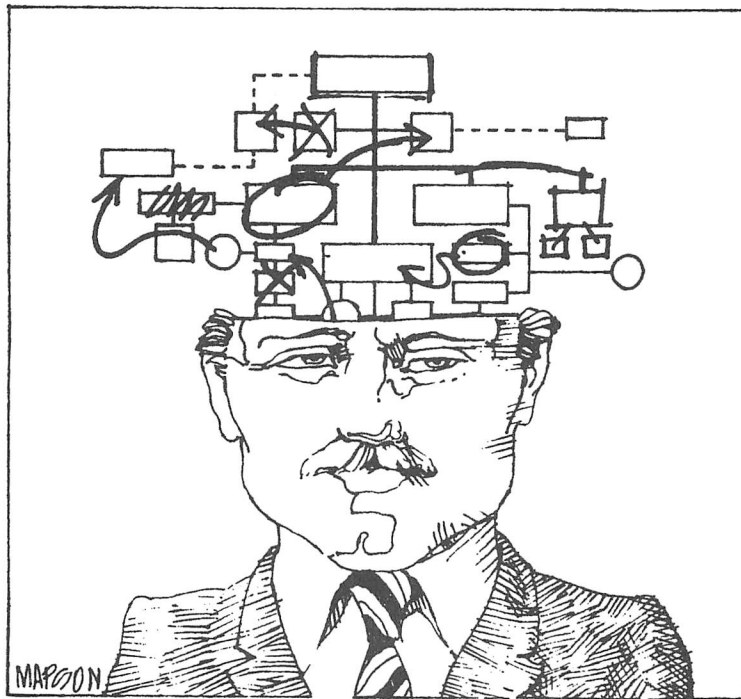
PLANNING THE THREE PROJECT PARAMETERS

Planning is crucial in project management. Planning means listing in detail what is required to successfully complete the project along the three critical dimensions of quality, time, and cost. Each of these dimensions will be considered in the following pages, along with a variety of tools and techniques.

Planning Steps

❑ Establish the project objective.

❑ Choose a basic strategy for achieving the objective.

❑ Break the project down into subunits or steps.

❑ Determine the performance standards for each subunit.

❑ Determine how much time is required to complete each subunit.

❑ Determine the proper sequence for completing the subunits and aggregate this information into a schedule for the total project.

❑ Determine the cost of each subunit and aggregate costs into the project budget.

❑ Design the necessary staff organization, including the number and kind of positions, and the duties and responsibilities of each.

❑ Determine what training, if any, is required for project team members.

❑ Develop the necessary policies and procedures.

PLANNING THE QUALITY DIMENSION

Planning for quality requires attention to detail. The goal of quality planning is to assure that the output of the project will perform—that it will do what it is supposed to do. The quality plan also establishes the criteria of performance by which the project output will be measured when it is completed.

In planning the quality dimension, include specifications for the quality and types of materials to be used, the performance standards to be met, and the means of verifying quality such as testing and inspection. Two techniques facilitate planning for quality: a *work breakdown structure* and *project specifications*. Both are described on the next few pages.
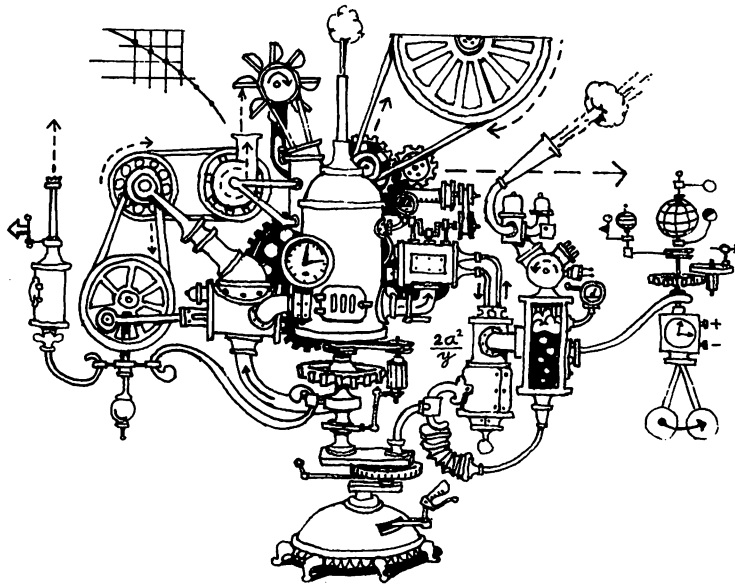
PROJECT QUALITY IS DEFINED BY DETAILED PROJECT SPECIFICATIONS

Creating a Work Breakdown Structure

A work breakdown structure is the starting place for planning all three parameters of a project: quality, cost, and time. It is a technique based on dividing a project into subunits, or work packages. Because all elements required to complete the project are identified, you reduce the chances of neglecting or overlooking an essential step.

A work breakdown structure is typically constructed with two or three levels of detail, although more levels may be required for very complex projects. Start by identifying logical subdivisions of the project, then break each of these down further. As you construct a work breakdown structure, keep in mind that the goal is to identify a unit of work that is discrete and that advances the project toward its completion.

SAMPLE WORK BREAKDOWN STRUCTURE FOLLOWS
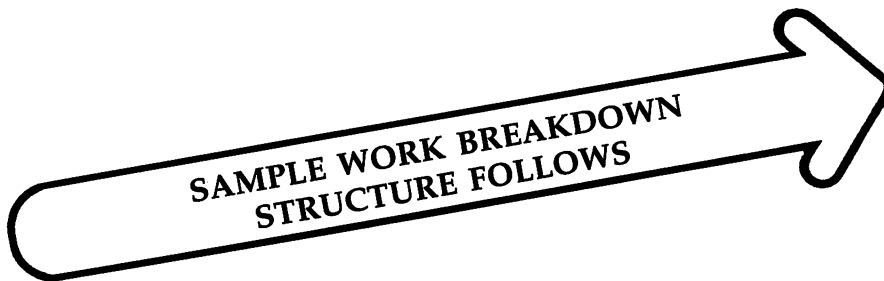
CASE STUDY: REMODELING PROJECT

Sample Work Breakdown Structure
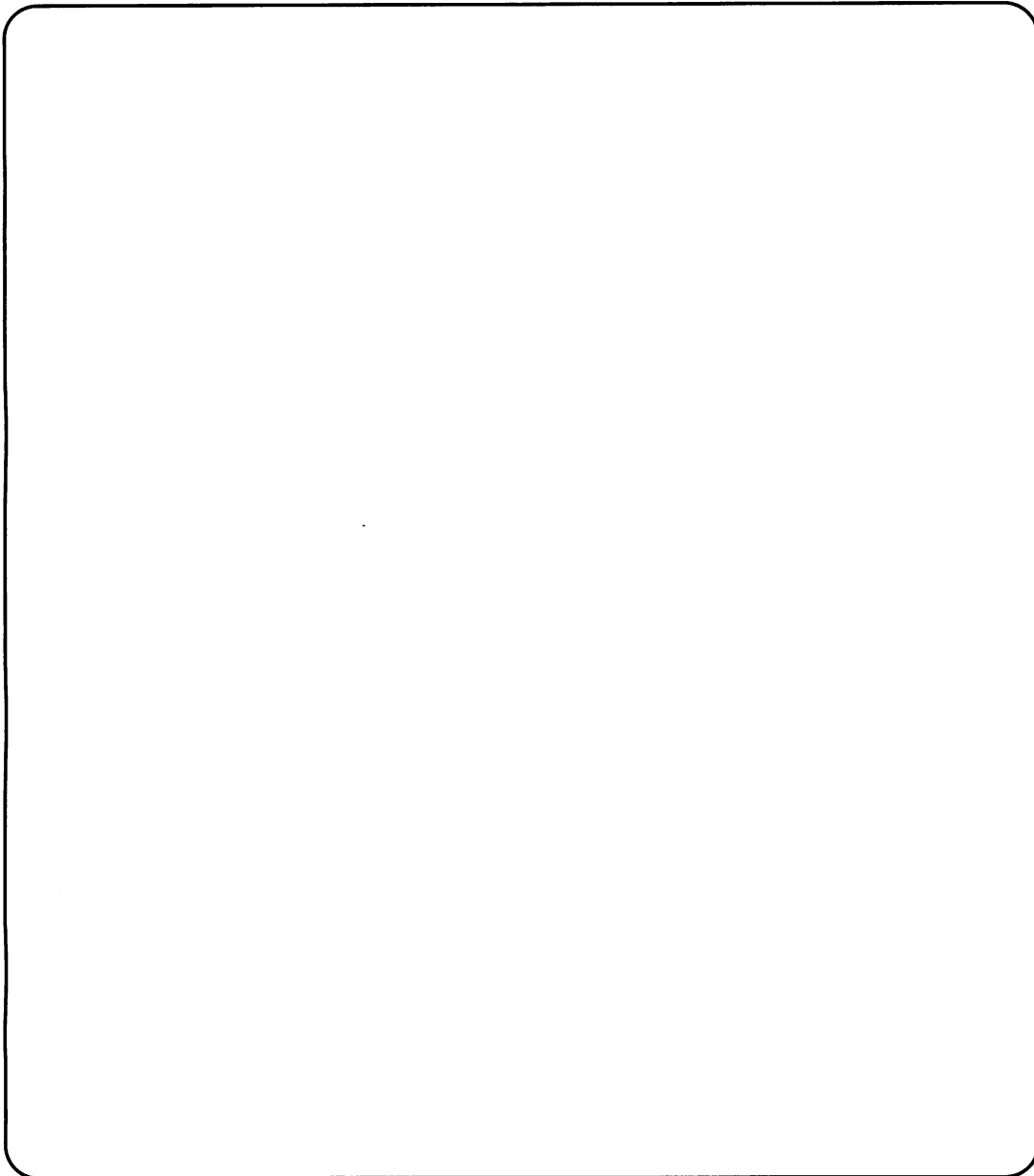
Project: Remodel Building #7 to provide four additional offices by the end of the third quarter at a cost not to exceed $17,500.

```
                    Add 4 offices to
                    Building #7
        ┌───────────────────┴───────────────────┐
   Foundation                              Exterior
   ┌────┴────┐                        ┌────────┴────────┐
Layout     Form              Frame and              Roof
                             Install Windows
            │                      ┌────────┴────────┐
       Pour                   Install            Paint
       and Finish             Siding

   Interior                                Finish
   ┌────┴────┐                        ┌────────┴────────┐
Heating/Air   Electrical          Paint            Electrical
Conditioning                                       Fixtures
       ┌────┴────┐                      ┌────────┴────────┐
  Insulate    Dry Wall            Floor               Cleanup
                                  Covering
       │
   Doors
   and Trim
```
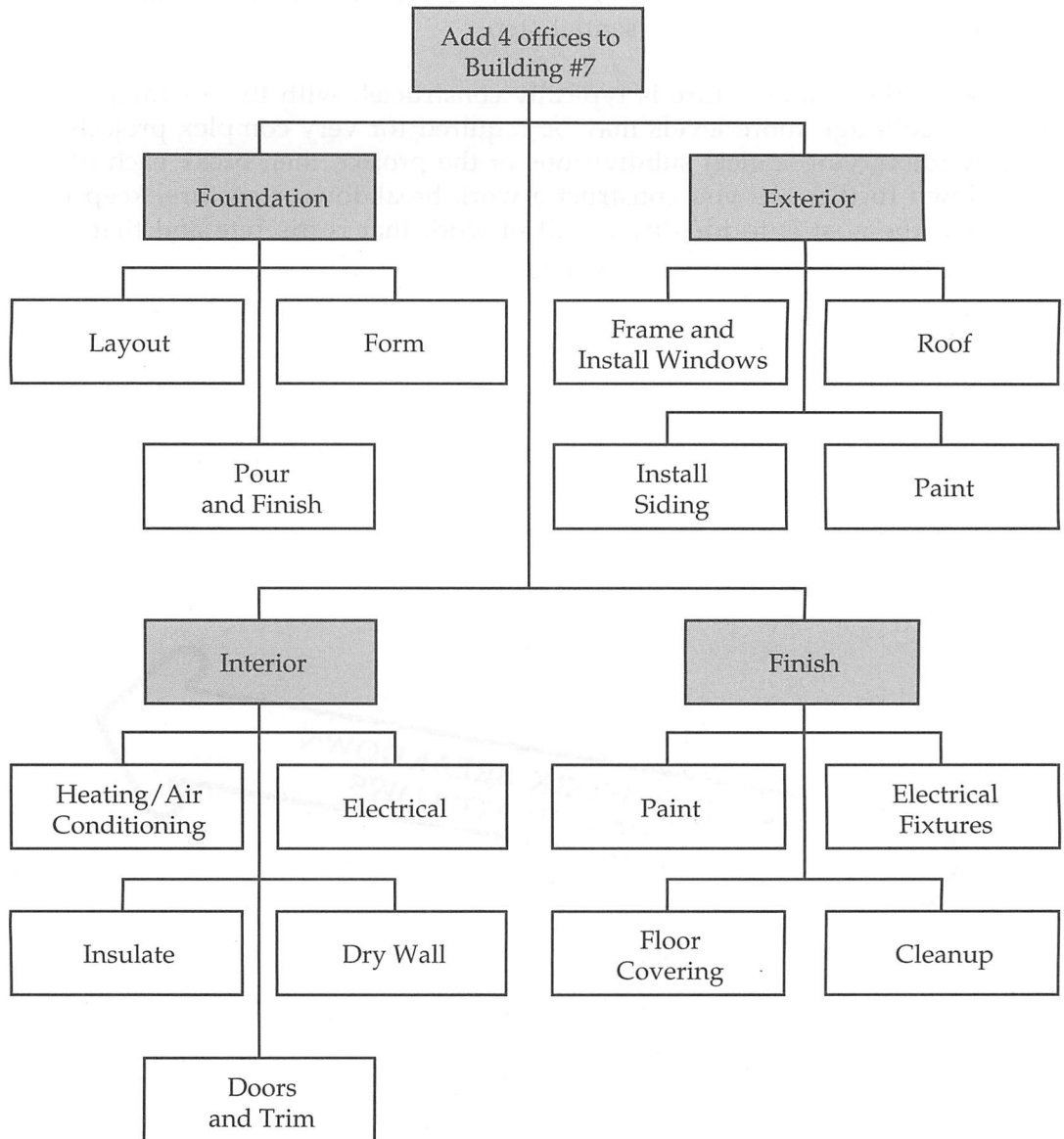
Practice Making a Work Breakdown Structure

