PROJECT MANAGEMENT

PROJECT MANAGEMENT

Strategic Design and Implementation

David I. Cleland

Lewis R. Ireland

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PREFACE

In today's environment, certainty of change is without precedent. Although the practice of project management has been with us for centuries, only in the past few decades has an expression in the literature of a philosophy and process of managing projects taken place. In recent years, there has been a growing interest in the use of projects as building blocks in the strategic management of the enterprise. This book's fourth edition continues to hold the commanding lead, taken by previous editions, in showing how to use projects for the management of product, service, and organizational process change to prepare the organization for its competitive future.

Today, project management has reached a maturity level in which it is applied to many uses. It is the principal means by which operational and strategic changes are managed in contemporary organizations, in both for-profit and not-for-profit enterprises. This growing maturity of project management has fostered the use of "nontraditional" project teams in the management of change. Benchmarking teams, concurrent engineering teams, reengineering teams, and self-managed production teams are a few of these nontraditional teams that are gaining popularity in strategies used by today's managers.

Formal project management emerged in an unobtrusive manner in the late 1950s and began taking on the characteristics of a distinct discipline. No one can claim to have invented project management. Its beginnings can be found in the creation and construction of many different historical architectural artifacts, such as in cathedrals, canals, highways, and in voyages of discovery and military campaigns, to name a few. In more recent times, project management has gained special attention in the military weapons and systems development businesses. The modem-day origins of project management concepts and techniques can be found in such large-scale ad hoc endeavors as the Manhattan Project and the Polaris submarine program, in large construction initiatives, and in the use of naval task forces.

The emergence of professional societies has helped stimulate the development and dissemination of project management knowledge and skills. There are many such professional societies in existence — with a commanding lead being taken by the Project Management Institute (PMI®). The growth of PMI in recent years in many ways reflects the increasing interest in the use of project management. PMI has over 90,000 members drawn from a wide variety of different industries and organizations.

Many books and articles that have been published about project management treat the subject as if it were a nearly separate entity in the management

of organizations. Little is found in this literature that puts project management in its proper place in the strategic management of organizations. This book tries to do just that. Our study of how contemporary organizations deal with change reinforced our belief that, in spite of an abundance of books and periodical literature, there was a serious lack of theoretical and practical literature that placed project management in the context of the design and execution of organizational strategies.

We found that too many leaders and managers, particularly at the upper and senior levels, were inclined to view project management as a special case of management—a minor departure from the proper or expected ways of managing the organization. Too often these managers failed to appreciate the strategic role that projects can play in the management of their organizations. Up until the last few years, many managers tended to tolerate rather than fully accept project management as the way to enhance organizational effectiveness. This caused project managers, functional managers, and project professionals to see themselves in ambiguous roles in supporting project initiatives. However, once upper and senior managers recognized project management for what it is—a philosophy and process for managing change—they embraced the use of project management in the enterprise.

In this fourth edition of ***Project Management: Strategic Design and Implementation,*** special care has been taken to update the material in each chapter. New material has been added that has emerged as part of the growing literature supporting project management, such as earned value, project management maturity, nontraditional teams, project partnering, and the outsourcing of project management, to name a few. In some cases, the growing literature in project management is adequately described in the text. In some cases, an area is only mentioned with guidance on where the reader can find expert references on the subjects. To give a detailed description of all of the emerging areas of thought that relate to project management would greatly lengthen the book to an unwieldy size.

Updated examples of the use of project management in many different contexts have been added. End-of-chapter material has been strengthened through the use of detailed chapter summaries, additional sources of information, discussion questions, user checklists, project management principles, a project management situation, and a student/reader assignment for further investigation of project management areas. Sufficient end-of-chapter material exists to support the use of the text in undergraduate and graduate programs as well as in short training courses. The book is valuable as well for the professional practitioners, who want to increase their knowledge and skills in the practice of project management. Upper-level and senior managers will find an abundance of information that can be used to enhance their use of project initiatives in the management of the enterprise.

We believe that this book is both "student" and "user" friendly!

David I. Cleland, Ph.D.
Lewis R. Ireland, Ph.D.

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The development and publication of this fourth edition required the cooperative effort of many people, who served as advocates, consultants, and facilitators. Our deep appreciation goes to all of these "stakeholders" who contributed in many important ways to this book. Much appreciation is due our students, clients, and project-community associates who allowed us to talk with them about the theory and practice of project management.

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INTRODUCTION

This fourth edition of ***Project Management: Strategic Design and Implementation*** has been put together with the objective of further contributing to the project management knowledge of professionals at all levels of responsibility and to the student aspiring to be a part of a project team.

Managers and professionals engaged in project management, who desire to be more effective contributors in their organization's success, will find this book useful. The format of the book is adaptable to many different uses. Readers may read sections and topics in whatever order best suits their interests. The 7 parts and 22 chapters provide an easy division of information for readers. In Figure I.1 these parts and chapters of the fourth edition are portrayed in the context of strategic management and project management and are briefly described in the following text.

Part 1, Introduction, consists of two chapters that introduce project management and describe the management processes that are involved in the practice of this discipline. Here, a historical perspective shows early efforts that could only be called projects in our modem interpretation.

Part 2, The Strategic Context of Projects, shows how projects are used in both the strategic and operational management of the enterprise. The theme emphasized in this section is how projects are building blocks in preparing the enterprise for its uncertain future. When to use project management, the strategic context of projects, strategic issues, and the role of stakeholders and boards of directors are examined in this part.

Part 3, Organizational Design for Project Management, looks at how to organize human resources, project authority, and project management maturity. Management of people and gain in project maturity capability are important to the achievement of enterprise goals.

Part 4, Project Operations, reviews project planning, information systems, project control, project termination, and earned value systems. Foundation areas of project operational framework provide views of what is needed to successfully manage a project.

Part 5, Interpersonal Dynamics in the Management of Projects, presents information on project leadership, communications, and effective project teamwork. Because only people can make things happen, various ways an individual or a team is motivated comes into play.

Part 6, The Cultural Elements, reviews a strategy of continuous improvement through projects, and cultural considerations in project management. A new aware-

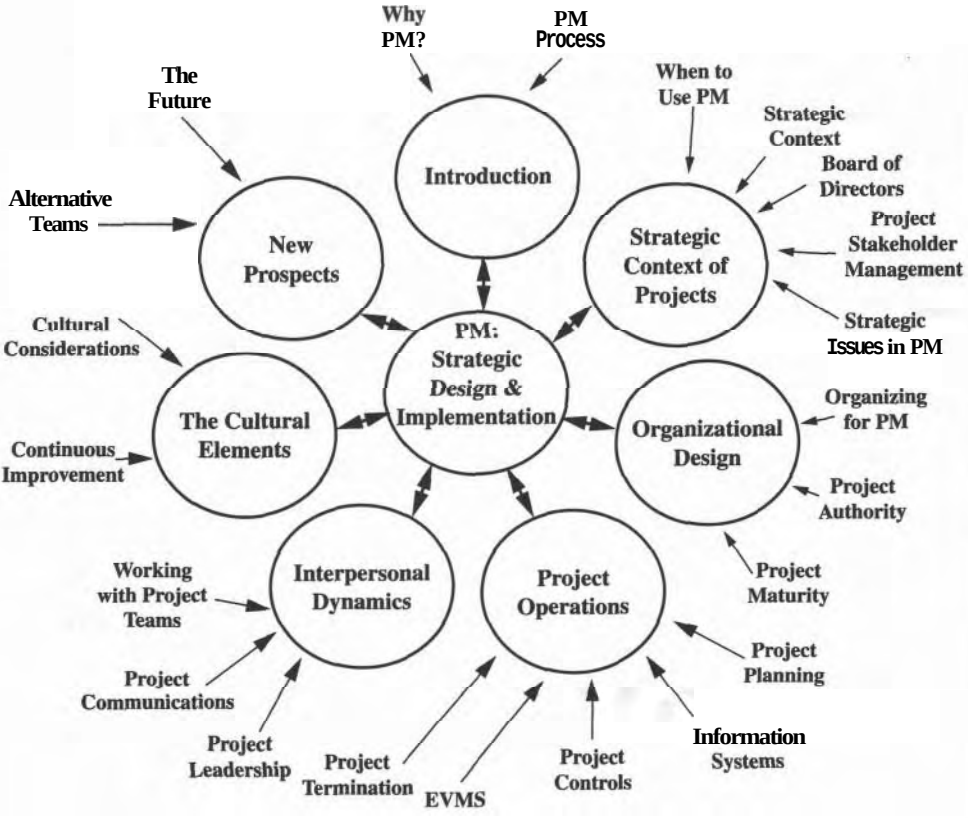


FIGURE 1.1 Strategic management context of project management.

ness is raised in project management that cultural aspects are perhaps as important as the "traditional" cost, schedule, and technical performance issues.

Part 7, New Prospects, considers the alternative uses to which project teams can be put. The final chapter of the book speculates on what the future of project management might be. The challenges of the future give rise to new and unique applications for project management.

The reader can do further reading about project management from the additional sources of information noted at the end of each chapter. Then, too, each reference cited in the text of the book can be a valuable source of additional information.

We wish readers much success in their project management work!

PROJECT MANAGEMENT

P · A · R · T · 1

INTRODUCTION

CHAPTER 1
WHY PROJECT MANAGEMENT?

"There is nothing permanent except change."
HERACLITUS OF GREECE, 513 B.C.
Rogers' Student's History of Philosophy

1.1 INTRODUCTION

It has been said that there is nothing as powerful as an idea whose time has come. Project management, an evolving field of theory and practice, has emerged slowly as the field of management has come forth. Since the 1950s there has been acceleration in the development of the theory, literature, and practice of project management. Today there is a sufficient body of knowledge about project management so that this discipline has taken an important position in the lexicon of management and in the practices of modem organizations.

In this first chapter of the book an historical perspective of projects will be given, augmented with examples of the early literature. The evolution of project management from organizational liaison devices will be explored. In addition a preliminary philosophy of the discipline will be offered. As a mark of the growing maturity of project management a description will be provided of the Project Management Institute, the commanding professional society in the field. The narrative of the chapter starts with a definition of just what a project is, followed by the way in which projects reflect how past societies have coped, in part, with changes in their environment.

This is a book about project management, a "field of study" and practice that has evolved over decades and now promises to take its rightful place in the lexicon of management and in contemporary organizations. In this chapter, the overall concept of a project will be presented along with some examples of historical and contemporary projects.

Just what is a project? Two early definitions are helpful. For example, it is "any undertaking that has definite, final objectives representing specified values to be used in the satisfaction of some need or desire."[1]

[1] Ralph Currier Davis, *The Fundamentals of Top Management* (New York: Harper, 1951), p. 268.

Newman, Warren, and McGill defined a project and described its value as

> simply a cluster of activities that is relatively separate and clear-cut. Building a plant, designing a new package, soliciting gifts of $500,000 for a men's dormitory are examples. A project typically has a distinct mission and a clear termination point.
>
> The task of management is eased when work can be set up in projects. The assignment of duties is sharpened, control is simplified, and the men who do the work can sense their accomplishment.
>
> [A project might be part of a broader program, yet the] chief virtue of a project lies in identifying a nice, neat work package within a bewildering array of objectives, alternatives, and activities.[1]

The authors define a project as a combination of organizational resources pulled together to create something that did not previously exist and that will provide a performance capability in the design and execution of organizational strategies. Projects have a distinct life cycle, starting with an idea and progressing through design, engineering, and manufacturing or construction, through use by a project owner.

Four key considerations always are involved in a project:

- What will it cost?
- What time is required?
- What technical performance capability will it provide?
- How will the project results fit into the design and execution of organizational strategies?

The questions noted above must be answered on an ongoing basis for each project in the enterprise that is being considered, or for projects on which organizational resources are being used. The answers to these questions must also be evaluated in the context of the project's fit into the organization's operational (short-term) or strategic (long-term) strategies. Figure 1.1 portrays these considerations.

Project management and strategic management are highly interdependent. In the material that follows, this interdependence will be presented.

1.2 STRATEGIC MANAGEMENT—THE PROJECT LINKAGES

One of the areas of management this book addresses is the strategic context in which projects are found in contemporary enterprises. In the material that follows, ***choice elements*** are found in the theory and practice of strategic management—***the management of the enterprise as if its future mattered. A*** key choice element

[1] William H. Newman, E. Kirby Warren, and Andrew R. McGill, *The Process of Management: Strategy, Action, Results. 6th* ed. (Englewood Cliffs, N.J.: Prentice Hall, 1987), p. 140. Reprinted by permission.

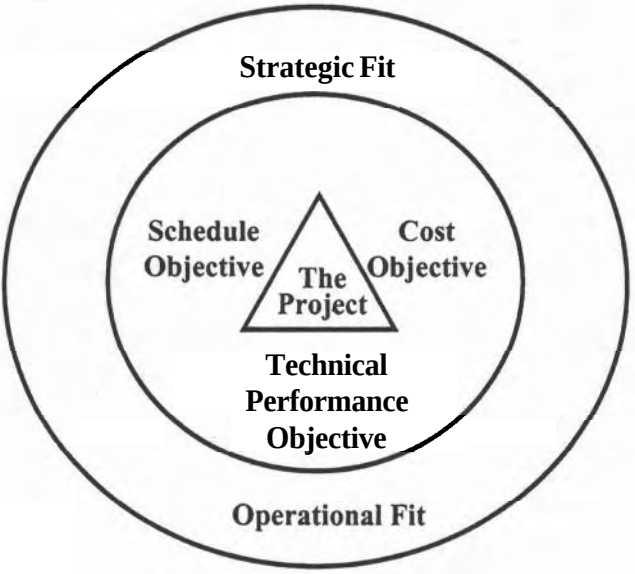


FIGURE 1.1 Interrelationships of project objectives and organizational fit.

of strategic management is the emerging projects that are building blocks in the design and execution of strategies for the enterprise's future.[3]

In the management of an enterprise as if its future mattered, nine key choice elements are involved. These choice elements for the enterprise are:

- Vision
- Mission
- Objectives
- Goals
- Strategies
- Programs
- Projects
- Operational plans
- Organizational design

These choice elements provide for the major performance standards by which enterprise resources will be identified, selected, committed, and reviewed in the enterprise for survival and growth in its future products, services, and organizational processes. These choice elements are defined below and portrayed in Table 1.1 and Fig. 1.2.

[3]The term "choice elements" was previously used in William R. King and David I. Cleland, *Strategic Planning and Policy* (New York: Van Nostrand Reinhold, 1978), chap. 5.

TABLE 1.1 Taxonomy of Choice Elements

Vision	Mission	Objectives
Intelligent and relevant foresight of probable future opportunities	Mission follows the vision of the organization	Objectives provide direction to the mission and define areas for pursuance
A mental image that anticipates something related to the future of the business	A broad, enduring intent that an organizational entity pursues	Long-term target and critical results that directly contribute to mission accomplishment to be achieved in an enterprise
Discernment and sharing of values to all organizational members	An assignment to an organizational entity for providing products and/or services	Performance criteria to be measured and achieved in utilization of organizational resources
Reflects assessment of enterprise strengths or weaknesses, and expected future environmental conditions	The overall strategic purpose toward which all organizational resources are directed and committed	Desired future destination of the organizational entity stated in qualitative and/or quantitative terms
Example: Customers must have a quality experience and must be pleased, not just satisfied. (COMPUTER COMPANY)	The "business" the organization is in	Performance results (financial, productivity, market share, etc.) and qualitative results (image, personnel development, research) are included
	What the organizational entity is and what it intends to become	*Example:* Lead in state-of-the art technology in our product lines. (COMPUTER COMPANY)
	The symbol around which all organizational effort is focused	
	Supported directly by objectives	
	Example: "...to be the number one aerospace company in the world, and among the premier industrial firms, as measured by quality, profitability, and growth." (AIRCRAFT MANUFACTURER)	

TABLE 1.1 Taxonomy of Choice Elements *(Continued)*

Goals	Strategies	Programs	Projects
Specific, time-sense milestones to be accomplished in using organizational resources Attainment of a goal signifies that progress has been made toward attaining organizational objectives in support of the mission Include quantitative performance goals (e.g., 15 percent ROI by a specific date) and qualitative goals (product development, project/program completion) Basic component for measuring progress toward an organization's desired end results Successful completion of a project means that one or more goals have been achieved for the organization *Example:* "We will initiate our basic research program strategy by January 1, 2002. (R&D ORGANIZATION)	Design of means through use of resources to accomplish organizational purposes Development of action plans for setting coordinated use of resources Designation and implementation of programs, projects, policies, procedures, and other protocols for use of resources Designation of organizational design initiatives to facilitate use of resources Selection among alternatives of the "best" method for implementing processes to achieve goals *Example:* Commit 5 percent of corporate earnings to product applied research programs. (INDUSTRIAL EQUIPMENT MANUFACTURER)	Resource-consuming element of organizational capabilities that have a common purpose An output, which serves the broad purpose of similar objectives of the enterprise Defined in the context of what the enterprise is trying to achieve (i.e., vision, mission, objectives, goals, strategies) Usually cast in context of extended enterprise horizons: say, 5 to 10 years Usually implemented through projects that define the specific work to be accomplished *Example:* Productivity improvement program. (ELECTRICAL EQUIPMENT MANUFACTURER)	Ad hoc resource-consuming initiatives having cost schedule and technical performance results that support organizational purposes Basic building blocks of organizational strategies to accomplish work and meet goals Any ad hoc undertaking that has definitive, final objectives to deal with product, service, or organizational process change Provide a philosophy and strategy for the management of change in the enterprise The primary means of planning and executing work within the organization *Example:* Highway construction project. (CONSTRUCTION PROJECT COMPANY)

FIGURE 1.2 Choice elements of strategic management.

Vision A vision is a mental image of what could be anticipated for the enterprise's future—such as becoming a world-class competitor. One company defined its vision to be a "world-class competitor—and to keep it that way.. ..We have programs in place to do just that such as a total quality management process whereby we *live* quality." Another company included in its vision statement: "We will enhance our competitiveness by being first in the development of advanced technology that supports our world-class products and services."

A telecommunications company conceived its vision in the following fashion: "As we enter the new millennium, AT&T is successfully transforming itself from a domestic long distance company to an any-distance, any-service global company. We've made the right strategic decisions, invested in the right assets, and have the right people to get the job done."[4]

Mission The mission of an enterprise answers the basic question: What business are we in? One project-driven firm defined its mission in the following way: "We are in the business of designing, developing, and installing energy management systems and services for the domestic industrial market." The Boeing Company, which uses project management widely, describes its mission in the following fashion: "to be the number one aerospace company in the world, and among the premier industrial firms, as measured by quality, profitability, and growth." Boeing uses projects as building blocks in the design and execution of strategies to fulfill its mission.

[4] "Delivering," Letter to AT&T Shareholders, Annual Report, 1999.

Objective An objective is a statement of the ongoing purposes in the enterprise that must be carried out to support the organizational mission. A computer company defines one of its objectives as "leading the state-of-the-art in its products and services." Another company defines its objectives as achieving a compounded earnings growth rate of 15 percent and a 20 percent return on capital. The major part of this strategy is to be the leader in providing scientists and educators worldwide with laboratory product and service systems created through technology, integrity, and a commitment to excellence. Objectives directly support the enterprise's mission. Thus a failure to maintain an organizational objective can put the accomplishment of the enterprise's mission in jeopardy.

Goal A goal is a specific achievement in the satisfaction of enterprise objectives. As a performance measurement for progress in the use of resources to support corporate purposes, a goal has a specific time element. One company defined its goals as the realization of a certain percentage of return on invested assets by a specific date. Another company stated one of its principal goals as follows: "We intend, by the end of 1999, to complete the construction of a new manufacturing facility, which will complete the transition begun in 1997 from a predominately R&D services company to an industrial manufacturer."

Further distinction between an objective and a goal is offered. An objective is an aspiration to be working toward on a continuous basis. A goal is an achievement to be realized in future times. Further differentiation between these two terms can be distinguished using a few measures:

- ***Time frame*** An objective is timeless and unending; a goal is time-based and intended to be overrun by subsequent goals.
- ***Specificity*** Objectives are usually stated in general terms, dealing with the attainment of desirable conditions in the future. A goal is much more specific, stated in terms of a particular result to be expected at a specific time point. Objectives are open-ended, and are sought on a continuous basis, regardless of the time element. Goals are milestones.
- ***Focus*** Objectives are usually stated in terms of some ongoing achievement in a relevant external environment, whereas goals are internally focused, whose achievement can be measured by a selected date. Objectives are often stated in the context of achieving leadership or recognition in certain desirable conditions for the enterprise. A goal implies a specific resource commitment to be used by a certain date.
- ***Measurement*** Both objectives and goals can be stated and measured in quantitative terms or qualitative terms. A company that states one of its objectives in terms of "achieving a compound rate of growth in earnings per share, placing its performance in the top 10 percent of all corporations" may attain that benchmark in 1 year, but it is timeless and means that the ensuing years must reflect the same performance unless changed. A goal that is quantified is expressed in absolute terms—a president of a company could state that the enterprise would "achieve half of its sales revenue from a particular industry by 2002." The achievement of that goal can be specifically measured. Once attained, the goal would be restated for the ensuing year.

- ***Organizational goals and projects are inextricably interwoven*** The successful completion of a project means that an organizational goal has been achieved; which in turn means that progress has been made toward the realization of the enterprise's objectives and mission. When a project is behind schedule, or overrunning costs, or unlikely to attain its performance objective, the enterprise's objectives and mission could be impaired.

Strategy ***An*** organizational strategy is the design of the means, through the use of resources, to accomplish end purposes. Strategies also include action plans for establishing the direction for the coordinated acquisition and use of resources through organizational design choices. Strategies also provide for the means to obtain resources for the enterprise, and how to use such resources effectively and efficiently in the fulfillment of organizational purposes.

Programs Programs are resource-consuming combinations of organizational resources, which have a common purpose in supporting the enterprise's purposes. For example, a productivity improvement program could be composed of projects such as the following:

- The use of self-managed production teams on the assembly line
- Plan and equipment modernization initiatives
- Use of computer-aided design and manufacturing
- Changeover of a production facility from conventional manufacturing to manufacturing cells

A capital investment program would consist of a number of new projects such as improved equipment development, new facilities, acquisition of equity or debt funding initiatives, and training of personnel.

Projects Projects are ad **hoc,** resource-consuming activities used to implement organizational strategies, achieve enterprise goals and objectives, and contribute to the realization of the enterprise's mission. An early definition of a project stated that it was "an undertaking that has definite final objectives representing specified values to be used in the satisfaction of some need or desire."[5]

Operational Plans Operational plans are those documents developed to guide the organization in a consistent fashion toward meeting its mission, objectives, and goals through designated strategies. These plans form the overarching polices, procedures, and practices for when and how program and project work will be accomplished.

Organizational Design Organizational design is the organizational structure that facilitates performing the work. Organizational design considers the business that is being conducted, the manner in which work will be conducted, the practices

[5] Ralph Currier Davis, *The Fundamentals of Top Management* (New York: Harper, 1951), p. 268.

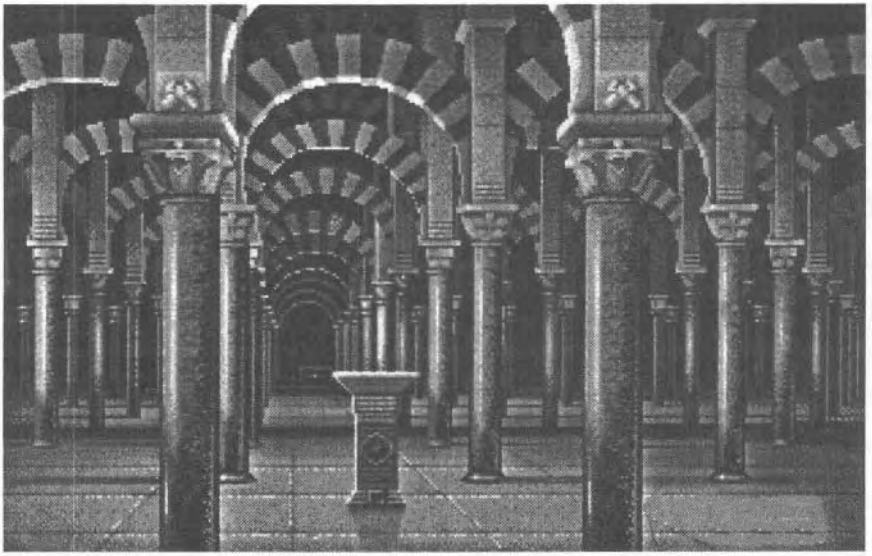
for managing the work effort, and strategies for work accomplishment. An optimal organization design supports the enterprise in getting its work accomplished in the most competitive way.

1.3 A HISTORICAL PERSPECTIVE OF PROJECTS

Projects have played a key role in some instances and have initiated changes in the societies of antiquity that are still being felt today. A few of these projects are cited and portrayed in Fig. 1.3 and in the material that follows:

1. In Europe there was a great advance in building projects for places of worship. Between 1050 and 1350, in France alone, over 500 large churches were built, as well as 1000 parish churches, so that there was a church or chapel for every 200 people. The Cologne Cathedral, considered by some to be the most perfect specimen of Gothic architecture, undoubtedly took the longest to build. The foundation stone was laid in 1248. By 1437, one of the towers was finished to one-third its present height, but at the time of the Reformation its roof was still covered with boards. Finally, the cathedral was completed in 1880, over 650 years after construction first began!
2. In the United States, the second half of the 1860s witnessed the presence of a project to join the continent of the United States by railroad. The two biggest corporations in American, the Central Pacific and Union Pacific, had armies of men at work building separate railroad lines. This immense project was an epic of logistics, organization, and endurance—as well as an opportunity for the railroad companies to get very rich. The federal government issued land grants along the right-of-way and low-interest bonds underwriting construction costs of up to $48,000 per mile in the mountainous regions. Although there were many things about this project that were marvelous, one record set by the Central Pacific workforce remains unequaled today: 10 miles and 56 feet of track were constructed in 1 day. When the Golden Spike went in the last tie to connect the last rail, it brought together the lines from east and west, thus initiating a transportation system that held the East and West together for the first time. As Stephen E. Ambrose noted, "Things happened as they happened. It is possible to imagine all kinds of different routes across the continent, or a better way to have the government build a railroad and own it. But those things didn't happen, and what did take place is grand. So we admire those who did it—even if it was far from perfect—for what they were and what they accomplished and how much each one of us owes them.'" The reader can only ponder with fascination the "strategic effects" that this project set in motion.
3. In the early years of the fifteenth century, Prince Henry the Navigator developed and operated what could be called today a primitive research and

[6]Paraphrased and quoted from Stephen E. Arnbrose, "The Big Road," *American Heritage,* October 2000, pp. 55–66.



- Egyptian pyramids
- European castles
- European cathedrals
- Great Wall of China
- Voyages of discovery
- Canals
- Military campaigns

FIGURE 1.3 Project management was born **in antiquity.**

development laboratory, located in Sagres, Portugal. During these early years, Prince Henry initiated, organized, and directed expeditions on the frontier of discovery. The voyages of the discovery that he set forth could be described as "projects." These projects of discovery made important contributions to the evolving body of knowledge in cartography, navigation, and shipbuilding. Prince Henry required his mariners, who also functioned as "project managers," to keep accurate logbooks and charts, and to make a record of everything they saw during their exploration of the waters. The knowledge base contributed by his discoveries helped add to the latest navigating instruments and newest navigating techniques. At Sagres and at the nearby port of Lagos, experiments in shipbuilding produced a new type of ship—the caravel—without which Prince Henry's exploring projects would not have been possible. This light sailing vessel was designed for explorers' needs, combining some cargo-carrying features and enhanced maneuverability of previous ships. The caravel had enough capacity to return from its voyages of commerce and discovery. Its shallow draft qualified it to explore inshore waterways, as well as made it easier to beach the vessel for repair.

Although Prince Henry did not actually build a research laboratory, he did through his strategies, collect the books, charts, sea captains, pilots, map makers, instrument makers, the shipbuilders and other craftspersons to plan voyages, learn from each voyage, assess the findings, and add to the growing knowledge base about waterways, new ships, and new lands. Indeed, Prince Henry's strategies might be called the first organized project-driven enterprise for continuous discovery.[7]

4. Another early explorer, Amerigo Vespucci, was in project work and indeed could be called a "project manager." In 1501, commanding three caravels, he arrived at a new land, which he called a "new continent." What he did was follow the South American coast for about eight hundred leagues, which took him well down into Patagonia, near the present San Lulian, only some four hundred miles north of the southern tip of Tierra del Fuego. The new continent that Vespucci discovered was not named by himself. Rather the name America came from the efforts of Martin Waldseemiller (1410?–1518), an obscure clergyman, who had studied at the University of Freiburg. In one of Waldseemiller's books, ***Cosmoqraphiae Introductio,*** which summarized the traditional principles of cosmography, he observed that "Inasmuch as both Europe and Asia received their names from women, I see no reason why any one should justly object to calling this new land Amerigo (from Greek "ge" meaning "land of," the land of Amerigo, or America, after Amerigo, its discoverer, a man of great ability."[8]

5. The "project" to discover the cause, and the cure of yellow fever was surely one of the health challenges of the nineteenth and twentieth centuries. Yellow fever had killed thousands of victims in epidemics that raged in tropical and coastal cities, especially in the Caribbean. Walter Reed (1851–1912) was an American army surgeon, who went to Cuba in 1900 to investigate an outbreak among U.S. soldiers. By intentionally subjecting volunteers to bites, he proved that, like malaria, yellow fever was carried by mosquitoes, not people. The success of his research efforts on this project is best described in a letter Walter Reed wrote to his wife:

> Columbia Barracks, Quesmados, Cuba, December 9, 1900 It is with a great deal of pleasure that I hasten to tell you that we have succeeded in producing a case of unmistakable yellow fever by the bite of the mosquito. Our first case in the experimental camp developed at 11:30 last night, commencing with a sudden chill followed by fever. He had been bitten at 11:30 December 5th, and hence his attack followed just three and a half days after the bite. As he had been in our camp 15 days before being inoculated and had had no other possible exposure, the case is as clear as the sun at noon-day, and sustains brilliantly and conclusively our conclusions. Thus, just 18 days from the time we began our experimental work we have succeeded in demonstrating this mode of propagation of the disease, so that the most doubtful and skeptical must

[7] Material paraphrased and embellished from Daniel Boorstin, *The Discoverers* (New York: Vintage Books, a division of Random House, 1983).

[8] Ibid.

yield. Rejoice with me, sweetheart, as aside from the antitoxin of diphtheria and Koch's discovery of the tubercle bacillus, it will be regarded as the most important piece of work, scientifically, during the 19th Century. I do not exaggerate, and I could shout for very joy that heaven has permitted me to establish this wonderful way of propagating yellow fever....Major Kean says that the discovery is worth more than the cost of the Spanish War, including the lives lost and money expended?

6. The creation of the Panama Canal was far more than a vast, unprecedented feat of engineering. It was a profoundly important historic event and a sweeping human drama not unlike that of war. Apart from wars, it represents the largest, most costly single effort ever before mounted anywhere on earth. It held the world's attention over a span of **40** years. It affected the lives of tens of thousands of people at every level of society and virtually every race and nationality. Great reputations were made and destroyed. For a large number of men and women it was the adventure of a lifetime.

   Because of it one nation, France, was rocked to its foundations. Another, Colombia, lost its most prized possession, the Isthmus of Panama. Nicaragua, on the verge of becoming a world crossroads, was left to wait for some future chance. The Republic of Panama was born. The United States embarked on a role of global involvement.

   In the history of financial capitalism and in the history of medicine, it was an event of single consequence. It marked a score of advances in engineering, government planning, labor relations—the first grandiose and assertive show of American power at the dawn of the new century."

7. The Manhattan Project for the development and delivery of the atomic bomb was put under the charge of General Leslie R. Groves for the period September **17, 1942,** through December **31, 1946.** There was, according to General Groves, a "cohesive entity" that was the Manhattan Project, a factor in its success. The memorandum of appointment for General Groves (Colonel Groves) is shown in Fig. **1.4.** The organization chart that identifies the position of General Groves in May **1945** is shown in Fig. **1.5.**

   Much has been discussed about the importance of the use of the atomic bomb as a key strategy in the U.S. pursuit of World War II. Perhaps there is no better example of how a research and development project led to a major building block in the design and execution of a nation's war strategy. The individual who wishes to pursue additional reading on the Manhattan Project could start with the book ***Now*** It Can Be Told, by Leslie R. Groves (New York: Harper, **1962).**

8. On a rainy day in May **1804,** Meriwether Lewis and William Clark started up the Missouri River. Their expedition's (project's) objective was to explore and find an easy water route across the continent, the fabled Northwest Passage that geographers believed lay somewhere to the west. It was the first

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[9]"Walter Reed to His Wife," *The Wall Street Journal,* October 22, 1999, p. B1.

[10]Drawn from David G. McCullough, *The Path Between the Seas—The Creation of the Panama Canal,* 1870–1913 (New York: Simon and Schuster, 1976), pp. 11–12.

September 17, 1942
MEMORANDUM FOR THE CHIEF OF ENGINEERS

SUBJECT: Release of Colonel L. R. Groves, C.E., for Special Assignment

1. It is directed that Colonel L. R. Groves be relieved from his present assignment in the Office of Engineers for special duty in connection with the DSM*project. You should, therefore, make the necessary arrangements in the Construction Division of your office so that Colonel Groves may be released for full time duty on this special work. He will report to the Commanding General, Services of Supply, for necessary instructions, but will operate in close conjunction with the Construction Division of your office and other facilities of the Corps of Engineers.

2. Colonel Groves' duty will be to take complete charge of the entire DSM project as outlined to Colonel Groves this morning by General Styer.

   a. He will take steps immediately to arrange for the necessary priorities.

   b. Arrange for a working committee on the application of the product.

   c. Arrange for the immediate procurement of the site of the TVA and the transfer of activities to that area.

   d. Initiate the preparation of bills of materials needed for construction and their *earmarking* for use when required.

   e. Draw up the plans for the organization, construction, operation and security of the project, and after approval, take the necessary steps to put it into effect.

BREHOM SOMERVELL
Lieutenant General
Commanding

*The then code name for the atomic energy project.

FIGURE 1.4 Appointment memorandum for Colonel Groves to the Manhattan Project.

Some of these instructions were never carried out because, as the work progressed, they no longer seemed appropriate. No working committee was ever established and it proved impracticable to transfer all activities to the Tennessee site.

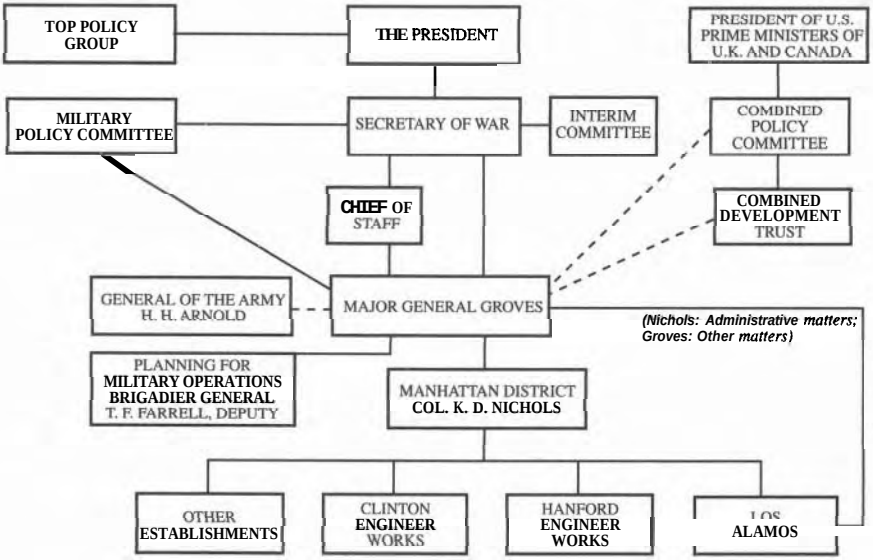

FIGURE 1.5 **Organization chart of the Manhattan Project, May 1945.**

American expedition to cross the continent and reach the Pacific Ocean by land. Today they are still America's best-known explorers. The project they launched had an original budget of **$2,500** and was to involve only a dozen men. But the project team that left the St. Louis area in **1804** numbered **45** men, and the final cost to the American taxpayers reached **$38,722.25,** more than **10** times the original estimate. In retrospect this project cost was a bargain—but it also was one of the nation's earliest examples of a government cost overrun. The project might be considered a failure, because the explorers did not find that water route. But the success of the project was in proving that no such Northwest Passage existed—and the initial disappointment was soon forgotten when it was realized that Lewis and Clark showed what was out there beyond the sunset, and created a desire for a westering nation of explorers and settlers."

9. A military initiative, or project, that was a major turning point for the United States during World War II was the battle of Midway in June of **1942.** In the initial phase of this battle, three squadrons of U.S. torpedo bombers attacked the Japanese aircraft carriers ***Agai, Kago, Soryo,*** and ***Hiryu,*** an attempt to draw first blood. A total of **41** U.S. torpedo planes left the carriers ***Enterprise, Yorktown,*** and ***Hornet.*** Traditional strategy called for such planes to have a fighter escort to protect them from air attacks as they made their torpedo runs. The U.S. planes attacked in three successive waves—from the start they were doomed. Japanese fighters and antiaircraft batteries on the Japanese fleet destroyed every plane in the first wave, and the next two waves were almost

[11] Paraphrased from *The Old Farmer's Almanac* (Dublin, *N.H.,* 1994), pp. 98–101

completely destroyed, with a loss of over 80 percent of the pilots. Only a few torpedoes were launched and none hit their targets. A tragic failure?

Historians have noted that the attack by the U.S. torpedo planes was ineffective by itself. But in the larger context of the battle of Midway, the Japanese fleet maneuvered to avoid the torpedo attack and was unable to sail into the wind to launch their planes against the U.S. fleet. When the U.S. SDB-3 Dauntless dive-bombers came in at 15,000 feet, there were no Japanese fighter planes to stop them. The Japanese carriers had heavily armed aircraft on their decks. During the next several minutes the Japanese fleet suffered a decisive blow to its carriers, from which it never recovered—and the naval war in the Pacific shifted in favor of the United States."

Thus, what was a tragic failure in a part of the overall strategy for the Midway "project" actually provided an opportunity, or window, for the project to be successful, as the final project results contributed to the evolving Allied military strategy in the South Pacific.

10. In the United States the building of the Pennsylvania Turnpike provided the opportunity to use an early process of project management. The Pennsylvania Turnpike was America's first superhighway. It paved the way for the superhighway system in the United States. Although the existing interstate superhighway system is tax-supported, the Pennsylvania Turnpike is financed from tolls and revenue bonds. The design engineers for the turnpike decided on several key design standards: a right-of-way width of 200 feet and a four-lane divided configuration with 12-foot-wide concrete traffic lanes with a 10-foot-wide median strip. Other design requirements included:

- A maximum grade of 3 percent
  A maximum curvature of 6 degrees
  Substantial banking on curves
- Limited access with 1200-foot-long entrance and exit ramps
- A minimum 600-foot sight distance from motorist to traffic ahead
- No cross streets, driveways, traffic signals, crosswalks, or railroad crossings

By July 1939, all 160 miles of highway, seven tunnels, and more than 300 structures were under contract, and by August 1939, every part of the project was under construction. Contractors worked usually two shifts a day, and often three. The project called for construction of 160 miles of highway, 7 two-lane tunnels, 11 interchanges, and 10 service plazas. The turnpike opened October 1, 1940. By the end of 1940, the turnpike had carried 514,231 cars, 48,170 trucks, and 2409 buses, and had collected total revenues of $562,464.[13]

The Pennsylvania Turnpike project was completed on time and within budget, and attained the expected technical performance objective—an innovative means for improving the efficiency of motor vehicle travel. Modern-day project managers should remember that most of today's project management

[12]This battle has been written about extensively. The account that is given here has been paraphrased from Owen Edwards, "Tragic Lost Cause?" *Forbes*, June 2, 1997, pp. 71–72.

[13]Dan Cupper, *The Pennsylvania Turnpike* (Lebanon, Pa.: Applied Arts Publishers, 1990), pp. 10–22.

processes and techniques did not exist: no cost and schedule software existed, no PERT scheduling techniques existed, the "matrix" organizational design had not been described, little literature existed on how to manage projects, and computers and modern communication means did not exist. Why was the Pennsylvania Turnpike project so successful? First, the project had a high priority in the U.S. defense initiative. Second, unemployment was high, and the opportunity to work on the project was a godsend for many people and families. Motivation of the work force was not a problem! Finally, the opportunity to be part of an innovative project, such as the turnpike provided, stimulated extraordinary support from the project's stakeholders.

1.4 OTHER EXAMPLES

Indicated below are a few examples of other projects that have provided the project "owner" or "sponsor" with an enhanced capability:

- Theatrical production involves the use of project teams, in part to evaluate the significant risks inherent in any theatrical production. Such productions involve a high financial investment with limited forecasting of probable success, use of highly skilled and expensive personnel, and great dependence on the producer's professional experiences. Improvisation while production itself is still in progress is a particular challenge. One author has examined the use of project management techniques in the performing arts and has concluded that the use of such techniques could help improve the planning, cost control, and schedule control of such productions.[14]
- The H. J. Heinz Company has used alternative project teams in the management of that enterprise. An old factory in Pittsburgh, Pennsylvania, was shut down and a new one was designed and built at the same time—resulting in not a day of lost production. A massive investment in training was initiated to enhance the skills of its seasoned work force. The company provided workers with an array of training tools--evaluation of basic skills, educational counseling, literacy education, classroom instruction, and training on the factory floor. The process of shutting the old factory down and starting up the new one provided the opportunity to bring about an unprecedented degree of employee involvement in day-to-day management. Teams of workers were provided the opportunity to solve problems and take on responsibility. Team-based quality and safety efforts slashed workers' compensation costs by 60 percent and helped make Heinz the quality leader of the pet food industry. In England, at Heinz's Harlesden and Kitt Green factories, worker-led project process evaluation teams helped streamline factory operations and improve quality, in some cases reducing overhead by as much as 40 percent. The teams developed their own plans, presented them to coworkers, and worked to implement the changes with scarcely any direct intervention by management.[15]

[14] Itzak Wirth, "Project Management in the Performing Arts," Proceedings, Project Management Institute, 25th Annual Seminar/Symposium, Vancouver, British Columbia, October 17–19, 1994, pp. 636–637.