Select a project you have completed or plan to complete and break it down into subunits (components or steps). Draw a work breakdown structure showing the relationship among the subunits.

Work Breakdown Structure

PLANNING THE QUALITY DIMENSION (continued)

Project Specifications

From the work breakdown structure, specifications can be written for each subunit of the project. Specifications include all relevant requirements to meet the project's quality dimension—materials to be used, standards to be met, tests to be performed, etc. Use extreme care in writing specifications, because they become the controlling factor in meeting project performance standards, and directly affect both budget and schedule.

Example of Project Specifications

Foundation

- Pour 4-inch concrete slab over 6 inches of compacted sand fill. Reinforce with 6-inch by 6-inch #6 wire mash. Install 6 mil polyethylene membrane water-proofing barrier between sand and concrete.

- Use 1-foot wide by 1-foot 6-inch deep beams around perimeter of foundation and under loadbearing walls, per blueprints. Beams to include #5 reinforcing steel bars in each corner positioned with 3 stirrups on 2-feet 6-inch centers.

- Concrete to withstand 2500 psi test after 28 days.

Practice Writing Project Specifications

Take the project for which you made a work breakdown structure and write specifications for at least one subunit of the project.
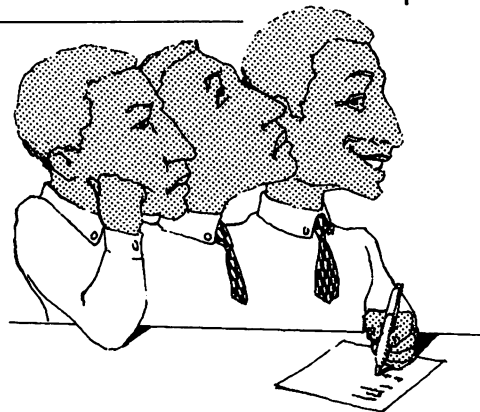
PLANNING THE TIME DIMENSION

The objective when planning the time dimension is to determine the shortest time necessary to complete the project. Begin with the work breakdown structure and determine the time required to complete each subunit. Next, determine in what sequence subunits must be completed, and which ones may be under way at the same time. From this analysis, you will have determined the three most significant time elements:

► The duration of each step

► The earliest time at which a step may be started

► The latest time at which a step must be started

Planning the time dimension can only be done by people who have experience with the same or similar activities. If you personally do not know how long it takes to do something, you will need to rely on someone else who does have the requisite experience.

Many project managers find it realistic to estimate time intervals as a range rather than as a precise amount. Another way to deal with the lack of precision in estimating time is to use a commonly accepted formula for that task. Or, if you are working with a mathematical model, you can determine the probability of the work being completed within the estimated time by calculating a standard deviation of the time estimate.

Using a Mathematical Model to Estimate Time

Estimating Time

Tm—The most probable time

To— The optimistic (shortest) time within which only 1% of similar projects are completed

Tp— The pessimistic (longest) time within which 99% of similar projects are completed

Te— The calculated time estimate

$$Te = \frac{To + 4\ Tm + Tp}{6}$$

σ = Standard deviation

$$\sigma = \frac{Tp - To}{6}$$

- 68.26% of the time the work will be completed within the range of *Te* ± 1 standard deviation.

- 95.44% of the time the work will be completed within the range of *Te* ± 2 standard deviations.

- 99.73% of the time the work will be completed within the range of *Te* ± 3 standard deviations.
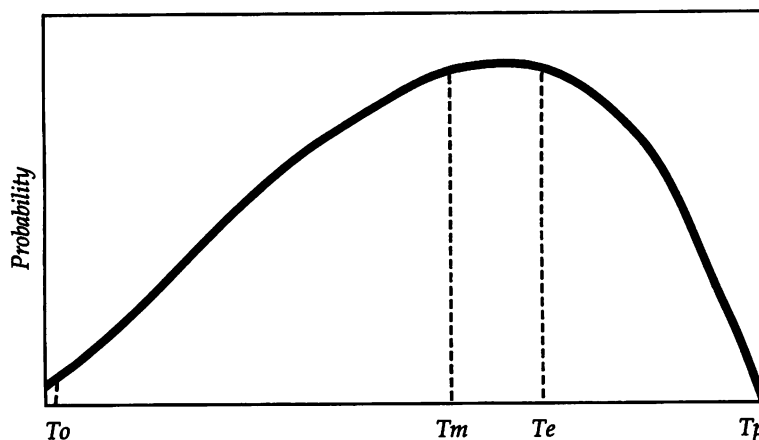
With a time duration determined for each subunit of the project, the next step is to determine the earliest and latest starting times for each subunit. There are two commonly used methods for charting the project: Gantt charts and PERT diagrams. The details of these two methods are discussed on the following pages.

PLANNING THE TIME DIMENSION (continued)

Practice Estimating Time

Using the same project, determine a time estimate for each of the project's subunits or steps.

Subunit or Step	To	Tp	Tm	Te

(Gantt Charts)

A Gantt chart is a horizontal bar chart that graphically displays the time relationship of the steps in a project. It is named after Henry Gantt, the industrial engineer who introduced the procedure in the early 1900s. Each step of a project is represented by a line placed on the chart in the time period when it is to be undertaken. When completed, the Gantt chart shows the flow of activities in sequence as well as those that can be under way at the same time.

To create a Gantt chart, list the steps required to complete a project and estimate the time required for each step. Then list the steps down the left side of the chart and time intervals along the bottom. Draw a line across the chart for each step, starting at the planned beginning date and ending on the completion date of that step.

Some parallel steps can be carried out at the same time with one taking longer than the other; this allows some flexibility about when to start the shorter step, as long as the plan has it finished in time to flow into subsequent steps. This situation can be shown with a dotted line continuing on to the time when the step must be completed.

When your Gantt chart is finished, you will be able to see the minimum total time for the project, the proper sequence of steps, and which steps can be under way at the same time.

PLANNING THE TIME DIMENSION (continued)

Example of a Gantt Chart

A Gantt chart showing steps 1 through 8 on the vertical axis and Time (in days) from 0 to 35 on the horizontal axis.

- Step 1: bar from about 3 to 16
- Step 2: bar from about 7 to 13, with dashed **Slack time** from 13 to 16
- Step 3: bar from about 16 to 25
- Step 4: bar from about 16 to 20, with dashed **Slack time** from 20 to 23
- Step 5: bar from about 25 to 30
- Step 6: bar from about 22 to 30
- Step 7: bar from about 30 to 34

Time (in days)

You can add to the usefulness of a Gantt chart by also charting actual progress. This is usually done by drawing a line in a different color below the original line to show the actual beginning and ending dates of each step. This allows you to quickly assess whether or not the project is on schedule.

Gantt charts are limited in their ability to show the interdependencies of activities. In projects where the steps flow in a simple sequence of events, they can portray adequate information for project management. However, when several steps are under way at the same time and a high level of interdependency exists among the various steps, PERT diagrams are a better choice.

CASE-STUDY: REMODELING PROJECT

Example of a Gantt Chart

Project: Remodel Building #7 to provide four additional offices by the end of the third quarter at a cost not to exceed $17,500.
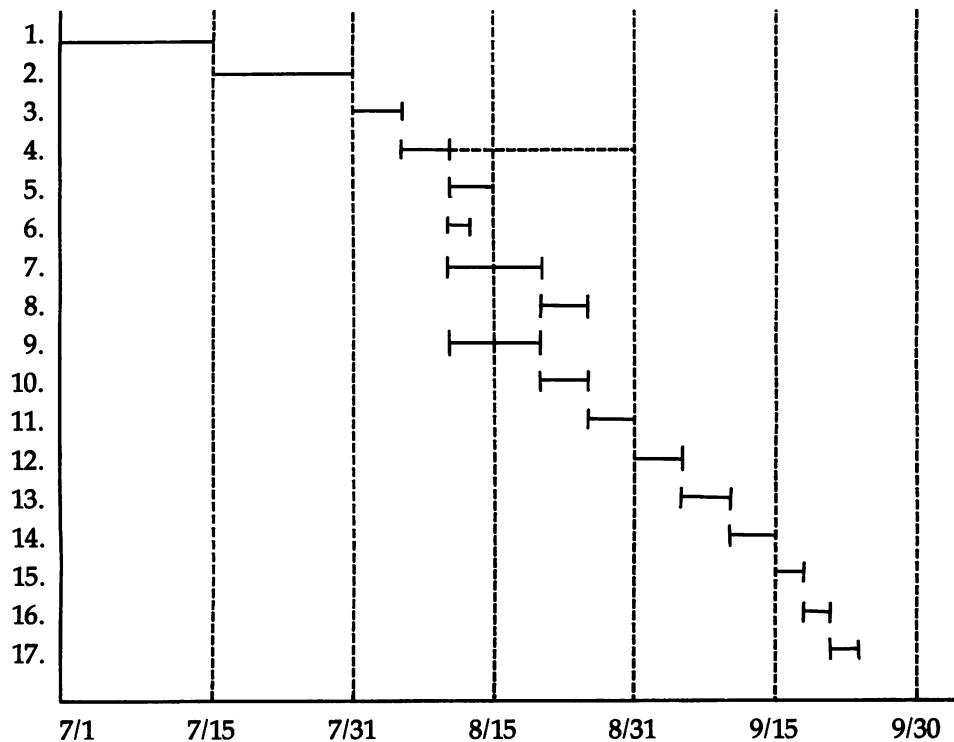
Steps in Project with Time Estimates

1. Draw working plans	15	10. Install heating/air conditioning 5
2. Obtain building permit	16	11. Insulate 5
3. Form/pour foundation	5	12. Install sheetrock 5
4. Frame walls and roof	5	13. Install interior doors, trim 5
5. Install roofing	5	14. Paint interior 3
6. Install windows	1	15. Install electrical fixtures 2
7. Install exterior siding	10	16. Cleanup 3
8. Paint exterior	3	17. Install floor covering 2
9. Install electrical wiring	10	

PLANNING THE TIME DIMENSION (continued)

Practice Drawing a Gantt Chart

Using the project you prepared a work breakdown structure for earlier, estimate the time required for each step. Then draw a Gantt chart for the project.

Project: _____

_____

_____

Project Steps with Time Estimates

(in _____)

STEP	TIME	STEP	TIME
_____	___	_____	___
_____	___	_____	___
_____	___	_____	___
_____	___	_____	___
_____	___	_____	___
_____	___	_____	___
_____	___	_____	___

Gantt Chart

PERT Diagrams

PERT stands for Program Evaluation and Review Technique. It is a more sophisticated form of planning than Gantt charts, and is appropriate for projects with many interactive steps. There are three components of a PERT diagram: Events are represented by circles or other convenient, closed figures; *activities* are represented by arrows connecting the circles; and *non-activities* connecting two events are shown as dotted-line arrows. (A non-activity represents a dependency between two events for which no work is required.)

Event ————————— Activity —————————▶ Event

Preceding
Activity
(Start Event)

Following
Activity
(Finish Event)
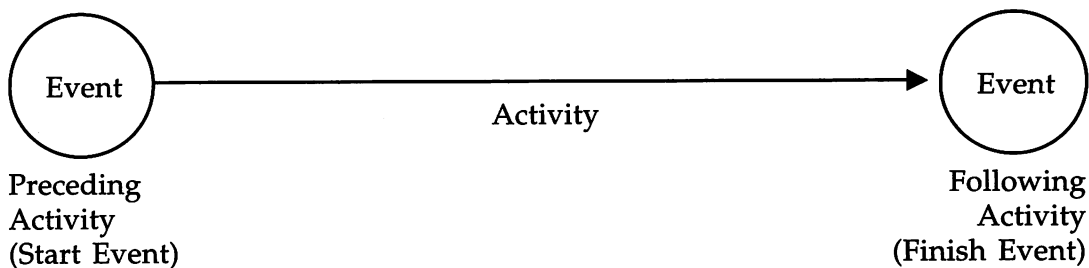
PERT diagrams are most useful if they show the time scheduled for completing an activity on the activity line. Time is recorded in a unit appropriate for the project, with days being most common, and hours, weeks, or even months occasionally used. Some diagrams show two numbers for time estimates—a high estimate and a low estimate.

The most sophisticated PERT diagrams are drawn on a time scale, with the horizontal projection of connecting arrows drawn to represent the amount of time required for their activity. In the process of diagraming to scale, some connecting arrows will be longer than completion of that task requires. This represents slack time in the project and is depicted by a heavy dot at the end of the appropriate time period, followed by a dotted-line arrow connecting with the following event.

PLANNING THE TIME DIMENSION (continued)

PERT Diagram Drawn to Time Scale

Time (in days)
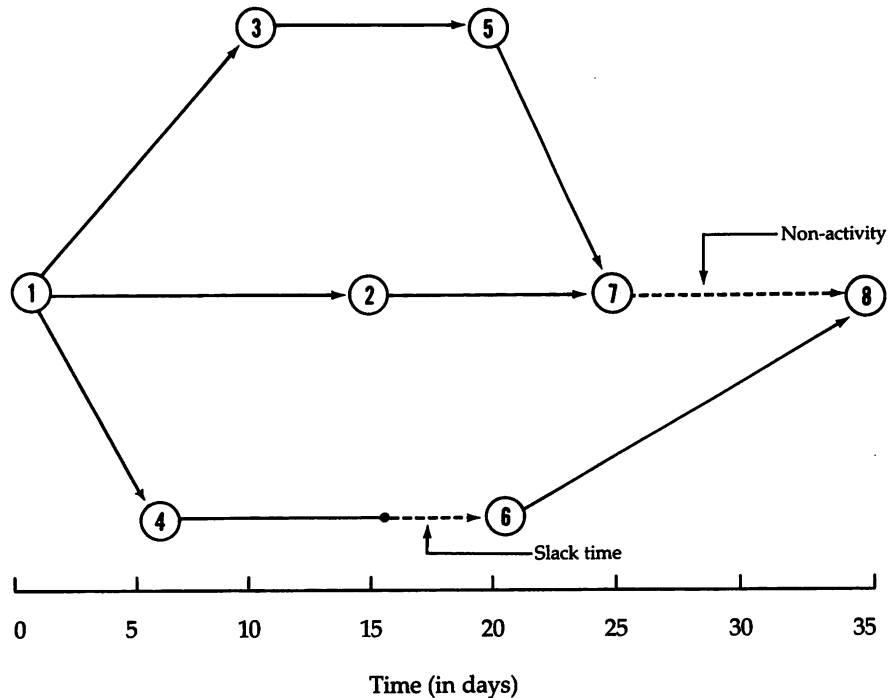
To draw a PERT diagram, list the steps required to finish a project and estimate the time required to complete each step. Then draw a network of relationships among the steps, keeping in mind the importance of proper sequencing. The number of the step from your list is written in the appropriate event circle to identify that step. The time to complete the following step is shown on the arrow. Steps that can be under way at the same time are shown on different paths. Be sure to include all the elements shown on your work breakdown structure.

A PERT diagram not only shows the relationship among various steps in a project, but also serves as an easy way to calculate the critical path. The *critical path* is the longest path through the network and as such identifies essential steps that must be completed on time to avoid delay in completing the project. The critical path is shown as a heavy line in the following example.

The usefulness of a PERT diagram can be increased by coloring each step as it is completed. Actual time can be written over the estimated time to maintain a running tally of actual versus planned time along the critical path.

CASE STUDY: Remodeling Project

PERT Diagram

Project: Remodel Building #7 to provide four additional offices by the end of the third quarter at a cost not to exceed $17,500.

Note: Numbers in the circles correspond to the steps listed below. Numbers on the lines show the days required to complete the following step.
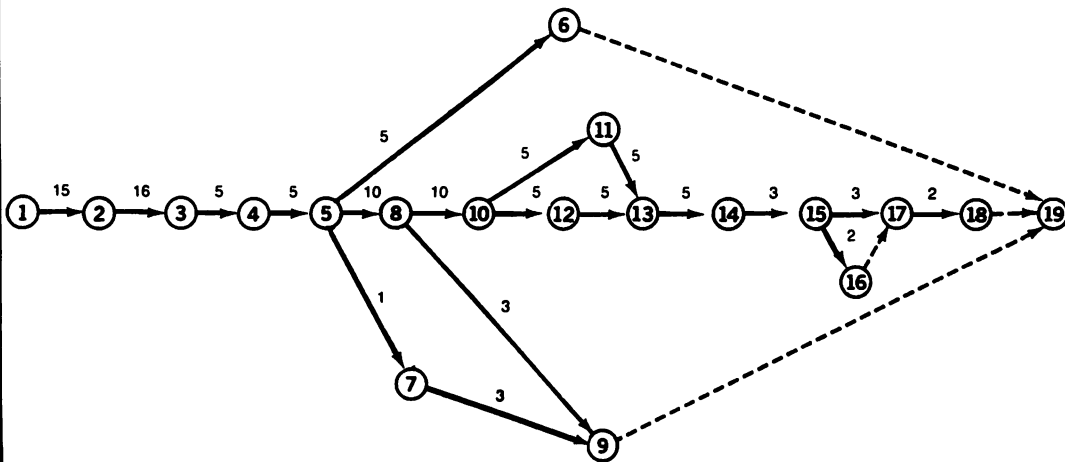
Steps in Project with Time Estimates
(in days)

1. Project started	—		11. Heating/airconditioning in	5
2. Working plans completed	15		12. Insulation	5
3. Building permit obtained	16		13. Sheetrock hung	5
4. Foundation poured	5		14. Interior doors/trim installed	5
5. Walls/roof framed	5		15. Interior painted	3
6. Roofing completed	5		16. Electrical fixtures installed	2
7. Windows installed	1		17. Cleanup completed	3
8. Exterior siding installed	10		18. Floor covering installed	2
9. Exterior painted	3		19. Project completed	—
10. Electrical wiring in	10			

PLANNING THE TIME DIMENSION (continued)

Practice Drawing a PERT Chart

Select a project, break it down into steps, estimate the time required to complete each step, and draw a PERT diagram for the project.

Project: _____

_____

_____

Project Steps with Time Estimates

(in _____)

STEP	TIME	STEP	TIME
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____

PERT Chart

PLANNING THE COST DIMENSION

There are many reasons to do careful planning for project costs. To begin with, if you overestimate costs you may lose the job before you begin because you are not competitive. A good plan includes the identification of sources of supplies and materials, and this careful research assures that the costs are realistic. The main function of a good budget is to monitor the costs of a project while it is in progress, and to avoid cost overruns.

Some inaccuracies in the budget are inevitable, but they should not be the consequence of insufficient work on the original plan. The goal is to be as realistic as possible.

You cannot estimate the cost of your project until you know how long it will take, since the time of labor is typically the most significant cost item. Therefore, use your work breakdown structure and project schedule as the starting point for developing your project budget.

Typical Costs Components

- Labor

- Overhead

- Materials

- Supplies

- Equipment rental

- General and administrative

- Profit (if applicable)

PLANNING THE COST DIMENSION (continued)

Cost Components Defined

▶ *Labor:* The wages paid to all staff directly working on the project for the time spent on it.

▶ *Overhead:* The cost of payroll taxes and fringe benefits for everyone directly working on the project for the time spent on it. Usually calculated as a percentage of direct labor cost.

▶ *Materials:* The cost of items purchased for use in the project. Includes such things as lumber, cement, steel, nails, screws, rivets, bolts, and paint.

▶ *Supplies:* The cost of tools, equipment, office supplies, etc., needed for the project. If something has a useful life beyond the project, its cost should be prorated.

▶ *Equipment rental:* The cost of renting equipment such as scaffolding, compressors, cranes, bulldozers, trucks, etc., for use on the project.

▶ *General and Administrative:* The cost of management and support services such as purchasing, accounting, secretarial, etc., for time dedicated to the project. Usually calculated as a percentage of project cost.

▶ *Profit:* In a for-profit project, the reward to the firm for successfully completing the project. Usually calculated as a percentage of project cost.

With the cost components identified and the project broken down into subunits, create a worksheet to tally the costs for the total project.

Note that costing a subunit is sometimes simplified if it is to be subcontracted. Costing then includes bidding the subunit, selecting a contractor, and then using the contract price as your cost.