[15] "Working Smarter," H. J. Heinz Company Annual Report, pp. 16–17.

- When the Chrysler Corporation sets out to create a new automobile, it forms a project team of about 700 people from the different principal disciplines of the company to work on the project. A corporate vice president acts as a "godfather" to the team, but the team and its leaders plan and direct the work. After a suitable contract has been worked out with management, the team is turned loose to design and develop the product. There are no committees, no hierarchy outside of the team. By using these concurrent engineering teams, the time to design and develop a new vehicle model has been reduced nearly 50 percent.[16]
- An important and exciting project that captured the attention and emotions of millions of people around the world occurred in the form of Desert Storm, a military project that changed the world and the use of military forces to bring about political change. Max Wideman, a Fellow of the Project Management Institute, described this extraordinary project as follows:

Project Desert Storm (July 2, *1991)*

Projects come in all sizes and shapes, so they tell us. Whether differentiated by duration, complexity or area of application makes no difference. A project is a project. So a [military] project like Desert Storm lasting just 100 hours should be nothing out of the ordinary. Of course, that covered only the duration of the execution [battle] and completion [victory] phases. The prior phases and stages of concept, planning, design, and procurement of a complex set of commitments by a large diverse group of culturally different participants [the United Nations], plus preparation for execution [the prior air campaign] which preceded the project accomplishment phases, added considerably to the real overall project duration.

Nevertheless, the project was a managerial triumph of successful project management [resounding military victory] even though one of the potential deliverables [the opposing Commander in Chiefl was not included. The project had some unique features. The location [miles of empty desert] was hardly one of the choicest. Project success would rely heavily on teamwork [joint military command], a decisive logistical achievement [assembling, supplying, and transporting over unheard-of distances the most fearsome strike force in history] and innovation [military surprise]. The project manager [General Schwarzkopfl did well to give recognition to his logistics manager for a job well done [battlefield promotion].

The project was full of risk, and was opposed by a large number of stakeholders [both at home and overseas]. Once committed, success depended on utterly logical and overwhelmingly powerful and determined courses of action.

For example, Project Desert Storm was superbly equipped. Firstly, its technology was unsurpassed [world-beating] and state-of-the-art [high-technology], the product of intensive and highly successful R&D. Secondly, the human resources [troops] working with the equipment and materials [weaponry and firepower] were rigorously trained to the highest standards — that showed not only in their effectiveness but also in their morale. Thirdly, an able team of leaders, highly trained, experienced, qualified and selected, had only reached the top [through military promotion] after much education and training both technical and general.

Another equally important aspect was the organizational structure [army command] within which the team operated. The project manager had full delegated power to

[16] Marshall Loeb, "Empowerment That Pays Off," *Fortune,* March 20, 1995, pp. 145–146.

run the operation his way. His instructions from above [the President's office] were absolutely clear, and his immediate sponsors [such as General Powell] gave their total support. Authority and responsibility were passed down the organization structure in the same way. Once allotted their role by the project manager, work package managers [field commanders] made their own plans and executed them decisively.

It is true that the project team was not very keen when the project manager first proposed his outlandish and risky strategy [a mighty encircling sweep behind the Republican guard] to save man-hours [lives], time and, ultimately, cost [subsequent prolonged war effort]. His team [tactical commanders] gave the classical response "It can't be done" but that only made the project manager more determined. After all, had he not found a very tempting market niche ignored by others? [Iraq's generals no doubt also thought that no army could drive their tanks over all that desert and that far without breaking down and going to ruin.] "They could never make it," they said.

That's what made the project so exciting. The project manager performed a crucial role of any project leader—he converted a tremendous risk into a tremendous opportunity by insisting that his team had to achieve the impossible. However, the team members only agreed to the course of action after the project manager had ordered his logistics manager to pledge in writing that everything would be in place by the scheduled deadline [February 21, 1991]. But that too is an elementary lesson of project management—give people the tools if you want them to do the job.

There's even more to it than that, of course. Project Desert Storm had an enormous supply of two vital elements: quality information and planning. They are necessary in that order because nothing can be effectively planned without solid information. But the planning and information experts were not an isolated function to satisfy some latest management theory whether in the design office [Washington] or in the field [war zone]. They were an integral part of the project process [war effort]. Line and staff relations were not an issue; the focus was on getting the job done [winning].

One advantage the project did enjoy, and that was it was not constrained by budget. Yet by the very acts of determination, precision, and quality organization [to say nothing of superb timing and decision making by the Chief Executive in the White House for launching the project] the project has proved to be highly cost-effective, compared to most similar ventures. It may even be a significant revenue generator when indirect benefits are taken into account. All of this in a most unappetizing market [the Middle East], where competition at the outset appeared to be overwhelming [the fourth largest army in the world]. Indeed, the project represents a powerful argument in support of establishing highly selective strategic alliances in order to achieve project goals.

Surely this must be one of the best object lessons for any project manager today?"

One of the outcomes of Desert Storm was that it demonstrated the need for further project management.

The Iraqi invasion of Kuwait in August of 1990, **and the subsequent Gulf war, caused almost all of the country's oil production facilities to suffer extensive damage from fires and other causes. The reconstruction of the oil field infrastructure was planned in November** 1990 **before the war ended in February** 1991. **At the time the amount of work that would be required to bring the oil fields up to production was**

[17]With apologies to *Management Today,* British Institute of Management, May 1991, p. 34. Appreciation is extended to R. Max Wideman, P. Eng., MCSCE. FEIC, FICE, Fellow PMI, for contributing the information on project Desert Storm.

not known—but some of the project work packages could be identified and front-end planning was undertaken for these.[18]

1.5 EARLY LITERATURE

One of the first comprehensive articles that caught the attention of the project management community was published by Paul O. Gaddis in the *Harvard Business Review* (May–June *1959).* This article, titled "The Project Manager," describes the role of that individual in an advanced technology industry, the prerequisites for performing the project management job, and the type of training recommended to prepare an individual to manage projects. Several basic notions put forth by Gaddis contributed to a conceptual framework for the management of projects that holds true today. These basic notions were:

- A project is an organizational unit dedicated to delivering a development project on time, within budget, and within predetermined technical performance specifications.
- The project team consists of specialists representing the disciplines needed to bring the project to a successful conclusion.
- Projects are organized by tasks that require integration across the traditional functional structure of the organization.
- The project manager manages a high proportion of professionals organized on a team basis.
- The superior/subordinate relationship is modified, resulting in a unique set of authority, responsibility, and accountability relationships.
- The project is finite in duration.
- A clear delineation of authority and responsibility is essential.
- The project manager is a person of action, a person of thought, and a front person.
- Project planning is vital to project success.
- The project manager is the person between management and the technologist.
- The subject of communication deserves a great deal of attention in project management.
- Project teams will begin to break up when the members sense the project has started to end.
- The integrative function of the project manager should be emphasized.
- Status reporting is appropriate and valuable to management of the project.
- The role played by project management in the years ahead will be challenging, exciting, and crucial.

[18]For a fuller description of the management of this project see Mehdi Adib, "Managing Kuwait Oil Fields Reconstruction Projects:' Proceedings, Project Management Institute, 25th Annual Seminar/Symposium, Vancouver, British Columbia, October 17–19, 1994.

Project management, as an important and growing ***philosophy*** of management, came into its present conceptual framework as a culmination of experimentation with a variety of organizational liaison devices. In a sense project management is the formalization of organizational liaison devices.

1.6 ORGANIZATIONAL LIAISON DEVICES

Project management evolved from a series of liaison devices that have been developed in contemporary organizations. These liaison devices, both formal and informal, have encouraged experimentation in integrating activities across organizational structures. Jay R. Galbraith is one of several researchers who have studied these liaison devices.[19] His research provides in part the basis for a description of the following types:

- Individual liaison
- Standing committees
- Product managers
- Managerial liaison
- Task forces
- Project engineer
- Liaison position

Figure 1.6 depicts the interrelationships of these liaison devices in the context of the emergence of project management. A brief discussion of these types follows.

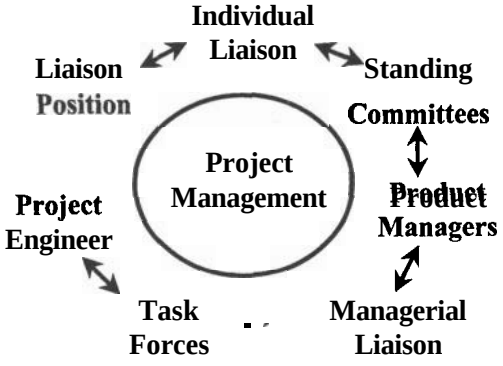

FIGURE 1.6 Organizational liaison activities.

[19] Jay R. Galbraith, *Organization Design* (Reading, Mass.: Addison-Wesley, 1977).

Individual Liaison

The simplest and perhaps best form of liaison is that brought about by people who sense the need to work together and go about maintaining contact with others in the organization who have a vested interest in an activity under way. This liaison is usually self-motivated.

Standing Committees

Standing committees are used extensively to integrate organizational activities. These committees are found at all levels in the organization. At the top level such committees are called plural executives. They bring about synergy in the making and execution of key operational and strategic decisions for the organization.

Product Managers

Product managers usually are appointed to act as a focal point for the marketing and sales promotion of a product. Originating in the personal products area, the first product manager appeared before 1930. Persons occupying these positions usually were provided a small administrative staff and might have had profit/loss responsibility. They usually were not backed up by a specific team but rather worked closely in a coordinating role with other key individuals.

Managerial Liaison

When a more formal linkage is needed, a manager or supervisor is appointed who is in charge of several people through setting direction for the organizational unit and providing supervisory jurisdiction over the people. This form is widely used in modem organizations. As the organization increases in size and the work becomes more complex, additional managers are added, resulting in the creation of a chain of command eventually leading to large management structures. Other liaison roles as described in this chapter deal with the organizational complexity and bureaucracy to encourage contacts between individuals and organizational units.

Task Forces

Task forces often are used to bring a focus to organizational activities, usually those that are short-term. Members are appointed to the task force to work on an ad hoc problem or opportunity. During the time they are on the task force, members have a reporting relationship to their regular organizational unit and to the task force chairperson as well. When the purpose for which the task force was created is accomplished, the task force is dissolved.

Project Engineer

Sometimes a liaison position evolves through practice. Such is the case of the project engineer, who is responsible for directing and integrating the technical aspects of the design/development process. These positions have evolved in contemporary organizations to the point where the project engineer manages a product through all its engineering steps, from initial design to manufacture or construction.

Liaison Position

When a significant amount of contact is required to coordinate the activities of two or more organizational entities, a liaison position is formally established to bring about synergy and communication between the units. Usually this position has no direct formal authority over the organizational units but is expected to communicate, coordinate, pull together, and informally integrate work among the organizational units. Examples of liaison roles are an engineering or construction liaison person and a production coordinator who mediates between the production control, product engineering, and manufacturing. A purchase engineer who sits between purchasing and engineering is another example.

Other liaison positions may join line and staff groups. In the military establishment, the position of military aide-de-camp, a military officer acting as a secretary and confidential assistant to the superior officer of general or flag rank, is a liaison role. Originating in the French army, this position originally served as a camp assistant. The aide-de-camp carried out a coordinating and liaison role for his or her commanding officer; because the aide was close to the senior officer, there was a good deal of implied authority attached to the aide's role.

Modem teams are used for a variety of purposes.

1.7 TEAMS

In modem organizations, project teams are used to complement an existing organizational design. An overriding feature of the team design is a departure from the traditional form of management in favor of a team form in which there are multiple authority, responsibility, and accountability relationships, resulting in shared decisions, results, and rewards. These teams include some of the teams already mentioned—project teams, project engineering teams, and task forces—but also include production teams, quality circles, product design teams, and crisis management teams. The importance of the use of teams in contemporary organizations cannot be underestimated. Peters and Austin found that small-scale team organization and decentralized units are vital components of top performance.[20]

[20] Tom Peters and Nancy Austin, "A Passion for Excellence," *Fortune,* May 13, 1985, pp. 20–32.

Some examples of project teams follow:

- At one end of a large IBM plant in Charlotte, North Carolina, 40 workers toil at building 12 products at once—hand-held bar-code scanners, portable medical computers, fiber-optic connectors for mainframes, satellite communications devices for truck drivers—a typical half day's output on a line designed to make simultaneously as many as 27 different products. Each worker has a computer screen hooked into the factory network. Called a digital factory for its dependence on information technology, it is sometimes called soft manufacturing, in which software and computer networks have emerged along with people, which will set the tone for years, perhaps decades, in manufacturing. Soft manufacturing blurs the boundaries of the traditional factory by integrating production closer to suppliers and customers. Often an order is complete within 80 minutes, and depending on where the customer lives, he or she can have the product the same day or the day after. Workers on the factory floor are organized into teams that manage themselves and have real decision-making power. Teams of knowledge workers are the force that makes the digital factory go—teams of people are tied together along with equipment through the medium of information.[21]
- The Advanced Development Company, or "Skunk Works," of the Lockheed Corporation continues its super-secret research and development. The results produced by the Skunk Works are unparalleled. In 1943, the XP 80 *Shooting Star;* the first operational U.S. fighter jet, was put together in 4 short months. During the Cold War, the Skunk Works came up with the famous U-2 and the SR-71 *Blackbird* spy planes that soared at the edge of space taking pictures of Russian and Chinese military installations. In 1991, a product developed at the Skunk Works, the F-117A *Stealth* fighter, slipped through Iraqi radar undetected to deliver "smart" bombs with pinpoint accuracy. The Skunk Works has a unique culture, a small-team approach to projects managed by project leaders, who have extraordinary latitude in recruiting in-house specialists. The project team is isolated from Lockheed's sprawling bureaucracy and is able to have direct contact with the military project team without going through "channels" at Lockheed. As the design teams developed product and process designs, they were able to alter their designs without the approval of a hierarchy of executives at corporate headquarters.[22]
- At the riot-ravaged Taco Bell restaurant in Compton, California, a joint effort of the city of Compton and Taco Bell management launched a 48-hour rebuilding plan. Fluor Daniel, Inc., an international engineering, construction, maintenance, and technical services subsidiary of Fluor Corporation, was called in to plan for the new restaurant less than 3 weeks before the building was to begin. Taco Bell wanted everything done on-site with nothing prefabricated and wanted to have the restaurant open and ready for business in 48 hours. Fluor Daniel used Primavera's Finest Hour software, which allows its users to schedule

[21] Gene Bylinsky, "The Digital Factory," *Fortune,* November 14, 1994, pp. 93–110.
[22] Eric Schine, "Out at the Skunk Works, the Sweet Smell of Success," *Business Week,* April 26, 1993.

by 1-hour increments to handle the complexities of a short-term, intensive project. Fluor Daniel organized a dry run of everything 3 days before construction started to ensure that all team members knew the plan. Progress meetings were held every 3 hours to distribute the earned-value report, just one of the software's several productivity reports, comparing plans versus actuals in terms of both budget and work accomplished. At hour 46 the health inspector gave the okay, and at hour 47 the certificate of occupancy was signed. At hour 48 the first new tacos were served.[23]

- At the Pennsylvania Electric Company's Generation Division (Penelec) project management is used as a "way of life." A centralized division planning group has been set up to link the different functional units required for a project and to integrate these units into a single project control system. Project teams are responsible for satisfying project objectives in the areas of life extension, maintenance, plant improvement, and the environment. On one project created to study turbine outage, the company estimated that the computerized project management system saved the company $300,000. Project management is recognized by senior division management as having credit to successfully allocate organizational resources to satisfy company objectives.[24]
- At Johnson Controls Automotive Systems Group, product development activities are done by using a company-institutionalized project management system. Use of project management by the company has prompted an increase in the training of employees and the creation of a standard approach for project management. The use of a common approach in project management has facilitated the development of organizational strategies, policies, procedures, and other ways of working on projects. Employees are educated in the company's project management process; the improvement of the culture for project management—and the development of a common approach for the management of projects—has enabled the company to complete project development efforts in a timely and efficient manner.[25]
- At MBI, Inc., a company that produces collectibles, such as porcelain birds and plates, program (project) managers are used, one for each series of collectibles. Two key objectives guide these program managers: Get new customers at the lowest possible cost and retain them for follow-on purchases. The company "piggybacks" on the Franklin Mint's product development costs and market research. Accordingly, industry observers believe that MBI, Inc.'s costs are much lower than its competitors'.[26]
- A central blood bank in a major U.S. city sees project management as a key management strategy in its world-class center for general support of the area hospitals' blood banks. Today over 400 staff members collect and test the units of over 152,000 donations, distributing more than 400,000 blood products per

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[23]"Riot-Ravaged Taco Bell Rebuilt in 48 Hours Using Project Planning Software," *Industrial Engineering,* September 1992, p. 18.

[24]Anthony J. Catanese, "At Penelec Project Management Is a Way of Life," *Project Management Journal,* Project Management Institute, December 1990, p. 7.

[25]W D. Keith and D. B. Kandt, "Project Management at a Major Automotive Seating Supplier," *Project Management Journal,* Project Management Institute. September 1991, p. 28.

[26]Phyllis Berman with E. Lee Sullivan, "Getting Even." *Forbes,* August 31, 1992, pp. 54–55.

year for 22 member hospitals. In addition, the bank provides pretransfusion testing services to three hospitals, reference testing to all areas involving clotting and bleeding disorders, and outpatient transfusion services for patients not requiring hospitalization.

- Nicolas G. Hayek and his colleagues at the Swiss Corporation for Microelectronics and Watchmaking have brought about one of the most spectacular industrial comebacks in the world—the revitalization of the Swiss watch industry. According to Hayek, "we are big believers in project teams." He describes the use of project teams in the context of finding your best people, letting them take on a problem, disbanding them, and then moving on to the next problem. According to Hayek, the whole process of using projects works only if the whole management team focuses on developing products and improving operations—not fighting with each other.[27]
- Project management is used in the U.S. Justice Department. In the early 1980s the Reagan administration came close to merging the Drug Enforcement Agency (DEA) and the Federal Bureau of Investigation (FBI)—a merger that was evaluated through the use of a project team. In 1984, over 56 separate projects were under way to integrate various functions of the two agencies. Only 9 of the 56 projects were completed; the others dropped into a state of bureaucratic limbo. An area that was successfully merged was training. Now the DEA has received $11 million to build its own training center in Quantico, Virginia—an effort that used project management to design, construct, and start up this new facility.[28]
- A large electronics company uses product design teams in simultaneous engineering to ensure the right timing and integration required during product and process development. These teams provide a focus for bringing together the people on a product development activity to coordinate and integrate an effort to support the product and process synergy. A product design team might include design engineers, technical writers, customer support people, marketing representatives, regulator and legal experts, purchasing agents, human factors analysts, and representatives from manufacturing and quality. These team members, acting in concert, provide both a focus and the necessary cross-fertilization of information and strategies to reduce the time required to get the product developed, manufactured, and in the customer's hands.
- A large agricultural and industrial equipment manufacturer that does material, manufacturing, and product-applied research at the business-unit level uses concurrent engineering to accelerate product and process development cycles. Product development research is not usually considered high-risk because it is primarily applied research. Few new product development efforts are carried out; rather, the research is aimed at incremental product and process improvements. Product improvement includes the enhancement of the product's performance as well as cost reduction and improvement of product quality. The research follows product lines and is evolutionary.

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[27] Reported in William Taylor, "Message and Muscle," *Harvard Business Review*, March–April 1993, pp. 99–110.
[28] Janet Novack, "How About a Little Restructuring?" *Forbes*, March 15, 1993, pp. 91–96.

Companies today, facing unprecedented global competition, are finding it advantageous to cooperate with partners around the world to share resources, risks, and rewards. These partnerships take the form of strategic alliances and are used for many purposes, such as sharing the design of products and processes, sharing manufacturing and marketing facilities, and sharing in the financial risk and rewards. Technology is changing so fast today that companies are finding it impossible to assemble the resources to keep ahead of the competition. Indeed, a form of "cooperative competition" is becoming the standard for success in the unforgiving global marketplace.

Once the opportunity for a strategic alliance has been established, a joint project team is often appointed to begin the analysis and work on the alliance. This project team establishes the rationale for the alliance, makes recommendations for the selection of the partner(s), and initiates the analysis required for the development of a suitable working agreement among the partners. Key matters considered by these teams include the mission, objectives, goals, and strategies for the alliance. The team develops the alliance performance standards and builds a recommended strategy for how the joint arrangement will be integrated and managed. A key responsibility of the joint project team is to prepare a strategy for and participate in the execution of the negotiations required to bring about a meeting of the minds on the partnership alliance.

Once the alliance is consummated, the project team that managed the alliance during its development can be disbanded. Then the alliance will start the process of becoming "institutionalized"—merged into the ongoing businesses of the partners. Something that did not previously exist has been created through the use of project management technologies. Sometimes the partners will continue the project team's existence to oversee the alliance in its early period and until the alliance can be integrated into the ongoing operations of the partners.

Many projects are becoming global, in some cases coming forth out of strategic alliances that global partners have negotiated. IBM alone has joined hundreds of strategic alliances with various companies in the United States and abroad, reflecting the fact that alliances have become a part of strategic thinking.

The challenges in a strategic alliance lie in the comparative management of the business and in the personal relationships between managers from different organizational cultures. Perhaps the biggest stumbling block to making an alliance work is the lack of trust among the partners.[29]

Project teams can be used for a wide variety of projects:

- Design, engineering, and construction of a civil engineering projects such as a highway, bridge, building, dam, or canal
- Design and production of a military project such as a submarine, fighter aircraft, tank, or military communications system
- Building of a nuclear power generating plant
- Research and development of a new machine tool

[29] Paraphrased fmrn Ricardo Swkedw, "Are Strategic Alliances Working?" Fortune, September 21, 1992, pp. 77–78.

- Development of a new product or manufacturing process
- Reorganization of a corporation
- Landing an astronaut on the moon and returning her or him safely to earth

Project work in the engineering, architecture, construction, defense, and manufacturing environments is easy to recognize. A new plant, bridge, building, aircraft, or product is something tangible; however, the project model applies to many fields, even to our personal lives.

These projects are the leading edge of change, in both our professional and our private lives. Change encourages-or may force—us to do something different, at some cost, and on some time or schedule basis. These changes often take the form of projects, such as:

- Writing a book or article
- Painting a picture
- Having a cocktail party and dinner
- Restoring an antique piece of furniture or an automobile
- Getting married or divorced
- Having children
- Adopting a child
- Designing and teaching a course
- Organizing and developing a sports team
- Building a house or modifying an existing house

Students are feeling the impact of project management. In May 1985, the National Academy of Engineering held a symposium on U.S. industrial competitiveness. The symposium brought together some of the nation's leading industrial and academic technological leaders to discuss the industrial competitivenesschallenge and how the National Academy of Engineering might formulate its programs to improve U.S. competitiveness. During the symposium's discussion of engineering education, it was recommended that the education of engineers for a future technological age require that the students develop the skills of leadership "for projects and programs...as well as technical leadership in their respective discipline."[30]

1.8 THE PROJECT MANAGEMENT PROFESSIONAL SOCIETIES

Emerging professional associations are dedicated to project management. The largest in number is the Project Management Institute with more than 85,000 members. In Europe, the International Project Management Association has more

[30] *The* Bridge, **Summer** 1985, pp. 22–25.

than 30,000 members and represents national project management associations throughout Europe. The Australian Institute for Project Management and the Japanese Project Management Forum have a few thousand members. There are a wealth of small professional societies that are either directly promoting project management principles, practices, and processes or have formed to exchange project management information within a particular segment of industry. It is estimated that there are perhaps more than a million individuals who could benefit from membership in a professional society.

Professional societies typically provide collectively through members what one member or organization cannot provide. Out of this concept, there have emerged over the past 20 years several project management bodies of knowledge—some compatible except for the cultural aspects of a particular region and others more comprehensive as the knowledge areas are defined.

These bodies of knowledge are used for certification of individuals as to their qualifications in the project management field. Two types of certifications have emerged over the past decade—certification based on a person's knowledge of the profession and certification based on a person's competency in the profession. Each certification has its merits and challenges.

A sample of the areas of knowledge is given in Table 1.2. This table is not representative of any particular society, but given to promote thought on the full range of knowledge and skills that a project management practitioner might need to be successful.

One of the distinguishing characteristics between different bodies of knowledge is the scope. Some bodies of knowledge are limited to the project's life cycle, that is, that of a single project from start to finish, whereas others take a larger view and address the aspects of projects within an enterprise or even within a global context. Either body of knowledge is valid and the value of it is dependent upon the application.

The scope of the body of knowledge, of course, defines any certification program and whether it can be a "knowledge-based" or a "competency-based certification. The number of areas included in the body of knowledge will show the range of knowledge needed to master the profession.

1.9 A PHILOSOPHY

A philosophy is a synthesis of all the knowledge, skills, and attitudes that one has about a field of learning and practice, the critique and analysis of fundamental beliefs about a discipline. A philosophy is also the system of motivating concepts and principles surrounding a field of study and practice. A field of thought or, to put it into more pragmatic terms, a "way of thinking" about a field of learning and practices, is what a philosophy is all about. Anyone who has been exposed to the field of management as either a manager or the objective of management has a philosophy or way of thinking about management. The study of the management discipline—

TABLE 1.2 Sample Project Management Knowledge and Skill Areas

No.	Knowledge area
1.0	***Primary knowledge and skill areas (samples)***
1.1	Scope management
1.2	Technical performance management
1.3	Schedule management
1.4	Cost management
1.5	Configuration management
1.6	Planning
1.7	Resource management
2.0	***Supporting knowledge and skill areas (samples)***
2.1	Risk management
2.2	Communication management
2.3	Contract administration
2.4	Negotiation
2.5	Leadership
2.6	Decision making
2.7	Marketing
2.8	Customer relationship
2.9	Personnel conflicts

and of project management in particular--enables one to broaden and sharpen the way one thinks about project management concepts and processes. Remember: To a large degree we participate on a project team, either as the team's leader or as a member of team, based on the way we think about the project management discipline. Although we may not recognize it, the philosophy that we hold about project management influences the decisions we make and implement in the project management way of doing things.

1.10 BREAKING DOWN HIERARCHIES

Project management has caused many changes in how contemporary organizations operate. One major change deals with organizational hierarchies. Paramount companies today are tearing down traditional hierarchies. In today's fast-changing,

information-driven, and computer-facilitated competitive economy, new paradigms on how to manage are coming forth. Some of the more important paradigms are described below:

- Project management and strategic management are highly interdependent.
- Work is organized around processes carried out by teams of employees working in an ever-changing organizational design.
- Temporary teams are drawn from a range of functional expertise and are formed around specific organizational projects.
- Few remaining vestiges of the traditional organization such as rigid hierarchy, command and control management styles, and bureaucratic policies and procedures remain.
- In the team-driven organization the organizational design is more like a web of teams and projects rather than a clearly defined vertical hierarchy with clear discipline boundaries.
- Managers constantly move people from projects and teams that are phasing down and seek out promising teamwork and projects positioned for the future.
- E-mail, Internet, and other forms of electronic communication which enable people at all levels of the enterprise to keep abreast of what is happening are used.
- The work force is constantly trained and retrained.
- More cooperation with suppliers, customers, and even competitors should be developed.
- Egalitarian cultures should be fostered, but not to excess.
- A general sense of urgency and importance to speed up product, service, and process development is required.

Alternative teams that provide for broad cross-organizational cutting such as new product development, new facilities, benchmarking, and reengineering initiatives have become the new organizational design replacing narrowly focused departments and functions. By organizing the resources so that focus can be brought to the management of organizational processes—such as order fulfillment and new-product development—a synergy is possible that could not be realized through using the traditional organizational design based on functional specialization. Under functional specialization each organizational unit became a fiefdom—a collection of talent and resources working in silos, usually independent of others, and developing and implementing strategies on its own.

The growth of project management is reflected to some degree by the recognition that was given to this discipline by contemporary literature. An excellent and timely article that appeared in Fortune magazine in mid-1995 doubtless helped to accelerate the growth of project management. According to this article:

- Midlevel management positions are being cut.
- Project managers are a new class of managers to fill the niche formerly held by middle managers.

- Project management is the wave of the future.
- Project management is spreading out of its traditional uses.
- Managing projects is managing change.
- Expertise in project management is a source of power for middle managers.
- Job security is elusive in project management—because each project has a beginning and an end.
- Project leadership is what project managers do.[31]

Some of the unique characteristics of project management today include the following:

- Projects are ad hoc endeavors, which have a defined life cycle.
- Projects are building blocks in the design and execution of enterprise strategies.
- Projects are the leading edge of new and improved organizational products, services, and enterprise processes.
- Projects provide a philosophy and strategy for the management of change in the enterprise.
- The management of projects entails the crossing of functional and organizational boundaries.
- The management of a project requires that an interfunctional and interorganizational focal point be established in the enterprise.
- The traditional management functions of planning, organizing, motivation, directing, and control are carried out in the management of a project.
- Both leadership and managerial capabilities are required for the successful completion of a project.
- The principal outcomes of a project are the accomplishment of technical performance, cost, and schedule objectives.
- Projects are terminated upon successful completion of the cost, schedule, and technical performance objectives-or earlier in their life cycle when the project results no longer promise or have a strategic fit in the enterprise's future.

1.11 TO SUMMARIZE

The major points that have been expressed in this chapter include:

- Strategic management and project management are interrelated in the management of an organization.
- The origins of project management are rooted in antiquity. The practice of project management has been carried out for centuries—if only in an unsophisticated

[31] Thomas A. Stewart, "The Corporate Jungle Spawns a New Species: The Project Manager," Fortune. July 10, 1995, pp. 179–180.

manner as compared to today's practices. Nevertheless, the results of ancient project management are found in many places in the world.

- Project management is an idea whose time has come, in terms of the continued design and development of project-driven management strategies for industrial, military, educational, ecclesiastical, and social entities. Project management processes and techniques can be used for the management of personal resources such as getting married or divorced, building a house, having a cocktail party, or pursuing a hobby such as forming and managing a sports team.
- The basic considerations in any project center around the cost, schedule, and technical performance parameters—and how well the project results fit into the operational or strategic purposes of the enterprise.
- The results of project management usually take the form of a new or improved organizational product, service, and process.
- Many examples of the use of project management were provided in the chapter to include representation from many different organizations.
- A project tends to be ad hoc in nature, and the project results can be considered to be building blocks in the design and execution of operational and strategic initiatives for the enterprise.
- No one can claim to have invented project management—rather the concept and process evolved over a long period of time.
- The Project Management Institute (PMI®) is the leading professional association in the discipline. Other professional associations also exist whose purpose is to facilitate the spread of the theory and practice of project management.
- The results produced by projects have had an impact on history—including a major influence on the infrastructure of many institutions and societies.
- Sometimes projects fail to produce the results that were planned because of such factors as technology, economics, and political and social imperatives.
- Project management began to become conceptualized and documented in the 1950s in the sense of a philosophy and process for dealing with ad hoc opportunities.
- Prior to the emergence of project management, various organizational devices evolved to provide the means for an integration of activities across organizational structures.
- Project management has laid down the strategic pathway for the emergence of alternative teams in the modem organization to deal with such change initiatives as reengineering, benchmarking, simultaneous engineering, and self-managed production teams.
- In the early days of project management it was considered to be a "special case" of management. Today it has taken its rightful place in the theory and practice of management.
- When projects are managed, there tend to be a breakdown and an alteration of the traditional organizational hierarchies in favor of a horizontal form of organizational design.

- Project managers are emerging as a new class of managers to fill the niche formerly held by middle managers.
- Projects provide a philosophy, strategy, and process for the management of change in the enterprise.
- The management of a project usually requires the crossing of functional boundaries of the enterprise.
- The traditional management functions of planning, organizing, motivation, direction, and control are carried out in dealing with a project.

1.12 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Curtis R. Cook and Carl Pritchard, "Why Project Management?" chap. 3 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- Mark Maremont, "Kodak's New Focus," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (First published in ***Business Week,*** January 30, 1995, pp. 62–68.)
- Henry Fayol, ***General and Industrial Management*** (London: Sir Isaac Pitman & Sons, 1949). This book is a scientific exposition of the general principles of management—written by one of the greatest pioneers of the field. The book is truly a "classic" of management, an indispensable work of reference for those engaged in the practice or teaching of management concepts and processes.
- Francis M. Webster, Jr., ***PM*** 101, ***According to the Old Curmudgeon,*** Project Management Institute, Newtown Square, PA 19073,2000. The author offers this book as a basic introduction to the fundamental concepts and processes of modem project management, and he delivers just that in this readable and enjoyable book. It is about the principles of modem project management—how many principles can be applied in modem organizations. Basic and sufficient information and explanations on how to manage projects are the themes of this book. It is designed to appeal to the professional who has been assigned in some capacity to the management of projects in the enterprise.
- Paul O. Gaddis, "The Project Manager," *Harvard Business Review,* May–June 1959. This is one of the earliest articles on project management that appeared in the

business literature. "The Project Manager" describes the role of that individual in an advanced technology industry, and the type of training recommended to prepare an individual to manage projects.

- Peter F. Drucker, "The Coming of the New Organization," ***Harvard Business Review,*** January–February 1988, pp. 45–53. In this article, Peter F. Drucker opines that organizations of the future will be "information-based" and have reduced numbers of hierarchical levels, with much of the work being done in task-focused teams. He further believes that these teams will work on new product and process development from the conceptual state of the product until it is established in the market.

  Dr. Alaa A. Zeitoun and Dr. Andy W. Helmy, "The Pyramids and Implementing Project Management Processes," ***Proceedings,*** Project Management Institute, 28th Annual Seminar/Symposium, Chicago, 1997, pp. 593–596. This paper addresses the building of the pyramids and the concepts behind this enormous project. The authors build a case that many of the concepts and processes of modem project management were likely applied in the building of this antique.

1.13 DISCUSSION QUESTIONS

1. How do projects fit into the overall design of enterprise purposes, in particular with the choice elements of an enterprise?
2. Describe and discuss situations in your work or personal experience that fit the definition of a project. How effectively were/are these managed?
3. In what ways do the concepts of project management appear to violate traditional, established ways of managing?
4. How do the three parameters of a project—cost, time, and technical performance—interact?
5. What are the various roles that need to be accounted for on a project team?
6. How do the leader's and the project manager's styles affect how these roles are played?
7. List and discuss the various liaison devices described in the chapter.
8. What are some of the advantages of the use of teams in organizations?
9. Why is it important for project managers to adapt "synergistic thinking"?
10. Discuss the steps involved in the management of change. What additional steps can be taken?
11. How can a young professional's experience in working on small projects benefit his or her professional development?
12. Describe what is meant by team management.

1.14 USER CHECKLIST

1. Are there clear and appropriate "choice elements" identified in your organization?
2. Does the management of your organization recognize projects and understand the concepts of project management?
3. How well does your organization use project management in dealing with change?
4. Are clear lines of authority, responsibility, and accountability defined for project team members?
5. How well are the liaison devices described in the chapter used to integrate activities across organizational lines?
6. Are cost, time, and technical performance objectives defined for each project? Are they properly managed? Do existing projects have a probable and suitable operation or strategic fit?
7. Does your organization use teams to its advantage? In what ways?
8. Is your organization prepared for change? Is change being managed effectively?
9. Are young professionals being properly trained in the concepts of project management so that they are prepared to take on the responsibilities of a project or team manager?
10. Does top management provide support and opportunities for functional and project managers to plan, organize, motivate, direct, and control those project activities for which they are responsible?
11. Does the organization use contemporaneous, state-of-the-art project management techniques in the management of projects?
12. How is project management integrated into the strategic management philosophies of the organization?

1.15 PRINCIPLES OF PROJECT MANAGEMENT

1. Project management has earned its rightful place in the evolution of the management discipline.
2. Strategic management and project management are interdependent in the management of an enterprise.
3. Projects are a key "choice element" in the management of an organization.
4. Projects are the building blocks of change in organizations.
5. The evolution of project management has influenced the continued evolution of general management theory and practice.

1.16 PROJECT MANAGEMENT SITUATION—EXTERNAL AND INTERNAL PROJECTS

Projects, as building blocks in the design and execution of enterprise strategies, can be either external or internal in nature. An ***external*** project is one undertaken for, or on behalf of, stakeholders who are not part of the enterprise structure, such as design and construction of a bridge, highway, or new product design. In an external project, the customer is located outside the enterprise, such as another company, government, or military organization. An ***intemal*** project is one to be carried out primarily for the improvement of organizational processes, such as productivity improvements, training initiatives, organizational restructuring, or reengineering. Internal projects usually have an intemal customer, such as a manufacturing manager who wishes to update the company's manufacturing equipment, build a new plant, or develop enhanced information systems capability.

Companies that are in economic difficulties often undergo downsizing or restructuring. Improvements in organizational processes can be gained from reengineering projects. The development of new award systems, flexible work practices, improvement of quality, or the flow of work on the production line, can be accomplished by using project teams. Although many of these projects are modest, compared to large projects that are being developed for an outside customer, for the members of the enterprise the internal projects usually indicate that a change in the operating policies is forthcoming.

Organizations are basically systems of people using resources to accomplish enterprise mission and purposes. Changing how an organization works is thus fundamentally about changing how people work and relate to each other. Organizational development projects are meant to be a planned process of change for the people in an organization's culture, often using management principles and behavioral processes. A major reason why some of these changes fail is because the action that is planned and undertaken is not treated as a project and—not managed as a project.

1.17 STUDENT/READER ASSIGNMENT

The reader/student should select an organization with which he or she is familiar and accomplish the following:

1. Identify the ***internal*** and ***external*** projects that are underway in the organization.
2. Determine the strategic or operational changes that each of the projects will likely impact.
3. Assess the effectiveness with which each project is being managed. Are there differences in how such projects are being managed?
4. Identify some probable forthcoming changes likely to impact the organization for which project management concepts and process can be applied.
5. Give thought to what project management principles might be applied in the management of these projects.

CHAPTER 2
THE PROJECT MANAGEMENT PROCESS

"The distance is nothing; it is only the first step which counts."
MADAME DUDEFFARD, 1697–1784

2.7 INTRODUCTION

Project management is a series of activities embodied in a process of getting things done on a project by working with project team members and other stakeholders to attain project schedule, cost, and technical performance objectives. The project management process is adapted from the general management process.

In this chapter the project management process will be explained along with an exploration of the project life cycle. How to manage this life cycle will be examined, along with an explanation of how project life cycles and uncertainty are linked. An early linkage of a ***project*** life cycle and a ***product*** life cycle will be presented.

Project management is a series of activities embodied in a process of getting things done on a project by working with members of the project team and with other people in order to reach the project schedule, cost, and technical performance objectives. This description helps identify project management, but it does not tell too much about how a project manager reaches project goals and objectives. This chapter will describe the project management process along with the idea of the life cycle. First we describe the management process.

2.2 THE GENERAL MANAGEMENT PROCESS

A process is defined as a system of operations in the design, development, and production of something, such as a project. Inherent in such a process is a series of actions, changes, or operations that bring about an end result, in the case of a project attainment of its cost, schedule, and technical performance objectives. Another meaning of a process is that it is a course or passage of time in which something is created—an ongoing movement or progression.

As a manner and means of progressing, a project management process sets the tone for the conceptualization of project management; the planning and execution of concepts, methods, and policies; and the commitment of resources to the project endeavors. Taken in its entirety a project management process provides a paradigm for how the management functions of planning, organizing, motivation, directing, and control will be carried out in the commitment of resources on the project.

Figure 2.1 provides a simple model of the management functions portrayed in the larger context of the management process. Each of these functions can stand alone—yet in their design and execution they are interdependent in the overall management process of an organization or a project.

The management discipline is usually described as a *process* consisting of distinct yet overlapping major activities or functions. A brief review of the early conceptualization of the management discipline in terms of the major activities or functions involved follows.

The management discipline that received recognition early in the twentieth century reflected to some degree the practices of the time. Although there were a few singular writings in historical times, there was no attempt to organize and portray an overall philosophy and concept of management. But in the early writings of Frederick W. Taylor and Henri Fayol the first integrated ideas about management started to take form. Taylor's book, The Principles of *Scientific* Management (1911), centered around the improvement of capabilities of people on the production line. Fayol, on the other hand, wrote his classic General and Industrial Management from the perspective of the overall management of the enterprise. Fayol's definition of management as consisting of forecasting and planning to organize, to command, and to coordinate and to control, set the stage for the differentiation of managerial activities from the technical activities of the enterprise. To quote Fayol: "To plan is to foresee and provide a means of examining the future and drawing up the plan of action. To organize means building up the dual structure, material and human, of the undertaking. To command means maintaining activity among the personnel. To co-ordinate means binding together, unifying, and harmonizing all activity and effort. To control means seeing that everything occurs

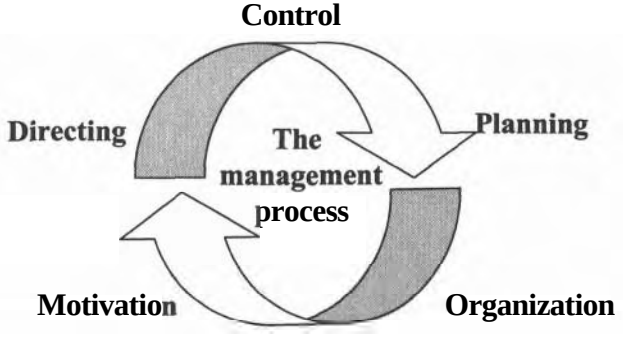

FIGURE 2.1 The management process.

in conformity with established rules and expressed command.'" Fayol goes on to note that management is an activity spread between the head and members of the body corporate. His early description of managerial functions being carried out from the highest to the lowest levels of an enterprise established the traditional hierarchical state of management—a state of perception and thought which characterized both the theory and practice of management for many decades. Any perception of the horizontal nature of management was largely confined to the idea of coordinating the technical activities of the enterprise. In the traditional paradigm of management authority, responsibility and accountability were primarily considered to be vertical forces, extending from the senior level of the enterprise down to the worker level.