CASE STUDY: REMODELING PROJECT

Project Costing Worksheet
(Prepared by General Contractor)

SUBUNIT (COMPONENT OR STEP)	LABOR	OVER-HEAD	MATERIALS	SUPPLIES	EQUIPMENT RENTAL	GEN & ADMIN.	PROFIT	TOTAL
1. Complete working plans	300	75		50		25	50	500
2. Obtain building permit						50		50
3. Pour foundation	500	125	1,300	100	100	125	250	2,500
4. Frame/install windows	500	125	1,500	75	300	150	300	2,950
5. Install roofing	400	100	500		75	50	125	1,250
6. Install exterior siding	700	175	1,800	100	500	150	375	3,800
7. Paint exterior	160	40	25		50		25	300
8. Heating/air conditioning	300	75	1,175			75	175	1,800
9. Electrical wiring	300	75	175			25	75	650
10. Insulation	300	75	300				75	750
11. Hang dry wall	400	100	300			25	75	900
12. Install doors, trim	200	50	350			25	75	700
13. Paint interior	200	50	25		50		25	350
14. Install electrical fixtures	50		100					150
15. Install floor covering	100	25	200			25	50	400
16. Cleanup	100	25		25				150
Total	4,510	1,115	7,750	350	1,075	725	1,675	17,200

POTENTIAL BUDGETING PROBLEMS

► The impact of inflation on long-term projects.

► The impact of currency exchange rates on international projects.

► Failure to obtain firm price commitments from suppliers and sub-contractors.

► Poorly prepared Work Breakdown Structures that lead to incomplete budgets.

► "Fudge Factors" built into internal support group estimates.

► Estimates based on different methods of costing, ie, hours versus dollars.

Practice Costing a Project

Prepare a cost estimate for the project you have been using. Use as many of the cost columns as apply.

SUBUNIT (COMPONENT OR STEP)									
TOTAL									
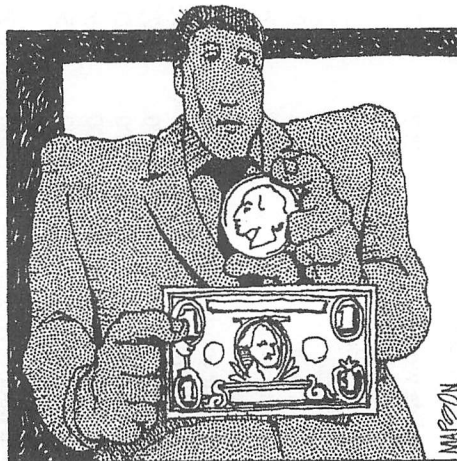
ASSIGNING RESPONSIBILITY

Determining who will have responsibility for completing each subunit or step of a project should be done as early as possible, so that they can participate in the planning of both schedules and budgets. This participation leads to a greater commitment to achieve the project within time and cost limitations.

The number of people involved in a project varies with its size and scope. Not every project has a different person responsible for each subunit.

To make the best use of your resources when deciding who is responsible for a portion of your project, broaden your point of view to include sub-contractors and service departments as well as members of the project team.

MAKE THE BEST USE OF YOUR RESOURCES.

Practice Making a Planning Summary Worksheet

Select a project, break it down into its components or steps, estimate the time required and cost for each subunit, and identify the person or group responsible for carrying it out.

Project: _____

_____

_____

COMPONENT OR STEP	BUDGET	SCHEDULE	RESPONSIBILITY

PROGRESS REVIEW: PART 3

Check either *True* or *False* in response to each of the following statements.

	True	False
1. Planning is not necessary on small projects.	❏	❏
2. A work breakdown structure is the starting point for planning a project.	❏	❏
3. Job specifications detail the requirements for project quality.	❏	❏
4. Tests should be a part of specifications.	❏	❏
5. When developing a project schedule, the duration and sequence of each step is important.	❏	❏
6. The latest time a step can begin is not significant in the planning process.	❏	❏
7. Experience is the only basis for estimating time requirements.	❏	❏
8. A Gantt chart graphically displays the time relationship of each step in a project.	❏	❏
9. A Gantt chart clearly displays the interdependencies of project steps.	❏	❏
10. A PERT diagram is more sophisticated than a Gantt chart.	❏	❏
11. The critical path is the shortest total time through a PERT diagram.	❏	❏
12. In cost planning, overhead includes general and administrative expenses.	❏	❏

	True	False
13. Those responsible for subunits of a project should not be included in planning.	❑	❑
14. Training project personnel is the responsibility of the Human Resources Department, and therefore should not be of any concern to the project manager.	❑	❑
15. Establishing project policies and responsibilities is a part of project planning.	❑	❑

Score Your Responses

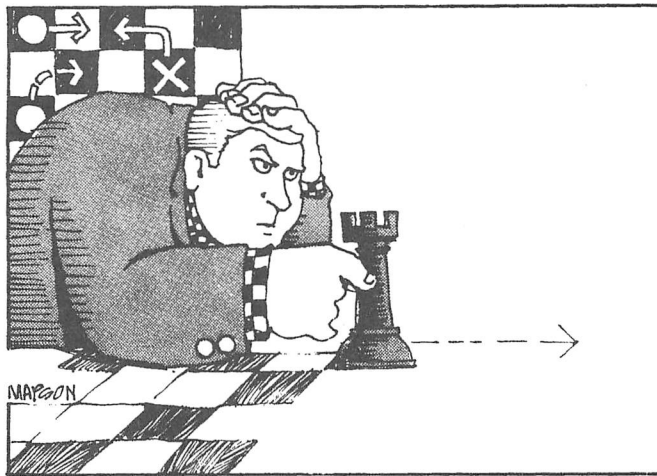| 1. F	4. T	7. T	10. T	13. F
2. T	5. T	8. T	11. F	14. F
3. T	6. F	9. F	12. F	15. T

Total Score: _____

12 to 15	*Excellent.* You understand project planning. Proceed to the next topic.
9 to 11	*Good.* Look back over the material to pick up what you missed the first time.
0 to 8	*Poor.* Take a break and then reread Part 3. This time be sure to complete the exercises.

P A R T

4

Implementing the Plan

WHAT HAPPENS IN THE IMPLEMENTATION STAGE?

During the implementation phase, the project manager coordinates all the elements of a project. This involves a number of responsibilities: controlling work in progress to see that it is carried out according to plan; providing feedback to those working on the project; negotiating for materials, supplies, and services; and resolving differences among those involved with the project. These responsibilities require a variety of skills. This section presents tools and techniques to help project managers during the implementation stage.

Key Duties During Implementation

- Controlling work in progress

- Providing feedback

- Negotiating for materials, supplies, and services

- Resolving differences

DETAILS FOLLOW

CONTROLLING WORK IN PROGRESS

Controlling is the central activity during implementation. The most important tool in this process is the plan that was developed to define the three parameters of the project—specifications, schedule, and budget. These are the standards against which performance is measured. Controlling involves three steps:

1. Establishing Standards

2 Monitoring Performance

3. Taking Corrective Action

1. Establishing Standards

Standards for the project were set in the detailed project specifications created in the planning stage. The project manager must constantly refer to these specifications and make sure the project team is also referencing them. If the project deviates from the original specifications, there is no guarantee that the success predicted by the feasibility studies will actually happen—the product or project outcome might fail to meet performance standards.

There are a number of tools available to help project managers control the project and make sure that the parameters defined in the specifications for quality, time, and budget are actually being met. A Gantt chart or PERT diagram designed at the planning stage is a great device for tracking how the time dimension of the project is proceeding in relationship to the plan.

In the following pages we will describe four additional charts that are useful for project control:

- Control Point Identification Charts

- Project Control Charts

- Milestone Charts

- Budget Control Charts

Control Point Identification Charts

A helpful technique for controlling a project is to invest some time to think through what is likely to go wrong in each of the three project parameters. Then identify when and how you will know that something is amiss and what you will do to correct the problem if it occurs. This will help minimize the times you will be caught by surprise as well as save time in responding to the problem. A control point identification chart is an easy way to summarize this information.

Example Control Point Identification Chart

Control Element	What is Likely to Go Wrong?	How and When Will I Know?	What Will I Do About It?
Quality	Workmanship or craftsman might be less than desired.	Upon personal inspection of each stage of project.	Have sub-standard work redone.
Cost	Cost of any subunit of project may exceed budget.	When purchase agreements are made.	First, seek alternative suppliers, then, consider alternative materials.
Timeliness	Time to complete any sub-unit of project may exceed schedule.	By closely monitoring actual progress against schedule along critical path.	Look for ways to improve efficiency, attempt to capture time from later steps, authorize overtime if budget permits.

CONTROLLING WORK IN PROGRESS (continued)

Practice Making a Control Point Identification Chart

Select a project and think through each of the questions relating to the three project parameters.

Project: _____

_____

_____

| Control Element	What is Likely to Go Wrong?	How and When Will I Know?	What Will I Do About It?
Quality			
Cost			
Timeliness			

Project Control Charts

Another helpful tool is a project control chart, which uses budget and schedule plans in a quick status report of the project. It compares actual to planned, calculates a variance on each subunit completed, and tallies a cumulative variance for the project.

To prepare a project control chart, refer to the work breakdown structure and list all of the subunits of the project. Then, use the schedule to list the time planned to complete each subunit, and use the budget to list the expected cost of each subunit.

As each project subunit is completed, record the actual time and actual cost. Calculate variances and carry the cumulative total forward.

This technique can easily be put into a spreadsheet format on your personal computer. Some large projects may be able to create this format for a report that uses cost and schedule data that is routinely captured by the company's computerized accounting system.

CASE STUDY: REMODELING PROJECT
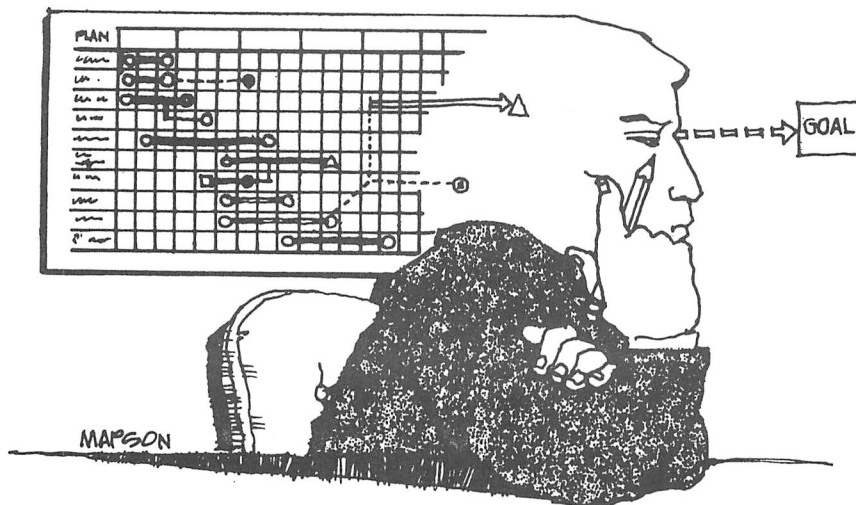
Project Costing Chart

Project: Remodel Building #7 to provide four additional offices by the end of the 3rd quarter at a cost not to exceed $17,500.

PROJECT STEPS	COST				SCHEDULE			
	BUDGET	ACTUAL	VARIANCE	TOTAL	PLANNED	ACTUAL	VARIANCE	TOTAL
1. Draw working plans	500	450	(50)	(50)	15	15	—	0
2. Obtain building permit	50	50	—	(50)	16	15	(1)	(1)
3. Form/pour foundation	2,500	2,750	250	200	5	3	(2)	(3)
4. Frame walls/roof	2,200	2,100	(100)	100	5	5	—	(3)
5. Install roofing	1,250	1,500	250	350	5*	6	1	(3)
6. Install windows	750	750	—	350	1*	1	—	(3)
7. Install exterior siding	3,800	3,350	(450)	(100)	10	9	(1)	(4)
8. Paint exterior	300				3			
9. Intall electrical wiring	650				10*			
10. Install heating & A/C	1,800				5			
11. Insulate	750				5			
12. Install sheetrock	900				5			
13. Install doors/trim	700				5			
14. Paint interior	350				3			
15. Install electrical fixtures	150				2			
16. Cleanup	150				3			
17. Install floor covering	400				2			
18. Project completion (Total)	17,400				84			

*Not on critical path—excluded from total.

NOTE: If you prefer over budget and schedule amounts to be negative numbers, subtract actual from budget and planned. Under budget and schedule amounts will then be positive numbers.

The project control chart on the following page may be reproduced for your own use.

Project Control Chart

Project Steps	Cost				Schedule			
	Budget	Actual	Variance	Total	Planned	Actual	Variance	Total

CONTROLLING WORK IN PROGRESS (continued)

Milestone Charts

A milestone chart presents a broad-brush picture of a project's schedule and control dates. It lists those key events that are clearly verifiable by others or that require approval before the project can proceed. If this is done correctly, a project will not have many milestones. Because of this lack of detail, a milestone chart is not very helpful during the planning phase when more information is required. However, it is particularly useful in the implementation phase because it provides a concise summary of the progress of the project.
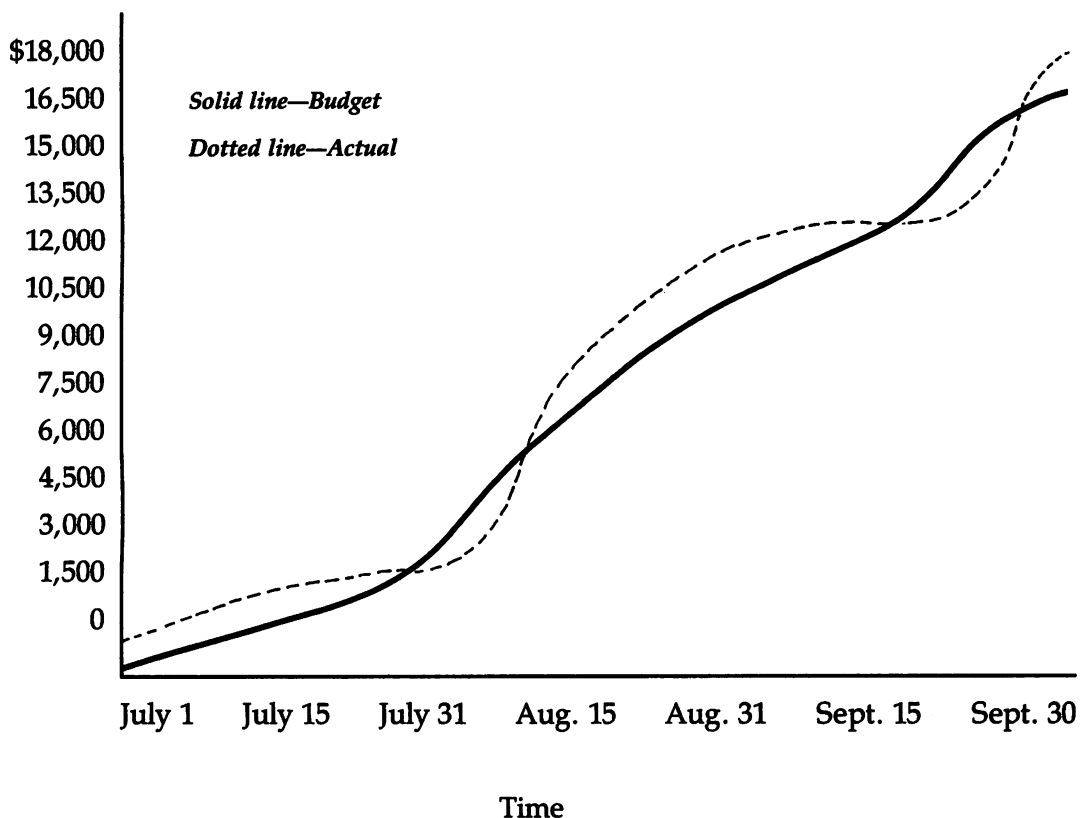
Example of Milestone Chart

MILESTONE	SCHEDULED COMPLETION	ACTUAL COMPLETION
1. Foundation completed	August 5	August 2
2. Framing completed	August 10	August 7
3. Exterior finished	August 25	
4. Electrical wiring completed	August 20	
5. Heating and air conditioning installed	August 25	
6. Interior finished	September 22	

Budget Control Charts

Budget control charts are generally of two varieties. One is a listing of the subunits of a project with actual costs compared to budget. They are similar to project control charts, discussed earlier, and can be either hand- or computer-generated. The other kind is a graph of budgeted costs compared to actual. Either bar or line graphs may be used. Bar graphs usually relate budgeted and actual costs by project subunits, while line graphs usually relate planned cumulative project costs to actual costs over time.

Example of a Budget Control Chart

Budget control chart with vertical axis ranging from 0 to $18,000 in increments of 1,500, and horizontal axis showing Time from July 1 to Sept. 30. *Solid line—Budget*; *Dotted line—Actual*.

Another helpful approach to budget control is to compare percentage of budget spent to percentage of project completed. These data can be compared by either listing or graphing. While percentage of budget spent is a precise figure, percentage of project completed is estimated by someone familiar with the project and its progress.

CONTROLLING WORK IN PROGRESS (continued)

2. Monitoring Performance

The heart of the control process is monitoring work in progress. It is your way of knowing what is going on—how actual compares to plan. With effective monitoring, you will know if and when corrective action is required. Common ways to keep abreast of project progress are:

- **Inspection**
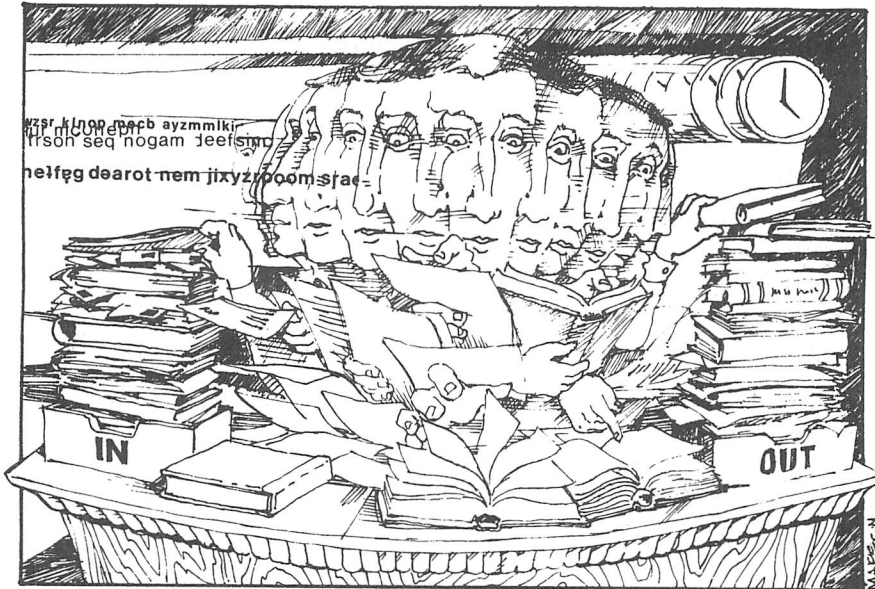- **Interim progress reviews**
- **Testing**
- **Auditing**

Inspection is probably the most common way to monitor project performance. It is handled by trained inspectors as well as by the project manager. Get out into the area where the work is performed and observe what is going on. Inspection is an effective way to see whether project specifications are being met, as well as whether there is unnecessary waste or unsafe work practices. Inspections should be unannounced and on a random schedule. However, they should also be open and direct. Ask questions and listen to explanations.

Interim progress reviews are communications between the project manager and those responsible for the various subunits of a project. Progress reviews can be in a group or on an individual basis, and either face-to-face or by telephone. Alternatively, progress reports can be submitted in writing. Progress reviews typically occur on a fixed time schedule—daily or weekly, or keyed to the completion of project subunits. These scheduled reviews are typically augmented by reviews called by either the project manager or the one responsible for the work. (Guidelines for conducting progress reviews follow.)

Testing is another way to verify project quality. Certain tests are usually written into the specifications to confirm that the desired quality is being achieved. Typical tests include pressure or stress tests on mechanical components.

Auditing can be done during the course of a project as well as at its conclusion. Common areas for audit are financial recordkeeping, purchasing practices, safety practices, security practices, maintenance procedures, and authority for disbursement. Auditors should be experts in the area of the project under review, and are typically not members of the project team. After carefully examining the area under review, a report is written describing in detail what was found and pointing out practices that deviate from established policy, authorized procedures, or sound business practices.

Effective monitoring includes more than one source of information. In addition to data from either hand- or computer-generated records, a combination of inspections, progress reviews, testing, and auditing will round out your information and keep you up-to-date on the status of your project.

AUDITS CAN BE EFFECTIVE

CONDUCTING INTERIM PROGRESS REVIEWS

Interim progress reviews typically occur on a fixed time schedule, such as daily or weekly. They may also occur when some problem in performance is observed or at the completion of a significant step toward the accomplishment of the project. Three topics are usually on the agenda:

> • **Review of progress against plan**
>
> • **Review of problems encountered and how they were handled**
>
> • **Review of anticipated problems with proposed plans for handling them**

Your role during an interim progress review is to achieve your objectives of knowing the status of operations and influence the course of future events as necessary. During the discussion, you may have any of the following roles:

► **LISTENER**

Listen as the individual updates you on progress, deviation from plan, problems encountered, and solutions proposed. Listen not only to what is said, but also to how things are said. Is the person excited, frustrated, discouraged? Help clarify what is being said by asking questions, and verify what you think is being said by restating your understanding of both facts and feelings.

► **CONTRIBUTOR**

In many interim reviews, progress is in line with plans. However, you will occasionally have problems to deal with. When this occurs, you can contribute to their solution by directing the other person toward possible courses of action. Use your knowledge and experience as necessary to move the project forward.

► **INTEGRATOR**

An important role of project managers is to integrate the individual parts of a project into a compatible whole. Is something being neglected? Is there duplication of effort? How can the people available be best deployed?

► **LEADER**

Perhaps the most important role for the project manager is that of leader. Through a variety of techniques, you must keep the team's effort directed toward the common goal of completing the project according to specifications, on time, and within budget. You must confirm and recognize good performance, correct poor performance, and keep interest and enthusiasm high.
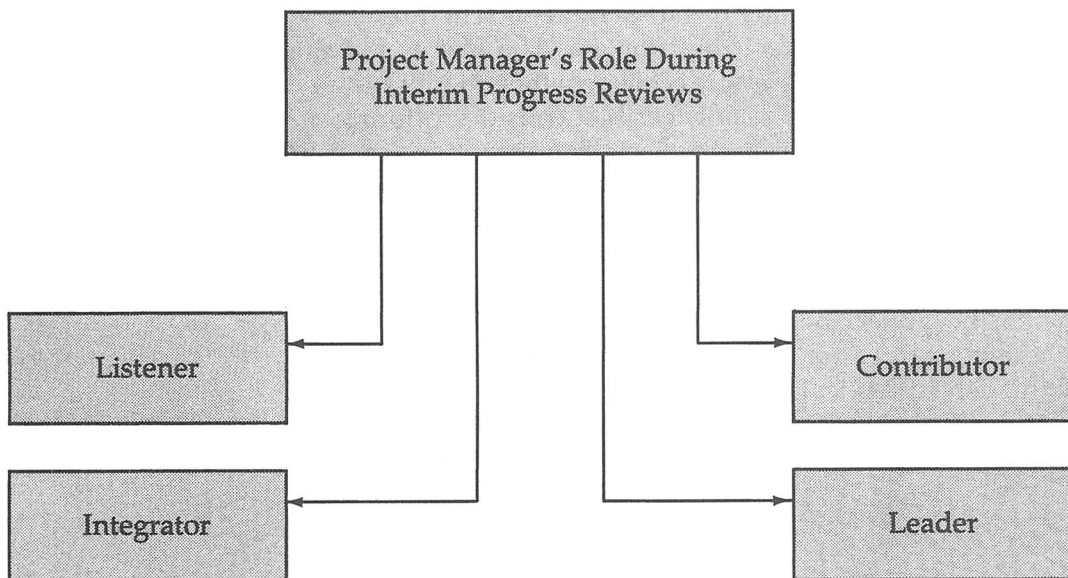
CONDUCTING INTERIM PROGRESS REVIEWS (continued)

3. Taking Corrective Action

As a project progresses and you monitor performance, there will be times when actual does not measure up to plan. This calls for corrective action. However, don't be too quick to take action. Some deficiencies turn out to be self-correcting. It is unrealistic to expect steady and consistent progress day after day. Sometimes you'll fall behind and sometimes you'll be ahead, but in a well-planned project, you will probably finish on schedule and within budget.