The idea of using teams as an alternative organizational design was described very little in the literature, but there were singular examples where the use of teams to integrate functional activities in the enterprise was recommended. An early advocate of teams was Mary Parker Follett.

In the 1920s she extolled the benefits of teams and participative management, and said that leadership comes from ability rather than hierarchy. She advocated empowerment and tapping the knowledge of workers, and supported the notion of cross-functioning in which a horizontal rather than a vertical authority would foster a freer exchange of knowledge within the organization. She fervently believed that knowledge and experience determine who should lead.[2]

A simple yet important way of further describing the management process through its major functions is indicated below:

- *Planning* What are we aiming for and why? In the execution of this function, the organization's mission, objectives, goals, and strategies are determined.
- *Organizing* What's involved and why? In carrying out the organizing function, a determination is made of the need for human and nonhuman resources—and how those resources will be aligned and used to accomplish the organization's mission. Authority, responsibility, and accountability are the "glue" that holds an organization together.
- *Motivation* What brings out the best performance of people in supporting the organization's purposes?
- *Directing* Who decides what and when? In the discharge of this management function, the manager provides the face-to-face leadership of the organizational members.
- *Controlling* Who judges results and by what standards? In this function the manager monitors, evaluates, and controls the effectiveness and efficiency in the utilization of organizational resources.

Figure 2.2 portrays the relationship of project management resources and the core functions of project management. There is much literature describing these management functions. Thousands of articles and hundreds of books are published every year about the management discipline.

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[1] Henri Fayol, ***General and Industrial Management*** (London: Sir Isaac Pitman & Sons, 1949). pp. 5–6.
[2] Dana Wechsler Linden, "The Mother of Them All." ***Forbes,*** January ***16,*** 1995, pp. 75–76.

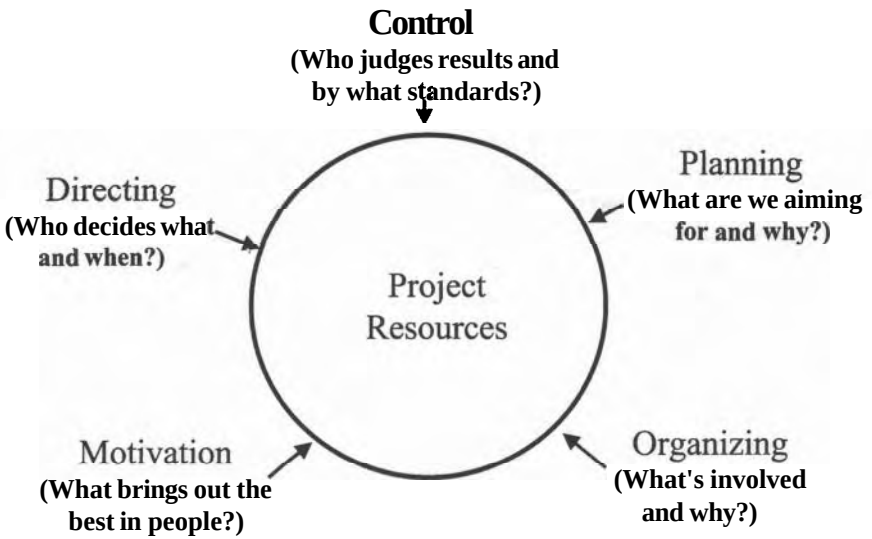


FIGURE 22 The core functions of project management.

TABLE 2.1 Principal Responsibilities: Project Management and General Management

Project management	General management
• Specific cost, schedule, and technical performance objectives	• Strategic management of the enterprise
• Matrix organizational design	• Vertical organizational design
• Ad hoc in nature	• Concerned with enterprise mission, objectives, and goals
• Focal point for functional and enterprise interfaces	• Ongoing enterprise
• Concerned with product, service, and enterprise process design and development	• Concerned with enterprise stakeholders
• Supports organizational strategies	• Seeks enterprise efficiency and effectiveness
• Concerned with project stakeholders	• Integrates functional and project activities

Table 2.1 shows the principal responsibilities between project management and general management. Both draw on the theory and practice reflected in the management discipline. There are some subtle differences, however, reflected in the main management considerations that are involved in the management of the project or the enterprise, as the case may be. Both general management and project management have the same basic philosophies, even though the application of the management process may differ depending on the applications in each area. Both make and implement decisions, allocate resources, manage organizational interfaces, and provide leadership of the people who are involved in the enterprise and the project. The differences and similarities are subtle yet important for both the managers and the professionals that are involved.

2.3 THE PROJECT MANAGEMENT PROCESS

In Table 2.2, the project management process is portrayed in terms of its major functions. The activities noted under each of these functions are only representative. Effective project management requires many more activities or "work packages" under each of these functions. More descriptions of these functions are found elsewhere in this book.

TABLE 2.2 Representative Functions/Processes of Project Management

Planning: What are we aiming for and why?
Develop project objectives, goals, and strategies.
Develop project work breakdown structure.
Develop precedence diagrams to establish logical relationship of project activities and milestones.
Develop time-based schedule for the project, based on the precedence diagram.
Plan for the resource support of the project.
Organizing: What's involved and why?
Establish organizational design for the team.
Identify and assign project roles to members of the project team.
Define project management policies, procedures, and techniques.
Prepare project management charter and other delegation instruments.
Establish standards for the authority, responsibility, and accountability of the project team.
Motivation: What motivates people to do their best work?
Define project team member needs.
Assess factors that motivate people to do their best work.
Provide appropriate counseling and mentoring as required.
Conduct initial study of impact of motivation on productivity.
Directing: Who decides what and when?
Establish "limits" of authority for decision making for the allocation of project resources.
Develop leadership style.
Enhance interpersonal skills
Prepare plan for increasing participative management techniques in managing the project team.
Develop consensus decision-making techniques for the project team.
Control: Who judges results and by what standards?
Establish cost, schedule, and technical performance standards for the project.
Prepare plans for the means to evaluate project progress.
Establish a project management information system for the project.
Evaluate project progress.

The management functions used in the management of a project are the principal elements in making and implementing decisions about the use of resources applied to project purposes. A checklist to review how well these functions are carried out can be useful. A representative general checklist is shown in Table 2.3.

2.4 THE PROJECT LIFE CYCLE

Project management is a continuing process. New demands always are put on the project team and have to be coordinated by the project manager through a process of planning, organizing, motivating, directing, and controlling. As new needs come up before the project, someone has to satisfy these needs, solve the problems, and exploit the opportunities. The project originates as an idea in someone's mind, takes a conceptual form, and eventually has enough substance so that key decision makers in the organization select the project as a means of executing elements of strategy in the organization. In practice, the project manager must learn to deal with a wide range of problems and opportunities, each in a different stage of evolution and each having different relationships with the evolving project. This continuing flow of problems and opportunities, in a continuous life-cycle mode, underscores the need to comprehend a project management process which, if effectively and efficiently planned for and executed, results in the creation of project results that complement the organizational strategy.

Managing a large project is so complex that it is difficult to comprehend all the actions that have to be taken to successfully plan and execute the project. We need to divide the project into parts in order to grasp the full significance of each part and just where that part fits in the scheme of the project. We have to look at the project parts, its "work packages," its logical flow of activities, and the phases that the project goes through in its evolution, growth, and decline.

The management of a project is like the management of any activity. Two fundamental steps are involved in such management, namely, the making and implementation of decisions. There is a substantial body of knowledge regarding how decisions can be made—in particular how to consider the evaluation of risk and uncertainty in the potential use of resources committed through the decision process. Decision analysis in projects is an important responsibility of the project team, facilitated by the project manager. A 12-part series that reviews and summarizes the concepts and processes behind good project decisions was published in PM *Network*.[3]

Using a model of the project's life cycle is useful in identifying and understanding the total breadth and longevity of the project and as a means to identify the management functions involved in the project life cycle. A project's life cycle contains a series of major steps in the process of conceptualizing, designing, developing, and putting in operation the project's technical performance "deliverable~." These major steps are the key work elements around which the project is managed. The context of a project life cycle—and how the conceptualization and

[3]See John R. Schuler, "Decision Analysis in Projects: Summary and Recommendations," PM *Network*, October 1995, pp. 23–27.

TABLE 2.3 Decisions of the Team Management Functions

Team planning
What is the mission or "business" of the team?
What are the team's principal objectives?
What team goals must be attained in order to reach team objectives?
What is the strategy used by the team to accomplish its purposes?
What resources are available for the team's use in accomplishing its mission?
Team organization
What is the basic organizational design of the team?
What are the individual and collective roles of the team that must be identified, defined, and negotiated?
Will the team members understand and accept the authority, responsibility, and accountability that is assigned to them as individuals and as a team?
Do the team members understand their authority and responsibility to make decisions?
How can the team effort be coordinated so that the members will work in harmony, nor against one another?
Team motivation
What motivates the team to do their best work?
Does the team manager provide the leadership style acceptable to the members of the team?
Is the team "productive"? If not, why not?
What can be done to increase the satisfaction and productivity of the team members?
Are the team meetings conducted in such a manner that people attending are encouraged? Discouraged?
Team direction
Is the team leader qualified to lead the team?
Is the team leader's style acceptable to the members of the team?
Do individual members of the team assume leadership in the areas where they are expected to lead?
Is there anything that the team leader can do to increase the satisfaction of the team members?
Does the team leader inspire confidence, trust, loyalty, and commitment among the team members?
Team control
Have performance standards been established for the team? For the individual members?
What feedback on the team's performance does the manager have who appointed the team?
How often does the team get together to formally review its progress?
Has the team attained its objectives and goals in an effective and efficient manner?
Do the team members understand the nature of control in the operation of the team?

Source: Adapted from M. H. Mescon, et al., *Management,* (New York: Harper & Row, 1991), p. 167.

development of that life cycle provide a useful model for project management—will be described in the material that follows.

But first, an example of a project's life cycle. All projects go through a series of phases in their life cycle as they progress to completion, transforming the project resources to a product, service, or organizational process. As the project results are transformed into a product, service, or organizational process, they create value for the enterprise. Modifications and improvements are typically added to the project results as they are provided to customers in the marketplace by way of new models, modified configuration, reduced price, and so forth, and as the results of the projects compete in the marketplace for which they were designed and developed. Project results, like most other things in the world, are always undergoing change in order to remain competitive in their marketplaces. For example, a new car, or a car that has been modified from the original configuration, may eventually be discontinued because of a key decision made by the car manufacturer. For example, in December 2000 the General Motors Company announced their intention to kill the 103-year-old Oldsmobile name, cut 15,000 jobs, and reduce 15 percent of GM's factory capacity in Europe. These were the first steps in a sweeping overhaul of the biggest U.S. automaker since the dark days of the early 1990s. GM is also setting up special project teams to work with suppliers on how to save money for parts and supplies. The management of GM hopes that the elimination of the Oldsmobile car and cost savings with suppliers will provide funds for the development of "hot new cars and trucks" that the number 1 automaker is counting on to reverse the decades of declining market share.[4]

The reader can note the many opportunities in the GM situation presented above for the use of project management:

- Development of the original Oldsmobile auto—although not recognized as such since the project management discipline did not exist at that time. What did exist was the need to bring together many disciplines and organizational functions to develop the original car and all subsequent models.
- Canceling the Oldsmobile auto required the use of project management, as well as using the discipline in downsizing the manufacturer's plants and other facilities.
- Setting up project teams to work with suppliers to reduce vendor costs.
- Need for project teams to develop new "hot cars" and trucks to reverse GM's declining market share.

Thus project management was used to create change in the strategic and operational purposes of the company, and to deal with the change coming from the marketplace that was impacting the company.

The phases of a project life cycle—and what happens to the project during its life cycle-depend on the distinctive nature of the project. The phases that are

[4]Gregory L. White, "Killing Off Oldsmobile Was Just the Beginning," The Wall Street *Journal,* December 18, 2000, pp. A1, A13.

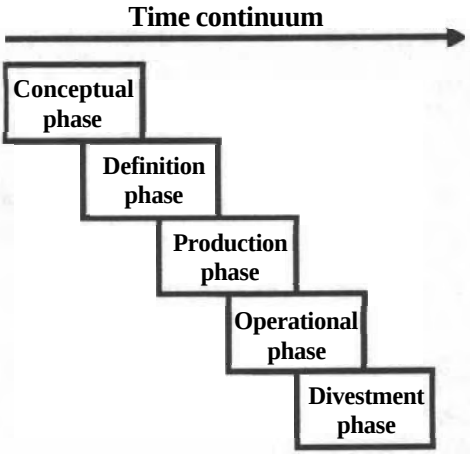


FIGURE 2.3 Generic model of project life cycle.

described in this chapter are generic and representative. Figure 2.3 is intended to provide a broad notion of the life cycle of a generic project to show how the project starts off with a conceptual model, goes through definition of its cost, schedule, and technical performance objectives, becomes operational, and will finally go into a divestment phase and is likely to be replaced by a new or improved project. Many different yet similar phases have been described in the life of a project. These phases typically include:

- ***Idea*** The generation of the notion or concept for a new product, service, or process that provides the basis for the creation of something new for the enterprise, which did not previously exist.
- ***Research*** The patient, systematic search and inquiry and examination into a field of knowledge. Such an inquiry is taken to establish facts or principles, and when successful, should convert an idea into a practical plan for further work. If the applied research does not result in anything of value, the project will be redirected or terminated as appropriate.
- ***Design*** The means for the conversion of the idea into a plan for a product, service, or organizational process.
- ***Development*** Usually means taking a design specification and converting it into an actual product, service, or process. This is done through added features of appearance and configuration change, and through the stages of experimental models, breadboard models, experimental prototypes, and production prototypes. The resulting outcome of the development phase is a product or service ready for production.
- ***Marketing*** Involves determining the need for the product or service, and the development of a sales and marketing plan to deliver the results to customers. The marketing effort is usually under way prior to or during the design and development efforts.

- ***Production*** The conversion of human and nonhuman resources into a product or service that provides value to the customers.
- ***After-sales services*** Means to provide the customer with maintenance, technical documentation, and logistics support for the product or service during the time that the product or service is being used by customers.

Projects, like organizations, are always in motion as each proceeds along its life cycle. Projects go through a life cycle to completion, hopefully on time, within budget, and satisfying the technical performance objective. When completed, the project joins an inventory of capability provided by the organization that owns the project.

All projects—be they weapons systems, transportation systems, or new products—begin as a gleam in the eye of someone and undergo many different phases of development before being deployed, made operational, or marketed. For instance, the **U.S.** Department of Defense (DOD) uses a life-cycle concept in the management of the development of weapons systems and other defense systems. An early **U.S.** Air Force version of this life cycle identifies a number of phases, each with specific content and management approaches. Between the various phases are decision points, at which an explicit decision is made concerning whether the next phase should be undertaken, its timing, and so on. Generically, these phases are as follows:

1. ***The conceptual phase*** During this phase, the technical, military, and economic bases are established, and the management approach is formulated.
2. ***The validation phase*** During this phase, major program characteristics are validated and refined, and program risks and costs are assessed, resolved, or minimized. An affirmative decision concerning further work is sought when the success and cost realism become sufficient to warrant progression to the next phase.
3. ***The full-scale development phase*** In the third phase, design, fabrication, and testing are completed. Costs are assessed to ensure that the program is ready for the production phase.
4. ***The production phase*** In this period, the system is produced and delivered as an effective, economical, and supportable weapons system. When this phase begins, the weapons system has reached its operational ready state and is turned over to the using command. During this period, responsibility for program management is transferred as an Air Force logistics supporting capability within the Air Force.
5. ***The deploymentphase*** In this phase, the weapons system is actually deployed as an integral organizational combat or support unit somewhere within the Air Force.

The management of technology can be viewed in a life cycle context. Cleland and Bursic have, in a research project, studied the management of technology within a major corporation. One of their conclusions is that technology can be managed from the context of a life cycle. Figure 2.4 illustrates this life cycle.

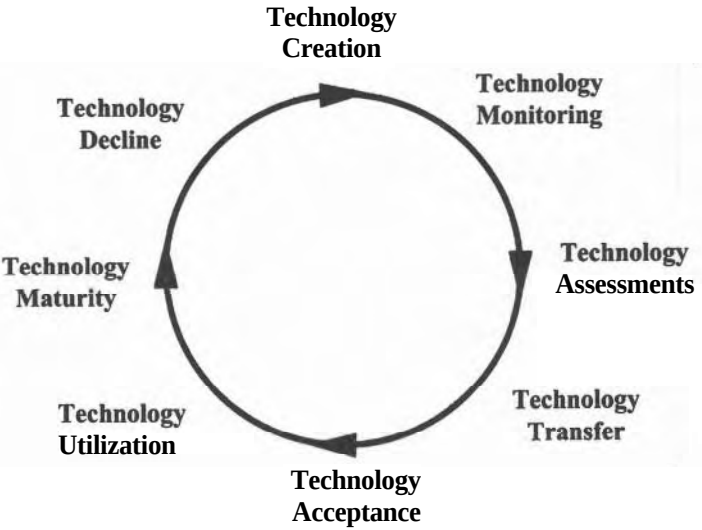


FIGURE 24 The life cycle of technology. *(Source: David* I. *Cleland and Karen M. Bursic,* Strategic Technology Management: Systems for Products and Processes, *AMACOM American Management Association, 1992, p. 23.)*

The results of this research project set a new standard in the corporation for the use of project management as a focus for the development of this new product.'

2.5 PRODUCT DEVELOPMENT

The National Society of Professional Engineers (NSPE) has developed a valuable and comprehensive document describing the new-product stages of development. These stages are defined, the objectives of the stage are presented, the engineering activities are described, and the information needed to communicate the actions and activities in each stage is provided.[6]

2.6 MANAGING THE LIFE CYCLE

One of the first undertakings in planning for a project is to develop a rough first estimate of the major tasks or work packages to be done in each phase.

There are many ways of looking at a project life cycle. Adams and Brandt suggest two ways of looking at the managerial actions by project phase and the tasks accomplished by project phase. See Table 2.4 and Fig. 2.5.

[5]David I. Cleland and Karen M. Bursic, *Strategic Technology Management: Systems for Products and Processes,* AMACOM American Management Association, 1992, p. 23.

[6]See, for example, *Engineering Stages of New Product Development,* Publication 1018, pp. 16–23, National Society of Professional Engineers, 1420 King Street, Alexandria, VA 22314.

TABLE 2.4 Managerial Actions by Project Phase

Phase 1 Conceptual phase	Phase 2 Planning phase	Phase 3 Execution phase	Phase 4 Termination
• Determine that a project is needed. • Establish goals. • Estimate the resources that the organization is willing to commit. • "Sell" the organization on the need for a project approach. • Make key personnel appointments.	• Define the project organization approach. • Define project targets. • Prepare the schedule for execution phase. • Define and allocate tasks and resources. • Build the project team.	• Perform the work of the project (i.e., design, construction, production, site activation, testing, delivery, etc.).	• Assist in transfer of project product. • Transfer human and nonhuman resources to other organizations. • Transfer or complete commitments. • Terminate project. • Reward personnel.

Source: John R. Adams and Stephen Brandt, "Behavioral Implications of the Project Life Cycle," in David I. Cleland and William R. *King* (eds.), *Project Management Handbook* (New York: Van Nostrand Reinhold, 1983), p. 227. All rights resewed.

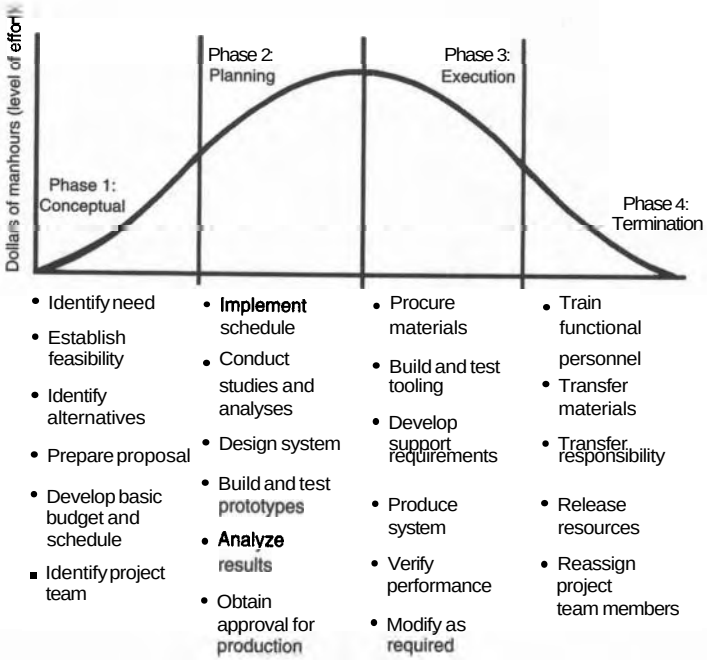


FIGURE 25 Tasks accomplished by project phase. *[Source: John R. Adam and Stephen E. Brandt, "Behavioral Implications of the Project Life Cycle," in David I. Cleland and William R. King (eds.),* Project Management Handbook *(New York: Van Nostrand Reinhold, 1983), p. 227.1*

Once established, the life-cycle model should be updated as more is learned about the project. As the project progresses through its life cycle, the project exhibits ever-changing levels of cost, time, and performance. The project manager must make correspondingly dynamic responses by changing the mix of resources assigned to the project as a whole and to its various work packages. Thus budgets will fluctuate substantially in total and in terms of the allocation to the various project work packages. The need for resources and various kinds of expertise will similarly fluctuate, as will virtually everything else. This is portrayed in Fig. 2.6, which shows changing levels of budget and of engineering and marketing personnel for various stages of the life cycle.

This constantly changing picture of the life cycle is an underlying structural rationale for project management. The traditional hierarchical organization is not fully designed to cope with managing such an always-changing mix of resources. Rather, it is designed to control and monitor a much more static entity that, day to day, involves stable levels of expenditures, numbers of persons, and so forth.

As has been stated earlier, project management is used by many different organizations. Banks, such as the Security Pacific National Bank in Los Angeles, California, use project management. At this bank project management was used in the automation of its loan collection system. Security Pacific had decided to centralize all of its collections, scattered throughout some 600 offices and collection centers. The plan was to devise six regional adjustment centers and a charge card center for all collection operations. Using project management, the development project was completed on time and within the budget that was allocated for it. There was a 100 percent increase in collector productivity in the first 6 months of

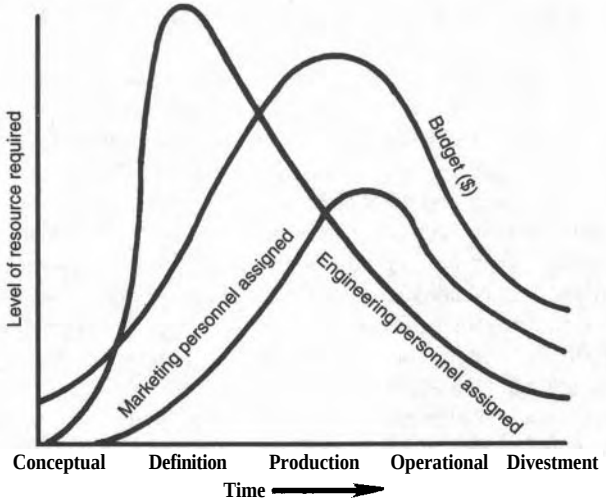


FIGURE 2.6 Changing resource requirements over the life cycle. *[Source: John R. Adams and Stephen E. Brandt, "Behavioral Implications of the Project Life Cycle," in David I. Cleland and William R. King (eds.),* Project Management Handbook *(New York: Van Nostrand Reinhold, 1983). p. 227.1*

operations under the new collection system. There was also a 95 percent decrease in paperwork generated by the collectors. Also, there was a significant reduction in loan delinquency and charge-offs. It was estimated that Security Pacific would save about $4 million by the end of the year because of the implementation of the new collection system?

2.7 PROJECT LIFE CYCLES AND UNCERTAINTY

As the project life cycle progresses, the cost, time, and performance parameters must be "managed." This involves continuous replanning of the as yet undone phases in the light of emerging data on what has actually been accomplished.

The project team must rethink much during the project life cycle to modify and fine-tune the work packages for each phase. Archibald notes, "The area of uncertainty is reduced with each succeeding phase until the actual point of completion is reached."[8]

Many organizations can be characterized at any time by a "stream of projects" that place demands on its resources. The combined effect of all the projects facing an organization at any given time determines the overall product, service, and process status of the organization at that time and gives insight into the organization's future.

The projects facing a given organization at a given time typically are diverse—some products are in various stages of their life cycles and embody different technologies; other products are in various stages of development. Management subsystems are undergoing development. Organizational units are in transition. Major decision problems, such as merger and plant location decisions, are usually studied as projects.

Moreover, at any given time, each of these projects usually will be in a different phase of its life cycle. For instance, one product may be in the conceptual phase undergoing feasibility study; another may be in the definition phase. Some might be in production. Others are being phased out in favor of upcoming models.

The challenges associated with the overall management of an organization that is involved in a stream of projects are influenced by life cycles, just as are the challenges associated with managing individual projects. In project-driven organizations whose main business is management of the stream of projects passing through the organization, the mix of projects in their various phases is most challenging, particularly in allocating work force, funding resources, scheduling work loads, and so on, to maintain a stable organizational effort.

In Chapter 1, the probable length of the life cycle for the building of the historical artifacts was noted. Some contemporary projects have a long life cycle as well. At Motorola, the Iridium 11-year project resulted in the launching of a 250-ton rocket carrying the first 3 of 66 planned satellites into orbit, 420 nautical miles above the

[7] H. B. Einstein, "Project Management: A Banking *Case* Study," The *Magazine of Bank Administration,* vol. 58, issue 43, 1982, p. 36.

[8] Russell D. Archibald, *Managing High-Technology Programs and Projects* (New York: Wiley, 1976), p. 23.

earth. By the time the entire constellation of satellites was up in September 1998, Motorola and its 16 coinvestors expected to spend close to $5 billion, making the project one of the largest privately funded infrastructure projects ever. The technical, regulatory, and political complexity of the project is numbing. More than 25,000 complex design elements have come forth. The project team scoured the globe, seeking partners and money to build the project, which began a new era of humanity-helping global interconnectedness. At the end of 1996, 2000 people were working on the project, up from 20 at the start. Marketing of the Iridium project was challenging. A sophisticated global marketing campaign is under way to sell its phones—aiming at vastly different markets around the world. Even if the project has less than hoped for success, it has yielded valuable indirect benefits, such as enhanced technology, greater attention to satellite technology, and a modem production facility that can be used for other satellite systems?

Drug research projects take an average of 12 years and cost an average of about $359 million. During the life cycle of these projects the disciplines critical to the project change. Projects often start with a biologist, and then a chemist and other disciplines become involved. Once developed, the new drugs have to be tested on animals and finally on human beings; then, on to manufacturing. Development projects require enormous amounts of expertise with a willingness to promote the free flow of information across disciplines and organizational boundaries.

The point to be remembered is that the management process has direct application to the management of the project resources and should so be approached in a life-cycle context.

2.8 TO SUMMARIZE

The major points that have been covered in this chapter include:

- The project management process was described as a guide for the management of those major activities involved in having an idea for a project and carrying that idea through to attainment of the project objectives.
- A process was described as a system of operations in the design, development, and production of something—such as a project.
- Henri Fayol, the noted French author, was the first individual to conceptualize and define the management functions. His definition set the stage for the subsequent examination of these functions in the management of an enterprise.
- Planning deals with how to determine the likely future forces facing an enterprise—and how to prepare the enterprise for its future.
- Organizing deals with how best to provide an orderly alignment of the people and the resources used by the enterprise for the accomplishment of its purposes.
- Motivation establishes the philosophy, attitude, and means for bringing out the best in people.

[9]Quentin Hardy, "Higher Calling: How a Wife's Question Led Motorola to Chase Global Cell-Phone Plan," The *Wall* Street *Journal*, December 16, 1996, p. 1.

- Directing is the face-to-face situation in which the leader provides a vision and the means of accomplishing that vision for the project.
- Monitoring, evaluation, and control provide the means for determining how well the project and organizational strategies are being used in meeting objectives and goals through the employment of predetermined strategy.
- A checklist to assist the project manager in determining how effectively decisions are being made on the project was provided in the chapter.
- Everything living in the world today goes through a life cycle. Projects are no different.
- Several paradigms of a project life cycle were provided to assist the reader in understanding how such paradigms can guide the management of a project.
- A project life cycle can be portrayed using the work packages of the project appropriately placed in the phases in that life cycle.
- Some projects have a long life cycle, such as that presumed about the building of the Great Pyramids. However, contemporary projects can have a long life cycle as well.
- Any new or improved product, service, or process goes through a life cycle as conceptual models are built, and design, development, production, and after-sales support initiatives are carried out in such a manner that the project results provide value to the customer.
- The management system for a project is built around the design and execution of the managerial functions that have been described in this chapter.

2.9 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and the theory of project management as it relates to areas covered here.

- John R. Adams and Miguel E. Caldentey, "A Project Management Model," and J. Davidson Frame, "Tools to Achieve On-Time Performance," chaps. 5 and 8 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- David I. Cleland, "Prudent and Reasonable Project Management," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (First published in ***Project Management Journal,*** December 1985, pp. 90–97.)
- Harold Koontz and Cyril O'Donnell, ***Principles of Management,*** 2d ed. (New York: McGraw-Hill Book Company, 1959). This book is considered to be one of the early "classics" in presenting a management theory that embodies a

principle and a process perspective. The authors believe that management is one of the more important activities through its task of getting things done through people.

- Charles B. Randall, ***The Folklore of Management*** (New York: Wiley, **1997).** The first edition of this book was written more than **30** years ago. **A** basic ***commonsense*** treatment of business management, Randall reveals the elements of success as well as failure in the corporate world. The simplicity and humor of this book, plus its insight into the management discipline, makes it a "management classic" in the literature. Any manager, whether at the senior or junior level of the enterprise--or a project manager—will find excellent insight into the management challenge in modern times by a reading of this book.
- Thomas C. Belanger, "Choosing a Project Life Cycle," in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997), pp. **61–73.** The author believes that the standardization of project management practices in an organization requires a flexible life-cycle model. Customizing a life-cycle model consists of deleting nonapplicable activities and tasks, and adding unique activities and tasks. By examining these ideas, a flexible life-cycle model can be developed for an organization that will increase the proportion of successful projects.
- William R. Duncan, "The Process of Project Management," ***Project Management Journal,*** vol. **24,** no. **3,** September **1, 1993.** In this article the process of project management is integrative, principally because a change in one department usually affects other departments. Trade-offs among project objectives are often required; successful project management can only be realized through the optimum handling of such interactions.
- Stephen E. Brandt, Julius C. Larsen, et al., "Organizational Climate Change in the Project Life Cycle." ***Research Management,*** vol. **20,** no. 5, **1977.** This article from a leading research journal puts forth the idea that organizational climate differs among project phases, but not always in a logical pattern. The results of the authors' research indicate that it may be important to think in terms of changing or differing organizational climates, not just the climate of the project organization.

2.10 DISCUSSION QUESTIONS

1. Identify and define the management functions discussed in the chapter.
2. Within the management function of planning, project managers and team members should settle on project objectives, goals, and strategies. How can this task help define the "strategic fit" of the project to the organization?
3. Discuss the difference between organizational policies and procedures.
4. Project review meetings often are used as a tool for controlling projects. In general, what kinds of questions should be addressed in these meetings?
5. List and briefly define the phases of a generic project life cycle.

6. What management functions are most important in the conceptual phase of the project life cycle?
7. During the definition phase of a project, it is important for management to design and develop a management system to support the project. Discuss the importance of each system.
8. Discuss what is meant by the project "losing its identity" and being "assimilated into the ongoing business of the user."
9. Discuss the importance of the divestment phase as a tool for avoiding technological obsolescence.
10. What is meant by the phased approach for project development?
11. How can a project manager, by understanding the project life cycle, use the concepts of this chapter to help direct and control projects?
12. Discuss the challenge of managing a project-driven organization with ongoing projects at various stages in their life cycles.

2.11 USER CHECKLIST

1. Do the managers of your organization understand and use the management functions in the management of projects?
2. Do the managers of your organization understand the project management process?
3. In the early stages of projects within your organization, are objectives, goals, and strategies clearly defined?
4. Are project management roles assigned? Are standards for responsibility and accountability established?
5. Does management consider the needs of individual team members in order to motivate people to do their best work?
6. How well does your organization use participative management techniques and consensus decision making in your project management work?
7. What techniques do project managers, within your organization, use to control project problems?
8. Do your organization's managers truly understand the implications of the project life cycle?
9. Does your organization use a systematic approach for managing projects?
10. During the conceptual phase of a project, does the organization attempt to determine the potential strategic fit of the project?
11. Does the organization recognize the need for a management system for managing projects?
12. Are projects purposely put through the divestment phase in order to avoid technical obsolescence? Why, or why not?

2.12 PROJECT MANAGEMENT PRINCIPLES

1. Project management is a series of activities comprising the process of applying management principles to project activities.
2. The management process consists of the organic functions of management.
3. All projects go through a series of phases in their life cycle as they progress to completion, transforming the project resources to a product, service, or organizational process to support organizational strategies.
4. The area of uncertainty in a project is reduced with each succeeding phase until the actual point of completion is reached.
5. A project life cycle can be portrayed using the work packages of the project appropriately placed in the phases of that life cycle.

2.13 PROJECT MANAGEMENT SITUATION—STRATEGIC MONITORING AND CONTROL

In Chapter 1 the interdependent relationship between strategic management and project management was presented. In Chapter 2 the project management process was described within the organic functions of management: planning, organizing, motivation, direction, and control. In the material that follows, the control function is presented from the perspective of strategic management.

Strategic Management Monitoring, Evaluation, and Control

Strategic management, like any other management activity, needs to be continually monitored, evaluated, and controlled to ascertain how the actual results compared with the results that were planned.

Steps in the Control Cycle There are several distinct steps in the project-oriented strategic management control system. In the material that follows a brief insight into the nature of these steps is provided. We will consider performance standards first.

Performance Standards Performance standards are based on the "choice elements" that have been established during the strategic process for the enterprise. Of these choice elements, projects and goals are particularly important. Goals represent milestones in the progress of the enterprise in accomplishing its objectives. Many of the goals of the enterprise are made up of projects under development and completion. For example, a goal for the enterprise to improve its manufacturing operations would have several key projects such as:

- Acquisition of state-of-the-art machine tools

  Construction of a new "green field" manufacturing facility

- Design and implementation of new training programs
- Design and development of automated factory production capabilities
- Redesign of the organizational structure to facilitate the operation of "self-managed" production teams
- Benchmark manufacturing capabilities of "best in the industry" firms as well as enterprise competitors

Following good project management practices, each of these projects would have appropriate objectives, schedules, and cost estimates. By reviewing the status of these projects, valuable insight into the progress that is being made toward the realization of company goals would be gained.

Comparing Planned and Actual Performance

An explicit review of the actual progress vis-8-vis planned progress provides strategic managers the intelligence to make an informed judgment of how well the strategic goals of the enterprise are being developed and implemented through the use of projects. An explicit review helps give answers to the following key questions:

- Is the project's progress consistent with the elements needed to support the strategic purposes of the enterprise?
- If there are deviations from the planned progress, how significant are these deviations?
- Will any changes in the resources directed to the project be required to more fully support the strategic purposes of the enterprise?
- Will the project's progress, or lack thereof, adversely impact the chances of the choice elements being adequately executed in the enterprise?

Corrective Action

Corrective action on the projects can take many forms of reprogramming, reallocation of assets, cancellation of the project, or reformulation of the goals of the enterprise, which the project was destined to support. Corrective actions directed to a particular project may have the result of impacting other projects--or even other goals of the enterprise.

An effective policy and process for reviewing the progress being made on those projects that support enterprise choice elements will enable the senior managers to tune their use of resources in preparing the entity for its future as if that future mattered.

Strategic management should be carried out at every level in the enterprise. Accordingly, the choice elements described in Chapter 1 have applications at each level; of course, the time dimension surrounding these choice elements is different. As these choice elements are developed and are used for each level in the enterprise, opportunities exist for the coordination and assessment of how well the overall enterprise accomplishes its strategic purposes.

As a result of the use of a strategic control system, certain initiatives of the enterprise will be changed. A few examples of such changes are listed in Table 2.5.

2.14 STUDENT/READER ASSIGNMENT

The reader should do a "self-test" by seeking the answers to the following questions—as well as following the instructions indicated for a fuller appreciation of the processes involved in tracking, monitoring, and controlling the design and execution of strategic management done in the context of projects.

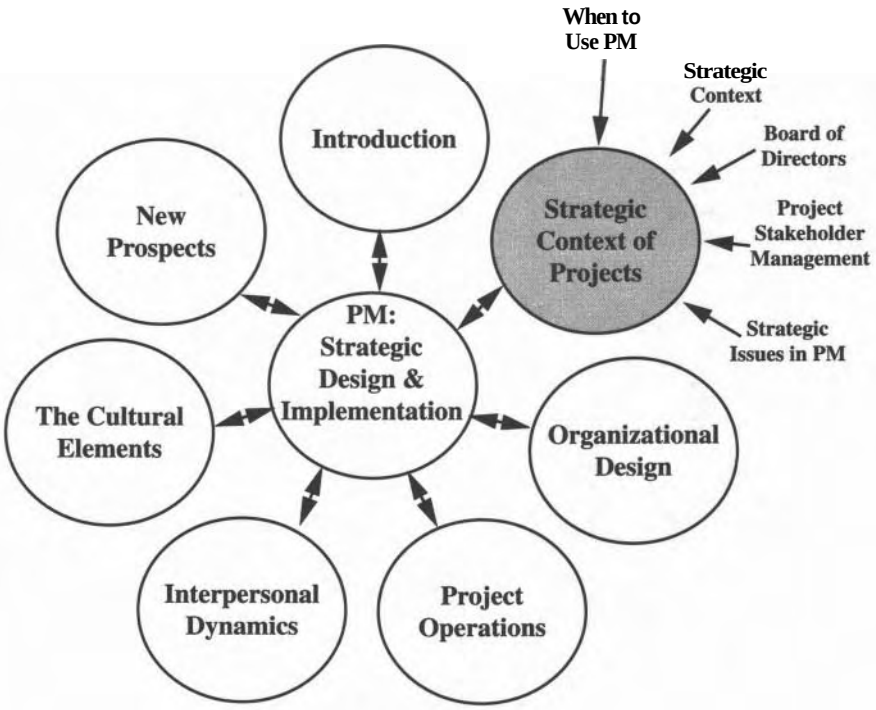
1. Why does it make sense to review the status of the projects in an enterprise when evaluating the performance of strategic management within the enterprise?
2. Select an organization with which the reader is familiar and identify the "stream of projects" in that organization that should be reviewed to ascertain how well the organization is being prepared for its future.
3. What does a "failing" project in an enterprise do to the development and execution of future strategies for the organization? Identify some "failing" projects in an organization with which you are familiar. Relate these "failures" to difficulties on the organization's part in the design and execution of future changes expected in the organization's environments.
4. Based on your current understanding of project management, what alternative strategies might be available to use in managing change in the enterprise?
5. What information should the project team have to make a strategic management control system operable?

TABLE 2.5 Examples of Changes Coming Out of a Strategic Control System

Changes in choice elements
Development of new/modified products, services, processes
Changes in market strategy
Modification of R&D programs
Cancellation of enterprise projects
Downsizing
Restructuring of organizational design
Changes in resource requirements

P · A · R · T · 2

THE STRATEGIC CONTEXT OF PROJECTS



CHAPTER 3
WHEN TO USE PROJECT MANAGEMENT'

"I keep six honest sewing-men (they taught me all I knew);
their names are What and Why and When and How and Where and Who."
RUDYARD KIPLING, 1865–1936

3.1 INTRODUCTION

The principal reason to use project management is to provide an organizational focus and a philosophy on how to deal with the inevitable changes facing contemporary organizations. There is a close relationship between project management and the organizational process changes that are required to cope with future opportunities. Projects are inexorably related to the design and implementation of strategic and operational initiatives.

In this chapter specific guidance will be presented on when projects are needed in an enterprise. Examples of project management applications will be given. The responsibilities of senior managers in the organization with regard to project management will be provided. Also, how to manage "small projects" will be presented—because many changes needed by organizations may be at minor levels of effort in that organization.

The primary reason for using project management is to provide an organizational design and a strategy to bring an organizational focus to those ad hoc activities needed to effect change in the organization. Modification of organizational products, services, and processes is required to accommodate the inevitable environmental changes that affect all enterprises today. Reaction to these changes usually requires an organized and focused use of resources to design new strategies in order to commit current organizational resources to prepare the enterprise for its future. An organization today that wants to remain competitive in providing its customers with continually improving products, services, and organizational processes has no choice but to use modern project management concepts and

[1]Some material in this chapter has been paraphrased from D. I. Cleland and W. R. King, *Systems Analysis and Project Management, 3d* ed. (New York: McGraw-Hill, 1983).

processes. The current use of reengineering initiatives has sharpened our assessment of organizational processes.

3.2 BUSINESS PROCESS CHANGES

If there is any basic belief that enterprise managers have today, it is that the cost of change in products, services, and organizational processes can be significant. In the early 1980s new products and services tended to last for 5 to 10 years—today some of them may last for only 2 years or less. Change cuts across the functions and locations of the enterprise as well as across the various professional groups of the enterprise.

Business process changes brought to our attention through the vehicle of reengineering projects have changed the way in which we deal with change in the enterprise. A business process reengineering project team provides for an excellent organizational design initiative to bring about the desired change in the management of the enterprise. Taken in its most basic form, a business process change provides for an outcome that reflects the need to change the way in which people work together. The business process change identifies a series of changes for the conversion of inputs to outputs, which represent an integrated assessment of the way in which value is created in the enterprise. Policies, procedures, rules, standards, and the manner in which resources are used are changed.

A business process is composed of logical steps that cross organizational functions and extend outward and cross stakeholder organizations such as vendors, customers, regulators, and even unions if labor issues are involved in the process change. All the aspects of the change coming about in creating a business process strategy must be managed as a whole. It is through project management that these changes are brought about. The business process change can be described in terms of performance objectives and goals that must be defined and must be capable of being measured. The major components of a process change brought about by a reengineering project could include:

- Designation of a business process work flow
- Job design
- Organizational redesign
- Redesignation of individual and collective roles of people
- Utilization of new or improved technology
- Modified management system to include changes in objectives, goals, policies, procedures, and rules for the use of resources
- Cultural changes to include modified behavior patterns by the people involved
- Finally, improved effectiveness and efficiency in the design and execution of strategies leading to improved products, services, and organizational processes in support of organizational goals, objectives, and mission

Business process strategies provide for the simultaneous design and execution of the manner in which resources are used to produce products and services. When properly designed and executed, such processes result in:

- An integrated strategy for the creation of value in the enterprise, at lower cost and of higher quality, that meets the timing required for market acceptance and meeting and beating the competition
- Greater customer satisfaction, enhanced enterprise performance, and state-of-the-art use of technology
- New policies, procedures, and the manner in which individual and collective roles are carried out in the enterprise
- Improvements in morale and motivation of people
- New skills, improved utilization of resources, and streamlined operations
- Improved productivity, quality, and organizational capabilities
- A new management philosophy with supporting policies, procedures, and strategies
- New knowledge, skills, and attitudes of people
- Improved competitive advantage
- Greater shareholder and stakeholder satisfaction

In the development of new products, services, and processes in organizations there is the need to provide an organizational focal point through which resources can be directed to keep abreast of—and even more, beyond—changing technologies. A "champion," such as a project manager, is needed to provide the leadership and management skills to bring about the needed changes—some of which may be global in nature. For example, strategic alliances—a form of long-term partnership being seen more and more in global competitive markets—are being conceptualized, developed, and managed through the use of project management.

In today's fiercely competitive world, sole dependence on traditional boundaries will ensure obsolescence. You have to reach out to the larger systems context and build new initiatives with and around key stakeholders. For example, the creative act of Wal-Mart and its unprecedented cooperation with its suppliers, through a sharing of information systems to improve manufacturing and distribution efficiencies, set a new competitive standard in the world of retailing.

3.3 SPECIFIC USES

Project management concepts and processes can be used to support an organization's crisis management strategies. Crises can arise from such mishaps as plane crashes, toxic chemical spills, hostage taking, product liability lawsuits, poisoned products, natural disasters, storms, and earthquakes.

For example, in the early morning of January 17, 1994, a 6.8 magnitude earthquake on the Richter scale struck the Los Angeles area centered in the San Fernando Valley. After the full extent of the highway damage was determined, coordinated planning started to respond. Construction crews immediately started demolition of failed structures and design engineers were alerted to start the redesign effort. Detours were worked out with participating local agencies.

A governor's task force was organized consisting of affected agencies, which met regularly to coordinate and evaluate progress. Project management played a key role in restoring the freeway system. Progress was tracked daily, and innovative contract procedures were developed. An extensive use of bonus/penalty clauses, invitation-only bids, and awards based on partially completed plans was carried out. Within 6 months four major freeways were restored.[2] Sawle recommends the use of a crisis control model consisting of the logical steps in preparing for and resolving a major crisis. He believes that project management and crisis management skills can be combined to deal more effectively with crisis situations.[1]

Project management is being increasingly used to support a company's factory operations. The entire field of manufacturing systems technology is changing rapidly. Just-in-time (JIT) inventory management, material requirements planning (MRP), total quality management, computer-integrated manufacturing, computer-aided design, and flexible manufacturing systems are some of the primary new technologies that have been developed to support manufacturing operations.

No doubt the pace of technology in manufacturing systems will continue to advance, resulting in "systems" changes impacting manufacturing as well as the supporting functions in the enterprise such as R&D, marketing, finance, and after-sales maintenance and support. What all these changes have done is create an environment in the modern company that is too multidisciplinary to be organized solely along traditional functional entities. Contemporary factory managers need a management philosophy that allows them to bring an organizational focus to the management of resources in the factory that are dedicated to change—to the creation of something that does not currently exist, but that is needed to remain competitive in the global manufacturing environment.

The factory manager has a wide range of options to consider in using resources to manufacture products and provide supporting resources. The "traditional" factory retains most of the basic functional characteristics tied together by hierarchical relationships where clearly established lines of command are exercised through authority and responsibility relationships. The functional subunits of the factory are headed by a department manager, along with a person designated to be in charge of the production workers—this individual is traditionally called a *first-level supervisor*, foreman, production boss, or some such title. The role of this first-level supervisor has changed, and will continue to change, significantly.

Peter Drucker noted that no job is going to change more in the future than that of the first-level supervisor. Production teams, concurrent engineering teams,

[2] Jerry B. Baxter, "Northridge Earthquake Response." *Proceedings*, Project Management Institute, 25th Annual Seminar/Symposium, Vancouver, British Columbia. October 17–19, 1994, p. 102.

[1] See W. Stephen Sawle, "Crisis Project Management." *PM Network*, January 1991, pp. 25-29.

quality teams, task forces, and such organizational designs dedicated to managing change in today's factories all draw heavily on the concepts and processes of project management to pull together resources across traditional factory operations.

The use of robots to perform simple repetitive manufacturing tasks reliably at relatively low cost is another application of manufacturing systems technology facilitated by the use of project management concepts and processes. However, the use of robots has not become widespread in manufacturing operations; only a modest percentage of the industrial enterprises that could benefit from robots have any. Part of the problem has been that in most companies the design process is not adequately integrated with manufacturing. The typical robot system takes up to 12 months or more to go through a life cycle of concept, design, fabrication, installation, debugging, and start-up. The use of a project manager, such as an indusmal engineer, to define robot tasks establishes operating parameters, and the designing and interfacing of the human/material/robot system provide for a means to integrate different disciplines to support a common objective. A project team led by an industrial engineer, including representatives from engineering, maintenance, production control, manufacturing, management, safety, personnel, labor reporting, and accounting, can effectively address the issues involved in setting up robots for use in the factory. Other responsibilities of this project team include addressing the issues of what will happen to the employees who are displaced by robots and how the supporting functional elements of the factory will be realigned to support the use of robots in the changed factory operation.

An industrial engineer whose education and experience are in forecasting techniques, economic order quantity calculations, material requirements planning, flow process charts, human-machine charts, time and motion study, time balancing Gantt charts, from-to charts, queuing networks, computer simulation, and of course project management, is well suited to perform the key role of a project manager in the factory environment.

More and more literature is coming forth that describes how project management can be applied to the factory. A typical contribution to the literature has been offered by Professor Hans Thamhain, "Project Management in the Factory:' chap. 5 in David I. Cleland and Bopaya Bidanda (eds.), ***The Automated Factory Handbook*** (New York: McGraw-Hill, 1990).

3.4 PROJECTS AND STRATEGIC PLANNING

Strategic planning establishes the mission, objectives, goals, and strategies for where the organization wants to go in the future. Project planning is discussed more fully in Chap. 11.

Projects play an important role in the enterprise. The importance of projects is related to how they provide the transformation process from enterprise resources to strategic initiatives. This transformation process is depicted in Fig. 3.1.

Strategic design and ***implementation*** are concerned with how the organization is going to get there through the planned use of resources. ***Strategies*** include things

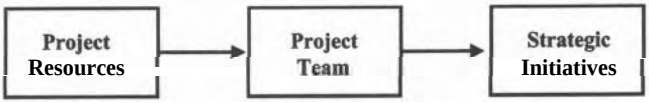


FIGURE 3.1 Project transformation process.

such as short-term action plans, policies, procedures, resource allocation directions, programs, and projects. Of these, ***programs and projects*** are of special interest. ***Programs*** are resource-consuming sets of organizational resources, which have a common purpose. For example, a productivity improvement program could be composed of the following projects:

- A participative management-style training project
- Realignment of manufacturing assembly processes
- Professional management development projects
- A project for development and use of autonomous production teams
- An integrated design-manufacturing information system

A principal reason to use project management is to facilitate the implementation of organizational strategy, although project management can be used effectively in other organizational contexts. Another reason for electing to manage things on a project basis is the fragmentation of functions and skills throughout the organizational structure. When an activity that is too large for any one functional department to manage is introduced into the organization, a single focal point must integrate the functional efforts through a matrix organizational design. The matrix organizational design is discussed in Chapter 8.

Davis and Lawrence insist that one should turn to a project only when the following conditions exist simultaneously:

- When outside pressures require that intensive attention be focused on two or more different kinds of organizational tasks simultaneously, **e.g.,** functional groupings around technical specialties and project groupings around unique customer needs
- When tasks become so uncertain, complex, and **interdependent** that the information-processing load threatens to overwhelm competent managers
- When the organization must achieve economies of scale and high performance through the shared and flexible use of scarce human resources[4]

Projects are resource-consuming activities used to implement organizational strategies, achieve goals, and contribute to the accomplishment of the organizational mission. All of these suggest that when an enterprise considers the use of project management in its strategy, it should first determine if the proposed projects could be associated with the following:

- The core "product line" business being pursued in the organization's market strategy

[4] Stanley M. Davis and Paul R Lawrence, Matrix (Reading, Mass: Addison-Wesley, 1977).

- A proposed new or improved product, service, or process design and development effort
- The development of resources to support the enterprise's product lines, such as facilities construction, productivity improvement programs, quality assurance programs, and employee participation projects

Whether to use project management raises the fundamental question of how to organize to implement our organizational strategy, because it is the organizational strategy that sets the organizational design that follows. In some situations, the decision to use project management techniques is made by the customer. Companies that bid on government contracts will probably find that they are expected to establish a project management system as a prerequisite to winning a contract.

3.5 WHEN IS A PROJECT NEEDED?

In general, project management may be applied effectively to any ad hoc undertaking. If such an undertaking is unique or unfamiliar, the need for project management is intensified. In some cases, such as that of an undertaking whose successful accomplishment involves complex and interdependent activities, a project manager can pull everything together to accomplish an organizational purpose. Basic to successful project management is recognizing when the project is needed—in other words, when to form a project as opposed to when to use another form of organizational design to do the job.

At what time do the forces in the organization and its environment add up to project management? The senior executives must have a basis for identifying undertakings, which the regular departments cannot manage. There are no simple rules to follow, but several general criteria can be applied in considering the use of project management. The justification for project management arises from the need for new or improved products, services, or organizational processes. Within this context Fig. 3.2 shows the principal criteria that can be applied in considering the use of project management. These criteria are discussed in the sections that follow.

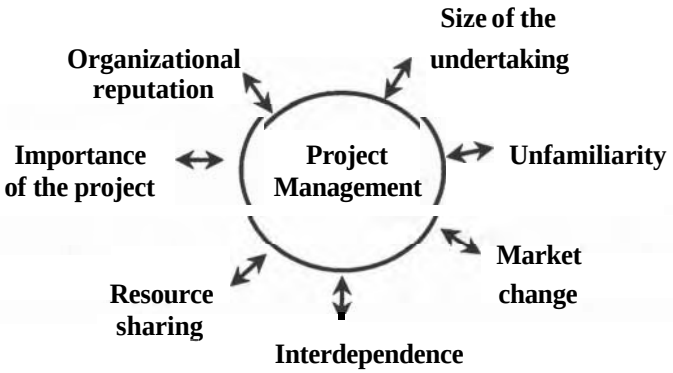


FIGURE 3.2 The need for project management.

Size of the Undertaking

The question of size is difficult to pin down because size is a relative matter. When an undertaking requires substantially more resources (people, money, and equipment) than are normally employed in the business, project techniques may be indicated. Even though the functional elements for the end product are discernible in the organization, the diversity and complexity of the task easily can overwhelm a department. In these cases, project management provides a logical approach to the organizational relationships and problems encountered in the integration of the work. For example, let us consider the move of a company from an eastern city to one in a southern state. This may appear to be a simple operation, but the complex development and correlation of plans, the coordination required in constructing the new site, and the task of answering numerous inquiries about the new site easily can swamp the existing organizational structure. These difficulties are compounded by the fact that the company must continue its normal operations during the period of the move. In such a situation, managing the move along traditional lines would be difficult, if not impossible.

In the future, the use of project management to manage changes in major infrastructures of societies can be expected. Such changes have already started. Two major projects give examples of the types of change that must be considered.

- In China, work has been inaugurated on the world's largest hydroelectric dam project, the Three Gorges effort on the Yangtze River. The dam will be nearly 1 kilometer long and some 100 meters high, and will consume enough material to build 44 Great Pyramids. The reservoir will stretch 600 kilometers upstream. Between 15 and 20 years will be required to build the dam--consequently nobody is reasonably sure how much the project will cost. Present estimates center on $12 billion at 1990 prices. Major environmental considerations are involved, to include landslides, potential military attacks, and earthquake issues, increasing the risk that the dam could fail. Continued planning to evaluate these and other risks will need to be carried out even though the dam is already under construction.[5]
- The proposed Hidrovia Project in Brazil is a proposal to reengineer the natural infrastructure of a continent. The Hidrovia project is planned to run the entire length of the Paraguay-Paran5 river system, some 3400 kilometers of it, into a superefficient shipping lane. As would be expected, conservationists in South America and throughout the world are alarmed about the potential social and environmental impacts of this project. The project will open up the heart of South America to private investment and will heighten interest in the continent's natural resources. Major issues concerning investment, social, and economic considerations are being evaluated to determine the long-term implications of the changes this project will cause. Unfortunately, detailed information needed to assess these changes has become notoriously difficult to obtain. Construction started in late 1997.[6]

[5]Fred Pearce, "The Biggest Dam in the World," *New Scientist*, January 28, 1995
[6]Raphael Heath, "Hell's Highway," *New Scientist*, June 3, 1995, pp. 22–25.

The minimum magnitude of project-oriented effort depends on the basic strategy of the organization. A company engaged in routine manufacturing probably does not require much project management. However, if the company were to go through a major redesign of its product line, which dictated significant special tooling and facility changes, project management could be set up to manage the change.

In the development and production of a weapons system or a nuclear power plant, an awesome inventory of human and nonhuman resources has to be synchronized and integrated into an operable system. The use of project management in these situations is clearly needed.

Indeed, the need for formal project management was heightened during the early days of the large DOD-NASA awards for the design, development, and production of major systems. In managing these projects, companies recognized that two or more functional elements of their organizations had to be pulled together in order to develop these systems.

The U.S. Air Force provided a strong impetus for the use of project management in the early 1950s. At that time it became clear to the USAF and the aerospace industry that a key point in the selection of system contractors would be whether the contractor had a project-driven organizational structure where work on a project could be centralized. By late 1958 and early 1959, aerospace companies had begun to establish project-driven organizations that cut across functional lines in order to accomplish project objectives. Factors that emerged in this period to account for the trend to centralize the management of projects within these organizations were as follows:

- A rapid technical advance in U.S. Air Force weaponry that led to the demand for minimum time in developing an operational system
- A change in technology that fostered new doctrines for the employment of costly weapons systems, along with the urgent need to produce project results at a minimum cost
- In the development of long-range ballistic missile systems, the motivation that arose from the management of the technology as well as the technology itself

  The extremely tight schedules, limited funding, state-of-the-art pressures, and increasingly complex procurement regulations that provided an unparalleled challenge to the aerospace industry

The current realignment of the DOD budget and the conversion to nondefense products by defense contractors will also provide ample opportunity for the use of project management.

Unfamiliarity

An ***ad hoc undertaking*** is a project out of the ordinary, something different from a normal, routine affair in the organization. But the degree of unfamiliarity also must be considered. For example, the redesign of a major product would require project management. An engineering change to an existing product, however,

could be conducted without setting up a project, although there might be a loss of overall efficiency in accomplishing the objective. In the first instance, the changes in cost, schedule, and technology would require a central management point to bring together the functional activities required and relate them to compatibility. In the second case, each of the functional managers could draw on experience to accomplish the work.

Unique opportunities or problems are generally project-oriented. Work on these opportunities is usually scattered in the organization, yet it is all interrelated, because various functional groups have to provide different disciplines to support the undertaking. Project management handles such opportunities well.

At NCR a corporate project manager was made responsible for overseeing all activities relating to a postmerger integration of AT&T's computer systems with those of NCR. The use of project management techniques helped reduce the time-consuming and complicated process of integrating AT&T's worldwide computer services division with NCR, without interrupting business as usual.[7]

There are other important and unfamiliar activities in an organization that require a management focus so that resources can be marshaled and closely controlled. Some of the particular problems or opportunities that fit into the category of the "unfamiliar" are:

- A major reorganization
- A takeover threat by an unfriendly suitor
- A crisis, such as a serious product failure, legal action, or other nonroutine occurrence, that seriously threatens the integrity of the enterprise
- Any unfamiliar undertaking that is of critical importance to the enterprise, such as new product or market development, a new business venture, or acquisition of another company

In these ad hoc situations, management may not know how to integrate many different profit centers in the corporate structure. To meet this problem, one large corporation created a projects division as a profit center to enhance its capabilities in competing for projects business in its industry products business unit. The mission of this profit center was to act as the project management arm of the corporation for those jobs that required teamwork among the corporate divisions that produced the products, the various sales organizations, and the supporting corporate staff. This projects division was chartered to handle projects:

- Of $10 million or more in the industrial products province
- With products from two or more divisions
- Managed under one contract
- Either domestic or international in scope
- Without any other appropriate lead division

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[7]Eva Hofstadter. "The Science of the Deal: Project Management Needs Wall Street," *PM Network*, November 1992. pp. 11–19.

This division acts as a "strike force" to develop project markets in a market segment for the overall benefit of the corporation. This division also organizes, coordinates, delivers, and installs the electrical equipment package for large industrial projects. Here, project management is used for the advantage of single-source responsibility for all stages of a project, including:

- Up-front studies and analyses
- A single, coordinated proposal
- A single contract covering all products and services
- An interface with customers, or with other contractors as required by the contract
- Large and complex projects packaged from smaller pieces
- Integrated equipment design and installation
- Stringent control of scheduling, shipping, and installation
- A single point of contact for problem resolution
- Centralized invoicing

In this corporation, project management is carried out by a team composed of representatives from the participating profit centers. The team is formed during proposal development and has responsibility through the warranty period. In addition to the design, development, and production phases of a project, the team manages installation, erection, and equipment start-ups (all integrated into the overall project) as well as support activities such as personnel training and start-up engineering. Some projects include field service and contract maintenance and repairs.

It took many years for this "interdivisional project management" to evolve, principally because of the territorial restrictions of the divisional charters that existed within the product group structure of the corporation. As the market for industrial equipment systems emerged, it became clear that no single division had the familiarity with the "systems" capability to serve the industry/construction project needs. What was needed was an organizational design to facilitate strategy across the many corporate profit centers that produced product components.

Market Change

Many firms and organizations operate in a turbulent market that is characterized by continually changing products, rapid technological innovations, and rapid changes in the values and behavior of customers and competitors. Such conditions place a premium on innovation, creativity, rapid response, and flexibility. Heterogeneous, changing markets require a management system that can flourish in the ambiguity of changing objectives and goals with the life cycle of many projects placing varying demands on managerial and professional support. These rapid market changes require an organizational approach that permits flexibility in the use of resources.

One company whose products are well known throughout America's kitchens uses project management as part of its competitive strategy. Wooster, Ohio-based Rubbermaid Company's products exhibit such high quality that they rarely need replacing. So this company must depend on new products and new markets for growth. The company's CEO plans to add a new market segment every 12 to 18 months. In the design of new products, the company depends heavily on a new generation of computer-aided design (CAD) workstations—so advanced that they reduce new-product design time from months to days. These workstations enable Rubbermaid to go directly from rough sketches to finished products in weeks rather than months. The company is moving from sequential to simultaneous design through the use of project teams—and in so doing is able to reduce cycle time, duplication of effort, and errors. In their markets, the reduction of cycle time is critical to enable the company to have a market as long as possible and before cheaper versions appear. The company, to survive, has to "reinvent itself' continuously. Simultaneous engineering facilitated by CAD technology is critical to this reinvention.[8]

A senior executive in a project-driven organization comments on the flexibility that project management provides:

- In the short term, the project team provides for flexible use of key technical resources, both people and facilities. (Functional "fiefdoms" don't have to be reorganized to move the talent from program to program to meet fluctuating demands.)
- For the long term, the team expands the avenues for business benefit from broadly applicable strategic investment. (A pattern of shared resources and shared responsibilities obviates the traditional "technology transfer" issue altogether.)
- Basically, through the program management dimension, the team establishes minigeneral managers (project managers) who are extensions of the general manager for a subset of the business, but without imposing the inflexibility and communication isolation of the functional resources that are characteristic of self-contained business segment departments?[9]

Interdependence

Another decision criterion for establishing a project is the degree of interdependence between the departments of the organization. If the effort calls for many functionally separated activities to be pulled together and if these activities are so closely related that moving one affects the others, project techniques are needed.

Consider the development and introduction of a new product. The early planning would require sales forecasts to be completed before plans for manufacturing processes, industrial facilities, special tooling, and marketing could be developed. Sales promotions cannot be completed before plans for manufacturing processes, industrial facilities, special tooling, and marketing. Sales promotions also cannot

[8] Seth Lubove, "Okay, Call Me a Predator," *Forbes*, February 15, 1993, pp. 150–153.

[9] John W. Stuntz, "A General Manager Talks about Matrix Management," in David I. Cleland (ed.), *Matrix Management Handbook* (New York: Van Nostrand Reinhold, 1984), p. 211.

be completed until the marketing research points the direction for the promotions. Performance and technical specifications, as well as the many interdependencies among the production, marketing, finance, advertising, and administration groups, must be resolved. Provincialism cannot be tolerated. If no one agency can pull all the separate parts together, if the functional groups fail to make credible estimates, or if the plans submitted by the different departments cannot be reconciled, then the activity needs the singleness of purpose of project management.

Sometimes project management comes about through a reorganization. In Norwalk, Connecticut, Perkin-Elmer Corporation reorganized into a functional alignment from its former geographic organization--one designed to compete in a global market. Project teams composed of people from engineering, manufacturing, sales, and services have the responsibility of developing new products.[10]

Product and service development projects are the lifeblood for success in the future. Manufacturing and marketing process development provide the basis for determining the resources needed to support the new product or service and the customer-related processes that will be used to get the product or service to the customer. In such situations, the interrelatedness factor in justifying a project is an important consideration. The timing of the development of projects is important as well.

Sometimes the risks and costs of developing new technology dictate the use of project management. For example, a project team with IBM, Siemens, and Toshiba participation was formed to design the first 256-megabit memory chip and its fabrication process at an estimated cost of $1 billion. Factories to produce the chips in volume will run another $1 billion each. These huge costs are the reason why such huge international alliances are likely to become the norm in the future. The new project-process team is centered at IBM's new Advanced Semiconductor Technology Center in East Fishkill, New York, where a trilateral team of some 200 engineers will report to a Toshiba manager."

World-class manufacturers are skillful at both product and process development and become expert in the design and manufacture of production equipment, either doing the work themselves or subcontracting the work to outside suppliers. Product development and process development are closely intertwined, usually through the use of a project team, often called a ***product-process design team,*** or ***simultaneous engineering.*** A brief continuing discussion of the subject of simultaneous engineering is presented here to demonstrate the project relevance of such engineering. This intertwining provides for the continual improvement of all the "systems" that support future organizational strategies. This subject is also briefly discussed in Chap. 1 and is further discussed in Chap. 21.

Using project-process design teams in simultaneous engineering increases the probability of close interaction among engineering, marketing, and manufacturing groups. The teamwork across disciplines helps ensure that everything that can influence the success of the new product or service in the marketplace is considered. With suitable senior management involvement and surveillance, a final core value is added to the development of new businesses.

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[10]Reed Abelson, "Getting Its Act Together," *Forbes,* August 31. 1992, pp. 44–45.
"Otis Port, "Talk about Your Dream Team," *Business Week,* July 27, 1992, pp. 59–60.

The importance of interdependence is clearly demonstrated in the use of product-process design teams. Not only does the use of such teams provide the opportunity to get the product or service to the market sooner, but also it ensures more "systems" considerations in the strategic management of the enterprise. Other benefits include these:

- Organizational resources are used more effectively and efficiently.
- People working on the teams sense a higher degree of ownership with the product or process being developed.
- The composition of the team, with people having different backgrounds and coming from different disciplines in the organization, provides an enhanced "checks and balances" in the design and execution of strategies for the product, service, or process being developed.
- Time is saved. Time represents money—and profit—when the product or service is introduced earlier into the market.

When a large research laboratory must pull together many different specialties, that is another example of the importance of interrelatedness. The laboratory must establish criteria for the use of formal project management when research and/or development projects require assembling diverse technologies and when larger projects require an engineering/design output as well as advanced technology. Laboratories typically use project management when a research project exhibits the following characteristics:

- A potential and significant long-range impact on the corporation
- The need to pinpoint corporate responsibility for the project
- The need for fast response
- The need for integrating widely varying disciplines, technical skills, backgrounds, and facilities
- The need for close coordination with corporate profit centers on product design, development, manufacturing equipment, and processes
- Significant size and duration
- Corporate technical and financial reporting requirements

Each year research projects are funded in a laboratory. A principal investigator or project manager provides the technical direction and integration of the project as well as accomplishing tasks on schedule and within budget. An informal project management system is used for small projects where only a few disciplines are required. For larger projects meeting the criteria just given, a formal project management system is used.

Resource Sharing

Projects are characterized by strong lateral working relationships requiring continuing coordination and decisions by many individuals, both within the parent

organization and in outside companies. During the development of a major product, there is close collaboration between the process and design engineers, and even closer collaboration between the individuals of a single department. These horizontal relationships do not function to the exclusion of the vertical relationships. Resource sharing becomes common practice.

Successful project management was executed in a resource-sharing partnership between General Electric and a group of Mexican appliance manufacturers to build a gas range manufacturing plant in San Luis Potosi in Mexico. GE management realized that the project's complexity was increased by working with a foreign partner in a foreign land. All members of the project team were given extensive Spanish language instructions; Mexican members of the team were put through an extensive U.S. language and culture training program. Care was taken during the project to identify cultural, linguistic, and other related issues that were liable to create barriers to communication.[12]

Project management makes sense when increasing professional specialization and its attendant higher cost lead to the need to share professional resources throughout the organization. It also makes sense when there are critical or scarce resources; when, in the ebb and flow of the life cycles of modem business products and services, it is difficult to keep a professional work force fully and effectively employed; or when certain types of professional skills are in short supply. Project management techniques can be utilized to share resources, potentially reducing both direct and indirect costs and delivering needed results.

Resource sharing in a project management context can lead to the best use of resources to promote the objectives and goals of the organization. Project management places priorities on the work efforts to allow resource assignment to those most critical aspects of business. Using resources from either internal or external sources on a shared basis leads to the most efficient and effective support of the organization's purpose.

Importance of the Project

Another reason for using project management techniques is the importance of the project to the enterprise. Managers might not want to place it in the "bureaucracy" of the organization, where it might become lost in the daily operational workings. When an ad hoc activity has high risks and uncertainty factors, then the use of project management techniques may be required. If an emerging problem or project is viewed as a potential building block in the design and implementation of future strategies for the enterprise, then project management techniques are required.

A new product line requires financing, design, development, and production—clearly an opportunity for project management, particularly if the emerging opportunity constitutes an effort that is too large to manage in a "business as usual" approach or if the product is very important to the company's future business. If such an emerging product carries high risk and has an apparent direct relationship to the company's objectives, then project management is usually required.

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[12] "Robert J. Butler, "A Project Milestone Bonus Plan: Bringing a Plant Startup On-Line, On-Time, On-Cost" *National Productivity* Series. Winter 1991/1992, pp. 31–39.

An important part of an organization's policy should be a statement of the conditions under which project management will be used. Senior managers will develop these criteria when they realize the important role that projects can play in the management of the enterprise.

The important thing to remember is that a project, as an ad hoc activity, cannot stand on its own; it is interrelated to the strategic mission of the organization. A project contributes something to the ability of an organization to change to meet its future. A project is the opportunity for an enterprise to complete a goal that leads to accomplishing its objectives, and ultimately its mission. Thus, the basic purpose for starting a project is to accomplish some goals that are held by the larger organizational unit—the department, the division, or the corporate entity. The reason for using a project is to provide a focus for organizational resources to be applied against the organizational problem or opportunity so that an enterprise goal can be attained.

Organizational Reputation

The overall organizational stake in the undertaking is another crucial determinant in the decision of whether to use the project techniques. For instance, if a failure to complete a contract on time and within cost and performance goals would seriously damage the company's image and result in customer and stockholder dissatisfaction, then the case for using project management is strong. A company's financial position can be seriously damaged if its performance on a contract fails to meet standards. In the case of government contracting, the company faces a single, knowledgeable customer, and failure to perform successfully can be catastrophic in terms of obtaining future contracts with the government.

Project management is no panacea, but it does provide a means for effective use of resources in ad hoc efforts. Project managers who see their role as that of integrator-generalists, responsible for meeting time, cost, and performance objectives, can do much to lessen the dangers inherent in an ad hoc undertaking. Project management concentrates into one person the attention demanded by a complex and unique undertaking, which will affect the enterprise's reputation.

Before a decision is made about whether to use project techniques, the effects of the company's environment on the project must be weighed and evaluated. The objective of the undertaking must be considered. Methodological improvements that might take some time to implement require considerable thought. The size and complexity of the project must be considered, because too much sophistication is also an ever-present danger. Other factors that merit consideration are the number of current projects in the company, the number in prospect, and the time remaining to complete the project. For example, establishing project management would be more appropriate at the start of an undertaking or at least early in its life, before large expenditures of work hours and resources are made. Each situation is unique, and the decision of whether to manage by a project or another approach should be made on the basis of specific problems expected as well as the concepts of organization presently used in the enterprise.

No company takes a purely project-orientedor a purely functional management approach. All companies combine the two, although one form may dominate, to focus the efforts and meet organizational objectives.

3.6 PROMOTING PARTICIPATIVE MANAGEMENT

In some cases, project management is used to provide an opportunity for an individual to take an idea and see that idea through to a successful product or service. Some companies have recognized the value of individual initiative and have organized their corporate structure and management philosophy to accommodate the entrepreneurial abilities of individuals.

At Honda, a fixed percentage (approximately 10 percent) of the R&D budget is set aside to fund new-concept development. Anyone can propose a new concept. It is reviewed by a peer group. If it is accepted, Honda organizes a small project team and provides funds to develop the concept to the point of a formal evaluation by senior management.

Texas Instruments' IDEA Program has a small pool of funds, distributed by senior technical people, to pay for concept development. Anyone who can get a concept development idea funded can manage a small project. Some ideas have led to full-scale product development projects and even commercial products.

In 3M Company, anyone who invents a new product, or promotes an idea when others lose faith, or figures out how to mass-produce a product economically has a chance to manage that product as though it were her or his own business, with a minimum of constraints from higher management. Called the process of divide and grow, the practice is aimed at keeping 3M a company of entrepreneurs. 3M's culture and its organizational structure are all directed to encouraging its people to take an idea and run with it. The new-product enterprises are broken out into self-sustaining units, each with considerable responsibility for its future. These ideas, developed into small projects managed by a team of professionals, may grow into departments and then into divisions within the corporate organizational structure. The depth of 3M's faith in allowing people to manage their ideas into projects was summed up by one manager at 3M, who stated:

> If **you put fences around people, you get sheep.** If **you want the best from people, give them all the room they need to grow, and all the responsibility they can handle.**[13]

3M's growth has been compared to cell mitosis because of the company's history of allowing small projects to grow and then dividing them. As described in a letter to the author:

> **... a product idea may emerge from a laboratory and link with a small amount of test-marketing assistance from a parent organization.**

[13] "Getting to Know Us," 3M pamphlet.

This product moves into the marketplace and reaches a level where a project is created as a profit center having responsibility for creating additional business and products.

The project succeeds and becomes a department. The department succeeds and becomes a division, which is the basic business unit at 3M. Divisions, in turn, are organized into product groups which themselves form business sectors.

The "mitosis" usually occurs at the division level when a department achieves certain goals for profitability and sales. It is spun off from the parent division to create another, new division. Simplistically but accurately, a former board chairman once explained, "Split a $100 million division and you get two $60 million divisions."

This process allows the product champions who have built a business to be rewarded without their having to wait for their bosses to retire or advance.

For example:

1. In the 1950s, Lewis W. Lehr was working as a tape engineer when he had some contacts with physicians with an idea for a surgical tape. Lehr developed such a product, which languished. 3M wanted to drop the idea, but Lehr asked to buy the line, and 3M regained its interest. The product succeeded eventually.
2. Autoclave tapes and other medical products followed.
3. In 1960, Lehr was named manager (not even general manager) of a Medical Products Division.
4. Through new technologies and acquisitions, the Medical Products Division grew to become a group, with medical, surgical, orthopedic and dental products divisions. This group, Health Care Products and Services, is a significant portion of our Life Sciences Sector, one of four major business areas of the company.

As for Lehr, he moved with [the] expanding business—becoming division general manager, division vice president and group vice president. He then became president of U.S. Operations and board chairman and CEO, retiring March 1, 1986.[14]

Truly, 3M's organizational design and operating philosophy emphasize project management, which in turn supports their corporate mission: "We Are in the Business of Building Businesses."[15]

3.7 SENIOR MANAGEMENT RESPONSIBILITY

Although it does not always happen, project management should be used only when senior management fully understands its own role in the strategic management of the enterprise and is fully committed to making it happen. The responsibilities of the senior managers of an organization and their willingness to provide an environment for the growth and propagation of project management depend on

[14] Letter from H. G. Owen, 3M Center, St. Paul, Minn., to D. I. Cleland, March 20, 1986.
[15] *3M 1985 Annual Report*, title page.

how well they establish an organizational culture for project management by doing the following:

- Maintaining the balance of power between the project office and the functional elements of the organization
- Providing facilitating services such as budget, finance, accounting, general administrative accommodation, and so on, to the project
- Developing and promulgating a philosophy of how resource priorities will be determined in the organization's matrix and how conflict over these resources will be resolved
- Providing performance standards for both project success and adequacy of functional support
- Establishing criteria for performance evaluation and wage and salary classification schemes in the organization's matrix
- Acquainting key individuals with the theory of matrix organization and presenting a process model of how the organization is intended to operate
- Providing models of organizational interfaces—developing authority, responsibility, and accountability relationships
- Defining decision parameters within the matrix organization
- Providing the project manager and the functional manager with strategic direction

If an executive wants to implement project management, the first requirement is for that executive to believe in project management and what it can do for the enterprise. With such belief can come commitment—and the demonstration of that commitment to the people who will be working on the new organizational design and project management strategies. To make project management work, strong leadership by the management cadre concerned with the use of project management is required. If senior management becomes too busy to take a strong leadership role in moving the organization to a project management strategy, the development effort will likely fail. What are some of the reasons for the failure of project management start-up strategies? The failures can usually be traced to one or more of the following:

- Design and implementation of a well-designed, well-developed strategy for project management in the enterprise are not done.
- Project management is viewed as the "fad of the month" and is not taken seriously, particularly by the managers and professionals in the product and service development part of the enterprise.
- Project management is viewed as a separate entity in the organization, and not as a building block in the management of change in the enterprise.

For those of us who believe in the project management process as a means for dealing with major change in the enterprise, it is difficult to believe that there are some who find fault with that process. One study of project management groups

in *Fortune* 500 companies conducted at the *Fortune* 500 Benchmarking Forum in Anaheim, California, found that communicating the financial benefits of project management to senior management and other corporate areas is the major project-related challenge. Even in dealing with peer groups within a functional area, project management can be seen as a threat to existing work groups and functional hierarchies.[16]

3.8 SELLING PROJECT MANAGEMENT TO SENIOR MANAGERS

It is often a challenge to obtain the approval of senior managers to change to something new when it is perceived that the present system is working. The question is typically, Why change something that is working? Responses from senior managers could also be the time-tested cliché, "If it ain't broken, why fix it?" Getting acceptance from decision makers for a change that has dramatic impacts on the organization, both in terms of what it takes to implement a new management approach and the time that it takes to adapt the culture, can be a challenge to the person offering a new way of doing business.

Project Management Application

Project management is used extensively in some form within many organizations. Regardless of industry or product being produced, project management has application for improved productivity. Surgeons can use these techniques to plan, implement, and follow through on surgical procedures. Grocery markets can use these techniques to change the layout in the stores. Book writers can use the techniques to plan, write, and review manuscripts. There has been no identified profession or industry where project management practices will not work.

Complete adoption of project management by an enterprise requires the acceptance by senior managers to champion and support its formalization and implementation. Senior managers may recognize the benefits of project management, but frequently do not become involved in the process. Perhaps, senior managers focus on more familiar processes for management and decision making. These senior managers are, therefore, not committed to the project management process that can make a significant difference in the organization's future.

This unrecognized potential of project management overlooks its contribution to an organization's capability to efficiently develop and deliver products and services as well as effectively implement organizational change. Project management's latent potential is not tapped to its fullest and organizations do not realize their optimum potential. Senior managers can "discover" this potential and cause changes in the policies, procedures, and practices for conducting the organization's business.

[16] Frank Toney, PMP, "Good Results Yield Resistance?" PM Network, October 1996, pp. 35–38.

Awareness of the Capability by Senior Managers

There is a vital need to raise the level of awareness of the potential for using project management in senior managers, those individuals charged with the responsibility to guide the organization in the most efficient and effective manner. Raising the level of awareness, or "selling project management to senior managers," is vital to maintaining the organizations' competitive edge. Without a competitive edge, organizations will shrink in the marketplace and their capability to develop new products and services to meet emerging needs will decline.

Project management, as an essential element of business solutions, is often discovered accidentally.[17] Only a few companies train their executives to understand project management and its effective use as a competitive-edge approach to developing products and services for customers. Also, the use of project management techniques is not fully appreciated as one of the most efficient and effective means of implementing organizational change.

Benefits Derived from Using Project Management

What are the benefits of project management that would demonstrate the need for full and complete implementation of a formal system? In a 1995 paper, Bradford Price reported the results of an assessment of implementing project management in the U.S. Army Corps of Engineers. Major benefits realized by the U.S. Army Corps of Engineers were described as follows:

- Helped reduce project duration from 26 years to approximately 10 years
- Increased cost estimating accuracy that resulted in 30 percent fewer projects experiencing cost increases
- Reduced schedule slippage by 23 percent with more reliable project schedule completion dates
- Enhanced the ability of local sponsors (customers) to influence the final design, cost, schedule, and plan
- Identified problems for resolution at all organizational levels
- Increased staff productivity
- Reduced total project management costs through shorter project phases

Further, Price reports that in a follow-on assessment on five projects, managed under the new project management system, the average project development cycle was reduced to less than 7 years from the previous 10-year cycle. Reduced project development cycle time resulted in significant savings for the organization.[18]

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[17] Jeffrey K. Pinto and O.P. Kharbanda, "Lessons for an Accidental Profession (Project Management)," *Business Horizons*, vol. 38, issue 2, March 1, 1995, pp. 41–45.

[18] Bradford S. Price, P.E., "Implementation of Project Management in the US. Army Corps of Engineers," Project Management Institute 26th Annual Seminar/Symposium, New Orleans, La., October 16–18, 1995.

Change to an organization's culture and its way of doing business takes time and concerted efforts on the part of many people. Senior managers direct the change and midlevel and project managers implement the change. Senior managers must have a vision for the future state to be achieved, sufficient goals to define the change, and a commitment to continue in the face of obstacles. Commitment to continue includes providing resources for the change and giving people the authority and responsibility for the tasks to be accomplished. Senior managers committed to adopting project management as the system of choice is the key to changing to a new project management culture.

The U.S. General Services Administration (GSA), a governmental agency, estimates that the change to a project-driven culture and full implementation took nearly 12 years. GSA's charter requires that it purchase supplies, information technology, and real estate for use by governmental activities. Each purchase could be viewed as a project and each delivery to a governmental activity as another project. GSA found that the change to a project-driven culture was slow and incremental. The change process needed to be stabilized at each step in the evolution process.[19]

AT&T's complex voice/data telecommunications/information systems projects benefited significantly through project management practices taught in project start-up workshops. These workshops established the requirements for the projects and set the baseline for project initiation. The workshops materially contributed to successful planning and successes for medium and large projects.[20]

Convincing Senior Managers to Use Project Management

"Selling project management to senior managers" is a task of developing a business case that clearly demonstrates the added value of changing to procedures, practices, and processes embraced by project management. Some questions that may be asked by senior managers are:

- What is the cost benefit of changing to a project management system?
- What impact does changing to project management have on customers?
- How is this going to improve business?
- What is the cost of converting to project management?
- How do our competitors use project management?
- How long will it take to convert our business to a project management culture?
- What are the immediate benefits?

Table 3.1 provides a comparison of some examples that would use project management. These examples are derived from experience and demonstrate the type of comparison that senior managers may find compelling cases for change to project

[19] Al Delucia, "The Evolution of Project Management at GSA," *PM Network*, September 1999, pp. 57-61.