When quality is not according to specification, the customary action is to do it over according to plan. However, this needs to be more closely examined in some instances. For example, if the work or material exceeds specifications, you may choose to accept it. If it falls short, you need to consider how much it deviates from specifications and whether the deficiency will cause the project to fail its performance evaluation. The final decision may be to have the work redone, but that is not an automatic outcome.

When the project begins to fall behind in schedule, there are three alternatives that may correct the problem. The first is to examine the work remaining to be done and decide whether the lost time can be recovered in the next steps. If this is not feasible, consider offering an incentive for on-time completion of the project. The incentive could be justified if you compare this expenditure to potential losses due to late completion. Finally, consider deploying more resources. This too will cost more, but may offset further losses from delayed completion.

When the project begins to exceed budget, consider the work remaining and whether or not cost overruns can be recouped on work yet to be completed. If this isn't practical, consider narrowing the project scope or obtaining more funding from your client.

WHAT TO DO WHEN YOU START FALLING BEHIND

ACTION	COST	SCHEDULE
1. **Renegotiate:** Discuss with your client the prospect of increasing the budget for the project or extending the deadline for completion.	X	X
2. **Recover During Later Steps:** If you begin to fall behind in early steps of a project, reexamine budgets and schedules for later steps. Perhaps you can save on later steps so the overall budget and/or schedule is met.	X	X
3. **Narrow Project Scope:** Perhaps nonessential elements of the project can be eliminated, thereby reducing costs and/or saving time.	X	X
4. **Deploy More Resources:** You may need to put more people or machines on the project to meet a critical schedule. Increased costs must be weighed against the importance of the deadline.	X	X
5. **Accept Substitution:** When something is not available or is more expensive than budgeted, substituting a comparable item may solve your problem.	X	X
6. **Seek Alternative Sources:** When a supplier can't deliver within budget or schedule, look for others who can. (You may choose to accept a substitute rather than seek other sources.)	X	X
7. **Accept Partial Delivery:** Sometimes a supplier can deliver a partial order to keep your project on schedule and complete the delivery later.	X	X
8. **Offer Incentives:** Go beyond the scope of the original contract and offer a bonus or other incentive for on-time delivery.	X	X
9. **Demand Compliance:** Sometimes demanding that people do what they agreed to do gets the desired results. You may have to appeal to higher management for backing and support.	X	X

PROVIDING FEEDBACK

Project managers find many opportunities to provide feedback to those who have a hand in completing the project. Through feedback, individuals learn about the effect their behavior has on others and on the project's success. It serves to maintain good performance and correct poor performance. To be effective, however, feedback must be handled properly. This illustration shows the continuous loop that exists when there is good feedback:
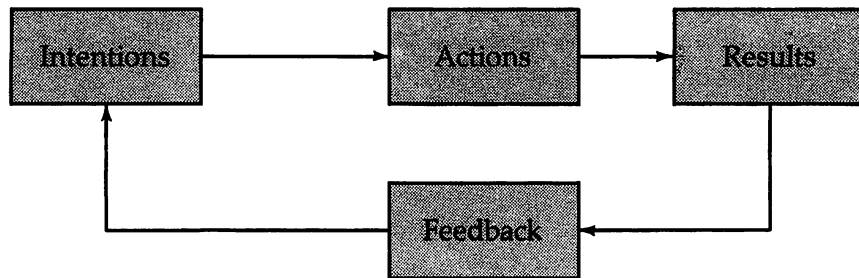
The most important guideline when providing feedback is to deal only with what you can observe. This limits your conversation to actions and results, because you cannot observe someone's intentions.

When offering positive feedback, describe the actions and results in a straightforward way and include an appropriate statement of your reaction. For example, you might tell someone, "By staying late last night and finishing the work you were doing, the project was able to move forward on schedule. I appreciate your putting out the extra effort."

Negative feedback can be handled in the same manner, but an important element is missing: how the team member should deal with similar situations in the future. The following sequence should prove more effective:


Handling Negative Feedback

1. Describe the observed actions and results.

2. Ask the individual if those were his or her intended results.

3. With a typical "No" response, ask what different actions would likely produce the desired results.

4. Discuss different alternative courses of action.

5. Agree upon a way to handle similar situations if they should occur in the future.

Check Your Feedback Style

Rate yourself by placing a check mark (✓) in front of each action that is typical of how you handle giving feedback. The ones you don't check represent opportunities for development.

☐ **Describe rather than evaluate.** By describing observed action and results, the individual is free to use or not use the information. By avoiding evaluation, you reduce the likelihood of a defensive reaction.

☐ **Be specific rather than general.** Avoid using "always" and "never." Rather, discuss specific times and events. Avoid generalized conclusions such as "you're too dominating." Rather, be specific by saying, "When you don't listen to others, you may miss a valuable idea."

☐ **Deal with behavior that can be changed.** Frustration is increased when you remind someone of a shortcoming over which he or she has no control.

☐ **Be timely.** Generally, feedback is most useful at the earliest opportunity after the behavior.

☐ **Communicate clearly.** This is particularly important when handling negative feedback. One way to ensure clear communication is to have the receiver rephrase the feedback to see if it corresponds to what you had in mind.

EFFECTIVE LISTENING > EFFECTIVE RESPONSE >
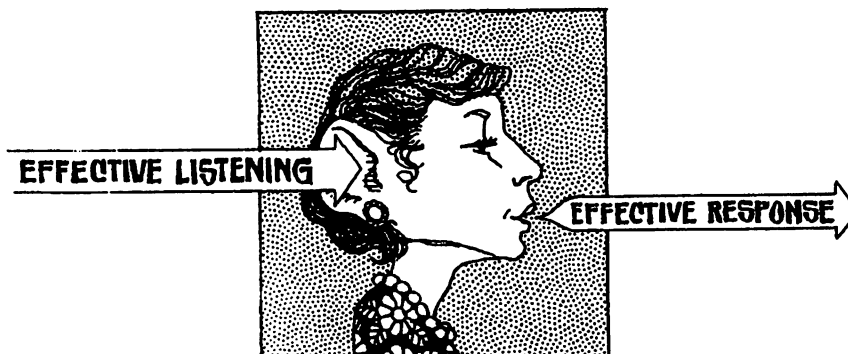
NEGOTIATING FOR MATERIALS, SUPPLIES, AND SERVICES

Negotiating* is an important process that takes up as much as 20% of a manager's time. Negotiating is one way to resolve differences, and it can contribute significantly to the success of your project.

The ideas presented here will prepare you to negotiate effectively.

Definition

Negotiation is a discussion between two parties with a goal of reaching agreement on issues that separate them when neither party has the power (or the desire to use its power) to force an outcome.

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* For an excellent book on this topic, order *Successful Negotiation* using the information in the back of this book.

Ten Guidelines for Effective Negotiation

1. PREPARE

Do your homework. Know what outcome you want and why. Find out what outcome the other party wants. Avoid negotiating when you are not prepared—ask for the time you need. As part of your preparation, figure out what you will do if you are unable to come to an agreement. Your power in negotiation develops from attractive alternatives—the greater your ability to walk away, the stronger your bargaining position.

2. MINIMIZE PERCEPTUAL DIFFERENCES

The way you see something can be quite different from how the other party sees it. Don't assume you know the other person's view: ask questions to gain understanding, and restate your understanding so it can be confirmed or corrected by the other party.

3. LISTEN

Active, attentive listening is mandatory to effective negotiation. Let the other side have an equal share of the air time. (If you're talking more than 50% of the time, you are not listening enough.) In the process, respect silence. Occasionally people need to collect their thoughts before moving ahead. Don't try to fill this time with talking.

4. TAKE NOTES

You need to know where you are—what has been agreed to; what remains to be resolved. Don't rely on memory. Take notes and then summarize your agreement in a memorandum.

5. BE CREATIVE

Early closure and criticism stifle creative thinking. Be willing to set some time aside to explore different and unusual ways to solve your problem. During this time, do not permit criticism of ideas offered. All negotiations can benefit from nonjudgmental creative thinking.

NEGOTIATING FOR MATERIALS, SUPPLIES, AND SERVICES (continued)

6. HELP THE OTHER PARTY

Good negotiators recognize that the other party's problem is their problem as well. Put yourself in the other's position and work to find a solution that meets everyone's needs. After all, no agreement will hold up unless both parties support it.

7. MAKE TRADE-OFFS

Avoid giving something for nothing. At least get some goodwill or an obligation for future payback. The basic principle to follow is to trade what is cheap to you but valuable to the other party for what is valuable to you but cheap to the other party.

8. BE QUICK TO APOLOGIZE

An apology is the quickest, surest way to de-escalate negative feelings. It need not be a personal apology. An apology for the situation you're in can be just as effective. Also, don't contribute to hostility by making hostile remarks. Hostility takes the discussion away from the issues and shifts it to a defense of self where the goal is to destroy the opponent.

9. AVOID ULTIMATUMS

An ultimatum requires the other party to either surrender or fight it out. Neither outcome will contribute to future cooperation. Also, avoid boxing someone in. This happens when you offer only two alternatives, neither of which is desirable to the other person.

10. SET REALISTIC DEADLINES

Many negotiations continue too long because no deadline exists. A deadline requires both sides to be economical in their use of time. It permits you to question the value of certain discussion and encourages both sides to consider concessions and trade-offs in order to meet deadline.
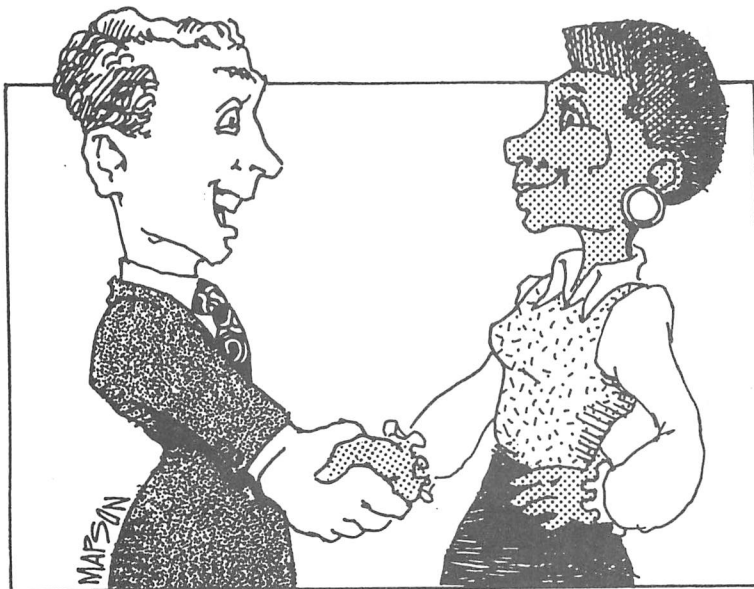
RESOLVING DIFFERENCES

What is best for one department or group won't necessarily be best for others. Out of these differences can come creative solutions when the situation is handled properly. Skill in resolving differences is an important quality of successful project managers.