[20] Dan Ono and Russell D. Archibald, "Project Startup Workshops: Gateway to Project Success," Workshop at Project Management Institute Seminar/Symposium, San Francisco. Calif., September 17, 1988. Also Russell D. Archibald, *Managing High-Technology Programs and Projects.* 2d ed. (New York: Wiley, 1992), chap. 11.

TABLE 3.1 Comparison for Project Management and Ongoing Functions

Item (examples)	Current method	Project management method	Differences (benefits and costs)
New product development	Team focuses on a technical solution without the requisite business solution (cost and time).	Focused planning and implementation against a schedule that incorporates the cost of development.	Reduced time to develop and market a new product.
Competitive analysis assessment	Typically, not performed. If done, uses an ad hoc team.	Dedicated team plans, implements, and reports assessment of competition vs. own business.	Rapid identification of strengths and weaknesses in relation to others. Provides basis for change to meet future business needs.
Organizational change	Ad hoc team to assess and plan change.	Dedicated team to assess and plan change.	Sharp focus on the change and improved planning for change. Should result in more effective organizational outcome.

management. The primary advantage envisioned is a sharp focus on the work to be accomplished and a dedicated effort to complete that work for the benefit of the organization.

Assessing the Opportunity to Implement Project Management

Many senior managers may view project management as a fad or something that is already in place within the organization. How many times does one hear, "Project management, yes, I do that all the time." Past experience will prevail unless there is compelling evidence that a change or new method will materially contribute to advancing the organization's goals. The old saying, "Change is inevitable, progress is optional," applies to those who deny the need for change.

To sell project management, one must first identify the stakeholder to champion change. There are those stakeholders who have the responsibility and authority to optimize the organization for the "best infrastructure" to meet strategic and business goals. There are those individuals who may desire "stability" in the workplace and oppose change. Then, there are those who are not key decision makers, but desire to improve the way work is accomplished. Table 3.2 lists some of the stakeholders, their responsibilities, and their potential for accepting or rejecting change.

There is a different time domain that each stakeholder views and each may have different interest. It does not appear that the stakeholders share common interests or common times for results. This shows the challenge in getting agreement on a change to use project management as the primary methodology for business solutions.

TABLE 3.2 Stakeholders for Change in an Organization

Stakeholder	Responsibilities	Accept/reject change
Corporate stockholders	Focus on the profitability of the organization and return on investment.	Probably would support a change to project management if the cost of change is low, the return on investment is high, and the risk is low or moderate.
Board of directors	Focuses on the long-term business and guides the organization in short-term decisions. This typically means setting goals 3 to 5 years for the future and conducting oversight on major ongoing activities.	Probably will accept change to project management if a compelling case is made. May also institute a system that links strategic goals with ongoing projects.
CEO, COO, president, vice presidents	Focus on the current business goals (current year and 1 year in future). May also serve on the board of directors.	May be reluctant to accept project management as a major change to the method of doing business. Any change to business procedures may negatively affect current plans, i.e., would cause a change to the plans.
Functional managers (e.g., finance, engineering, marketing, manufacturing)	Focus on repetitive type of work with emphasis on maintaining the status quo.	May reject the concept of using project management. May see a threat to their positions and status. May not understand project management concepts and would argue that project management does not fit in this organization.
Project directors, program directors	Focus on ongoing projects and projects being planned or initiated.	May accept changes to the project management system in the future, but would be reluctant to change procedures on current projects.
Project managers, project team members	Focus on one or more projects in the planning, implementation, or closeout phases.	Probably would support converting the organization to a "project-driven enterprise." These stakeholders are in a position to observe the positive and negative aspects of projects.

Table 3.3 identifies some of the differences in a typical organization's stakeholders. The approximations give some idea as to the barriers to successfully "selling" project management to senior managers. Take, for example, that stockholders are looking for either immediate return on investment and the board of directors is charged with developing a strategic position that may take 3 years. Expenditures in

TABLE 3.3 Stakeholder Focus and Interests

Stakeholder	Window focus	Principal interest
Corporate stockholders	3 to 12 months for dividends 3 to 5 years for capital growth	Return on investment
Board of directors	1 to 5 years for planning 1 to 12 months for implementation of plans	Strategic direction and future business opportunities
CEO, COO, president, vice presidents	0 to 3 months for operations 3 to 12 months for changes to operations	Meeting quarterly and annual objectives
Functional managers (e.g., finance, engineering, marketing, manufacturing)	0 to 12 months to meet organization's objectives	Maintain the status quo with some improvements in operations
Project directors, program directors	0 to 12 months to complete projects ongoing and new projects	Maintaining the momentum on project execution and new project initiation
Project managers, project team members	1 to 12 months to complete current projects	Complete projects and start new ones

the current year will affect the dividends paid to stockholders and defer their return on investment. On the other hand, if the investment is not made the business will suffer and perhaps not be competitive in the future.

The previous discussion gives mostly an internal sell of project management. This internal selling needs someone within the current system to propose a change. Most changes are generated as a result of external threats or opportunities. For example, if a company views its competition becoming more productive through the use of project management practices, that company may change to meet or beat the competition. If that same company was in the leading position, would it make changes to move farther ahead of the competition? Probably it would not.

3.9 EXTERNAL PROJECT MANAGEMENT SELLING

With the predictions for the information technology industry that more than 50 percent of project management will be outsourced in less than 5 years, this presents a different approach to "selling project management to senior managers." A scenario that places the project management provider outside the organization and in a competitive situation with similar service providers dictates that the seller be able to describe his/her product and service in such a manner that senior managers decide to buy.

A decision to sell project management services by an external consultant requires defining the services as well as being able to deliver in a manner that provides satisfaction with the customer.[21] Selling project management or being a service provider is typically defining the services being provided and convincing senior managers that the services can be delivered to meet their needs. Project management services from external sources may take on different characteristics, based on the needs of the customer. A range of services may be similar to the following:

- Provide interim project planning services to assist an organization in building its capability while delivering a product that is immediately put to use.
- Provide project planning and control services to support project managers. These services often entail only the schedule and cost functions. Specialists develop resource-loaded schedules and track progress as well as expenditure of labor hours.
- Provide a project manager, a project control team, and technical specialists to plan, execute, and close out the project. The work may be conducted on the customer's site or at the provider's location. The customer's expectation is for an end product that meets specifications and periodic reports to confirm the project is progressing in a satisfactory manner.

3.10 WHAT IT TAKES TO SELL PROJECT MANAGEMENT

A compelling story for senior managers and decision makers must be developed on the basis of facts to obtain their commitment to change to project management approaches for developing and delivering products and services. This commitment can only be obtained if there is value to the proposed change and the change replaces current methods that are less effective. One or more of the senior managers must champion the change.

The sequence for selling project management to an organization follows a series of steps. These steps may be sequential or in parallel, depending upon the situation:

- Define the organization that should change to project management. Identify the areas that should change or would change.
- Assess the positive and negative impacts of change to project management.
- Identify the stakeholders and their probable support or rejection of the proposal to change functions to project management.
- Identify success stories for conversion to project management and quantify the benefits.

[21] David I. Cleland and Lewis R. Ireland, *Project Manager's Portable Handbook* (New York: McGraw-Hill, 2000), pp. 7.52–7.53.

- Prepare a proposal with an implementation plan. This document must make the compelling case for change and the implementation plan should use project management techniques to show the process of change.
- Generate support for the change with those individuals who will directly benefit from the change.
- Reduce resistance for the change with those individuals who may oppose the change regardless of benefits to the organization.
- Schedule an informal meeting with the champion and determine the approach to other organization decision makers.
- Make a formal presentation to the organization's decision makers and present examples of where immediate improvements may be made and the resultant benefits derived by the organization.
- Obtain approval of the implementation plan to include a schedule of milestones and a budget.
- Implement the plan.

3.11 TWO VIEWS OF SELLING PROJECT MANAGEMENT

Selling project management takes on two views. One is the view of the internal person attempting to change the way the organization creates business solutions. The second view is the external consultant or project management provider attempting to convince senior management that his/her project management services can add value to the organization.

The internal selling is difficult because of the number of stakeholders with different interests to serve and the time in which each would like to see a solution. A crisis will energize senior managers to act and use project management when it is viewed as the solution to the problem. A crisis usually dictates some action and the implementation of project management may be identified as the solution. A crisis also has the challenge of immediate action for which the organization may not be prepared.

The external selling is primarily a transfer of responsibility for work and the work being accomplished through project management. There may be some instances of augmenting an organization's project management team to either perform the work or to gain experience from the person providing the services. Outsourcing of project management work is an organization's option if they do not want to build it as a core competency. As a core competency, it would not be outsourced.

Whether the "selling of project management" is internal or external, there must be perceived value by the senior manager. There must be some compelling reason for the senior manager to become the champion and support the change. The value must be to the organization and it must outweigh considerations such as economic,

political, and stakeholder objections, and personal interests. The change must also advance the organization on the competitive scale to improve its position with relation to competitors.

Selling project management is no different than selling a product or service to an organization. One must show the benefits of project management to the organization and the differences between what is currently done compared to the future. Benefits might include faster delivery of products to customers, improved productivity that results in lower costs, better products to meet customer needs, and greater confidence in the organization's ability to plan, implement, and close out work areas.

Senior managers are looking for value-added solutions in project management and not the features, characteristics, or process. Anyone selling project management or project management services must focus on the value to the organization. This value must be quantified and show the advantages or benefits of changing to project management practices.

In this chapter, the matter of when to use project management has been emphasized. The final answer in this regard is that project management provides an important means of how to manage change. Figure 3.3 poses a provocative question in the matter of dealing with change facing the enterprise.

3.12 TYPES OF PROJECTS

When assessing whether to use project management and how to use it effectively to meet the objectives of the organization, one should have an understanding of the types of projects that will be applied. Typically, all projects have not been defined by an industry or organization, but are simply viewed as the work to be accomplished. Project types can be useful in determining how to approach the work and what degree of planning is needed, for example.

Understanding the types of projects that an organization will or will not perform and the types that an organization has the capability to perform can assist in developing the organization's competencies. Developing the organizational competencies through understanding what is needed to use project management should give a useful insight on individual and team competencies needed to pursue the organization's mission.

If we could — by a deliberate and diabolic stroke — eliminate all projects and project management literature, how would we (could we) deal with change in the world?

FIGURE 3.3 The management of change.

Some typical project classifications are:

- ***Product projects.*** Projects that design, develop, and deliver a product as a result of the work effort. The customer for this project is typically an external stakeholder, who has contracted for a product to meet a specific need.
- ***Service projects.*** Projects that plan, design, and deliver services to external customers. The customer has contracted for specific expertise that is not available in-house.
- ***Continuous improvement projects.*** Projects that are internal to the organization and result in process change. The customer is an internal manager, or group of managers, who wants to change the manner in which current operations occur.

This simple approach to "types of projects" leads to an expanded listing of attributes or characteristics of projects or those that describe projects. This list may be expanded to include other features of projects, both from the physical features and the need features, to create a type of project specific to an industry or organization.

The 12 feature areas in Table 3.4 are a start to describing or classifying projects by type. These features are not necessarily a complete list and other features that may be more meaningful for an industry or organization could be added. This list can help understand the projects, whether from an organization's perspective or from a customer's perspective.

Martin and Tate describe projects as Type 1, Type 2, and Type 3 for a degree of definition of a range of projects. These project types are defined primarily on the basis of need for coordination of efforts. Type 1 projects include process improvement, reengineering, and strategic planning. Type 2 projects are typically small projects accomplished by a small team. Type 3 projects require extensive coordination because of their size and complexity.[22]

Although a degree of coordination is required for a project, both internal and external, it is but one parameter for classifying projects. The degree of coordination perhaps relates to project complexity, project, and number of stakeholders.

Many organizations classify projects only by the size—small, medium, and large. These classifications are subjective in that a "large" project for a medium-size company may be a "small" project for a large-size company. Large (major) projects for the U.S. Department of Defense are $1 billion and more. Many organizations do not classify projects by "urgency of need," or have a priority system. It is often assumed that the larger the project, the more important the work.

Priority of a project should be assigned because it relates to delivering benefits to either internal or external customers. Some small projects, such as a software upgrade to fix defects, may have more benefits than a large project for say $50 million. Failure to fix the software defects could potentially have impacts that range across the organization's ability to do business.

[22] Paula K. Martin and Karen Tate, "What's Your Type," *PM Network*, Project Management Institute, April 1999, pp. 53–55.

TABLE 3.4 List of Feature Areas for Project Classification

Size
• Dollar value • Number of people on project • Duration (calendar time) • Geographic span (global, multicountry) • Combination of above
Priority
Urgency of need for business • Urgency of need for customer • Urgency of need to meet market requirements
Degree of risk
• High risk • Medium risk • Low risk
Profitability
• High margin • Medium margin • Low margin • No margin • Loss
Cash flow
• Immediate return on investment • Near-term return on investment • Long-term return on investment
Technology
• Low technology • Medium technology • High technology • Mature technology • Immature technology
Business experience
• Projects that have been done before • Projects that haven't been done before • Projects that have some new work, for which no experience base exists • Projects that no one has done before

TABLE 3.4 List of Feature Areas for Project Classification (Continued)

Business base
• Projects that build on core competencies
• Projects that build on new core competencies
• Project unrelated to core competencies
• Projects that leverage core competencies
Project definition
• Undefined projects Ill-defined projects
• Partially defined projects
• Fully defined projects
Results (objectives)
• Strategic results
• Operation/business results
• Part of larger program
Deliverables
• Product
• Product and service
• Service
• Product improvement/upgrade
• Product disposal (e.g., nuclear power plant closeout)
• Product restoration (repair, renovate)
• Product maintenance (facilities maintenance—planned and unplanned)
• Emergency operations (fire, life saving, rescue, utilities outages)
• Legal services (litigation, felony prosecution, and trials)
• Law enforcement (car patrols, foot patrols, accident investigation, and incarceration)
• Political campaigns (fund raising, speaking engagements, travel schedule)
Other features
• Engineering
• Research
• Production with many of the same products
• Production with several models of products
• One-of-a-kind product
• Prototype product (brassboard, breadboard)

Categorization of projects is not an exercise in trivia, but it is an essential understanding of one's business and what comprises the business. Building a business base to support the organization's mission and purposes dictates that project types be defined and the correct type applied to potential business situations. Matching a project type with its requirements should enhance the capability of the organization.

3.13 THE MANAGEMENT OF SMALL PROJECTS

In any organization that is in motion there are usually many small projects that are used to cope with the minor changes that are underway in that organization's products, services, or organizational processes. A small project is one whose performance takes only a few weeks, has an easily defined scope, and has a dollar value between $5000 and $50,000. The project team is small, only a few cost centers are involved, and manual methods are used for facilitating the management of the project. Some examples include:

- Reengineering of a production line
- Realignment of a production line
- Development of an information system to support an element of the enterprise
- Revitalization of procurement practices
- Reorganization of an enterprise

The management of small projects is much like managing a large project—except for the degree of complexity involved. There is a routine protocol that should be followed to include (1) identify the need, (2) plan the project, (3) collect relevant information, (4) analyze the data, (5) develop alternative ways to accomplish the project results, and (6) present suitable recommendations. The "work packages" that are involved in each of these protocols are indicated below.

Identify the Need

- Identify the client/sponsor and their perception of the problem.
- Conduct an initial analysis to get an idea of what is involved in the small project.
- Be careful to separate "problems from opportunities."
- Establish tentative objectives and goals for the project.
- Identify the funds that are available for the project.
- Find the initial documentation that describes the problem or opportunity.

Plan the Project

Every small project needs a plan. The essentials of a small project plan are:

- A summary that can be read in a few minutes.
- A list of milestones (goals) identified in such a way that there can be no ambiguity when a goal is achieved.
- A work breakdown structure (WBS) that is sufficiently detailed to provide for the identification of all tasks associated with the project.

- An activity network that shows the sequence of the work packages and how they are related.
- Separate budgets and schedules that are consistent with the work breakdown structure.
- A description of the review process.
- A list of key project team members and associated stakeholders.
- Identification of final objectives, goals, and strategies for the project.
- Identification of what the client or sponsor expects by way of deliverables from the project.
- Identification of and attempt to seek potential answers regarding the key questions surrounding the problem and the project.
- Development of a work plan on how and who will perform tasks.
- Organization of the project team to include identification of individual and collective roles to be carried out by members of the team. The use of an LRC, as described in Chap. 9, is useful here.
- Familiarization with the organization's work authorization process through which funds are transferred for work on the project to an organizational unit within the organization or to an outside vendor.
- Preparation of schedules for the work to be carried out.
- A preliminary outline of the expected final report.

Collect Information

Use interviews, surveys, or other data collection mechanisms.

- Develop a bibliography of basic information regarding the problem.
- Study the background information.
- Review miscellaneous data and information regarding the problem and the surrounding circumstances or situations.
- Observe activity by the people associated with the problem to discern what is going on.
- Correlate the data and information that have been gathered.
- Use techniques such as work sampling, work flow, and individual and collective behavior by the people associated with the problem.
- As the strategies for the solution of the problem begin to emerge, conduct a preliminary test of these strategies (policies, procedures, processes, methods, techniques, roles, etc.).

Analyze Data

Classify the data by some common methodology.

- Question what the data appear to be revealing.
- Count, measure, and evaluate the forces and factors that begin to emerge during the analysis of the data.
- Compare data to the objectives and goals that have been established for the project.
- Look for trends, deviations, and other distinct characteristics of the data.
- Correlate different data that have emerged on the project.
- Conduct quantitative and qualitative assessment of the data. Consider using statistical techniques to assess the data.
- Follow your instincts in terms of what the data are revealing—which elements of data are providing meaningful insight into the problem and its solution.

Develop and Evaluate Alternatives

- Identify a few alternatives that might solve the problem.
- Evaluate these alternatives through the use of informal "cost-benefit" analysis to select the one or two that promise a useful solution to the problem.
- Test the one or two alternatives with the client.
- Select a final alternative.
- Develop implementation strategy.

Present Recommendations

- Prepare report.
- Brief client and/or sponsor.
- Rework as needed.
- Submit final report.
- Send a thank-you note (e-mail) to the project team members and other stakeholders who helped bring the project to a successful conclusion.
- Work with the project team members to prepare a "lessons learned" summary of the project and forward it to key stakeholders.

A small project can be managed by using a scaled-down version of most of the concepts, processes, and techniques employed for larger projects. The client that is sponsoring the project and the project stakeholders should be kept informed on the status of the project on a regular basis.[23]

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[23] Material on small project management is paraphrased from David I. Cleland and Lewis R. Ireland, Project Manager's Portable Handbook (New York: McGraw-Hill, 2000), pp. 3.17–3.21.

3.14 TO SUMMARIZE

Some of the major points that have been expressed in this chapter include:

- Project management can be used for a wide variety of purposes. On balance, the reasons for the use of project management can be centered around the following categories: (1) size of the undertaking, (2) unfamiliarity, (3) market change, (4) interdependence, (5) resource sharing, (6) importance of the project, and (7) organizational reputation. Within these categories project management is used:
  - To share resources across organizational units
  - To focus attention on specific customers in specific market segments
  - To integrate systems and subsystems simultaneously or in parallel within independent organizations
  - To manage focused interorganizational efforts from a profit-center perspective
  - To deal with specific ad hoc problems and opportunities
  - To expedite responses to new events in the organization or its environment
  - To accommodate the inherent interdependency within an organizational system
  - To combine several proven methods of organizational design, such as product, functional, and geographic
  - To preserve unity of command, unity of direction, and parity of responsibility and authority for disparate activities
  - To fix accountability within organizations
  - To bring a wide range of experience and viewpoints into focus on tasks, opportunities, and problems
  - To formalize an informal management process such as project engineering
  - To establish a liaison role between organizational units or specialties
  - To test a new organizational strategy without committing to a formal structural reorganization
  - To deal with the magnitude of an undertaking requiring massive input of capital, technology, skills, and resources
  - To manage unique or rare activity
  - To focus effort to maintain an organizational reputation
  - To keep a low-profile, long-term organizational effort alive while awaiting suitable competitive or environmental conditions
  - To facilitate the participation of organizational members in the management process of the enterprise
  - To deal with a new technology which requires pooling of existing resources and capacities
  - To satisfy a customer's need for the unified management of a project-based contract in order to avoid having that customer work with many different functional organizations
  - To meet competition

  - To deal with a task that is bigger than anything the organization is accustomed to handling
  - To promote participative and professional management
- There is a cost associated with dealing with change. That cost typically centers on the use of resources in dealing with the creation of improved and new products, services, and organizational processes.
- Throughout this chapter are examples of how projects are used to deal with change, including the change forced on an organization through a crisis or unexpected event.
- Project management can be used to shut down operations such as in the deactivation of a plant, meet environmental protection standards, or implement other facility modifications where the objective is to change the circumstances under which the enterprise is operating.
- Major projects dealing with the changing of the infrastructure of societies are particularly complex to manage. A couple of examples were provided in this chapter to illustrate this point.
- A few typical challenges to the design and implementation of projects were cited at the end of this chapter.
- Project management meets the need for providing an organizational focus not found in the traditional form of organization. However justified, project management should not be used until the leaders of the organization are committed to its use and are willing to prepare a suitable culture for project management to germinate and grow.
- "Selling" project management to senior managers is a value proposition that focuses on the difference between what is being done today and what can be done through the use of project management.
- Internal selling of project management is trying to change the organization to adopt project management as the management system of choice.
- External selling of project management is providing a service to an organization when that organization does not want to develop project management as its way of doing business for product and service development and delivery as well as organizational process change.
- Using a system to categorize and define the types of projects an organization will use for business is a means of building and understanding the organization's capability.
- Priority of projects equates to urgency of need for the benefits of that project.
- Small projects require disciplined planning and management, but at a lesser scale than large projects.
- Small projects can be used for a variety of work efforts for the organization, such as reengineering, organizational change, and studies.

3.15 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Christopher A. Chung and Abu Md Huda, "Practical Tools for Project Selection," chap. 4 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- Lynn Crawford, "Winning the Sydney to Hobart: A Case Study in Project Management," and Gerald W. Crabtree, "TAXOL—An Example of 'Fast-Track' Drug Involvement," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (First published in ***Proceedings,*** PMI Seminar/ Symposium, 1993, pp. 53–59; and ***Proceedings,*** PMI Seminar/Symposium, 1993, pp. 616–621.)
- Russell D. Archibald, ***Managing High-Technology Programs and Projects*** (New York: Wiley, 1992). This book provides a wealth of information based on theory and tempered by the author's experiences over an extensive career in project management. Written from the project manager's perspective and designed to provide detailed guidance, this book expounds on proven methods that include checklists for start-up and closeout of projects.
- Kevin Forsberg, Hal Mooz, and Howard Cotterman, ***Visualizing Project Management: A Model for Business and Technical Success*** (New York: Wiley, 2000). This book details the practices and a proven methodology for performing project management in a variety of industries—most specifically in manufacturing. The concrete examples of "how to" perform various tasks that support project management work. It also addresses the technical performance requirements for projects and provides a model for requirements analysis, which most project management books omit.
- Lynn Crawford and Terry Cooke-Davies, "Enhancing Corporate Performance through Sustainable Project Management Communities," ***Proceedings,*** Project Management Institute, 1999 Annual Seminars and Symposium, October 10, 1999, 7 pp. This paper looks at the success and failure of projects as they affect organization performance. The authors identify seven prerequisites for an effective project management community.
- George Pitagorsky, "A Scientific Approach to Project Management," ***Machine Design,*** Cleveland, Ohio, July 26, 2001, pp. 78–83. The author touches on several areas of importance to consider when using project management and the areas in which one may apply the principles of project management. This article also challenges the reader to find new and workable solutions to business problems.

- Janice Thomas, Kam Jugdev, Connie L. Delisle, and Pam Buckle, "Selling Project Management to Senior Executives: What's the Hook?" *Proceedings,* Project Management Institute, Annual Seminars and Symposium, September 7–16, 2000, pp. 827–833. This paper looks at research efforts on "selling" project management to senior executives. The authors make specific points about executive needs, value alignment, and competitive "selling" to executives

3.16 DISCUSSION QUESTIONS

1. What is involved in strategic planning? In strategic implementation?
2. How do projects become the driving force in determining how organizational resources are used?
3. What is meant by the sentence, "Projects are resource-consuming activities"?
4. List and describe some of the major reasons for an organization to use project management.
5. How does an organization know when the size of an undertaking suggests using project management?
6. Discuss situations in your work or school experiences that were permeated by unfamiliarity. Could project management have been used to address the unfamiliarity?
7. What kinds of projects can be crucial to an organization's professional reputation?
8. What types of questions would a manager ask to determine the importance of a project?
9. How does the use of a project management structure affect the culture of a corporation?
10. What kinds of questions are important in determining whether a project supports an organization's strategies and its overall mission, objectives, and goals?
11. How would you "sell" project management within a major corporation, if you work in the organization?
12. What "value statements" would you use to "sell" project management to your boss?

3.17 USER CHECKLIST

1. Is the use of project management in your organization driven by any outside forces? What forces?
2. Is your organization project-driven in any way? In what way?

3. Does your organization recognize when the need for project management arises? Give examples.
4. Does the size of any of your current undertakings warrant using project management?
5. Are any of the ad hoc projects currently being undertaken by your organization fraught with unfamiliarity?
6. Is your organization comfortable in understanding the competitive market in which it works? Is the market dictating the use of project management?
7. Does management recognize and facilitate the large number of interrelationships that can exist between functional departments when each has some role in a project?
8. Are any of your organization's current undertakings crucial to its reputation?
9. How does your organization combine project and functional approaches to management?
10. Does your organization take advantage of emerging opportunities for new products by using a project management team to design and develop innovative ideas?
11. Does your organization promote individual entrepreneurship by supporting the development of creative ideas?
12. Does your organization recognize when not to use project management?

3.18 PRINCIPLES OF PROJECT MANAGEMENT

1. Project management provides a sharp focus on planning, implementation, and control over work of a unique or unfamiliar nature.
2. Project management has three functions: develop and deliver products and services as well as support organization process change.
3. Project management involves greater stakeholder involvement than typical general management approaches.
4. Project management "flattens" an organization's structure, which puts a sharp focus on the work to be accomplished through dedicated efforts of planning, controlling, and implementing.
5. Project management is used to implement the strategic goals through the best use of resources to meet organizational purposes.
6. Project management, when properly implemented in an organization, has an interdependence with strategic objectives.
7. Selling project management requires that the value be sold rather than the features.

8. Selling project management as the system of choice changes the fundamental way business is pursued.
9. Selling project management requires changing a mindset that the current method of work is adequate.
10. Crisis creates opportunities to implement project management.

3.19 PROJECT MANAGEMENT SITUATION— WHEN TO USE PROJECT MANAGEMENT

This book promotes the use of project management as a key competitive advantage for all organizations. It also avoids stating that project management is the only solution for all business needs. Project management, however, is considered a vital part of the strategies for an organization to use when certain conditions exist and when there is a need for rapid planning and execution of critical work to develop and deliver products and services as well as a means of effecting organizational process change.

Knowing when to use project management requires some consideration of the situation and getting the stakeholders to support project management as "the best solution" for a given need. This approach drives the need to understand project management capabilities and when to apply these capabilities. It also drives development of a project management capability within a company.

The situation is that a company with 122 employees provides maintenance services for large residential housing complexes where the residential complexes require common services to retain their operations. Some of the areas that require services are:

- Clean and paint swimming pool; winterize for cold weather.
- Maintain common landscape areas by cutting grass, trimming bushes and hedges, fertilizing plants, trimming trees, and planting replacement ground cover materials.
- Service air conditioning units that serve common areas.
- Service heating units that serve common areas.
- Remove snow during winter months.
- Service plumbing, water, electrical, and gas items when there is a failure.
- Telephone, cable television, and personal items of residents are not serviced.

This company has grown from 7 people approximately 9 years ago to 122 today. The company performs tasks associated with 14 major residential complexes and 6 smaller residential units. Over the years, growth has been steady, but the turnover of technicians has been high. Those who left complained that the amount of work and the erratic schedules hampered their personal lives. Management, consisting of two owners and a general manager, has been frustrated

in efforts to smooth out the fluctuations in work load. Further, there are several individuals, some former employees, who are starting companies that will directly compete for the work at residential units.

It is recognized that the high turnover rate with technicians and the emerging competition will probably stop further growth and, if nothing is done, the company will probably lose some of its current customers. A consultant recommends converting to a project-driven enterprise whereby all work is performed as projects by teams. Management is considering this, but doesn't know if it will work because they are uncertain as to how projects could be used.

Concerns facing the company are:

- Is the work to be accomplished compatible with a project approach?
- Can the employees work in teams to perform the different tasks?
- What is the cost to change to a project-driven enterprise?
- What is the cost if the organization does not adopt project management?
- How soon could the organization change and start delivering services under project management?
- How will a change to project management affect the customers? Positively? Negatively?

The company faces a dilemma that it must change. What is the proper direction? Can the company use project management for all of its work or just a part of it? One thing is sure, it must change to something that is successful in delivering services and reducing costs for these services to beat the emerging competition.

3.20 STUDENT/READER ASSIGNMENT

1. Using the project management situation, identify the benefits and shortcomings for an immediate transition to use project management for all services.
2. Considering the nature of the work being done and the knowledge levels of the technicians (probably high school graduates, some tech school graduates), how long would it take to indoctrinate them in the principles of project teams?
3. What do you see as most challenging if the company decides to convert to a project-driven enterprise?
4. Do the customers have any say in converting to a project-driven and delivered service? If so, what are some potential questions that the customers may ask?
5. Are there any potential savings (productivity increase) that you can identify from changing this company to a project-driven company?

CHAPTER 4
THE STRATEGIC CONTEXT OF PROJECTS[1]

"Many of us are like the little boy we met trudging along a country road with a cat-rifle over his shoulder. 'What are you hunting, buddy?' we asked. 'Dunno, sir, Zain't seen it yet.'"

R. LEE SHARPE

4.1 INTRODUCTION

An emerging conviction among those professionals who do research on, publish, and practice project management is the belief that projects are building blocks in the design and execution of organizational strategies. An ongoing and competitive organization has a "stream of projects" flowing through the organization that support changes in operational and strategic initiatives.

In this chapter the strategic relationship of projects to organizational purposes will be considered. A project selection framework will be suggested. An initial look at project planning will be provided, along with a description of the project "owner's" need for participating in the selection and use of projects to support organizational purposes. A key part of this chapter includes the description of a ***project management system,*** which provides a philosophy and standard for a "systems view" in the management of projects.

4.2 STRATEGIC TRANSITIONS

The most dangerous time for an organization is when old strategies are discarded and new ones are developed to respond to competitive opportunities. The changes that are appearing in the global marketplace have no precedence; survival in today's

[1] Portions of this chapter have been taken from D. I. Cleland, "Measuring Success: The Owner's Viewpoint," *Proceedings,* PMI Seminar/Symposium, Montreal, Quebec, September 20–25, 1986; and D. I. Cleland, "Project Owners: Beware," *Project Management Journal,* December 1986, pp. 83–93.

unforgiving global marketplace requires extraordinary changes in organizational products, services, and the organizational processes needed to identify, conceptualize, develop, produce, and market something of value to the customers. Projects, as building blocks in the design and execution of organizational strategies, provide the means for bringing about realizable changes in products and processes. Senior managers, who have the residual responsibility for the strategic management of the enterprise, can gain valuable insights into both the trajectory of the enterprise and the speed with which the competitive position of the enterprise is being maintained and enhanced. This can be done by conducting a regular review of the status of the "portfolio of projects" in the enterprise.

A belief that projects are building blocks in the design and execution of future strategies for the enterprise means that the organizational planners recognize that preparing for the future on the basis of extrapolations of the past results from a well-understood and predictable platform of past experience is not valuable—and can be dangerous to the health of the enterprise. Although planning based on extrapolation of the past has some value for an ongoing business providing routine products and services, it makes little sense when the enterprise's future is dependent on developing and producing new products and services through revised or new organizational processes. All too often people persist in believing that what has gone on in the past will go on into the future--even while the ground is shifting under their feet. If the enterprise is engaged in a business where competition is characterized by the appearance of unknown, uncertain, or not yet obvious new products and services, especially to the competition, then project-driven strategic planning is needed. Project-based strategic planning assumes that:

- Little may be known of the new product or service but much is assumed about potential customer interest in the forthcoming initiative.
- Decision making on the project during its early conceptual phases is based on what information is available. Assumptions concerning the potential future business success of the innovation are an important source of knowledge on which decisions can be made.
- Assumptions concerning the new venture are systematically converted into meaningful databases as new knowledge concerning the innovation evolves through study by the project team.
- Even after the prototype is developed and field-tested with customers, uncertainty remains as to how well the product or service will do in the competitive marketplace.

One company that has married strategic planning and project management is Blue Cross and Blue Shield of Louisiana (BCBSLA). Linking project management, strategy formulation, and implementation provides for a system of checks and balances for the company. A Corporate Project Administration Group was formed to assist corporate executives in a refinement of the scope of corporate initiatives—and to develop goals and objectives for corporate projects. The group

was responsible for working with project managers to develop and execute plans and keep corporate executives informed of the progress being made on the projects. A process was created that tracks corporate initiatives and project performance as they relate to corporate goals and objectives. Monthly status reports are provided for each project initiative. By combining project management and strategic planning the company is better able to select corporate objectives and goals, and initiate and track projects that are related to corporate initiatives.[2]

4.3 IMPLICATIONS OF TECHNOLOGY

Management of an enterprise so that its future is ensured requires that the technology involved in products and/or services and organizational processes is approached from two principal directions: the strategic or long-term perspective and the systems viewpoint. In both directions, projects play a key role. In this chapter these two directions will be woven into a project management philosophy in which projects are building blocks in the design and execution of organizational strategies. A couple of examples of how contemporary organizations deal with projects make the point:

- At Banc One Corporation, one of the fastest-growing and most profitable banks in the United States, 3 percent of the profits has been dedicated to technology R&D. One of the bank's most important technology projects is a new computer system that has dramatically altered the way Banc One branches operate. The system includes the creation of a new credit card processing system. With the assistance of the Dallas-based Electronic Data Systems Corporation, the bank has moved from older mainframe systems to a distributed architecture.[3]
- Sony is probably the most consistently inventive consumer electronics enterprise in the world. It has had hit after hit of high-technology products. Its products have created billion-dollar markets, with devices that have altered people's work and leisure. Sony's portfolio of products ranges from semiconductors, batteries, and recording tapes to video and audio gear for consumers, professionals, computers, communications equipment, and factory robots. Last year the company spent $1.5 billion on research and product development projects—roughly 5.6 percent of revenues. Each year the company sends out 1000 new products—an average of almost 4 a day. Some 200 of these new products are aimed at creating whole new markets, such as the Mini Disc portable digital stereo. Sony founder and honorary chairman Masaru says that the key to success at Sony—and to everything in business, science, and technology—is never to follow the others. In other words, use innovation—the creation of something that does not currently

[2] Philip Diab, "Strategic Planning + Project Management = Competitive Advantage," PM *Network*, Project Management Institute, July 1998, pp. 25–28.

[3] Alice LaPlante, "Shared Destinies: CEOs and CIOs," *Forbes* ASAP, December 7, 1992, pp. 32–42.

exist. Product/project ideas come from many different organizational levels in the company, from the senior managers to the young engineers working in the product design department. Some of Sony's key philosophies are:

- An emphasis on making something out of nothing
- People who are optimistic, open-minded, and wide-ranging in their interests, who move around a lot among product groups
  A belief that having continuous success in the same area makes you believe too much in your own power, which harms your creativity
  A belief that new products come primarily out of a creator's imagination, not from a marketing study
- Occasional use of a "skunk works" project to circumvent the formal project approval process in the company
- Use of competing project teams to work on promising technologies[4]

- In the early 1990s, Boeing invested heavily in new technology so that it could design a commercial aircraft, the 777 twin jet, entirely by computer. It connected 1200 engineers and countless other staffers to 2200 work stations and four mainframes, in Seattle, Philadelphia, the Midwest, and Japan. That technology enabled the aircraft manufacturer to solve virtually every design problem through computer animation—without having to build a prototype—and thereby limit the cost of making design changes down the line. For instance, when a team of engineers discovered a glitch in the jet's wiring, they "fixed" it instantly on their 3-D digital model. The technology cut the design time for the 777 in half.[5]

Projects are essential to the survival and growth of organizations. Failure in project management in an enterprise can keep the organization from accomplishing its mission. The greater the use of projects in accomplishing organizational purposes, the more dependent the organization is on the effective and efficient management of those projects. Projects are a direct means of creating value for the customer in terms of future products and services. The pathway to change will be through projects. Future strategies will entail a portfolio of projects, some of which will survive and lead to new products and/or services and the manufacturing and marketing processes that will beat out the competition. With projects playing such a pivotal role in future strategies, senior managers must approve and maintain surveillance over these projects to determine which ones can make a contribution to the strategic survival of the company. Two authors state:

> **The challenge facing senior management seeking to implement revolutionary change within the organization is to manage that change outside the straitjacket of the existing bureaucracy, procedures and norms. Projects and project management help senior management to do precisely** that.[6]

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[4]Brenton R Schlender, "How Sony Keeps the Magic Going," *Fortune,* February 24,1992, pp. 75–82.
[5]Paraphrased from Anne Bernasek, "Prosperity," *Fortune,* October 2, 2000, pp. 101–108.
[6]Sergio Pellegrinelli and Cliff Bowman, "Implementing Strategy through Projects," *Long Range Planning,* vol. 27, no. 4, 1994, pp. 125–132.

For the last decade or so, many managers have been preoccupied with the improvement of operations through remedial strategies involving the use of reengineering, benchmarking, TQM, time-based competition, empowerment, team-based organizational designs, continuous improvement, and the so-called learning organization. The use of outsourcing and the "virtual" organization helped eliminate inefficiencies, improve customer satisfaction, and make the enterprise more competitive. In the short run, these remedial strategies helped improve organizational efficiency and effectiveness. But survival in the long-term requires that the enterprise do something that will establish a difference in its products/services and organizational processes that it can preserve in the marketplace. Although current activities are the basic components of today's competitiveness, overall strategic competitive behavior requires that new initiatives are conceptualized, developed, and implemented that will lead to changes in products/services and organizational processes that will ensure future competitiveness. In many cases this means that these new initiatives have to be different from those of the competitors. Few enterprises are able to survive and compete successfully on the basis of current operational capabilities over an extended period. The reason for this is the simple diffusion of new technologies, practices, and best products/services and supporting organizational processes––expressed in a superior way of meeting and exceeding customer expectations. The more a company benchmarks its competitors, the more likely it is that the enterprise and the competitor will become similar. The more a company uses outsourcing as a competitive thrust, the more likely it is that its competitors will copy its strategies and move to an equitable market position.

As rivals imitate each other's operational competitive strategies, the more probable it is that their strategies will converge. Competition becomes a series of behaviors that look similar—and no one competitor can become a big winner. Competition based on operational performance becomes self-defeating, leading to wars of competitive attrition. Unfortunately, many of the "flavors of the year" in the last 10 years have led to diminishing competitive returns. Competition based on continuous improvement reinforced by many of the flavors of reengineering, benchmarking, change management, and so forth, have drawn all too many enterprises into a "me too" mentality that has inhibited true creativity and innovation in creating strategic pathways for true competition in strategic performance.

The responsibility for allowing companies to degenerate into competition based on operational improvements clearly rests with the company's leaders. Unfortunately, this means that such leaders have failed to recognize their larger role beyond just operational stewardship, namely, a proactive role in selecting and executing the use of resources to provide a competitive, strategic pathway for the enterprise. Enterprise leaders have to work with the creative and innovative talent in the enterprise's pool of people and define and communicate new directions, allocating resources, making trade-offs through the study of alternatives, and making the hard choices of what to do for the future and—just as important—what not to do by way of committing organizational resources.

A product or process development project is a business venture—the creation of something that does not currently exist but which can provide support to the overall organizational strategy being developed to meet competition. Many projects are found in successful organizations.

4.4 A STREAM OF PROJECTS

An enterprise that is successful has a "stream of projects" flowing through it at all times. When that stream of projects dries up, the organization has reached a stable condition in its competitive environment. In the face of the inevitable change facing the organization, the basis for the firm's decline in its products, services, and processes is laid—and the firm will hobble on but ultimately face liquidation.

In the healthy firm, a variety of different preliminary ideas are fermenting. As these ideas are evaluated, some will fall by the wayside for many reasons: lack of suitable organizational resources, unacceptable development costs, a position too far behind the competition, lack of "strategic fit" with the enterprise's direction, and so on. There is a high mortality rate in these preliminary ideas. Only a small percentage will survive and will be given additional resources for study and evaluation in later stages of their life cycles. Senior managers need to ensure that evaluation techniques are made available and their use known to the people who provide these preliminary innovative ideas. Essentially this means that everyone in the organization needs to know the general basis on which product and process ideas can survive and can be given additional resources for further study. Senior management must create a balance between providing a cultural ambience in the enterprise that encourages people to bring forth innovative product and process ideas and an environment that ensures that rigorous strategic assessment will be done on these emerging ideas to determine their likely strategic fit in the enterprise's future.

For example, Elan Corporation, Plc., whose mission is the development of novel drug absorption systems for therapeutic compounds that provide distinctive benefits for the physician and patient—carrying out all the necessary clinical studies and regulatory work prior to market introduction—follows a fundamental strategy called *mind* to market. To implement this strategy, which brings their products to market through the formulation, clinical testing, registration, and manufacturing phases, project management is used. In the product development area, the company was committed to 56 active projects, utilizing 9 specialized drug delivery technologies in 18 therapeutic categories, which range from cardiovascular and narcotic analgesics to antiemetics and neuropharmacological agents. Research and development is the very essence of the company's business. Its work in R&D ensures a continuing stream of new products and technologies. In the global marketplace, the company currently has new-drug applications or their equivalent filed for 20 products in 30 countries around the world.[7]

[7] *Annual* Report. Elan Corporation. Plc., 1992.

A large retailer's strategy in assessing strategic opportunities is to jump-start a number of small projects at a relatively low cost and then shift the money into the promising ideas as the development work evolves. One example of such a promising project involves the development of electronic shelf tags, which would display pertinent information about a product, including the unit price, price per ounce, sales data, or whatever the company wanted to highlight. No longer would the employees have to change the traditional shelf tags. Another project is under development for a ceiling-mounted scanner to track the number of customers entering and exiting a store, thus alerting personnel that additional sales assistance is needed in specific departments. Another project borrows from just-in-time manufacturing inventory management concepts and processes. Products are shipped to distribution centers only when needed, thus reducing inventory requirements. Suppliers under this new procedure would write their own purchase orders by looking into the retailer's inventory databases and would ship products in time to keep the shelves from becoming bare.

When the use of project management is described in an enterprise, it is easy to think of just one project in the organization. Often we think of a large single dedicated project team led by a project manager who has the proper authority and responsibility needed to do the job. What usually exists after the enterprise has experimented with project management for a while is that several and perhaps many projects are under way, each having its own life-cycle phases. Team members may be working on several different small projects. As the use of project management continues to expand, the matrix organizational design emerges more fully and many projects share common resources provided by the functional entities and appropriate stakeholders. As the growth of project management continues and different projects come and go, there are some unique forces at work. The projects share common resources but will likely have objectives that are not shared with other projects, particularly if a diverse set of customers is involved. As projects start and are closed out or terminated for cause, a new mix in the use of resources comes forth. New projects may have a higher priority than the existing ones. As the competition for resources gets under way in the matrix organization, the opportunities for conflict in the assignment of the resources to the projects will erupt, often requiring senior management to intervene in deciding how the project priorities will impact the priorities for the use of the resources; the opportunity for gamesmanship emerges. Also, having many projects under way provides the opportunities for politics to enter the picture. Sometimes the enterprise will appoint a "manager of projects" who has jurisdiction over the project managers who are acting as a focal point for the projects.

4.5 STRATEGIC RELATIONSHIP OF PROJECTS

Organizational conceptual planning forms the basis for developing a project's scope in supporting the organizational mission. For example, a project plan for facilities design and construction would be a series of engineering documents

from which detailed design, estimating, scheduling, cost control, and effective project management will flow. Conceptual planning, while forming the framework of a successful project, is strategic in nature and forms the basis for the following:

- Contributing, through the execution of strategies, to the organizational objectives, goals, and mission
- Standards by which the project can be managed
- Coping with the market and other environmental factors likely to have an impact on the project and the organization

Senior management deficiencies in the organization using project management will probably be echoed in the management of the projects. For example, an audit conducted in the early 1980s of a gas and electric utility that experienced problems with a major capital project found several key deficiencies in that utility, such as:

- Weak basic management processes
- No implementation of the project management concept for major facilities
- Fragmented and overlapping organizational functions
- No focus of authority and accountability[8]

Ford Motor Company is committed to the use of project management in its corporate strategy. To provide consistency in the use of project management, Ford realized during the 1980s that a common project management system was required. To bring about a consistent way to manage projects, a Ford corporate mainframe project management tool selection committee was created. Care was taken to ensure that users would be given a voice in the system selection process. Several key policies were established to both guide and motivate the committee to pursue its work. (1) There was agreement by senior management to accept the recommendations of the committee, assuming that such recommendations were supported by adequate facts. (2) The committee agreed to operate as a cross-functional project team. (3) A schedule was adopted to maintain user interest and enthusiasm; decisions by the committee would be made by consensus. (4) It was recognized that leadership of the committee was an important variable in realizing success of the work under way?[9]

4.6 DETERMINING STRATEGIC FIT

Projects are essential to the survival and growth of organizations. Failure in the management of projects in an organization will impair the ability of the organization to accomplish its mission in an effective and efficient manner. Projects are a direct means of creating value for customers—both customers in the marketplace

[8] Cresap, McCormick, and Paget, Inc., "An Operational and Management Audit of PG&E: Executive Summary," June 1980.

[9] Paraphrased from "Using a Cross-Functional Team at Ford to Select a Corporate PM System:' PM Network. August 1990, pp. 35–59.

and "in-house" customers, who work together in creating value for the ultimate customer in the marketplace. The pathway to change is through the use of projects that support organizational strategies. Future strategies for organizations entail a portfolio of projects, some of which survive during their emerging life cycle and create value for customers. Because projects play such a pivotal role in the future strategies of organizations, senior managers need to become actively involved in the efficiency and effectiveness with which the stream of projects is managed in the organization. Surveillance over these projects must be maintained by senior managers to provide insight into the probable promise or threat that the projects hold for future competition. In considering these projects, senior managers need to find answers to the following questions:

- Will there be a "customer" for the product or process coming out of the project work?
- Will the project results survive in a contest with the competition?
- Will the project results support a recognized need in the design and execution of organizational strategies?
- Can the organization handle the risk and uncertainty likely to be associated with the project?
- What is the probability of the project's being completed on time, within budget, and at the same time satisfying its technical performance objectives?
- Will the project results provide value to a customer?
- Will the project ultimately provide a satisfactory return on investment to the organization?
- Finally, the bottom line question: Will the project results have a strategic fit in the design and execution of future products and services?

As senior managers conduct a review of the projects under way in organizations, the above questions can serve to guide the review process. As such questions are asked and the appropriate answers are given during the review process, an important message will be sent throughout the organization: Projects are important in the design and execution of our organizational strategies!

The question of the strategic fit of a project is a key judgment challenge for senior executives. Who should make such decisions? Clearly those executives whose organizational products and services will be improved by the successful project outcome should be involved. Senior executives of the enterprise should act as a team in the evaluation of the stream of projects that should flow through the top of the enterprise for assessment and determination of future value. Participative decision making concerning the strategic fit of projects is highly desirable. For some senior executives this can be difficult, particularly if they have been the entrepreneurs who conceptualized the company and put it together. Such founding entrepreneurs tend to dominate the strategic decision making of the organization, reflecting their ability in having created the enterprise through their strategic vision in developing a sense of future needs of products and services.

But senior executives, too, can lose their sense of future vision for the enterprise. Or they can become fixated on favorite development projects that may not make any strategic sense to the organizational mission and goals. For example, in a large computer company the founder's dominance of key project decisions drove out people whose perceptions of a project's strategic worth were contrary to that of the CEO. A new-products development group was abruptly disbanded by the CEO, who had sharp differences of opinion with the group executive over several key projects. This group executive had disagreed with the CEO on a key decision involving continuing development of a computer mainframe project whose financial promise was faint—if potentially attainable at all.

4.7 THE VISION

Projects and organizational strategies start with a vision. A "vision is the art of seeing things invisible to others," according to Jonathan Swift.

The corporate vision statement of Whirlpool Corporation is, "Whirlpool, in its chosen lines of business, will grow with new opportunities and be the leader in an ever-changing global market." Implicit in the statement are commitments to market orientation, leadership, customer satisfaction, and quality.

During the strategic fit review of organizational projects, insight should be gained into which projects are entitled to continue assignment of resources and which are not. Senior managers need to decide; the project manager is an unlikely person to execute the decision. Most project managers are preoccupied with bringing the project to a successful finish, and they cannot be expected to clearly see the project in an objective manner of supporting the enterprise mission. There is a natural tendency for the project manager to see the termination of the project as a failure in the management of the project. Projects are sometimes continued beyond their value to the strategic direction of the organization. The selection of projects to support corporate strategies is important in developing future direction.

4.8 A PROJECT SELECTION FRAMEWORK

In general terms, projects are selected through a filtering process, which considers all alternative projects available to the organization. Figure 4.1 depicts this general filtering process.

A project selection framework is shown in Table 4.1. In the leftmost column is a set of evaluation criteria. The body of the table shows how a proposed new program to begin manufacturing system components in Europe might be evaluated. The following explains the table's components:

- The "criteria weights" in the third column of the table reflect the components' relative importance and serve to permit the evaluation of complex project characteristics within a simple framework. A base weight of 20 is used here for

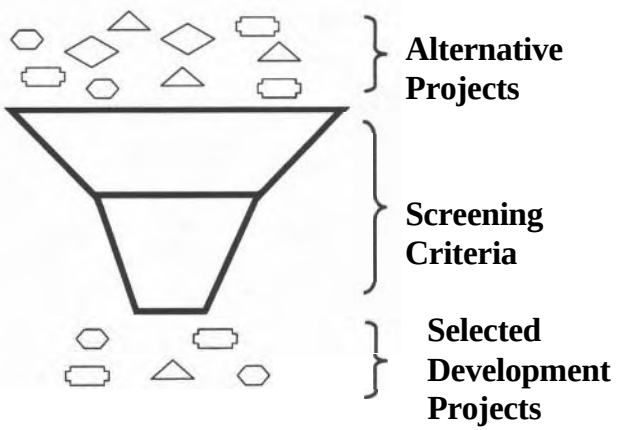

FIGURE 4.1 New project/process development filter.

the major category related to mission, objectives, strategy, and goals. Weights of 10 are applied to the subcategories.

- Within each major category, the 20 "points" are judgmentally distributed to reflect the relative importance of subcategories or some other characteristic of the criterion. For instance, the three stages of ***strategy*** and the four subgoals are weighted to ensure that earlier stages and goals are treated as more important than later ones. This implicitly reflects the time value of money without requiring a more complex "present value" discounting calculation.
- The first criterion in Table 4.1 is the ***"fit" with mission.*** The proposal is evaluated to be consistent with both the "product" and "market" elements of the mission and is thereby rated to be "very good," as shown by the 1.0 probability entries at the upper left.
- In terms of ***consistency with objectives,*** the proposal is rated to have a .2 probability (20 percent chance) of being "very good" in contributing to the ROI element of the objectives, a 60 percent chance of being "good," and a 20 percent chance of being only "fair," as indicated by the probabilities entered into the third row of the table. The proposed project is rated more poorly with respect to the "dividends" and "image" elements.
- The proposal is also evaluated in terms of its expected contribution to each of the three stages of the strategy. In this case, the proposed project is believed to be one that would principally contribute to Stage 2 of the strategy. (Note that only certain assessments may be made in this case, because the stages are mutually exclusive and exhaustive.)
- The proposal is similarly evaluated with respect to the other criteria.
- The overall evaluation is obtained as a weighted score that represents the sum of products of the likelihood (probabilities) and the 8, 6, 4, 2, and 0 arbitrary

level weights that are displayed at the top of the table. For instance, the ***consistency with objectives—ROI*** expected level weight is calculated as:

$$.2\,(8) + .6\,(6) + .2\,(4) = 6.0$$

This is then multiplied by the criterion weight of **10** to obtain a weighted score of **60.** The weighted scores are then summed to obtain an overall evaluation of **610.**[10]

Of course, this number in isolation is meaningless. However, when various projects are evaluated in terms of the same criteria, their overall scores provide a reasonable basis for developing the ranking shown on the right side of Table 4.1. Such a ranking can be the basis for resource allocation, because the top-ranked program is presumed to be the most worthy, the second-ranked is the next most worthy, and so forth.

It can readily be seen that such a project selection process will enhance the implementation of the choices made in the strategic planning phase of management. The critical element of this evaluation approach is its use of project selection criteria that relates to the organization's mission, objectives, strategy, and goals and will reflect critical bases of strategy, such as business strengths, weaknesses, comparative advantages, internal consistency, opportunities, and policies.

4.9 PROJECTS AND ORGANIZATIONAL MANAGEMENT

Projects, goals, and objectives must fit together in a synergistic fashion in supporting the enterprise mission. Project success by itself may not contribute to enterprise success. Projects might, early in their life cycle, show promise of contributing to enterprise strategy. A project that continues to support that mission should be permitted to grow in its life cycle. If the project does not provide that support, then a strategic decision faces the senior managers: Can the project be reprogrammed, replanned, and redirected to maintain support of the enterprise mission, or should the project be abandoned?

Project managers cannot make such a strategic decision because they are likely to be preoccupied with bringing the project to a successful finish, and project termination is not their responsibility. Such managers may lack an overall perspective of the project's strategic support of the enterprise mission. Therefore, the decision of what to do about the project must remain with the general manager, who is the project "owner" and has residual responsibility and accountability for the project's role in the enterprise mission and usually puts up the money for the project.

Project success is very dependent upon an appropriate synergy with the enterprise's success. The management of the project and the management of the enterprise depend on a synergistic management approach — planning, organizing, evaluation, and control tied together through an appropriate project-enterprise leadership. This synergy is shown in Fig. 4.2.

[10] Adapted from D. I. Cleland and W. R. King. *System Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983), pp. 68–70.

TABLE 4.1 Project Selection Mode1

Program/project evaluation criteria	Sub-category	Criteria weights	Very good (8)	Good (6)	Fair (4)	Poor (2)	Very poor (0)	Expected level weight	Expected weighted score
"Fit" with mission	Product	10	1.0					8.0	80
	Market	10	1.0					8.0	80
	Subtotal	20							
Consistency with objectives	ROI	10	.2	.6	.2			6.0	60
	Dividends	5		.2	.6	.2		4.0	20
	Image	5			.8	.2		3.6	18
	Subtotal	20							
Consistency with strategy	Stage 1	10					1.0	0	0
	Stage 2	7	1.0					8.0	56
	Stage 3	3					1.0	0	0
	Subtotal	20							
Contribution to goals	Goal A	8					1.0	0	0
	Goal B	6	.8	.2				7.6	45.6
	Goal C	4		.8	.2			5.6	22.4
	Goal D	2					1.0	0	0
	Subtotal	20							
Corporate ***strength*** base		10				.8	.2	1.6	16
Corporate ***weakness*** avoidance		10				.2	.8	.4	4
Comparative advantage level		10	.7	.3				7.4	74
Internal consistency level		10	1.0					8.0	80
Risk level acceptability		10				.7	.3	1.4	14
Policy guideline consistency		10			1.0			4.0	40
								Total score	610

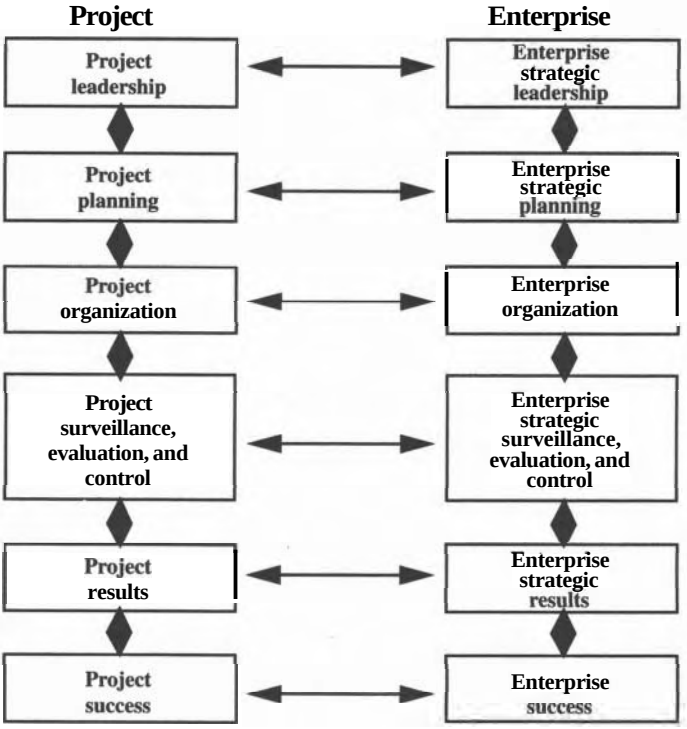

FIGURE 4.2 Project/strategic enterprise synergy. ***(Source: David I. Cleland, "Measuring Success: The Owner's Viewpoint,"*** Proceedings, ***Project Management Institute Seminar/Symposium, Montreal, Quebec, September 20–25, 1996, p. 6.)***

Projects are designed, developed, and produced or constructed for a customer. This customer or project owner may be an internal customer, such as a business unit manager who pays for product development by the enterprise central laboratory. An external customer might be a utility that has contracted with an architectural and engineering firm to design, engineer, and build an electricity generating plant.

Senior managers, who have the responsibility to sense and set the vision for the enterprise, need a means of marshaling the resources of the organization to seek fulfillment of that vision. By having an energetic project management activity in the enterprise, an organizational design and a development strategy are available to assist senior managers in bringing about the changes and synergy to realize the organizational mission, objectives, and goals through a creative and innovative strategy. Leadership of a team of people who can bring the changes needed to the enterprise's posture is essential to the attainment of the enterprise's vision. As additional product and/or service and process projects are added to marshal the enterprise's resources, the strategic direction of the enterprise can be guided to the attainment of the vision. When projects are accepted as the building blocks in the design and execution of organizational purposes, a key strategy has been set in motion

to keep the enterprise competitive. Such strategies are dependent on the quality of the leadership in the enterprise.

Compaq Computer Corporation CEO Eckhard Pfeiffer provided the leadership in launching a long-term strategy initiative in that company. This planning effort was launched as soon as the immediate situation at the company was moving adequately toward correction. A comprehensive long-range strategy was developed and put in place. The CEO stated that the focus of the company was clearly on future strategy—a means to totally transform the company.

One of the more important strategic decisions made by the Compaq CEO was to launch development efforts into cut-rate personal computers (PCs). An independent business unit was organized into a project team to develop a low-price machine—a real Compaq.

Revised manufacturing strategies were developed to get costs down at plants in Houston, Singapore, and Scotland. The entire manufacturing process strategy was rethought. An entire system is now built on a single assembly line instead of making the motherboard in one building and the chassis in another. Testing of every subassembly was stopped in favor of testing a sample. All finished systems were still fully tested. Compaq leaned on suppliers to cut prices to bring down overall manufacturing costs."[11] Project planning contributed to the overall planning strategy at Compaq.

4.10 PROJECT PLANNING

Why is project planning so important? The answer is simply because decisions made in the early phases of the project set the direction and force with which the project moves forward as well as the boundaries within which the work of the project team is carried out. As the project moves through its life cycle, the ability to influence the outcome of the project declines. After design of the project done early in the life cycle, the cost of producing the resulting product, as well as the product quality, has been largely determined. Senior managers tend to pay less attention during the early phases of the project than when the product development effort approaches the prototype or market-testing stage. By waiting until later in the life cycle of the project, their influence is limited in the sense that much of the cost of the product has been determined. Design has been completed, and the manufacturing or construction cost has been set early in the project. Senior managers need to become involved as early as possible, and they must be able to intelligently assess the likely market outcome of the product, its development cost, its manufacturing economy, how well it will meet the customers' quality expectations, and the probable strategic fit of the resulting product in the overall strategic management profile of the enterprise. In other words, when senior managers become involved early in the development cycle through regular and intelligent review, they can enjoy the benefits of leverage in the final outcome of the product and its likely

[11] Catherine Arnst and Stephanie Anderson Forest, "Compaq." *Business* Week, November 2, 1992, pp. 146–151.

acceptance in the marketplace. What happens early in the life cycle of the project essentially lays the basis for what is likely to happen in subsequent phases. Because a development project is taking an important step into the unknown—with the hope of creating something that did not previously exist—as much information as possible is needed to predict the possible and probable outcomes. For senior managers to neglect the project early in its life cycle and leave the key decisions solely to the project team is the implicit assumption of a risk that is imprudent from the strategic management perspective of the enterprise. Project planning is discussed more fully in Chap. 11.

Project planning and organizational renewal are linked through the development of organizational strategy. For example, Lawrence A. Bossidy, former CEO of Allied-Signal Company, upon joining the company established ambitious objectives including:

- An 8 percent annual revenue growth
- A total-immersion total-quality program
- A top-to-bottom change in human resources management

A statement of corporate vision and values listed these objectives, developed by the company's top 12 executives to include such things as being "one of the world's premier companies, distinctive and successful," and also the values of satisfying customers, integrity, and teamwork. The vision helped galvanize people. In addition, with these objectives as guidelines, Bossidy chopped $225 million from capital spending, reduced the annual dividend to $1 a share from $1.80, put eight small divisions up for sale, cut 6200 jobs, and combined 10 data processing centers into 2.

The company formed commodity teams—cross-functional project teams of manufacturing, engineering, design, purchasing, and finance in such areas as castings, electronic gears, machine parts, and materials. Each team was responsible for picking the best suppliers in its specialty, with the chosen suppliers getting long-term national contracts. Suppliers were expected to bring down costs for themselves and for Allied-Signal.

Projects are usually paid for by the project owners, key members of project teams. The project owner has the residual responsibility and accountability for managing the project during its life cycle.

4.11 THE PROJECT OWNER'S PARTICIPATION

Project owners cannot leave to others the responsibility for continuously measuring the success of the project, even experienced project management contractors and constructors. Foxhall stated:

> **The owner must recognize that he is the key member of the project development team. Only he can select and organize the professional team, define his own needs,**

> set his priorities and make final decisions. He cannot delegate these roles, so he must have a sustained presence in project management.[12]

The project owner clearly has responsibility for the efficiency and effectiveness of a contractor involved on the project. This requires a surveillance system to know what the contractor is doing and how well the contractor is performing. For example, one report noted:

> Another essential characteristic of a successful nuclear construction project is a project management approach that shows an understanding and appreciation of the complexities and difficulties of nuclear construction. Such an approach includes adequate financial and staffing support for the project, good planning and scheduling, and close management oversight of the project.[13]

Project owners in the utility industry, driven by the need to better manage projects, have responded by building up personnel and developing improved management systems. Such involvement has enabled the owners to obtain better control over projects and reduce risk.[14]

Every project has (or should have) its owner: the agency or organization that carries the project on its budget and whose strategic plans include the project as an essential building block for future growth or survival. The project owner has the residual responsibility to approve and maintain oversight of the project during its life cycle. The project owner should be more than a corporation or a government agency. Rather, the project owner should be identified by name, an individual recognized as the "personal owner," who assumes managerial oversight of the project as an element of future strategies. Project owners can come from within the organization, such as:

- A senior manager who budgets for a product or process development project
- A division profit center manager who funds an R&D project to support a product improvement program
- A manufacturing manager who is converting a traditional factory to an automated, flexible manufacturing system

Outside project owners usually contract for the project work through architects, engineers, and constructors. The Department of Defense contracts for substantially all the work involved in designing, engineering, and manufacturing weapon systems. In the electric utility industry, many investor-owned utilities do not design and construct their own generating facilities but hire architects, engineers, and constructors to perform most of the work. However, other utilities, such as

[12]William B. Foxhall, "Professional Construction Management and Project Administration," *Architectural Record*, March 1972, pp. 57–58.

[13]"Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," NUREG-1055, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984, pp. 2–17.

[14]Theodore Barry & Associates, "A Survey of Organizational and Contractual Trends in Power Plant Construction," Washington, D.C., March 1979.

Duke Power and Pacific Gas & Electric, perform a substantial portion of the design and construction for major projects in-house.

> To put it simply, the project owner is the one who puts up the money to fund the project. On such a project funder rests the responsibility to see that those funds are used in a prudent and reasonable fashion. This requires adequate assessment of the project risk, project plans, and ongoing monitoring, evaluation, and control of the resources used on the project. Furthermore, an owner's decision to fund a project affects a variety of "stakeholders" who have, or believe they have, a stake in the project and its outcome. In some cases some of these stakeholders will seek legal redress if the project does not meet their particular expectations. Emerging case law establishes that project managers have the legal responsibility for the strategic management of projects.[15]

These stakeholders and their predilections are discussed in Chap. 6.

A landmark study of the design and construction of nuclear power plants found that deep involvement by utilities (owners) in cost, schedule, productivity, and quality considerations contributed to project success as much as close management oversight of the project and the project's contractors.[16]

Project success depends on a commitment by the owner to use contemporaneous project management theory and practice. Support of the enterprise mission comes about through the project owner's effective discharge of her or his strategic planning and management responsibility.

Successful project management depends on senior enterprise management for authority, strategic guidance, and support. Senior managers in turn depend on project managers for timely, cost-effective achievement of project results to support corporate strategy. Project management is a form of "strategic delegation" whereby senior managers delegate to project managers the authority and responsibility to do such things as building capital facilities, introducing new products, conducting research and development, and creating new marketing and production opportunities.

Project management also is a type of strategic management control. Senior managers can use project management as a way to ensure that key strategies are accomplished in an effective manner. A senior manager oversees the strategic direction of the enterprise by providing resources to accomplish the mission, objectives, goals, and strategies. By determining the success or failure of a project, senior management ensures that control systems are instituted to track strategic progress of the enterprise. As project managers make and execute key decisions, these key decisions should be reviewed by senior managers to determine if the decisions are consistent with corporate strategy. Senior enterprise managers commit a serious breach of responsibility and accountability for the manage-

[15]For a more thorough analysis, see Randall L. Speck, "The Buck Stops Here: The Owner's Legal and Practical Responsibility for Strategic Project Management," *Project Management Journal*, September 1988, pp. 45–52.

[16]"Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," NUREG-1055, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984, pp. 3–15.

ment of the enterprise when they ignore or accept key project decisions without review. When adequate project evaluation is carried out to determine project success, senior managers get information on how effectively enterprise strategies are being implemented.

In order for the owner to do a credible job of measuring project success, several conditions must exist:

- An appropriate organizational design is in place that delineates the formal authority, responsibility, and accountability relationships among the enterprise corporate senior managers, project manager, functional manager, and work package managers.
- Adequate strategic and project planning have been carried out within the enterprise.
- Relevant and timely information is available that gives insight into the project status.
- Adequate management monitoring, evaluation, and control systems exist.
- Contemporary state-of-the-art management techniques are used in the management of the project.
- A supportive cultural ambience exists that facilitates the successful management of projects.

An important part of the strategic management of a project is to carry out such management in the context of a project management system.

4.12 PROJECT MANAGEMENT SYSTEM

Once the mission of the enterprise is established through the operation of a strategic planning system, planning can be extended to select and develop organizational objectives, goals, and strategies. Projects are planned for and implemented through a *project* management system composed of the following subsystems.[1]

The facilitative *organizational* subsystem is the organizational arrangement that is used to superimpose the project teams on the functional structure. The resulting "matrix" organization portrays the formal authority and responsibility patterns and the personal reporting relationships, with the goal of providing an organizational focal point for starting and completing specific projects. Two complementary organizational units tend to emerge in such an organizational context: the project team and the functional units. The project control subsystem provides for the selection of performance standards for the project schedule, budget, and technical performance. The subsystem compares actual progress with planned progress, with the initiation of corrective action as required. The rationale for a control subsystem arises out of the need to monitor the various organizational

[1] David I. Cleland, "Defining a Project Management System," *Project Management Quarterly*, vol. 10, no. 4, 1977, pp. 37–40.

units that are performing work on the project in order to deliver results on time and within budget.

The ***project management information subsystem*** contains the information essential to effective control of the projects. This subsystem may be informal in nature, consisting of periodic meetings with the project participants who report information on the status of their project work, or a formal information retrieval system that provides frequent printouts of what is going on. This subsystem provides the data to enable the project team members to make and implement decisions in the management of the project.

Techniques and methodology is not really a subsystem in the sense that the term is used here. This subsystem is merely a set of techniques and methodologies, such as PERT, CPM, and related scheduling techniques, as well as other management science techniques which can be used to evaluate the risk and uncertainty factors in making project decisions.

The ***cultural ambience subsystem*** is the subsystem in which project management is practiced in the organization. Much of the nature of the cultural ambience can be described in how the people—the social groups—feel about the way in which project management is being carried out in the organization. The emotional patterns of the social groups, their perceptions, attitudes, prejudices, assumptions, experiences, and values, all go to develop the organization's cultural ambience. This ambience influences how people act and react, how they think and feel, and what they say in the organization, all of which ultimately determines what is taken for socially acceptable behavior in the organization.

The ***planning subsystem*** recognizes that project control starts with project planning, because the project plan provides the standards against which control procedures and mechanisms are measured. Project planning starts with the development of a ***work breakdown structure,*** which shows how the total project is broken down into its component parts. Project schedules and budgets are developed, technical performance goals are selected, and organizational authority and responsibility are established for members of the project team. Project planning also involves identifying the material resources needed to support the project during its life cycle.

The ***human subsystem*** involves just about everything associated with the human element. An understanding of the human subsystem requires some knowledge of sociology, psychology, anthropology, communications, semantics, decision theory, philosophy, leadership, and so on. Motivation is an important consideration in the management of the project team. Project management means working with people to accomplish project objectives and goals. Project managers must find ways of putting themselves into the human subsystem of the project so that the members of the project team trust and are loyal in supporting project purposes. The artful management style that project managers develop and encourage within the peer group in the project may very well determine the success or failure of the project. Leadership is the most important role played by the project manager.

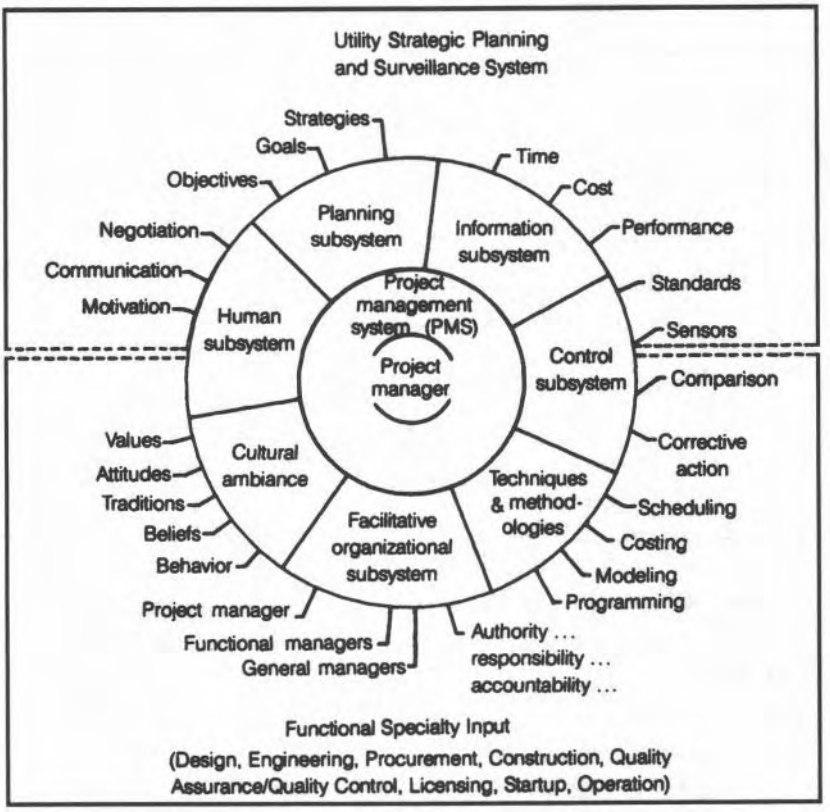

FIGURE 4 3 The project management system. ***(Source: Adapted from D. I. Cleland, "Defining a Project Management System,"*** **Project Management Quarterly,** ***vol. 110. no. 4, p. 39.)***

Figure 4.3 depicts the project management system in the context of a public utility commission with all its subsystems. The utility owners responsible and accountable for the effective management of the project work through their boards of directors and senior management with the project manager, functional managers, and functional specialists.

In Fig. 4.4, the integrated relationship of a strategic management system and project management system is portrayed. Indeed, the subsystems of a project management system touch all the "choice elements" of a strategic management system.

4.13 TO SUMMARIZE

Some of the major points that have been expressed in this chapter include:

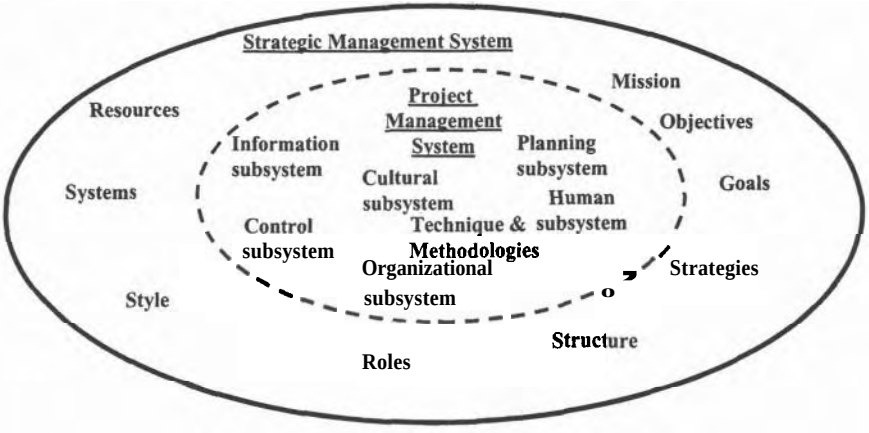

FIGURE 4.4 The integration of project management systems and strategic management systems.

- The most dangerous time for an enterprise is when new strategies are being developed and old ones are being discarded.
- Projects are building blocks in the design and execution of organizational strategies.
- People have a tendency to believe that the future will be a simple extrapolation of the past.
- Projects are the leading edge of product, service, and organizational process change in the enterprise.
- Improvement of operations, such as through the use of a reengineering initiative, has its place. But the enterprise must have strategic projects under way to prepare the organization for its uncertain future.
- Examples were given in the chapter of how contemporary organizations have used projects to change their products, services, and organizational processes.
- A successful enterprise has a "stream of projects" flowing through it all the time. Conversely, an organization that is failing is likely to have few projects under way to allocate resources for future purposes.
- A series of important questions can be asked to determine if an existing or proposed project has a "strategic fit" in the enterprise.
- A simple scoring model was suggested as a useful way to select projects from an inventory of potential projects that exist in the enterprise.
- There is a synergy between projects and the other elements of the enterprise. This synergy is shown in Fig. 4.2.
- A brief introduction to project planning was given along with a promise of more material on project planning contained in Chap. 11.
- The project owner has specific responsibilities in the overall management of the project.

- A project management system is a useful way of depicting the principal subsystems that are involved in the management of a project. Unless all of these subsystems are up and running, there is likely to be a deterioration in the effectiveness and efficiency with which the project is managed.

4.14 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- David I. Cleland, "Strategic Planning" and "New Ways to Use Project Teams," chaps. 1 and 29 in David I. Cleland (ed.), Field Guide to Project Management (New York: Van Nostrand Reinhold, 1997).
- John Tuman, Jr. and Moses Thompson, "Using Project Management to Create an Entrepreneurial Environment in Czechoslovakia," and Virginia Fairweather, "The Channel Tunnel: Larger than Life, and Late," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, Project Management *Casebook,* Project Management Institute (PMI). (First published in Proceedings, PMI Seminar/Symposium, September 1992, pp. 405409; and *Civil* Engineering, May 1994, pp. 4246.)
- John Stanley Baumgartner, Project Management (Homewood, Ill.: Richard D. Irwin, 1963). This is probably the first book on project management that was published by a commercial publisher. The book's principal focus is on the management processes with which the project manager of DOD and NASA projects had to contend. It is intended primarily for people in companies doing business with the U.S. government. The author also suggests that it may also be of interest to construction and other project-oriented activities. The book's value is in the background that is provided as project management began its emergence as a major building block in management thought and theory.
- Peter W. G. Moms, The Management of Projects (London: Thomas Telford, 1994). This book provides an interesting and comprehensive survey of the issues involved in appraising, beginning, and accomplishing any project. It details the experience and lessons learned from the management of projects over the past 50 years. The book concludes with a prediction of how the discipline of project management will likely develop over the next 10 to 20 years. The book is particularly interesting to those people who have a desire to trace the development of project management.
- Janice Thomas, Connie L. Delisle, Kam Jugdev, and Pamela Buckle, "Selling Project Management to Senior Executives: What's the Hook?" *Proceedings,* PMI Research Conference, Paris, France 2000, pp. 431–442. The article

reports on a research project under way under PMI's sponsorship to develop insights—and potential strategies--on how best to convince senior executives to use project management in leading their enterprises. Subsequent articles and research reports will doubtlessly follow from these authors on the subject matter.

- Sergio Pellegrinelli and Cliff Bowman, "Implementing Strategy through Projects," *Long Range Planning,* vol. *27,* no. **4, 1994,** pp. **125–132.** The authors make the point that the challenge facing senior managers who wish to bring revolutionary change within an organization is to manage that change outside the "straitjacket" of the existing bureaucracy. Projects and project management can help senior management to do just that. They also make the important point that the concept of a project has to be understood in a wider sense as a vehicle for achieving change. The authors also state that most strategic initiatives can be conceived and handled as projects—and that the conceptualization and implementation of a strategy usually involves defining and undertaking a range of projects which address a component of the strategy.

4.15 DISCUSSION QUESTIONS

1. Discuss the importance of the strategic management of projects.
2. The chapter described one quantitative method for project selection. What are some other possible methods of project selection? What other factors can be included in the analysis?
3. Why is it important for general managers to take responsibility and accountability for the strategic fit of a project?
4. Discuss criteria for when a project would or would not be a strategic fit.
5. Discuss how a project could be selected for an organization and not be a strategic fit.
6. Discuss the importance of owner participation in measuring and controlling the success of a project.
7. What hinders senior management involvement in large organizational projects?
8. What kinds of questions need to be addressed in order to measure project success?
9. What contemporaneous state-of-the-art management techniques can be used to help control and measure project success?
10. Discuss the responsibilities of project owners with respect to strategic planning and management.
11. Discuss the importance of establishing policies that describe the organizational structure and the authority, responsibility, and accountability of managers within the structure.
12. List and define the various subsystems of the project management system.

4.16 USER CHECKLIST

1. Are the projects within your organization being managed from a strategic perspective? Why or why not?
2. What quantitative and qualitative methods does your organization use for project selection?
3. Does the top management of your organization accept the responsibility for determining the strategic fit of projects?
4. Does the top management of your organization accept the responsibility for monitoring the cost, time, and technical performance objectives of major projects?
5. How do the senior managers of your organization monitor the ongoing progress of major projects?
6. What issues do you see regarding senior managers not monitoring project progress and what is the result?
7. Do the key project managers use state-of-the-art management techniques to control the projects of the organization?
8. Are organizational projects being managed from a project management system perspective?
9. Does the top management of your organization accept the responsibility to develop and implement adequate strategic plans for the enterprise and for projects?
10. Are adequate information systems available to support managers and professionals working on various organizational projects?
11. Does appropriate policy exist that defines the organizational structure and the fixing of authority, responsibility, and accountability of managers at each organizational level?
12. Does the top management of your organization foster an attitude that supports the management of projects?

4.17 PRINCIPLES OF PROJECT MANAGEMENT

1. Projects are building blocks in the design and execution of organizational strategies.
2. Projects provide the means for bringing about realizable changes in products, services, and organizational processes.
3. A regular review of the status of the "portfolio of projects" in an organization provides an excellent assessment of how well the organization is preparing for its future.

4. Failure in project management in the enterprise will impact how well the organization is able to accomplish the "choice elements" in its strategic management strategy.
5. The health of an enterprise can be determined from a review of the "stream of projects" flowing through the organization.
6. The question of the strategic fit of a project is a key judgment challenge facing senior executives.
7. The use of a project selection framework can help in the selection of projects to support the enterprise's strategy.
8. Project success is dependent upon an appropriate synergy with the enterprise's success.
9. The project owner has a key responsibility to maintain surveillance of the status of the projects that are under way to support owner initiatives.
10. Projects are best managed under a project management system philosophy and process.

4.18 PROJECT MANAGEMENT SITUATION—IMPROVEMENT OF PROJECT MANAGEMENT

An electric utility was organized in a very traditional way. Project engineering was carried out in the engineering organization. Any project management that was done was also planned and executed within engineering, a subdivision of the Engineering and Research Department. Although the professionals in the engineering department were excellent project engineering planners and executors, very few of these professionals had any real appreciation of project management—and its broader context in the management of the other functional input areas for a project. Consequently, the quality of project management and leadership was sadly lacking in the company.

Historically, as the company grew, many additional levels were added to the existing bureaucratic structure. Communication between functional "silos" became complex, cumbersome, and slow. Responsibilities were diluted for the overall management of projects for new power plant construction. The cultural ambience of the company could be described as a highly structured, hierarchical enterprise. People tended to focus on the specialization of their functional organizations. Boundaries between the functional organizations became more rigid. As the company grew, its bureaucratic organizational design continued. Fences between functions became higher, and coordination of any particular project became more difficult. Many of the problems in the development and construction of new power plants continued to be difficult.

Senior management, after some major cost and schedule overruns on new power plant construction, concluded that there was no cohesive force to bring together the diverse activities involved in the design, construction, and start-up of

new plants. No one individual, other than the CEO, had the authority and responsibility for the building of new plants. Some of the major problems in the management of the acquisition of new power plants included:

- Planning was diffused throughout the organization and no individual had the responsibility for maintaining oversight of the planning for the new plant.
- Although project coordinators had been appointed, the authority of these coordinators was lacking. About all those coordinators could do was to persuade, cajole, or "threaten" the functional people into working in a cooperative fashion in designing, construction, and getting the plant up and running.
- One-way communication prevailed. When a functional element finished its work, the results were "thrown over the organizational wall" to the next function. Concurrent work by the functions on a particular project was limited.
- No person watched the overall project budget. This lack of budget control set the stage for subsequent project cost and schedule overruns.

The stress on the organization and the people was severe. Everyone knew that there must be a better way of dealing with new plant initiatives.