Consider the model on the following page. Differences can be resolved either *my way*, *your way*, or *our way*. As a result, four strategies emerge.
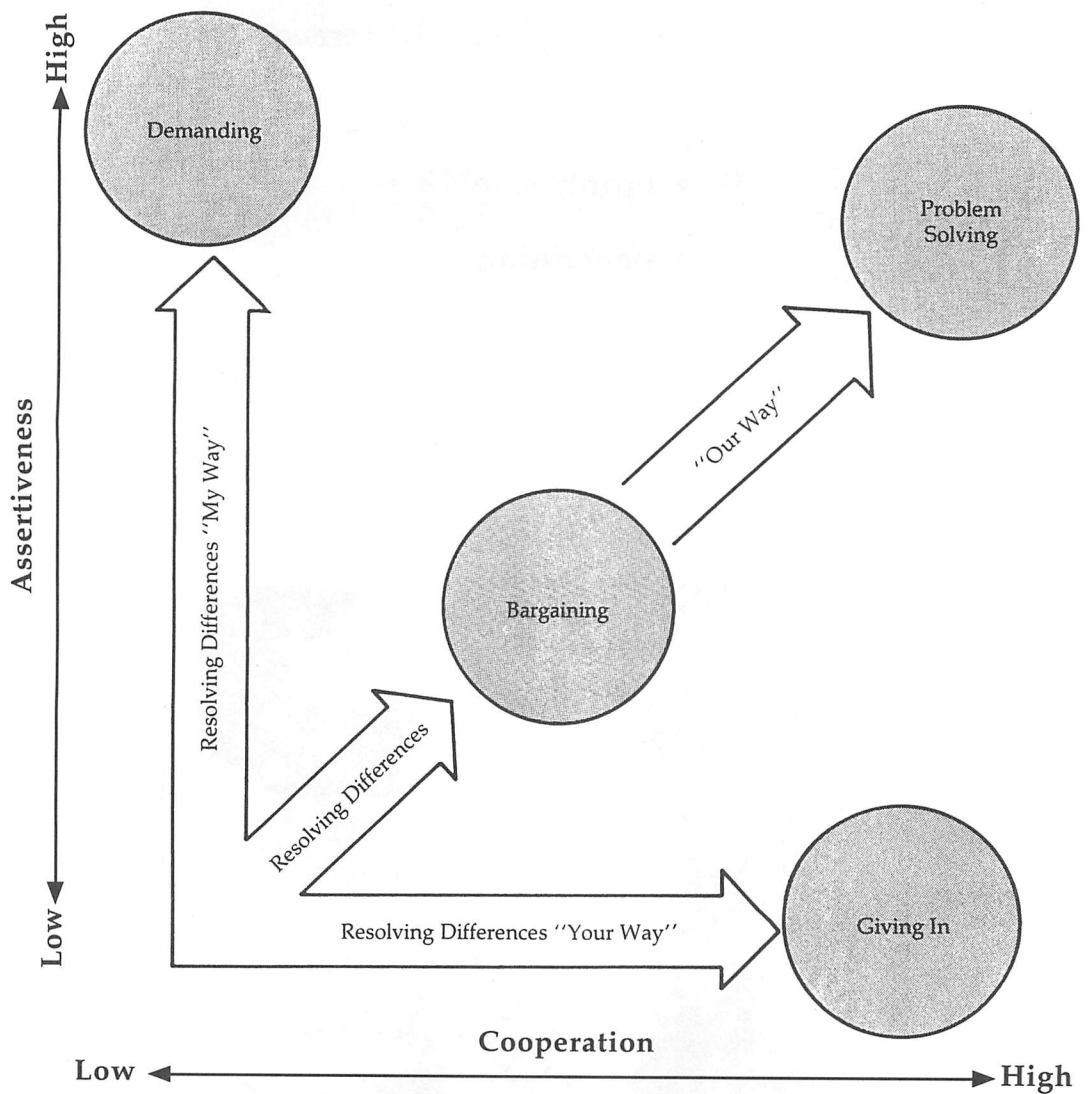
Strategies for Resolving Differences

- Demanding

- Problem solving

- Bargaining

- Giving in

RESOLVING DIFFERENCES (continued)

Model for Resolving Differences

The strategy one chooses to resolve differences tends to result from an interplay of assertiveness and cooperation. This process can be clouded by emotion at times, and when this happens, it is difficult to achieve a satisfactory outcome. Therefore, when you sense that either you or the other person's thinking is clouded by emotion, ask to delay discussion a while. The following issues influence assertiveness and cooperation:

Assertiveness

- People tend to be more assertive when an issue is important to them.

- People tend to be more assertive when they are confident of their knowledge.

- People tend to be more assertive when things are going against them.

- People tend to be less assertive when they feel they are at a power disadvantage.

Cooperation

- People tend to be more cooperative when they respect the other person.

- People tend to be more cooperative when they value the relationship.

- People tend to be more cooperative when they are dependent on the other person to help carry out the decision.

RESOLVING DIFFERENCES (continued)

Given the interplay of assertiveness and cooperation, the following strategies are common for resolving differences:

► **DEMANDING**

Demanding is high in assertiveness and low in cooperation. It suggests confidence and that the issue is important, coupled with a lack of concern for the relationship and no dependency on the other person.

► **PROBLEM SOLVING**

Problem solving is high in assertiveness, coupled with high cooperation. It suggests that the issue is important, and that there is the need for an ongoing relationship with the other person.

► **BARGAINING**

Bargaining is moderate in both assertiveness and cooperation. It suggests that an important issue is being addressed by equally powerful parties. Each must be willing to give a little to reach agreement. Bargaining is also an appropriate backup strategy when joint problem solving seems unattainable.

► **GIVING IN**

Giving in is low in assertiveness and high in cooperation. The issue may be unimportant to you, you may lack knowledge, or you simply want to go along with the other person's proposal in order to build up the relationship between you.

Each strategy has its place. However, too few people recognize the conditions that support each strategy. Many people adopt one approach for resolving differences and use it in all situations. Obviously, it will be ineffective in many cases. Learn to distinguish among the various types of situations and adopt an approach that has the greatest chance of success in the long run. Don't overlook the importance of maintaining cooperative relationships.

COMMON SOURCES OF DIFFERENCES
IN PROJECT MANAGEMENT

▶ **Allocation of Human Resources**—With limited personnel, project managers often have different views than others have on how staff will be assigned.

▶ **Use of Equipment and Facilities**—Project managers often differ with others over the use of equipment and facilities that must be shared.

▶ **Costs**—As you work at controlling costs against the approved project budget, you will often encounter conflict with suppliers who feel a need to increase costs over their original commitment.

▶ **Technical Opinions**—Frequently there will be different opinions on how something ought to be done.

▶ **Administrative Procedures**—Administrative procedures often become points of difference, especially when not followed.

▶ **Responsibilities**—There will be occasions when more than one person claims an area of responsibility and other occasions when no one wants to accept responsibility.

▶ **Scheduling**—Differences will develop around schedules and deadlines. Others you are depending on will not deliver on their commitments.

▶ **Priorities**—There will be differences about which of several things is more important and therefore should be handled first.

PROGRESS REVIEW: PART 4

Check either *True* or *False* in response to each of the following statements.

	True	False
1. Negotiating for materials, supplies, and services is not a part of a project manager's duties.	❏	❏
2. Controlling is the central activity during the implementation phase of a project.	❏	❏
3. Specifications, schedules, and budgets developed during the planning phase become the standards against which actual progress is measured in the implementation phase.	❏	❏
4. Control point identification usually does not save time.	❏	❏
5. A project control chart summarizes information on the quality dimension of a project.	❏	❏
6. A milestone chart is less detailed than required for project planning.	❏	❏
7. Budget data does not adapt to line graph presentation for monitoring progress.	❏	❏
8. Testing provides important information on the quality dimension of a project.	❏	❏
9. Personal inspection is the least effective way to monitor project progress.	❏	❏
10. Audits are done only at the end of projects to see whether the project is over budget.	❏	❏
11. An interim progress review requires good listening skills.	❏	❏
12. All off-specification work should be redone.	❏	❏
13. Lost time can often be made up on later steps of the project.	❏	❏

	True	False
14. Deploying more resources may save money for the client in the long run.	❏	❏
15. It is never acceptable to renegotiate the terms of the project after it is under way.	❏	❏
16. Effective feedback focuses on actions, results, and reaction to them.	❏	❏
17. It is not important to communicate clearly when giving feedback, because the other person already knows what you are talking about.	❏	❏
18. Successful negotiating requires a power advantage over the other person.	❏	❏
19. You have power in negotiation when you have attractive alternatives.	❏	❏
20. Giving in is never an acceptable strategy for resolving differences.	❏	❏

Score Your Responses

1. F	5. F	9. F	13. T	17. F
2. T	6. T	10. F	14. T	18. F
3. T	7. F	11. T	15. F	19. T
4. F	8. T	12. F	16. T	20. F

Total Score: _____

17 to 20 *Excellent:* You're right on track. Proceed to the next section and keep up the good work.

12 to 16 *Good:* You missed some important information. Review this section before proceeding.

0 to 11 *Poor:* Did you doze off? Reread the section and redo this review before proceeding.

5

Completing
the Project

BRINGING THE PROJECT TO A SUCCESSFUL CONCLUSION

The goal of project management is to obtain client acceptance of the project result. This means that the client agrees that the quality specifications of the project parameters have been met. In order to have this go smoothly, the client and project manager must have well-documented criteria of perform-ance in place from the beginning of the project. This is not to say that nothing can change, but when changes are made, the contract must be amended to list the changes in specifications along with any resulting changes in schedule and budget.

Objective, measurable criteria are always best, while subjective criteria are risky and subject to interpretation. There should be no room for doubt or ambiguity, although this is often difficult to achieve. It is also important to be clear about what the project output is expected to accomplish. For instance, these three outcomes may produce entirely different results; the project product performs the specified functions; it was built according to approved design; or it solves the client's problem.

The project may or may not be complete when results are delivered to the client. Often there are documentation requirements such as operation manuals, complete drawings, and a final report which usually follow delivery. There may also be people to be trained to operate the new facility or product, and a final audit is common.

Finally, project team members need to be reassigned; surplus equipment, materials, and supplies disposed of; and facilities released.

The final step of any project should be an evaluation review. This is a look back over the project to see what was learned that will contribute to the success of future projects. This review is best done by the core project team and typically in a group discussion.

PROJECT COMPLETION
CHECKLIST FOLLOWS

Project Completion Checklist

❏ **1.** Test project output to see that it works.

❏ **2.** Write operations manual.

❏ **3.** Complete final drawings.

❏ **4.** Deliver project output to client.

❏ **5.** Train client's personnel to operate project output.

❏ **6.** Reassign project personnel.

❏ **7.** Dispose of surplus equipment, materials, and supplies.

❏ **8.** Release facilities.

❏ **9.** Summarize major problems encountered and their solution.

❏ **10.** Document technological advances made.

❏ **11.** Summarize recommendations for future research and development.

❏ **12.** Summarize lessons learned in dealing with interfaces.

❏ **13.** Write performance evaluation reports on all project staff.

❏ **14.** Provide feedback on performance to all project staff.

❏ **15.** Complete final audit.

❏ **16.** Write final report.

❏ **17.** Conduct project review with upper management.

❏ **18.** Declare the project complete.