Finally the senior management of the company established a new project management organizational unit. Some of the key actions undertaken by this new organizational unit included:

- An in-depth assessment of the problems and difficulties being encountered in designing, building, and bringing new plants on-line.
- The development of a strategy on how project management concepts and processes could be implemented in the organization.
- The identification of key individual and collective roles in the organization, particularly those that would be concerned with the management of forthcoming projects.
- The appointment of project teams to evaluate and come up with recommended strategies for the improvement of the management of projects in the enterprise.
- A training program for all key people on the concept and process of project management.
- A commitment on the part of the senior managers, to include corporate directors to provide support and resources to develop a project-driven culture in the enterprise.
- A project review strategy for all projects whereby the project's cost, schedule, and technical performance would undergo careful scrutiny.
- A commitment by the senior managers of the enterprise that projects would be considered key building blocks in the design and execution of enterprise strategies.
- A plan to go through a formal assessment process of the efficacy of the emerging project management concept and processes within the enterprise.

4.19 STUDENT/READER ASSIGNMENT

1. Evaluate the strategy initiated by this company for the improvement of project management in the enterprise.
2. What could have been done differently in the improvement of the company's remedial strategy for project management?
3. What would you have done if you had been appointed as the project manager for the remedial strategy for the improvement of project management within the enterprise?
4. What are some of the key issues and considerations to keep in mind when initiating a remedial strategy in a company undergoing a cultural change to emphasize the practice of project management?
5. What project management principles and process could be applied to a situation such as this where an entrenched traditional bureaucracy needs to become a project-driven enterprise, with all the support that a philosophy of project management can provide?

CHAPTER 5

THE BOARD OF DIRECTORS AND MAJOR PROJECTS[1]

"There is plenty of substantive evidence that 'too many corporate boards fail to do their jobs.'"

WALTER J. SALMON
"Crisis Prevention: How to Gear Up Your Board,"
Harvard Business Review, *January–February* 1993, *p. 68.*

5.1 INTRODUCTION

An important responsibility that managers at all levels of the organization have is to be involved in the decisions to initiate a project, and to maintain surveillance over ongoing projects during their life cycle. The board of directors (BOD), supported by senior managers, needs to be involved in the selection of major projects to support the "choice elements" of the enterprise. Once projects are selected and funded, the responsible managers—to include the BOD—must maintain an ongoing review of how well the project is being managed and the potential results that are promised by the project.

This chapter starts off with looking at how some boards of directors have neglected their responsibilities for the management of major projects, and through their neglect have allowed major problems in the management of the project to develop and endure. Conversely, exemplary BOD behavior, the empowerment of the BOD, and how major projects are to be reviewed are also subjects in this chapter. Finally the chapter looks at the project information needed by the BOD, how project performance audits can be used, how cultural considerations impact the role of the BOD, and what general criteria can be used in the selection of the members of the BOD.

[1]This chapter is an extension of the paper "Capital Projects: The Role of the Board of Directors," presented at the PMI 1988 Annual Seminar/Symposium in San Francisco and published in the 1988 Proceedings, pp. 8–12. Appreciation is extended to Attorney Randall L. Speck of Rogovin. Huge & Schiller, Washington, D.C., and Attorney Edward O'Neill of the California Public Utilities Commission, for their helpful guidance in the preparation of this chapter.

5.2 THE NEED FOR BOARDS OF DIRECTORS

Boards of directors have been used in the business community for over 150 years. State general corporation laws require that all business corporations have boards, typically stipulating that the corporation "shall be managed by a board of at least three directors."

Once a project is funded and corporate resources are expanded to design, develop, and construct or manufacture the project, it becomes an important responsibility of the board to maintain surveillance over the efficiency and effectiveness with which corporate strategy is being implemented through the use of major projects. Corporate strategy is clearly a key responsibility of the corporate board of directors. Strategy, according to Chandler, is "the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and allocation of resources necessary for carrying out these goals.'" The ,boardof directorscannot work out a company's strategy, but it is the duty of the board to make sure that a company has adequate strategies.[3]

5.3 SURVEILLANCE

By maintaining surveillance over the status of major product and process projects within the enterprise, senior managers—to include members of the board of directors--can gain valuable insight into the effectiveness with which the enterprise is preparing for its future. There are, of course, limits to the number of projects that such managers can monitor. There are, however, certain projects whose outcomes can have major impacts on the organization's future direction. Senior managers should review the adequacy of the planning for these projects and keep abreast of which projects are being executed to further corporate purposes. The projects in which the directors should be particularly interested include:

- New-product, service, and process development projects that have the promise of giving the company a competitive advantage in the marketplace. Projects that contain the possibilities of technological breakthroughs, or significant incremental improvements in products, services, and processes, should be of particular interest to the directors.
- Projects whose execution requires the commitment of substantial resources, such as the building of new facilities, or the development of major supporting organizational resources, such as restructuring or downsizing initiatives.

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[2]Alfred D. Chandler, Jr., ***Strategy and Structure: Chapters in the History of the Industrial Enterprise*** (Cambridge, Mass.: MIT Press, 1962). p. 13.

[3]Peter F. Drucker, "The Real Duties of a Director," in ***The Changing World of the Executive*** (Heinemann, 1985), p. 33.

- Projects that are the outgrowth of a strategic alliance being negotiated for the sharing of resources, results, and rewards with another organizational entity. Research consortia, partnering, and sharing of manufacturing facilities and marketing facilities are some common examples.
- Other projects for supporting the strategic purposes of the firm, such as major cost-reduction initiatives; new major, corporatewide information systems; and investment opportunities.

When the directors accept the concept that projects are building blocks in the design and execution of organizational strategies, the directors gain the use of an important strategic management tool--the inventory of product, service, and process projects under way in the enterprise. As the corporate directors sense competitive changes in the marketplace, or realize that new technological initiatives are coming forth from the research of competitors, or recognize any other major change in the enterprise's future, they need to ask a key question: What projects are under way in this company to meet—and exceed—these competitive threats coming out of the firm's environmental and competition system? If relevant product, service, or process projects are not under way, then the firm's competitive position will be threatened, and projects to position the enterprise to meet these changes need to be undertaken in a forthright manner. If the directors become involved in regular and rigorous review of these important projects, an important message will be sent throughout the company: Projects are important to this company, because it is through projects that we are able to organize our resources to position ourselves for the uncertain future.[4]

The chief executive officer of an aerospace firm assessed its market challenges and keynoted the need for project-related strategies in the following manner:

- Earlier commercialization is increasingly important as a competitive weapon.
- The company tends to revitalize its product and service development process to get the right products to the market quickly and effectively to enhance the company's competitive position.
- Supporting management systems and organizational design alternatives need to be assessed and developed to support the above strategies.

From these policies, assessment strategies were launched to design, develop, and implement project management strategies throughout the enterprise.

Why have some boards overseeing capital projects not carried out their responsibilities? This chapter will attempt to answer this question by examining the role of the board of directors with respect to the strategic management of projects. To gain insight into why many boards seem to have been so ineffectual, the activities of several boards will be discussed. Then some constructive ideas will be offered about what the role, the information required, the actions, and what the background of the board members should be.

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[4]David I. Cleland, "The Board of Directors and Projects," PM Network, January 1991, pp. 6–7.

5.4 SOME BOARD INADEQUACIES

Directors watched seemingly idly as one seemingly invincible corporation after another—from Eastman Kodak and General Motors to IBM, Sears Roebuck, and Westinghouse Electric—faltered and declined. Inadequacy of a board of directors' performance is not limited to for-profit enterprises. The following examples reflect on the board performance in a not-for-profit entity.

After more than a decade of excessive spending, rapid expansion and poor decision making, Allegheny Health Education and Research Foundation (AHERF) filed for bankruptcy on July 21,1998: At this time, AHERF had accumulated over a billion dollars in debt, representing the largest nonprofit health-care system failure in history. In the ensuing postmortem analysis, the inability of its board of directors to rectify major problems in a timely manner was evident. Following are some examples:

> **. . . directors didn't have the time to study all of the documents made ready for every meeting. Sometimes there'd be more than 1,000 pages.**
>
> **There weren't a lot of probing questions, and those who did speak up were discouraged from doing so again.**

Fortune magazine published an article in their May 14, 2001 issue titled 'The Dirty Half-Dozen: America's Worst Boards." The boards that qualify for the magazine's "Hall of Fame" include Coca-Cola, Intel, Pfizer, Target, and Texas Instruments. The boards that are in the "Hall of Shame" include Advanced Micro Devices, Archer Daniels Midland, Maxxam, Occidental Petroleum, and Warnaco.

In a strategy to improve directors' performance, companies are cracking down on the number of directorships board members can hold.[6] The article cites examples of notable executives who serve on seven to nine boards.

But things are changing. There is a quiet revolution going on in American boardrooms—the directors are waking up and taking the job as director more seriously. Unfortunately, there are still many firmly entrenched CEOs and old-line directors who resist modern governance. For most CEOs the reality of global competition has motivated the need for knowledgeable, talented directors to serve as sounding boards and advisers. Some of the enhanced assumption of responsibility on the part of directors has come about from the heightened scrutiny of boards by the press and public, combined with a growing respect—if not fear--of the threat of litigation against directors. With so much stock concentrated in a few large institutions, pension funds, and mutual funds, shareholders are more organized and active. They are making their presence felt and are demanding that the directors exercise genuine involvement and oversight.

[5]The story of their demise is described in a six-part series appearing in the *Pittsburgh Post Gazette* (Carpenter, January 24,1999; Massey, January 17–22, 1999).

[6]See John S. Lubin, "Multiple Seats of Power," The *Wall Street Journal,* January 23,2001, p. B-1.

In recent years there has been a strong movement for companies adding more outsiders to their boards, but also vastly upgrading their requirements for directors. Figureheads, celebrities, and yes-persons are not wanted. Companies want outside directors who can take an active role in helping guide the company to sustained superior performance. Companies also express a preference for only those active executives that sit on no more than three outside boards.[7]

Some boards have performed in a stellar fashion in their involvement in the shaping and review of strategic plans for the enterprise. The board at Campbell Soup Company is one such board—and it topped ***Business Week*** magazine's list of the best boards of directors? According to ***Business Week,*** the best boards, among other things:

- **Do an annual assessment of the CEO, conducted in a meeting of independent directors, and link the CEO's remuneration package to specific goals**
- **Actively participate in the assessment of strategic plans and 1-year operational plans for the enterprise**
- **Use a governance committee that regularly evaluates board performance and that of the individual directors**
- **Require each director to own a significant amount of company stock**

Further, recommendations by ***Business Week*** include putting the entire board up for election every year; limiting the number of inside directors; ensuring that the audit, compensation, and nominating committees are composed of independent directors; and, finally, banning interlocking directorships and putting limits on the number of boards on which directors can serve.[9]

The linkage with project management comes about through the board's assessment of the ability of the CEO to provide the leadership of the enterprise through the use of effective strategic management initiatives. Put in the language of management theory, this means that the CEO should provide the environment, resources, and proactive actions to develop and implement the core elements of strategic management: mission, objectives, goals, and strategies. The goals—the milestones for the enterprise—are projects that provide for the design and development of new products, processes, and organizational processes. Thus, to prepare for the enterprise's future means that current projects are the basic building blocks and the means for identifying and integrating resources to develop future initiatives for the enterprise. Major projects, which represent a significant commitment of resources for the enterprise, should be reviewed on a regular basis by the directors. By doing so the directors should have an excellent means for determining if enterprise resources are being committed in meaningful ways to prepare the enterprise for its future.

Corporate difficulties, many of which can be traced to an inactive or inefficient board of directors, are helping shape changes in the governance of corporations. Following some of the past strategic difficulties at IBM, a more proactive board created a "directors and corporate governance committee." Critics of the IBM board pointed out that board members waited too long to hold former IBM CEO John F. Akers accountable for IBM's dismal performance.

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[7] Anthony Bianco, et al., "The Rush to Quality on Corporate Boards," ***Business Week,*** March ***3, 1997,*** pp. 34–35. "Richard A. Melcher, "The Best and the Worst Boards," ***Business Week.*** November ***25, 1996,*** pp. **82–98.**
[9] Ibid.

Two studies report that boards are getting smaller—moving to about a dozen members that would enable more ease in discussing issues. Then too, on smaller boards, members would likely take responsibility more personally. Both studies show that boards continue to favor outsiders on the board. More companies are paying directors partly in stock--or at least extending that option to the members—hopefully leading to having the outside directors identify with the shareholders they represent rather than the CEO over whom they maintain oversight. Board reformers continue to push such issues as independent nominating committees, payment in stock, and splitting the job of chairperson and CEO.[10]

It is clear that every time you find a business in trouble, you find a board of directors either unwilling or unable to fulfill its responsibilities." On the Trans-Alaska Pipeline System (TAPS), the individual oil companies that owned the project formed an owner's committee to maintain oversight of the TAPS project. In addition, an owner's construction committee was established to administer the contract with Alyeska, the agent for the owners and their designated project manager. This committee, which was to act much in the manner of a board of directors, did not focus adequately on the strategic decision making on the TAPS project. Its members also improperly intervened in day-to-day operating decisions. A review of the record of this committee indicated little resolution of substantive strategic issues on the project, such as:

- The development of a master strategic plan for the project
- Early integrated life-cycle project planning
- Design and implementation of a project management information system
- Development of an effective control system for the project
- Design of a suitable organization[12]

Too many corporate boards are overpopulated with members of management. Inside directors tend to be committed to the way things have always been done and to their own ideas. Outside directors often have insufficient information about the company, and in too many situations, they receive information concerning the matters scheduled for a board meeting only shortly before the board is convened. In practice, when the CEO encourages board members to meet with senior company managers on a regular basis, outside the formal board meetings, this increases the likelihood that the outside directors will be able to have a fuller grasp of what is really going on in the company.

The nuclear industry was a striking example of the laxity of the directors. In the nuclear industry in the past all too many utilities had boards that neglected to exercise "reasonable and prudent" strategic management in their oversight of nuclear power plant projects. As a result, administrative courts disallowed substantial costs from inclusion in the customer rate base for the utility. In many cases, a failure

[10]Judith H. Dobrzynski, "Corporate Boards May Finally Be Shaping Up," *Business Week,* August 9, 1993, p. 26.
[11]Dan Bayly, "What Is the Board of Directors Good For?" *Long Range Planning,* vol. 19, no. 3, 1986, p. 22.
[12]David I. Cleland, prepared direct closing testimony, Trans-Alaska Pipeline System, Alaska Public Utilities Commission, Federal Energy Regulatory Commission, Washington, D.C., October 19, 1984.

of the board to participate in key decisions set the stage for the major difficulties later in the project's life cycle.

The clear responsibility and accountability of the board of directors can be demonstrated by reviewing a few key litigation conclusions drawn from the nuclear power industry. Although these projects are now history, there are important lessons to be remembered!

- Cincinnati Gas & Electric Company reached a $14 million settlement in a shareholder suit that charged directors and officers with improper disclosure concerning a nuclear power plant.
- The Washington Public Power Supply System (WPPSS) defaulted on interest payments due on $2.5 billion in outstanding bonds in part because of the failure of its directors. Communication at the senior levels of the organization, including that of the board of directors, tended to be "informal, disorganized, and infrequent."
- On the Long Island Lighting Company Shoreham project, the public utility commission determined, "The company should be able to show that its directors . . . were attentive to the project's progress, and aggressively pursued cost containment measures wherever there were reasonable opportunities to do so."[13] Noting the small proportion of board minutes devoted to addressing the Shoreham project, the commission remarked on the "lack of urgency in the board's approach to the project's large cost escalations." The commission also was concerned with the board's "lack of involvement" regarding the critical decision to replace the project's construction management firm. In addition, it found that "prudence dictated that the board carefully examine management's plan and its potential consequences."[14]
- On another nuclear project in the state of Washington, the Washington Utilities and Transportation Commission determined that a number of ominous external occurrences should have caused the officers and directors of the Puget Sound Power and Light Company to call for an in-depth cost-effectiveness study, something they neglected to do.[15] In a separate opinion, one of the commissioners elaborated:

> It is clear the deficiency extends to the company's board of directors. Board minutes . . . provide no indication that Puget's board either was informed of the magnitude of the problem by management or on its own motion requested management to study the economic consequences of continued investment in the . . . plant.[16]

- In a review of the role of the board of directors of the Diablo Canyon project, an expert witness testified that the board's decisions and actions were either limited or nonexistent in regard to several key decisions and actions. These included the approval of a strategic project plan and the decision that the company acted as its own architect and its own engineering and construction manager.

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[13] Long Island Lighting Company, 71 Pub. Util. Rep. 4th 262 (N.Y.P.S.C. 1985).
[14] Ibid., p. 273.
[15] Washington Utilities and Transportation Commission (WUTC) v. Puget Sound Power & Light Co., 62 Pub. Util. Rep. 4th 557 (WUTC 1984).
[16] Ibid., p. 598.

Furthermore, the board did not give proper attention to the choice of a basic organizational design for the project, nor to the implications of the discovery made during the construction of the plant that there was a major earthquake fault in close proximity to the plant. Nor did the directors make a full assessment of the flawed quality assurance and control procedures that led to major design deficiencies in the plant. The board also had too little to say about the selection of a project manager and constructor in the final phases of the plant's construction." At key decision points in that project, the board of directors' role was little more than that of a passive onlooker. The failure of this board to insist upon thorough information and its inaction in the face of serious problems confronting the project were incautious, far from what one would expect a "reasonable and prudent board" to carry out.

In this same case, it was found that from the very outset, the board's role was deficient in overseeing the selection of the plant site. The selection was not even considered by the board but was relegated to the chief executive officer's advisory committee, a top-level executive body whose authority was purely advisory. Although this committee evaluated the site for the nuclear plant, it was done during one of their regular meetings along with 19 other agenda items, allowing only 5 minutes per item on average. Later, during the construction of the plant, an earthquake fault was found offshore, and it caused the Nuclear Regulatory Commission to order a redesign of the plant to bring the plant up to a higher earthquake design configuration. The redesign of the plant and the subsequent reconstruction increased the total cost of the plant by approximately $1.4 billion.

It is clear that the boards of the various nuclear projects mentioned in the preceding discussion could have helped reduce their projects' problems or reduce the threats that faced their projects by careful, informed involvement in key project matters on a regular basis.

5.5 EXEMPLARY BOARD BEHAVIOR

The inadequacies of the boards mentioned up to this point reflect a pattern of inactivity and ignorance concerning the problems and threats that buffeted the projects. It is clear that the boards of the various projects, nuclear and otherwise, could have helped reduce their problems and the associated threats that faced their projects by careful, informed involvement in key matters on a regular basis. This has been done on some nuclear plant projects. For example, the Pennsylvania Power and Light Company's board of directors played an active role on the Susquehanna nuclear plant project, as stated in a letter to one of the authors:

Our Board of Directors was kept abreast of project activities on a monthly basis. The project issued a monthly report to the Board prior to their meetings. The Project

"David I. Cleland, rebuttal testimony, Diablo Canyon project, California Public Utilities Commission, Division of Ratepayer Advocate, Application Nos. 84-06-014 and 85-08-025, San Francisco, June 20, 1988.

> Director was then available at the Board meeting to discuss the report. In addition, for several of the critical construction years, the Board held an expanded meeting at the plant site annually. This permitted Board members to view progress firsthand and permitted additional nuclear topics to be included in the agenda.
>
> The monthly reviews . . . also served as the regular, integrated review of the project by the project manager/project team. These reviews included senior management from our engineer/constructor . . . . Senior representation from the reactor manufacturer was also present when appropriate. These meetings focused on performance and progress and highlighted issues significant to management. The reporting of progress and performance was an integrated team effort.

This plant earned high marks from the Nuclear Regulatory Commission in its latest Systematic Assessment of Licensee Performance (SALP). Susquehanna earned the highest rating possible in 9 of 11 categories and the second-highest rating in the remaining two areas. This gave Susquehanna the second-highest average rating of all nuclear reactors in this country.[18]

There are other examples of good board review. The $2.1 billion Milwaukee Water Pollution Abatement Program initiated a comprehensive review of the status of the projects in that program to be conducted on a monthly basis by the owner's senior managers. The program manager was present to explain the program's status and to answer any questions posed by these senior managers. The senior managers, in turn, kept the board of commissioners of the Milwaukee Metropolitan Sewerage District informed on a regular basis. This complex, high-visibility program, which has held the attention of many stakeholders during its life cycle, finished on schedule and close to the original project budget estimates. The continued review by the senior managers and the commissioners is a major reason this project was successful.

Some corporations have special meetings of the board to deal with major projects in the corporation's strategic plans. Besides providing more concentrated time for discussion on the projects, the social events of such meetings provide the opportunity for the directors to learn about the capability and knowledge of the senior corporate executives as well as something of the credentials of the other directors.

In Fig. 5.1, a conceptual model is offered which notes the key roles to be carried out by an ideal board of directors. As discussed in this chapter, all too often some of these key roles are not effectively carried out by some incumbent board members.

5.6 THE BOARD'S RESPONSIBILITIES

Directors are the representatives of the owners of the corporation. Boards often move glacially in reviewing and approving the strategic management initiatives for the enterprise. Companies can become noncompetitive and dwindle, often without any intervention initiatives encouraged by the directors. Today increasingly

[18] PP&L shareowners' newsletter, July 1,1988.

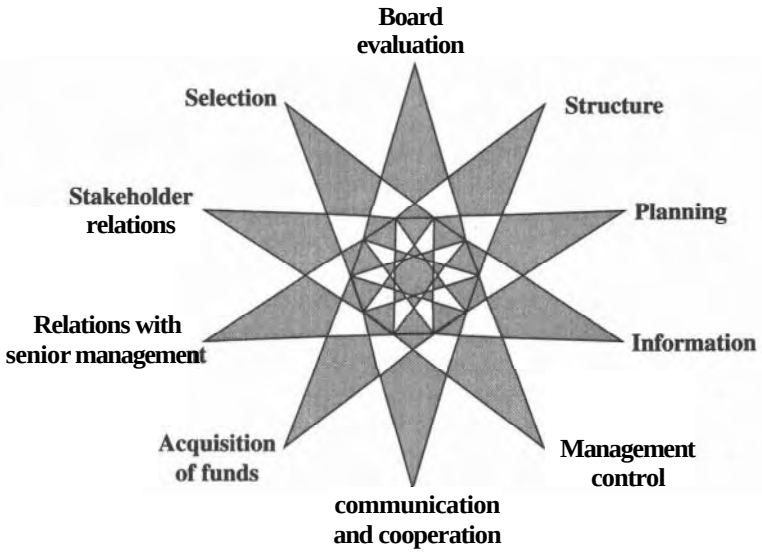

FIGURE 5.1 Conceptual model of **roles** for **the board** of **directors.**

impatient owners, representing such groups as government officials, shareholders, and institutional investors, are taking the lead in evaluating and changing the attitudes of investors.

The corporate governance system may be in place—the senior managers of the enterprise and the directors provide the strategic direction for the enterprise. But these officials, failing to set and follow up on the strategic initiative of the enterprise, often set the game plan unknowingly for corporate decline, leading to failure. Leadership is a critical function for individual and collective roles in discharging the director's functions.[19]

Directors exercise a special kind of management surveillance. Although generally not concerned with short-term operational matters, directors should be alert to any problems and opportunities that are significant to the long-term performance of the company, such as profitability trends, competitive threats, increased costs, loss of future business opportunities, loss of market share, regulatory changes, and quality problems. Observation of any of these problems should alert the directors to the need for an investigation or audit of the company's strategies. Such an audit should determine whether the corporation's strategies have been designed to cope with these difficulties and what the possible and probable long-term impact of the current operations would be.

The directors should expect the corporation's senior managers to manage the organization's resources in a reasonable and prudent manner. Why should any less be expected of the directors themselves? Although their involvement in the corporate affairs is necessarily much broader, the directors need to determine to what extent

[19]Paraphrased from Myron Magnet, "Directors, Wake Up" *Fortune,* June 15, 1992, pp. 85–92.

the senior managers are executing their own responsibilities in the planning, organizing, and control of corporate resources. In other words, the directors are still managers in the truest sense of the word. As managers, they should be expected to perform as any other senior manager, differing only in degree. Because corporate resources are at stake, commissions or omissions at the corporate level are vastly more serious than at lower levels in the organization.

The directors are the "most senior" managers in the corporation; they should set an example for reasonable and prudent management on the part of the corporate senior managers who are concerned with the strategic management and operational effectiveness and efficiency of the corporation. To accomplish this, the directors must demand high performance from the senior managers by ensuring that strategic planning and surveillance are carried out in the corporation, and that efficient and effective operational performance is realized.

The role of senior managers is critical in the success of project management in an enterprise. Because projects are building blocks in the design and execution of strategies for the enterprise, managers at all levels must have an interest and obligation to strategically manage the enterprise. The successful management of the relevant product, service, and organizational process projects means that an appropriate future is likely to come for the enterprise. Some of the common "failures" of those managers who are charged with the responsibility for strategically managing the enterprise include:

- An inappropriate linkage of projects to the strategic direction of the enterprise, resulting in too many of the projects lacking a "strategic fit" after too many organizational resources have been committed to those projects.
- Failure to integrate project development efforts with other development strategies that are under way in the enterprise such as training initiatives, market development, recruitment and training of people, reengineering efforts, and so forth.
- Delaying the decision to establish a project or a family of projects causing "catch-up ball" in getting the project team assigned and the identification of the project resources under way.
- Failure to establish firm and timely project technical performance objectives, which leads to future changes in the project's scope, cost, and schedule.
- Failure to review the project results on a regular basis and to adjust resource input into the projects if needed as a result of the project review.
- Failure to build and maintain alliances with key stakeholders of the project to include visitations to the key stakeholders—like customers and suppliers—to keep them informed and help solidify their continuing support to the project.
- Failure to provide an ongoing training program for the enterprise to include project teams to update knowledge, skills, and attitudes of these people.
- Failure to recognize the motivational considerations of the project teams—and provide those teams with a leadership model for the managers and team members to carry out in the enterprise.

5.7 EMPOWERMENT OF THE BOARD

According to the *Harvard* Business *Review,* the age of the empowered board of directors is here. Almost all major public corporations recognize that they must make their senior managers more accountable to their stakeholders and strengthen the role of outside directors in development and review of major strategies for their enterprises. Boards need to maintain a certain distance between themselves and the company CEO without turning a meaningful and constructive relationship into an adversarial one.[20]

Empowerment of the board of directors means that outside directors have the competency and independence to monitor the performance of the company and the senior managers—and to influence top management on their role as overseers of the company's fortunes. Outside directors create the opportunity to influence the strategic management of the enterprise and to influence changing corporate leadership if needed to keep the enterprise moving forward in new products, services, and organizational processes. Senior executives should seek the appointment of an empowered board that is truly involved, in an oversight role, in the strategic management of the enterprise. This calls for the board of directors to operate in a new form of teamwork—one in which the individuals work together in their individual and collective roles to improve the operational and strategic performance of the enterprise.

In theory the director's legal authority to govern a company comes from the laws of the state in which the enterprise is incorporated. For example, in Delaware the law states that "The business and affairs of every corporation organized under this charter will be managed by or under the direction of a board of directors." In carrying out their residual responsibility of overseeing corporate management, board members are expected to demonstrate care and loyalty and to exercise judgment in their trustee relationship to the board.

The characteristics of an empowered board include having most of the directors come from outside the enterprise. The board should be small enough to be a cohesive group, with the individual members understanding their reciprocal obligations. A range of business and leadership experience by the board members is required—and the board members should communicate freely when attending board meetings and, more important, in between meetings. If the corporate CEO is also chair of the board, then the outside directors should select a leader from among themselves. Board committees should be made up entirely of outside directors. Finally, board members should receive information about the company's performance in a form that is intelligible to the members.[21]

5.8 THE ROLE OF PROJECTS

In 1968 a landmark study of the practices of senior management in leading industrial corporations noted the responsibilities of directors for project management. The

[20] "Redraw the Line between the Board and the CEO," *Harvard Business Review,* March–April 1995, pp. 153–166.

[21] Paraphrased from Jay W. Lorsh, "Empowering the Board," *Harvard Business Review,* January–February 1995, pp. 107–117.

study was conducted by Paul Holden and several members of the faculty at the Graduate School of Business at Stanford University. Their findings established that project management was an important factor in overall enterprise management. The study further found that the high-level committee (such as the board of directors) was widely used as a valuable organizational design to:

- Establish board policies
- Coordinate line and technical management
- Render collective judgments on the evaluation of corporate undertakings
- Conduct periodic review and monitoring of ongoing programs and projects[22]

To state again—major projects are key building blocks in the design and execution of corporate strategy. This is a fundamental principle all too often missed by key corporate managers and directors. Project management is not recognized for what it is: ***a process for the creation of something that does not currently exist but is needed to support future corporate purposes.*** When perceptive directors recognize the intertwining of projects and corporate strategies, project management takes on a new significance in the management of the corporation. Unfortunately, some directors have not recognized this fundamental principle. Before the project starts, the board should take action to require that a project plan be developed and presented for its review. Why should a board concern itself with the plan for projects? Several principal reasons are suggested:

- The board needs specific evidence that corporate managers have a planned process for managing projects.
- The project plan provides a performance standard against which project progress can be evaluated as the directors carry out their strategic monitoring, evaluating, and control responsibilities.
- If the project team, project manager, and responsible general managers know that the board will review the project plan, a clear message will reverberate through the organization: This project is important.
- Knowing the project plan can help give the board a reference point for other key corporate decisions which interface with the major project such as recapitalization issues, product introduction plans, and support facilities.
- The evaluation of the project plan and of management's adherence to it allows continual evaluation of key managers.

In some cases a committee of the board, such as the executive committee, is given the authority to act for the full board. Such a delegation without adequate monitoring by the outside directors can have a deleterious effect, particularly if the executive committee's deliberations are not reviewed or are accepted with only minimal questioning. Even with an active and competent executive committee, the board should reserve for itself a regular review of capital projects. Such reviews should

[22] Paul E. Holden, et al., Top *Management* (New York: McGraw-Hill, 1968), pp. 6, 71–74, 108–109.

include discussions of the cost and schedule of the project and future strategies for the resolution of any problems known or anticipated on the project.

The existence of projects in organizations is one clear indication that the organization is changing and is attempting to meet changing future environments. This is a key point not to be missed by senior managers and directors.

5.9 THE ORGANIZATIONAL DESIGN

An important part of corporate strategy is an appropriate organizational design for the implementation of projects. The directors should ensure that an appropriate organizational design is in place for the project. The design should delineate the formal authority, responsibility, and accountability relationships among the senior managers, project manager, functional managers, and work package managers of the enterprise.

Russell D. Archibald, an expert witness evaluating a utility's nuclear plant project organization in a rate case litigation, found serious deficiencies in one utility's project organization and staffing. His findings were:

- The absence of a true project manager
- Inadequate planning and control supporting staff
- Lack of definition of responsibilities and inadequate policies and procedures for fulfilling assigned responsibilities[23]

These deficiencies were found to contribute to schedule delays and cost overruns on this project.

5.10 PROJECT REVIEWS

Directors and senior managers who clearly recognize their responsibilities should feel the need to regularly review projects along with other major organizational activities. Why should the board concern itself with review of the major projects? The board needs specific information that the projects are being designed and developed according to plan and in support of corporate strategies.

Then, too, knowing the status of the projects can give the board a reference point for the review of management actions and recommendations that are interdependent with the other projects and strategies in the organization's strategy. Directors will gain an appreciation of the underpinnings of strategy such as policies, resource commitments, and executive and professional development to support the company's strategies along with its capital projects. By having the directors insist that the company have a strategy and a management philosophy for major project review, another mechanism is in place for facilitating the continuous evaluation of senior managers.

[23] Russell D. Archibald, testimony on project management, Diablo Canyon rate case, California Public Utilities Commission, San Francisco, Exhibit No. 11, 175, March 1987.

Some projects reach the point where their continuation does not make sense for the organization. Because of the vested interest that the project manager and the project team have in the project, they are in the least logical position to recommend termination of the project. But total reliance on the senior managers to do this evaluation is not sufficient because the board is the corporate conscience to make an independent evaluation of where the project stands within corporate strategy. Therefore, both senior managers and directors are the most appropriate decision makers to recommend termination of the project.

How is the project review best done? Here is a prescription to guide directors' surveillance of major projects:

- Accept a philosophy that projects are indeed basic building blocks in the design and execution of corporate strategies, requiring ongoing strategic management and surveillance.
- Conduct a formal review of the strategic plan for the project to determine if appropriate technology is planned and if suitable management systems are in place to keep all the principal managers abreast of the project.
- Require special briefings on the project during key periods of the project's life cycle, such as finalization of design, commitment to construction or prototype manufacturing, design reviews, engineering completion, preliminary customer acceptance, or delivery of the first production unit.
- Go out and "kick the tires." Use plant or construction site visits to observe firsthand what is really happening on the project.
- Insist that the project manager (and the responsible general manager) appear before the board on a regular basis to give a status report on the project.
- Question and question again any funding changes on the project to ascertain what caused the change and what the longer-term impact would be.
- Carefully deliberate on what information the board needs to do its job on capital projects, and relate this information to the major decisions or actions that require board scrutiny.
- If things on the project are not fitting together well, or if major questions and issues are emerging for which answers are not forthcoming, consider a performance audit of the project.

The foregoing list hints at overtones of interference with senior management responsibilities. Perhaps so. But as one reviews some of the major project failures of the recent past, a clear message comes through: Most of these failures can be attributed to the failure of senior management and the board of directors to follow some of the basic "commonsense" prescriptions just outlined. What is the cost of not following these commonsense principles? The answer to this question is imprudent financial performance, delay of effective strategies, waste of corporate resources, and support of a corporate culture that condones poor quality in the management of corporate resources.

During the review of major projects, with the project managers present to answer questions, the review should be structured to focus discussion and debate on the hard questions about the projects. Both the bad news and the good news of the project should get attention. The board should be concerned about the schedule, cost, and technical status of the project, as well as an ongoing assessment of the strategic fit of the project. Does the project continue to occupy a building block in the design and execution of corporate strategies? If not, why not? If there is adverse information about the project, what significance does the information have for the directors in coping with their responsibilities?

This discussion about the need for a regular review of the project implicitly assumes that performance standards exist which provide the basis for reaching a judgment of where the project stands. Experience has shown that such assumptions cannot always be made. If a comprehensive project plan and performance standard for the project do not exist, then monitoring, evaluation, and control of the project are difficult, if not impossible.

Something is added to the discipline of the project team simply because the project is reviewed by the board of directors. When the project team knows that a formal presentation on the project's status will be required by the board, the team will be motivated to do a better job of thinking through the problems and of being prepared with solutions, explanations, or rationales.

What do the directors need to know to adequately review the project? The key to satisfaction of this need is the quality of the information provided to the board.

5.11 INFORMATION FOR THE BOARD

The ***Corporate Director's Guidebook*** makes the point that "the corporate director should be concerned with the establishment and maintenance of an effective reporting system."[24] A reporting system involving major projects takes the form of a project management information system (PMIS), which contains the intelligence essential to the effective monitoring, evaluation, and control of the project. Corporate directors require such information to determine the efficiency and effectiveness with which corporate resources are being used on the project. Also, the directors need other corporate information relative to the enterprise's forward planning. This includes critical events and issues facing the enterprise that often might have a strong project context such as new products, facilities, and recapitalization strategies. The project's cost, schedule, and technical performance considerations are certainly worthy of a director's ongoing surveillance.

Juran and Louden, in a book published in 1966, addressed the information that the board requires to fulfill its obligation to exercise due diligence and to increase the knowledge that directors have about the company. Juran and Louden spoke of the "philosophy of completeness," regarding information as an essential part of the climate in which the board and management operate. They stated, "Under this

[24] *Corporate Director's Guidebook*, American Bar Association, January 1978, p. 14.

philosophy the rule with respect to information for the board is: ***Resolve all doubts in favor of completeness."***

According to the authors, the practical result of the philosophy of completeness is the advance information package in widespread use in many companies. According to them:

> This package is sent to the directors in advance of each meeting to include the agenda, which is a listing of the topics, which are to be discussed at the meeting. It is not merely a table of contents; it serves also as a kind of notice of what is to come up at the meeting. (By strong implication, anything not on the agenda will be regarded as a surprise.) In some companies the agenda carries notations showing just what actions, if any, the board is being asked to take with respect to each item.[25]

Juran and Louden also recommended that the typical information package for board approval include not only the project proposals on expenditures and actions which are on the list of reserved board powers but also those actions which chart a new course. The reports furnished to the board on the project's status are important tools to help the directors do their job. At the minimum, such reports should contain summary information to help the directors meet their responsibilities: the surveillance of the project's cost, schedule, technical performance objectives, and the probability of continued strategic fit in the enterprise. The project manager has the responsibility to see that the project's status report provides sufficient intelligence for the directors to reach a conclusion about where the project stands.

The typical board meets on a monthly basis. Prior to a meeting, the directors usually are provided with an agenda and appropriate supporting materials for review so that they are able to do their "homework."

Some important things to consider in the use of project-related information for the board include:

- Presenting important issues on the project to the directors before, and not after, corporate senior management has taken a firm position
- Making sure that the directors get any important information before the board meeting in order to make an informed judgment about the project
- Not burying the project information in a stack of corporate information
- Allowing the directors sufficient time to make a decision in which they have confidence
- Making sure there is time at the board meetings for a full discussion of the project with the project manager present to answer questions
- Using the board committees, such as the executive committee and the audit committee, to do detailed analyses and present their recommendations to the full board

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[25] Reprinted by permission of the publisher from The *Corporate Director* by J. M Juran and J. Keith Louden, pp. 257–258. © 1966 AMACOM, a division of the American Management Association, New York. All rights reserved.

5.12 THE PERFORMANCE AUDIT

If the information reported to the board and obtained during the project manager's status report reveals project inadequacies or problems, a performance audit may be in order. Independent performance audits on large projects can provide valuable insight for the board and other corporate managers. An independent performance audit on a project may be defined as an in-depth, process-involving analysis of a project's performance and outlook. The analysis should cover both the technical side of the project and its management. Project performance audits are best made at key points in the project's life cycle or when the project is being buffeted by important problems or changes whose effects may not be fully fathomed. Heyel noted, "Regardless of intent, a failure to investigate independently may be deemed culpable ignorance and a breach of duty to stockholders."[26] Although the full board may order the audit, a subcommittee of the board can make sure the audit is appropriately executed and followed up with the most efficient and productive remedial action.

Although project history is relevant, because past events provide a base from which the project moves forward, the performance audit should not be done to find fault or to debate over past disappointments. Rather, it should use the past to develop a better understanding of how current and future performance on the project can be improved.

On a large water pollution abatement system project, an audit was conducted prior to initiation of detailed planning to turn the project results over to the user. This audit disclosed several contract modification changes that were unduly delayed and that could have an adverse influence on the operational availability of the system. By discovering this delay of changes through the audit, the project manager was able to initiate remedial strategies to get the project back on schedule and meet its operational date.

An independent performance audit appraises results so that the board and its subcommittees can objectively evaluate the need for and extent of remedial strategy and resources required. Failure to conduct an independent performance audit on an ailing or failing project may very well be considered culpable negligence and a breach of duty to the stockholders, leading to legal action.

5.13 CULTURAL CONSIDERATIONS

Over time camaraderie develops among members of the board of directors and the corporate managers. This camaraderie makes it difficult for outside directors to remain objective regarding corporate matters—and makes it unlikely that any director would want to play the role of a spoiler by challenging the board's actions. Yet there would be value in having a forum where consensus could be developed regarding the viewpoints and concerns of the outside directors. One writer on the

[26] Carl Heyel (ed.), *The Encyclopedia of Management*, 3d ed. (New York: Van Nostrand Reinhold, 1982), p. 222.

subject has suggested the appointment of a management advisory committee composed of outside directors only. Through such a collective consensus the role of a spoiler could be played without jeopardy of any individual outside directors. Most public companies have an audit committee and a compensation committee. Having an advisory committee would be an extension of such committees and would bring another fiduciary watchdog to the board of directors' processes."

Directors (and senior managers) influence the culture of the organization, and that culture in turn influences projects. Corporate culture is reflected in the key values held by members of the organization. Managerial and professional behavior are influenced by what the people perceive as the "corporate way of doing things." The value orientation, leadership style, and example set by senior managers greatly influence the behavior of the people.

The attitudes expressed by senior managers can have a significant effect on the organization's culture. Communication by senior management can influence the outcome of the project. Davis noted that senior managers' most important task is to foster a corporate environment that facilitates honest and frank disclosures in dealing with a budget-breaking project. He further notes that discouraging cover-ups and recriminations by senior executives depends on their management style?'

A corporation that does not commit itself to comply with government regulations sends an important message throughout the organizational hierarchy. On the other hand, a senior corporate management that takes the lead in developing and promulgating policies that demand full cooperation and disclosure to government bodies will find such policies echoed and enforced throughout the company's organizational structure.

In the nuclear plant construction industry, the Nuclear Regulatory Commission found a direct correlation between the project's success and the utility's view of NRC requirements. More successful utilities tended to view NRC requirements as minimum levels of performance, not maximum, and the utilities strove to achieve increasingly higher, self-imposed goals. This attitude covered all aspects of the project, including quality and quality assurance.[29]

During a performance audit of a large project, it was found that the attitudes, values, beliefs, and behavior demonstrated by senior management of the organization were detrimental to the successful outcome of the project. In an assessment of the corporate culture of this project, it was found that senior management had condoned a culture that contributed to various problems on the project with significant injurious results, such as:

- A lack of candor and openness in dealing with government agencies, particularly the Nuclear Regulatory Commission
- Management leadership which encouraged the destruction of documents that might have negatively affected the company during customer rate litigation

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[27] John L. Grant, "Shield Outside Directors from Inside Seduction," *The Wall Street Journal,* November 23, 1992.
[28] David Davis, "New Projects: Beware of False Economies," *Harvard Business Review,* March–April 1985, p. 97.
[29] "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," NUREG-1055, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984, pp. 2-1 to 2-6.