Project Evaluation Form

1. How close to scheduled completion was the project actually completed?

_____

_____

_____

2. What did we learn about scheduling that will help us on our next project?

_____

_____

_____

3. How close to budget was final project cost?

_____

_____

_____

4. What did we learn about budgeting that will help us on our next project?

_____

_____

_____

5. Upon completion, did the project output meet client specifications without additional work?

_____

_____

_____

PROJECT EVALUATION FORM (continued)

6. If additional work was required, please describe:

_____

_____

_____

7. What did we learn about writing specifications that will help us on our next project?

_____

_____

_____

8. What did we learn about staffing that will help us on our next project?

_____

_____

_____

9. What did we learn about monitoring performance that will help us on our next project?

_____

_____

_____

10. What did we learn about taking corrective action that will help us on our next project?

_____

_____

_____

11. What technological advances were made on this project?

_____

_____

_____

12. What tools and techniques were developed that will be useful on our next project?

_____

_____

_____

13. What recommendations do we have for future research and development?

_____

_____

_____

14. What lessons did we learn from our dealings with service organizations and outside vendors?

_____

_____

_____

15. If we had the opportunity to do the project over, what would we do differently?

_____

_____

_____

PROGRESS REVIEW: PART 5

Check either *True* or *False* in response to each of the following statements:

|	True	False
1. The work of a project manager ends with the delivery of the project output to the client.	❏	❏
2. The criteria of performance must be agreed to by the client before the project gets under way.	❏	❏
3. Objective, measurable criteria of performance are easy to develop.	❏	❏
4. Writing operations manuals and training client personnel in the operation of project output are part of the completion phase.	❏	❏
5. There is usually no surplus equipment, materials, or supplies to worry about at the end of a project.	❏	❏
6. The reassignment of project team personnel is one of the final steps in closing down a project.	❏	❏
7. Typically, the completion of a final audit and the writing of a final report concludes the project manager's responsibilities.	❏	❏
8. After a project is completed, little can be gained from spending time evaluating the experience.	❏	❏
9. Projects often make technological advances that are worth sharing with other parts of the organization.	❏	❏
10. If they are not recorded, lessons learned during the course of a project are typically lost and must be relearned by future project managers.	❏	❏

Score Your Responses

1. F	3. F	5. F	7. F	9. T
2. T	4. T	6. T	8. F	10. T

Total Score: _____

9 to 10	*Excellent:* You're ready to take on a project and put the knowledge you have gained to productive use.
6 to 8	*Good:* You need some more study of the final phase of a project. A quick review should do it.
0 to 5	*Poor:* You didn't get much from reading this section. I suggest you do it again with more attention to the message.

P A R T

6

Summary
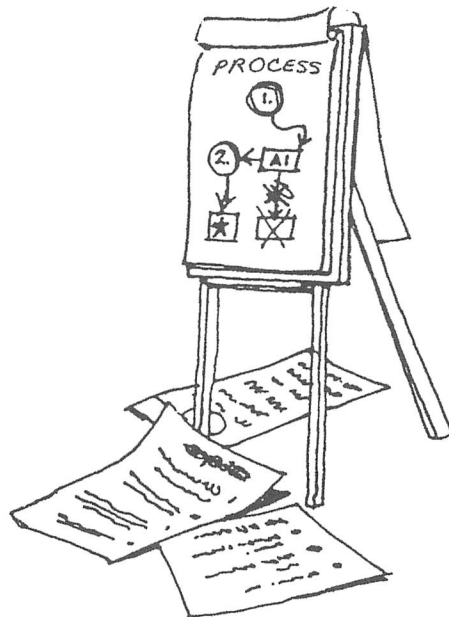
A MODEL FOR SUCCESSFUL PROJECT MANAGEMENT

Projects are temporary undertakings that have a definite beginning and end. This quality distinguishes them from the ongoing work of an organization. There are four phases in any successful project: defining, planning, implementing, and completing. The diagram shown on page 93 summarizes these phases.

It is imperative to the success of a project that it be clearly defined before it is undertaken. Any definition should include the criteria for determining successful completion of the project. It is reasonable to expect changes to occur once the project is under way, but these changes should be documented along with any resulting impact on schedule and budget.

A successful project produces an outcome that performs as expected, by deadline, and within cost limits. Thus, the three parameters by which a project is planned and controlled are established. Quality is defined by specifications, time is defined by schedule, and costs are defined by a budget.

To carry out the work of the project, a temporary team is usually assembled. This necessitates developing an organization, assigning duties and responsibilities, and training people in their duties. Frequently, policies and procedures are required to clarify how the team is to function during the project.
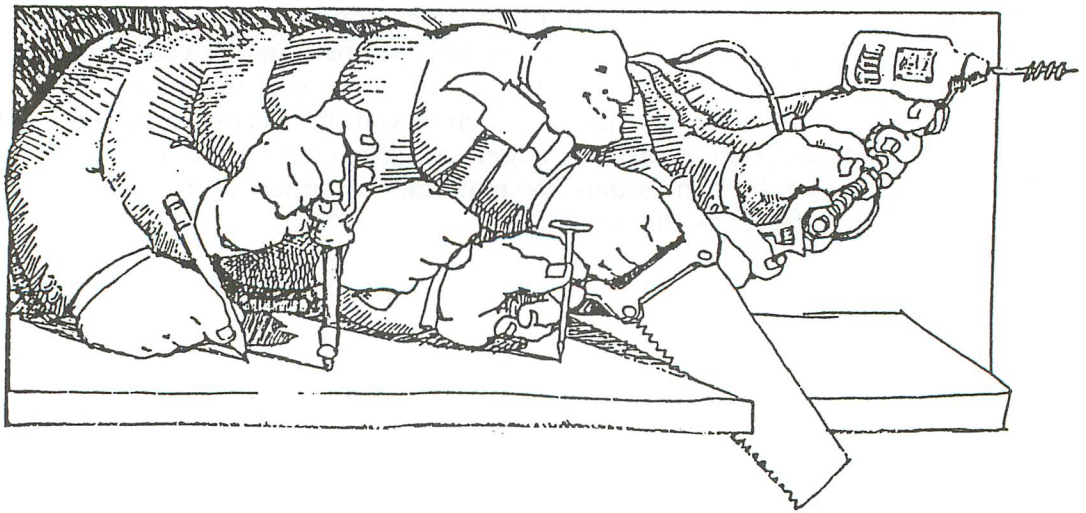
When work on the project begins, the project manager has many responsibilities. The work of different individuals and groups must be coordinated so that things run smoothly, and the progress of the project must be monitored and measured against plans. When deviations occur, corrective action must be taken. Also, project managers are expected to provide feedback to team members; negotiate for materials, supplies, and services; and help resolve differences that occur.

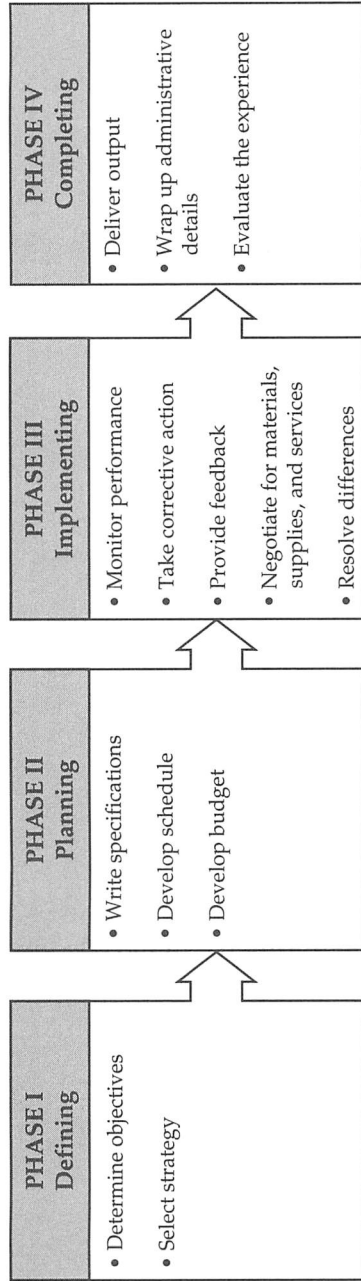# A MODEL FOR SUCCESSFUL PROJECT MANAGEMENT (continued)

The goal of the project is to deliver an outcome to the client. When that day finally arrives, there are still things to be done before the project is complete. This includes writing operations manuals; training client personnel on the use of the project output; reassigning project personnel; disposing of surplus equipment materials, and supplies; evaluating the experience; completing a final audit; writing a project report; and conducting a project review with upper management.

Not every project requires the same attention to each of these activities. It will depend upon the type of project you are undertaking, its size and scope, and the type of organization you are affiliated with. Use your own judgment in selecting the steps important to the success of your project.

Best of luck in the projects you undertake. Success can be yours if you use the concepts presented here.

Four Phases of Project Management

PHASE I
Defining

- Determine objectives
- Select strategy

PHASE II
Planning

- Write specifications
- Develop schedule
- Develop budget

PHASE III
Implementing

- Monitor performance
- Take corrective action
- Provide feedback
- Negotiate for materials, supplies, and services
- Resolve differences

PHASE IV
Completing

- Deliver output
- Wrap up administrative details
- Evaluate the experience

A MODEL FOR SUCCESSFUL PROJECT MANAGEMENT (continued)

Project Manager's Checklist

❑ **1.** Define the project.

❑ **2.** Select a strategy.

❑ **3.** Develop specifications.

❑ **4.** Develop a schedule.

❑ **5.** Develop a budget.

❑ **6.** Organize the project team.

❑ **7.** Assign duties and responsibilities.

❑ **8.** Train new team members.

❑ **9.** Monitor progress.

❑ **10.** Take corrective action.

❑ **11.** Provide feedback.

❑ **12.** Test final outcome.

❑ **13.** Deliver outcome to client.

❑ **14.** Write operations manual.

❑ **15.** Train client personnel.

❑ **16.** Reassign project staff.

❑ **17.** Dispose of surplus equipment, materials, and supplies.

❑ **18.** Release facilities.

❑ **19.** Evaluate project performance.

❑ **20.** Complete final audit.

❑ **21.** Complete project report.

❑ **22.** Review project with management.

COMPUTERS AND PROJECT MANAGEMENT

There are several good software packages to help plan and monitor projects. Two worth considering are: MacProject II and Microsoft Project. Computers can make planning, modifying, contingency planning, and updating much easier, especially on large, complicated projects. They can not define projects, set objectives, determine budgets or time requirements, or define control points, activities, or relationships. These very important activities must be done by project managers and/or team members.

What to Expect from Project Planning Software

► Easy development of and changes to Gantt Charts and PERT diagrams and calculation of the critical path.

► On-screen viewing of information before printing.

► Easy production of schedules and budgets.

► Easy access to project information for preparing reports.

► Integration of project schedule with a calendar allowing for weekends and holidays.

► Easy access to different scenarios for contingency planning and updating.

► Easy checking for errors in logic and overscheduling of individuals and groups.

Getting Started

When you work with project planning software for the first time, it is a good idea to experiment with it using a project you have already completed. This will allow you to become familiar with the program before putting it to work.

COMMON ABBREVIATIONS IN PROJECT MANAGEMENT

ACWP	Actual Cost of Work Performed
B & P	Bid and Proposal
BAC	Budget at Completion
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
CCN	Contract Change Notice
CDR	Critical Design Review
CFE	Customer Furnished Equipment
CFSR	Contract Funds Status Report
CMO	Contract Management Office
CPFF	Cost Plus Fixed Fee
CPIF	Cost Plus Incentive Fee
CPM	Critical Path Method
C/SCSC	Cost/Schedule Control System Criteria
C/SSR	Cost/Schedule Status Report
EAC	Estimate at Completion
ETC	Estimate to Complete
FFP	Firm Fixed Price
FP	Fixed Price
G & A	General and Administrative
IR & D	Internal Research and Development
ODC	Other Direct Cost
PDR	Preliminary Design Review
PERT	Program Evaluation and Review Technique
PM	Project Manager or Management
PO	Purchase Order
PR	Purchase Requisition
RFP	Request for Proposal
RFQ	Request for Quotation
T & M	Time and Material
WBS	Work Breakdown Structure
WO	Work Order

NOTES

NOTES