- A lack of commitment to adequate communications within the company concerning the status of the project
- Not taking a conservative approach to unknown factors in the design and construction of the project
- The general lack of leadership to solve problems on the project in a timely manner
- Reliance on past management philosophies and practices and a failure to recognize the impact of new technology on both the design of the project and the use of contemporaneous project management practices

5.14 SELECTION OF DIRECTORS

Every corporation should have formalized criteria for the election of the directors, including the insider-outsider mix, occupational expertise, and length of tenure. Used as guidelines, such criteria can be varied to accommodate different requirements for the board. Considering the importance of project management to the corporation, the board should include individuals who have had experience in either the management of projects or the senior executive oversight of such projects. If the projects involve new technology, then at least some of the outside directors should have experience in that technology. Directors should be chosen who have experience in the industry or knowledge about the business the corporation pursues. In large integrated corporations, this is difficult, but by careful choice of the directors, a collective understanding of the corporation's business can be known. If the board does not have outside directors with such experience, then the board should request external assistance in the form of project performance audits and consultations to evaluate and question the projects' status.

5.15 TO SUMMARIZE

The major points expressed in this chapter include:

- Corporate strategy is clearly a responsibility of the enterprise's directors.
- Because projects are building blocks in the design and execution of enterprise strategies, the board of directors should be vitally concerned about the status of major product, service, and organizational process projects in the organization.
- Specific policies and philosophies should be established in the enterprise that deal with how the directors carry out their fiduciary responsibilities for the surveillance of major projects.
- In the past, and even today, there are directors whose performance has been inadequate. In the chapter, examples were given of how poorly some directors have performed.
- Some boards of directors have performed their fiduciary duties in a stellar fashion. Examples were given in the chapter of such performance.

- A survey by ***Business Week*** established key distinctive characteristics of competent boards. The reader should review the results of this survey.
- There is evidence that boards of directors are reducing the number of members, leading to easier assessment and discussion of corporate performance and future strategies.
- Whenever you find a business or a major project in trouble, the cause can likely be traced to a board of directors that was unwilling or unable to fulfill its responsibilities.
- Directors are becoming more liable for lawsuits, which charge them with imprudence in their fiduciary role.
- Examples were given of how inadequate performance by directors on projects in the nuclear power industry adversely impacted the performance of construction projects in that industry.
- Some of the common "failures" of middle and senior managers charged with responsibility for project management were given.
- Boards of directors are becoming more empowered, particularly in increasing the authority of outside directors.
- Regular and rigorous review of the status of major projects is the best way for directors to be kept informed of how corporate strategy is evolving—and how well the enterprise is preparing for its future.
- A prescription for how directors could best review major projects was given. In order to conduct effective reviews, the directors need timely and relevant information on the key projects in the enterprise.
- Project performance audits can be a powerful tool to use in gaining an independent assessment of a project's status.
- Cultural considerations in the enterprise impact the rigor with which projects are managed and reviewed. When the directors participate in regular and rigorous review of key projects, an important message is sent throughout the enterprise.
- In the selection of directors, consideration should be given to the individual's competency in project management.

5.16 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Randall L. Speck, "Legal Considerations for Project Managers," and Kenneth O. Hartley, "The Role of Senior Management," chaps. 13 and 17 in David I.

Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).

- Philip J. Damiani and Robert J. Teachout, "Pittsburgh International Airport Midfield Terminal Energy Facility," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (First published in ***Proceedings,*** PMI Seminar/Symposium, 1992, pp. 44–50.)
- Paul E. Holden, ***Top Management*** (New York: McGraw-Hill, 1968). Although this book was published over 30 years ago, its description of the theoretical role of senior managers in an enterprise holds true today. The book was one of the first to recognize the important role that senior managers and directors have in maintaining oversight of the planning for, organization of, and execution of projects in the enterprise.
- Jay A. Conger, ***Strategies for Adding Value at the Top*** (San Francisco: Jossey-Bass, 2001). In this book the author explores the roles that corporate governance will play in the twenty-first century. Although the book provides little guidance on the role of projects in the design and execution of enterprise strategies, it provides an excellent overview of the major responsibilities of directors. The author proposes that the focus of judging a board's success should move from a shareholder to a ***stakeholder*** point of view. Conger also examines a board from an organizational effectiveness perspective and proposes a framework that centers on what really influences effective governance strategy.
- Kenneth R. Andrews, "Director's Responsibility for Corporate Strategy," ***Harvard Business Review,*** November–December 1980. This article points out the key fiduciary responsibilities that directors have for the well-being of the enterprise—to include the obligation to ensure that the senior managers prepare strategic plans for the directors' review. Andrews makes it clear that a board of directors should review corporate strategy periodically to determine its validity, and use it as the reference point for other key board decisions. He further states that key approval decisions on the part of the board should evaluate the risks involved, and share with management the risks associated with its adoption.
- Jay W. Lorsh, "Empowering the Board," ***Harvard Business Review,*** January–February 1995, pp. 107–117. In this article, the author provides a general assessment of the responsibilities of the board, and suggests strategies that can be used by boards working with senior managers for the empowerment of the board. In addition, the author makes a key point about the key roles to be carried out by board members. He suggests that outside directors should select a chairperson from among themselves and board committees should be made up of outside directors.
- David I. Cleland rebuttal testimony, Diablo Canyon Project, California Public Utilities Commission, Division of Ratepayer Advocate, Applications

Nos. **84-06-014** and **85-08-025,** San Francisco, June **20,1988.** This testimony provides expected performance standards for exemplary board behavior regarding the design and construction of a major nuclear power generation plant—and how the project owner neglected these standards. In his testimony, the author found major discrepancies with the manner in which senior managers and board members conducted themselves with regard to the management of this nuclear power plant. Other major problems were found in other areas of this project by expert witnesses. After reading this testimony, and the testimony of other expert witnesses on this project, one can easily have the perception that the project could not have been more badly managed, if the project team, senior managers, and directors had really tried to fail in the management of this project.

5.17 DISCUSSION QUESTIONS

1. What kind of evidence might indicate that a company's board of directors has been inadequate in its monitoring of major project undertakings? Explain.
2. What actions and activities indicate that a company's board of directors has taken an active interest in major projects? Explain.
3. Briefly describe some of the major responsibilities of a board of directors with respect to project management.
4. "Projects are key building blocks in the design and execution of corporate strategy." Explain what is meant by this. What ramifications does this idea have with respect to the responsibilities of a corporate board of directors?
5. Cite and explain some of the reasons for the need for board interest in a project plan.
6. How can a board of directors ensure that the organization design will be effective for accomplishment of corporate strategies and projects?
7. What specific questions should be addressed by the board in project review meetings?
8. What kind of information about a project should be prepared for and presented to the board of directors? Explain.
9. What is the purpose of a performance audit? Under what circumstances might a board of directors consider such an audit? Why?
10. Discuss the effect of corporate culture on organizational performance. What role does the board of directors play in shaping corporate culture?
11. What steps can be taken to protect a board of directors from litigation and subsequent court actions? Explain.
12. Discuss the importance of proper board member selection for organizational effectiveness.

5.18 USER CHECKLIST

1. What evidence indicates the possibility of inadequate attention by the board of directors to the projects within your organization? Does any evidence suggest that your organization's board of directors has been adequately involved in the corporation's major undertakings?
2. What responsibilities do you believe the board of directors should be taking but has not? Explain.
3. How do the major projects within your organization contribute to strategic plans and achievement of objectives and goals? What does this suggest about the need for board involvement?
4. Does your corporation's board of directors receive information about major project plans? What contributions do they make to these plans?
5. What attention has the board of directors of your organization given to the organizational design? What attention is needed?
6. Is the board involved in project review meetings? Why or why not?
7. What questions are addressed by the board of directors with respect to the project's progress? What questions should they be asking?
8. What kind of project status information is presented to the board of directors? Is information presented on a regular basis and in advance of meetings?
9. Under what circumstances might a project audit be needed on a major project in which your organization is involved?
10. What board actions have had an impact on the corporate culture of your organization? Explain.
11. Have any of your organization's projects undergone scrutiny in litigation? How could the company have been better prepared for such litigation?
12. Is your corporate board of directors staffed with knowledgeable, competent members? Why or why not?

5.19 PRINCIPLES OF PROJECT MANAGEMENT

1. The board of directors, along with senior management in an enterprise, has the responsibility to maintain surveillance over the planning for and execution of a project.
2. It is the responsibility of the senior managers of an enterprise to select major projects that should be reviewed by the board of directors.
3. The directors of an enterprise must review, on a periodic basis, the linkage between the strategic management and projects in the enterprise.

4. The board of directors and the senior managers of the enterprise have residual responsibility for the success or failure of a project.
5. In order to maintain effective surveillance over the conduct of a project in an enterprise, the board should approve the project's plan.

5.20 PROJECT MANAGEMENT *SITUATION*— BOARDS OF DIRECTORS' INADEQUACIES

In the material that follows, some of the key testimony presented by an expert witness on the prudence and reasonableness of the role of the Pacific Gas & Electric Company (PG&E) in the design and construction of the Diablo Canyon nuclear power plant is presented. This testimony, along with other expert witness testimony, was presented during the period when the State of California was involved in evaluating the utility's request for rate charges to offset the cost of the plant's design and construction of approximately $5 billion.

The Diablo Canyon nuclear power plant is located in San Luis Obispo, California. Nearly 20 years elapsed before the plant became operational. It was the first nuclear power plant constructed by PG&E—who did the design engineering for the plant. Other plants that were built by the company were traditional "fossil-fueled" power plants. Excerpts from the expert witness testimony follow:

- "The evidence is clear, however, that neither the Board nor the Executive Committee played any significant role in directing and controlling Diablo until late in the project,"
- ". . . at least until 1979, the Board functioned without meaningful formal input of significant Diablo Project data."
- "Because they lacked adequate information, PG&E Directors were unable to take appropriate action in the strategic management of the Diablo Project until late in its history."
- "My further review of all of the meeting minutes of the Board of Directors and Executive Committee cited by PG&E's witnesses indicates that major periods passed during which these senior executive bodies took no action on the Diablo Project."
- ". . . the Board's effectiveness was limited severely due to its failure to insist upon timely, easily understood information on the project."
- "The Major Construction Report (in both its weekly version given to the Executive Committee and the monthly version provided to the Board) was deficient in at least the following significant respects:
  - It did not distinguish between Diablo and other, much less significant jobs.
  - The report provides no basis for comparing planned and actual costs of the job.
  - The report provides no basis for comparing the planned and actual schedule.

  - The report did not identify key problems, events or issues that could affect cost or schedule.
  - The report totally neglected consideration of technical performance, including quality assurance and quality control.
  - The report did not facilitate identification of project trends."
- ". . . PG&E failed to develop an effective project information system for the Diablo Project until 1982."
- "At PG&E, however, such informational material and agenda items were typically not presented to the Board until the outset of the meeting."
- "My review of a number of key strategic decisions and actions on the Diablo Project indicates little, if any, involvement by the Board of Directors and the Executive Committee."
- "These decisions and actions included:
  - Approval of a strategic plan for Diablo;
  - PG&E's decision to act as its own architect, engineer and construction manager (AE/CM);
  - Choice of a basic organizational structure for the project;
  - Assessment of the suitability of the Diablo Canyon site;
  - Assessment of the implications of the Hosgri fault;
  - Full assessment of the implications of the Mirror Image Error; and
  - Selection of Bechtel Power Corporation as Project Completion Manager."
- *"Conclusion:* The most crucial questions in evaluating the reasonableness of the Board of Directors' performance are: (a) what did the Board know, and (b) what action did it take. It is apparent from PG&E's witnesses' testimony and their voluminous exhibits that the Board knew very little about the most significant project the Company has ever undertaken. It is also apparent that the Board was little more than a passive onlooker at key decision-points in the Diablo Project. The PG&E Board's failure to insist upon thorough information and its inaction in the face of various problems were unreasonable."[30]

5.21 STUDENT/READER ASSIGNMENT

1. What overall action should the board of directors of the PG&E Company have taken with regard to this major project when it was initiated?
2. What project management principles were not followed in the management of this project?
3. What do you believe to be the most serious omission in the management of this project by the senior managers and directors of this company?

[30] Rebuttal testimony of David I. Cleland, California Public Utilities Commission, Division of Ratepayer Advocates, San Francisco, California, June 20, 1988.

4. What "philosophy of project management" should the senior managers and board members have followed with respect to the project?
5. The PG&E Company had an excellent "track record" in the design and construction of fossil-fueled power plants. Why did they have major problems on the Diablo Canyon project?

CHAPTER 6
PROJECT STAKEHOLDER MANAGEMENT[1]

"Smile at the claims of long descent."
ALFRED, LORD TENNYSON, 1809–1892

6.1 INTRODUCTION

One of the major concerns coming forth in the management of projects is the recognition and "management" of project stakeholders. These stakeholders are project team members, higher-level managers, and outside organizational entities such as contractors, subcontractors, customers, regulators, financial institutions, and other claimants who have--or believe they have—vested rights in the project. Acceptance of the notion of project stakeholders means that the project has to be managed from an overall perspective of all of the stakeholders—not just the customer(s) and the organization.

This chapter provides a description of generic stakeholders, along with examples of successful and not-so-successful stakeholder management. A model and a process will be suggested that can be used in identifying and understanding project stakeholders, the management of such stakeholders, and how to understand and deal with the likely parochial interests of stakeholders. How to predict stakeholder behavior and how to manage the project from a total stakeholder context will be examined. After reading this chapter the people who are associated with enterprise projects or are engaged in learning how to manage projects should gain important concepts and processes to be added to their overall philosophy of project management.

6.2 WHY MANAGE STAKEHOLDERS?

Stakeholder management is also an important part of the strategic management of organizations. There is abundant literature in the management field that establishes

[1] Portions of this chapter have been paraphrased fmm David I. Cleland, "Project Stakeholder Management" *Project Management Journal,* September *1986,* pp. 36–43. Used by permission.

the need to analyze the enterprise's environment and its stakeholders as part of the strategic management of the enterprise. Full recognition of the role of enterprise stakeholders is a recent phenomenon.

Political, economic, social, legal, technological, and competitive environments affect an enterprise's ability to survive and grow. Project managers need to identify and interact with key institutions and individuals in the project's systems environment. An important part of the management of the project's systems environment is an organized process for identifying and managing the probable stakeholders in that environment. This management process is necessary to determine how the probable stakeholders are likely to react to project decisions, what influence their reaction will carry, and how the stakeholders might interact with each other and with the project's managers and professionals to affect the chances for success of a proposed project strategy.

Cleland and King,[2] Rothschild,[3] Freeman,[4] and Mendelow[5] have presented strategies for dealing with stakeholders in the corporate context. The management of a project's "stakeholders" means that the project is explicitly described in terms of the individuals and institutions that share a stake or an interest in the project. Thus, the project team members, subcontractors, suppliers, and customers, to name a few, invariably are relevant. The impact of project decisions on all of them must be considered in any rational approach to the management of a project. But management must also consider others who have an interest in the project and are, by definition, also stakeholders. These stakeholders are outside the authority of the project manager and often present serious management problems and challenges.

Corporations have always been accountable to their shareholders. Now they are also accountable to their stakeholders. At times, the interests of employees, government, customers, suppliers, creditors, or environmentalists can dominate the interest of the shareholders. In recent years laws have been passed giving stakeholders legal protection, such as found in the use of environmental considerations in making and marketing products. There is a subtle shift from a ***shareholder*** paradigm to a ***stakeholder*** paradigm. Project teams are using techniques such as "stakeholder reaction assessment" to identify stakeholder interests[6]

Some companies have explicit policies that guide their strategies regarding stakeholders. For example, Elan Corporation, Plc., states that "It is our policy to support the communities in the areas in which we are based. In Ireland, we have given significant support to the higher education system, including the new school of pharmacy at Trinity College, Dublin, and to the Michael Smurfit Graduate School of Business at University College, Dublin. Ireland has been good for Elan, and we have enjoyed strong support from its government and development agencies from our early years. In giving something back through the support of higher

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[2]D. I. Cleland and W. R. King, *Systems Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983).
[3]W. E. Rothschild, *Putting It All Together: A Guide to Strategic Thinking* (New York: AMACOM, 1976).
[4]R. E. Freeman, *Strategic Management—A Stakeholder Approach* (Boston: Pitman, 1984).
[5]Aubrey Mendelow, "Stakeholder Analysis for Strategic Planning and Implementation," in William R. King and David I. Cleland (eds.), *Strategic Planning and Management Handbook* (New York: Van Nostrand Reinhold, 1985).
[6]Leonard J. Brooks, "Higher Stakes," *CA Magazine,* March 1995, pp. 53–56.

education, we are benefiting both Elan and the country from which we will have access to future generations of scientists and managers.'"

6.3 ORGANIZATIONAL STAKEHOLDERS

Organizational stakeholders have been defined in the context of a business organization. Table 6.1 shows a model of generic organizational claimants (stakeholders) and their claims (stake) for a business organization. The model requires the key managers to develop an appropriate strategy to manage the organization through:

- Identifying appropriate stakeholders
- Specifying the nature of the stakeholder's interest
- Measuring the stakeholder's interest
- Predicting what each stakeholder's future behavior will be to satisfy her or his stake
- Evaluating the impact of the stakeholder's behavior on the project team's latitude in managing the project

The value of using a model like Table 6.1 is to establish a point of departure for developing a model appropriate to a project. It is interesting to know that an environmental group may be concerned about the outcome of a project. But it is vital that the project team have a specific delineation of the various strategies that a stakeholder, such as an environmental group, intends to employ in satisfying that stakeholder's goals and objectives, along with a prediction of the future impact of that stakeholder's actions on the project's outcome. For example, a project manager who must make a recommendation concerning the design of a new plant must be aware of state and local land use, plant design, and tax laws, and the area's likely pattern of growth. The project manager must be aware of the local political climate, availability of a skilled labor force, and public attitudes toward the location of the plant in the community. To put all aspects of the stakeholders together requires an understanding of how to apply the management process in dealing with project stakeholders.

The political side of project management is very real. The project manager who neglects the building and maintenance of alliances with key political stakeholders will soon find indifference or opposition to his or her project. There are several notable examples of projects that were impacted by the political exigencies of the period. The recently completed English Channel tunnel project was first proposed in 1802 and was actually started in 1876. Technologically, the tunnel was possible even in that period with more than a mile of tunnel started at each side of the English Channel. But the project was killed by politics many times—and it was not until 1993 that the tunnel became a reality.

The Interstate Highway System proposed by President Eisenhower was sidelined by politics—and when President Eisenhower adopted a bipartisan approach,

'Annual Report 1996, Elan Corporation, Plc., p. 10.

TABLE 6.1 Organizational Claimants and Their Claims

Claimants	Claims
Stockholders	Participate in distribution of profits, additional stock offerings, assets on liquidation; vote of stock, inspection of company books, transfer of stock, election of board of directors, and such additional rights as established in the contract with the corporation.
Creditors	Participate in legal proportion of interest payments due and return on principal from the investment. Security of pledged assets; relative priority in event of liquidation. Participate in certain management and owner prerogatives if certain conditions exist within the company (such as default of interest payments).
Employees	Economic, social, and psychological satisfaction in the place of employment. Freedom from arbitrary and capricious behavior on the part of company officials. Share in fringe benefits, freedom to join union and participate in collective bargaining, individual freedom in offering up services through an employment contract. Adequate working conditions.
Customers	Service provided the product; technical data to use the product; suitable warranties; spare parts to support the product during customer use; R&D leading to product improvement; facilitation of consumer credit.
Suppliers	Continuing source of business; timely consummation of trade credit obligations; professional relationship in contracting for, purchasing, and receiving goods and services.
Governments	Tax (income, property, other), fair competition, and adherence to the letter and intent of public policy dealing with the requirements of "fair and free" competition. Legal obligations for business people (and business organizations) to obey antitrust laws.
Unions	Recognition as the negotiating agent for the employees. Opportunity to perpetuate the union as a participant in the business organization.
Competitors	Norms established by society and the industry for competitive conduct. Business statesmanship on the part of contemporaries.
Local communities	Place of productive and healthful employment in the local community. Participation of the company officials in community affairs, regular employment, fair play, local purchase of reasonable portion of the products of the local community, interest in and support of local government, support of cultural and charity projects.
The general public	Participation in and contribution to the government process of society as a whole; creative communications between government and business units designed for reciprocal understanding; bearing fair portion of the burden of government and society. Fair price for products and advancement of the state of the art in technology, which the product line offers.

Source: D. I. Cleland and W. R. King, *Systems Analysis and Project Management.* 3d ed. (New York: McGraw-Hill, 1983). p. 45.

the project was initiated. The Interstate Highway Act of 1956 provided something for everyone, and that was the secret of political success of the highway system. The Superconducting Supercollider project was killed by stakeholder action. Projects can and do fail because of politics. Some of the lessons learned concerning politics and projects include:

- The story of the project must be told so that all stakeholders understand its rationale and purpose.
- Senior management must be fully behind the project.
- Project managers must sell their project to the stakeholders, particularly those who are "nonbelievers."
- Benefits must be widespread and provide something for all stakeholders.

One author summed up the political challenges in project management very well by stating: "Successful project management means successful political management as well."[8]

Corporate executives are becoming more aware of the need to consider the needs of the stakeholders in their management of the company. For example, NCR, in support of its mission of "creating value for our stakeholders," believes it must first satisfy the legitimate expectations of every person with a stake in the company. NCR attempts to satisfy their stakeholders' expectations by promoting partnerships in which everyone is a winner. The company describes this commitment to its mission in the following way:

- We believe in building mutually beneficial and enduring relationships with all of our stakeholders, based on conducting business activities with integrity and respect.
  We take customer satisfaction personally; we are committed to providing superior value in our products and services on a continuing basis. We respect the individuality of each employee and foster an environment in which employees' creativity and productivity are encouraged, recognized, valued and rewarded. We think of our suppliers as partners who share our goal of achieving the highest quality standards and the most consistent level of service. We are committed to being caring and supportive corporate citizens within the worldwide communities in which we operate.
- We are dedicated [to] creating value for our stakeholders and financial communities by performing in a manner that will enhance the return on their investments?[9]

6.4 PROJECT STAKEHOLDERS

Each project has its own unique set of stakeholders. For example, on the O'Hare Development Program (ODP), a $1.6 billion, 10-year expansion program of Chicago's

[8] Bud Baker, "The Power of Politics: The Fourth Dimension of Managing the Large Public Project," *Proceedings,* Project Management Institute, 25th Annual Seminar/Symposium, Vancouver, Canada, October 17–19, 1994, pp. 830–833.

[9] Courtesy NCR Corporation.

O'Hare International Airport, many different stakeholders were involved. Their involvement is described as follows:

> The City of Chicago is involved on a daily basis at levels from the Mayor's Office to purchasing. Many City departments and other City consultants provide guidance and significant contributions to the ODP. Additional government agencies involved include the Federal Aviation Administration, the Illinois Department of Transportation and the Illinois State Toll Highway Authority. Specialized Architect/Engineer design firms and contractors are selected by the City to execute each project within the Program. Each must be supplied with information, formatted to suit their particular needs and level of participation.[10]

A classic case of stakeholder involvement is found in the Milwaukee Water Pollution Abatement Program (WPAP). In this project, not unlike many others, stakeholders had a major impact on the success of the project. Groundwork was laid for stakeholder involvement in this program through the policy of the Environmental Protection Agency (EPA), which recognizes the need for the citizenry to be involved in the planning of major public works projects and requires a public involvement program on EPA grant–supported projects.

It was necessary to keep the public informed every step of the way on this huge and complex $2.2 billion project to renovate and upgrade the sewage system of Milwaukee and its suburbs. Legislative and judicial actions set the direction of the Water Pollution Abatement Program at Milwaukee. A tight timetable and the involvement of 27 separate municipalities, compounded by the need to undergo massive renovation of an existing sewerage system without disrupting service, added to the complexity of the project. CH2M Hill, an international firm of engineers, planners, economists, and scientists that had been in business for 43 years, and its consortium of principal associate consultants were selected to manage the Milwaukee WPAP.[11]

Successful project management can be carried out only when the responsible managers take into account the potential influence of the project's stakeholders. An important part of the project planning is the identification of all project stakeholders and their relevant stakes in the project. Stakeholder analysis during the planning of the project is particularly useful for the development of strategies to facilitate the "management" of the stakeholders during the life cycle of the project.

Two public works highway projects in Illinois were subjected to effective stakeholder management. The management of stakeholders on these projects involved five essential elements: (1) identification of stakeholders, (2) tiered approach to involvement, (3) active investigation to identify issues of concern or conflict, (4) resolution of concerns and conflicts to an acceptable solution, and (5) formal approval.

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[10] Paul B. Demkovich, "Goal Achievement through Program Control Systems on the O'Hare Development Program," *Proceedings,* PMI Seminar/Symposium, October 1987, p. 303.

[11] See Henry F. Padgham, "The Milwaukee Water Pollution Abatement Program: Its Stakeholder Management," *PM Network,* April 1991, pp. 6–18.

Some of the stakeholders were obvious: city and county councils, chambers of commerce, and agencies that had regulatory oversight of the highway projects. Others, such as environmental interest groups, neighborhood and historic associations, and business organizations, were less noticeable. Efforts to identify the less visible stakeholders included drives through the area, visits to adjacent businesses, institutions, and residences, and consultation with local representatives. Leading questions that were asked, such as Who cares about this project? and What groups represent the interests of these people? were helpful.

The project team put special effort into forming interest groups that cut across geographic and special interest communities. Meetings were conducted with stakeholders, such as formal briefings for Illinois Department of Transportation officials and Federal Highway Association representatives. Working sessions were held for technical groups composed of representatives of local government, institutions, industries, and agencies. All told, about 65 meetings were held with stakeholder interest groups, for example, informal meetings with interested groups to explain the project, its rationale, its cost, its schedule, and what it would do for the community.

Newsletters and project updates were disseminated on a regular basis. Having the project team take the lead in working with the stakeholder groups and discuss the project increased the comfort levels of the stakeholders. The stakeholders grew to recognize the names and faces of the project team, helping to increase the stakeholders' confidence level. Other strategies that were used to manage the stakeholders and keep them informed included:

- Seeking out and addressing contentious issues promptly to avoid getting blindsided at the formal hearings.
- A series of local drop-in centers to present basic project information and solicit comments.
- Great care in defining the scope, probable cost, and schedule for the stakeholders.
- A constant message: Are there any stakeholder concerns of which the project team is unaware?
- An ongoing willingness to meet with any stakeholders to assure them that their concerns were being considered by the project team.

The result of this proactive stakeholder management strategy: The project team was not taken by surprise by any issue or concerns, nor were the stakeholders surprised about any aspect of the project. The projects were carried out with almost complete acceptance by the affected stakeholders and the general public. Clearly the proactive management of the stakeholders contributed significantly to the project's value.[12]

Project stakeholders include not only the obvious members of the project team but also those principals in the political, economic, social, legal, and technological environments in which the project exists. In some cases the stakeholders will be highly organized and motivated; for example, some environmental groups have been influencing the construction of nuclear power generation plants.

[12]Larry Martin and Paula Green, "Gaining Project Acceptance," Civil *Engineering,* August *1995,* pp. 51–53.

Because project stakeholder management assumes that success depends on taking into account the potential impact of project decisions on all stakeholders during the entire life of the project, the project team faces a major challenge. In addition to identifying and assessing the impact of project decisions on stakeholders who are subject to the authority of the management, the team must consider how achievement of the project's goals and objectives will affect, or be affected by, stakeholders outside their authority.

The former head of the Bonneville Power Administration in Portland, Oregon, describes the challenges and anxieties involved in making a commitment to public involvement over some company projects and the awesome challenge in making that commitment work. Peter Johnson has become a convert, stating that "public involvement is a tool that today's managers...must understand."[13]

Youker found in his experiences with the World Bank that in reviewing the status of the implementation of its entire portfolio of projects, many of the most important problems of implementation lie in the general environment of the project and are beyond the direct control of the project manager.[14]

Project stakeholders, often called intervenors in the nuclear power plant construction industry, can have a marked influence on a project. At one nuclear power plant, numerous bomb threats over the life of the project lengthened construction schedules, shut down work on select areas, frustrated managers and professionals, and forced more intensive security provisions, including physical searches of people, equipment, and vehicles. Antinuclear blockades and demonstrations impacted productivity. In the fall of 1981, the Abalone Alliance, an antinuclear organization, attempted to blockade the plant. The plant had to pay for housing and feeding the plant operating crew, management staff, National Guard troops, and law enforcement officers. Costs associated with such intervenor action, such as work shutdown and absenteeism because of the physical threats, could not be calculated.

6.5 SOME EXAMPLES OF STAKEHOLDER INFLUENCE

Some recent project management experiences highlight the role of these stakeholders:

- In the investigation of management prudence on the Long Island Lighting Company (LILCO) Shoreham project, Suffolk County, the New York State Consumer Protection Board and the Long Island Citizens in Action (intervenors) argued that the project suffered from pervasive mismanagement throughout its history. The record, in the view of these intervenors, established that approximately

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[13] "Peter T. Johnson, "How I Turned a Critical Public into Useful Consultants:' *Harvard Business Review.* January–February 1993, pp. 56–66.

[14] Robert Youker, "Managing the International Project Management Environment," Management Planning and Control Systems, 5825 Rockmere Drive, Bethesda, MD 20816-2443.

$1.9 billion of Shoreham's cost was expended unnecessarily "as a result of LILCO's mismanagement, imprudence or gross inefficiency."[15]

- One reason that the Supersonic Transport program failed in the United States was that the managers had a narrow view of the essential players and generally dismissed the key and novel role of the environmentalists until it was too late.[16]
- State public utility commissions (PUCs) are key and formidable stakeholders in the design, engineering, construction, and operation of nuclear power generating plants. In past years, state PUCs have prevented the recovery of billions of dollars in generating plant construction costs. Some utilities have been penalized for imprudent spending on nuclear plants; others have been told that their plants were not needed. For example, the Pennsylvania State Public Utility Commission ruled that the Pennsylvania Power and Light Company's newly opened 945-MW $2 billion Susquehanna Unit 2 nuclear plant would provide too much generating capacity for the utility's customers. The utility was allowed to recover only taxes, depreciation, and other operating costs. The Missouri Public Service Commission recently disqualified Union Electric Company from charging ratepayers for $384 million of the $3 billion spent on the new Callaway nuclear plant in central Missouri. The commission cited high labor expenses, improper scheduling of engineering, and "inefficient, imprudent, unreasonable, or unexplained costs" during 4 years of delay."
- In a 1-million-square-foot addition to the New York Hospital, environmental, political, and social challenges existed. The New York City Department of Environmental Protection even required a wildlife preservation plan. Over 45 agencies—"stakeholders"—had to be satisfied even though no public money was involved in the project. Public money was about the only issue missing—air rights, the highway, the river, near-zero work space, historic preservation, sheer size, and other issues had to be considered. The problem was less the outcome of the product—a new hospital addition—and more the process of the conceptualization and management of the project mindful of the key issues involved.[18]
- Diverse stakeholders, or intervenors, are taking active roles in rate-setting case hearings. For example, when the Union Electric Company of St. Louis, Missouri, instituted proceedings for authority to file tariffs increasing rates for electric service, the following parties were granted permission to intervene in the proceedings: 25 cities, the state of Missouri, the Jefferson City school district, the Electric Ratepayers Protection Project, the Missouri Coalition for the Environment, the Missouri Public Interest Research Group, Laclede Gas Company, Missouri Limestone Producers, Dundee Cement Company, LP Gas Association,

[15]Recommended decision by administrative law judges William C. Levey and Thomas R. Matias, Long Island Lighting Company–Shoreham Prudence Investigation, case no. 27563, State of New York Public Service Commission, March 13, 1985, p. 57.

[16]Mel Horwitch, "The Convergence Factor for Successful Large-Scale Programs: The American Synfuels Experience as a Case in Point," in D. I. Cleland (ed.), *Matrix Management Systems Handbook* (New York: Van Nostrand Reinhold, 1984).

"William Glasgall, "The Utilities' Pleas Falling on Deaf Ears," *Business Week*, June 17, 1985, p. 113.

"Nadine M. Post, "And a Highway Runs through It," ENR, August 7, 1995, pp. 24–28.

Missouri Retailers Association, the Metropolitan St. Louis Sewer District, and the industrial intervenors—American Can Company, Anheuser Busch, Inc., Chrysler Corporation, Ford Motor Company, General Motors Corporation, Mallinckrout, Inc., McDonnell Douglas Corporation, Monsanto Company, National Can Corporation, Nooter Corporation, PPG Industries, Inc., Pea Ridge Iron Ore Company, River Cement Company, and St. Joe Minerals Corporation (Monsanto et al.).[19]

- The Nuclear Regulatory Commission is a proactive stakeholder in the management of nuclear power plant projects. Its principal interest is the licensing of nuclear plants to ensure quality assurance, safeguards, inspection, and proper operation. Its influence in the industry is substantial. In addition to licensing individual plants, the NRC conducts studies in the design, engineering, and licensing of plants. In 1984 it published a landmark study of existing and alternative programs for improving quality and the assurance of quality in the design and construction of commercial nuclear power plants.[20]
- Competitors are key stakeholders, particularly during the competitive phase before the architect and engineer, project manager, or constructor firm is selected during a source selection process. During this competitive phase, an in-depth analysis of competitors is essential to winning a contract. The business literature contains descriptions on how to access the competition.[21] A potential winning contract can become a loser if the competition is ignored.
- Stakeholder management includes very favorable situations when companies are creating wealth for their stockholders at a phenomenal rate. The Wall ***Street Journal*** reports that Royal Dutch/Shell Group has a huge problem while generating profits of approximately $1.5 million per hour and sitting on more than $11 billion in the bank. This creates a predicament with its stockholders—primary stakeholders—because they are looking for growth as well as current profits. Stockholders want the money put to use for increased benefits over the long haul. Shell has used some of the money to reduce debt and some to buy back stock. Efforts have even been made to acquire small, less successful energy companies. The problem still remains that there is too much cash that is not working for the stockholders.

  Shell, like other energy companies, would like to develop more oil fields, but is constrained by U.S. economic sanctions against countries with huge oil reserves. Such countries as Libya, Iraq, and Iran are included in these biggest oil producers. Areas such as the North Sea and the United States are experiencing a decline in oil production. Other countries experiencing political turmoil, such as Indonesia and Nigeria, present challenges to operating and managing oil production. There are other countries that do not meet the expectations of energy companies and these opportunities are currently being deferred.

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[19] Case Nos. ER-85-160 and EO-85-17. State of Missouri Public Service Commission, Jefferson City, March 29, 1985.

[20] W. Altman, T. Ankrum, and W Brach, "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants." NUREG-1055, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984.

[21] Richard Eells and Peter Nehemkis, ***Corporate Intelligence and Espionage*** (New York: Macmillan, 1984).

Energy companies are holding nearly $40 billion in cash reserves that cannot be spent to extend the oil production—the area where this reserve of money was generated. Efforts to expand into new fields of work unrelated to energy production have caused stockholder reactions. Companies are being "forced" to stay within their core business areas by stakeholders. To appease stakeholders, including shareholders, Shell points out that the oil business is extremely cyclical, the top of the cycle has lots of expenditures, and opportunities would not be passed up. The stock buyback is a means of preventing too much cash from accumulating, but is not a means of generating more in the oil-producing business.

Throughout this report in ***The Wall Street Journal,*** there are examples of stakeholders for oil exploration projects. Stockholders want to ensure that their money grows through investments rather than being held in a bank. Different politics for each of the oil-producing countries brings about challenges to management in view of government instability or uncertainty. Executives of the oil companies must also be considered stakeholders, although not specifically addressed as such. Missing and perhaps the largest group of stakeholders is the consumer, both in the United States and overseas.[22]

6.6 SOME EXAMPLES OF SUCCESSFUL STAKEHOLDER MANAGEMENT

There are some excellent examples of successful stakeholder management:

- Care was taken during the design and construction of the Hackensack Meadowlands sports complex to develop cooperation among the groups concerned with environmental impact, transportation, development, and construction.
- On the James Bay project special effort was made to stay sensitive to social, economic, and ecological pressures.[23]
- James Webb and his colleagues at NASA were adept at stakeholder management during the Apollo program. NASA gained the support not only of the aerospace industry and related constituencies, but also of the educational community, the basic sciences, and the weather forecaster profession.[24]
- The 12.5-mile, $490 million highway project through Glenwood Canyon in Colorado is one of the most expensive nonurban sections of the interstate system. This project has no operations component. As such, there is no added level of liability/risk to markets or investors upon its completion. It required more than a decade of planning and 12 years to construct. The project involved an unprecedented degree of cooperation among the project team, environmentalists, and tourists to create a major highway that preserved and even enhanced one of the

[22]Paraphrased from Christopher Cooper and Thaddeus Herrick, "Pumping Money," ***The Wall Street Journal.*** July 30, 2001, pp. A1, A8.

[23]Peter G. Behr, "James Bay Design and Construction Management," ASCE Engineering Issues, ***Journal of Professional Activities,*** April 1978.

[24]E. Ginsburg, J. W. Kuhn, and J. Schnee, ***Economic Impact of Large Public Programs: The Nash Experience*** (Salt Lake City, Utah: Olympus Publishing, 1976).

nation's premier natural settings. The construction of the highway through a scenic gorge overcame fierce initial opposition, a wide variety of design changes and physical constraints, plus remarkable cooperation in creating a four-lane highway that even the environmentalists love.[25]

- Bechtel planned, designed, engineered, and managed the procurement, right-of-way acquisition, and construction of a second gas pipeline extending 875 miles from Canada into central California. This included the construction of a new compressor station and the retrofit of 17 compressor stations and three major meter stations at a cost of approximately $1.6 billion. This new pipeline parallels the first completed in the early 1960s. Throughout the pipeline expansion, concern about the wide range of environmental factors was paramount. Careful planning by Bechtel resulted in the development of extensive safeguarding of environmental factors on the pipeline. Certain measures dealt with the control of erosion, noxious weeds, hazardous material, and construction noise, as well as extensive training for all personnel on environmental awareness of work practices.[26]

6.7 PROJECT STAKEHOLDER MANAGEMENT (PSM) PROCESS

The principal justification for adopting a PSM perspective springs from the enormous influence that key external stakeholders can exert. Arguably, the extent to which the project achieves its goals and objectives is influenced by the strategies pursued by key stakeholders. Stakeholder management leading to stakeholder cooperation enhances project objective achievement, while stakeholder neglect hinders it.

In working with project managers to develop a project strategy, which encompasses a PSM philosophy, the following basic premises can serve as guides for the development of a PSM process:

- PSM is essential for ensuring success in managing projects.
- A formal approach is required for performing a PSM process. Multiyear projects are subject to so much change that informal means of PSM are inadequate. Reliance on informal or hit-or-miss methods for obtaining PSM information is ineffective for managing the issues that can come out of projects.
- PSM should provide the project team with adequate intelligence for the selection of realistic options in the management of project stakeholders.
- Information on project stakeholders can be gained from a variety of sources, some of which might superficially seem to be unprofitable.

PSM is designed to encourage the use of proactive project management for curtailing stakeholder activities that might adversely affect the project and for facilitating the project team's ability to take advantage of opportunities to encourage stakeholder

[25] John Pendergast, "Pioneer Highway," *Civil Engineering,* July *1993,* pp. 36–39.
[26] Gary Walker and John Myrick, "Doubling a Pipeline," *Civil Engineering,* January *1994,* pp. 50–52.

support of project purposes. These objectives can be achieved only by integrating stakeholder perspectives into the project's formulation processes and developing a **PSM** strategy. The project manager is then in a better position to influence the actions of the stakeholders on project outcome. Some objectives for **PSM** might be as follows:

- Ensure the availability of timely, credible, and comprehensive information of the capabilities and the options open to each stakeholder.
- Continue to identify the probable strategies of the stakeholders.
- Determine how key stakeholders' strategies might affect current project interests.
- Continuously monitor and provide comprehensive information about probable actions in the project stakeholder environment that might have an impact on the interests of the project.
- Organize the collection, analysis, and dissemination of stakeholder information for the project team.

Failure to recognize or cooperate with adverse stakeholders may well hinder a successful project outcome. Indeed, strong and vociferous adverse stakeholders can force their particular interest on the project manager at any time, perhaps at the time least convenient to the project. **PSM** is thus a necessity that allows the project manager to set the timetable to maintain better control. A proactive **PSM** process is designed to help the project team develop the best possible strategies.

6.8 PLANNING STAKEHOLDER MANAGEMENT

Developing a strategy to manage the stakeholders starts with putting forth a few key questions:

- Who are the project stakeholders—both primary and secondary?
- What stake, right, or claim do they have in the project?
- What opportunities and challenges do the stakeholders pose for the project team?
- What obligations or responsibilities does the project team have toward its stakeholders?
- What are the strengths, weaknesses, and probable strategies that the stakeholders might employ to realize their objectives?
- What resources are at the stakeholders' disposal to implement their strategies?
- Do any of these factors give the stakeholders a distinctly favorable position in influencing the project outcome?
- What strategies should the project team develop and implement to deal with the opportunities and challenges presented by the stakeholders?
- How will the project team know if it is successfully "managing" the project stakeholders?

6.9 A MODEL OF THE PSM PROCESS

The **PSM** process consists of executing the management functions of planning, organizing, motivating, directing, and controlling the resources used to cope with external stakeholders' strategies. These functions are interlocked and repetitive; the emergence of new stakeholders might require the reinitiation of these functions at any time during the life cycle of the project. This management process is continuous, adaptable to new stakeholder threats and promises and to changing strategies of existing stakeholders. Putting the notion of stakeholder management on a project life-cycle basis emphasizes the need to be aware of stakeholder influence at all times.

The management process for the stakeholders consists of the phases depicted in Fig. 6.1 and discussed below.

6.10 IDENTIFICATION OF STAKEHOLDERS

The identification of stakeholders must go beyond the internal stakeholders. Internal stakeholders must, of course, be taken into account in the development of project strategies. Their influence is usually supportive of project strategies

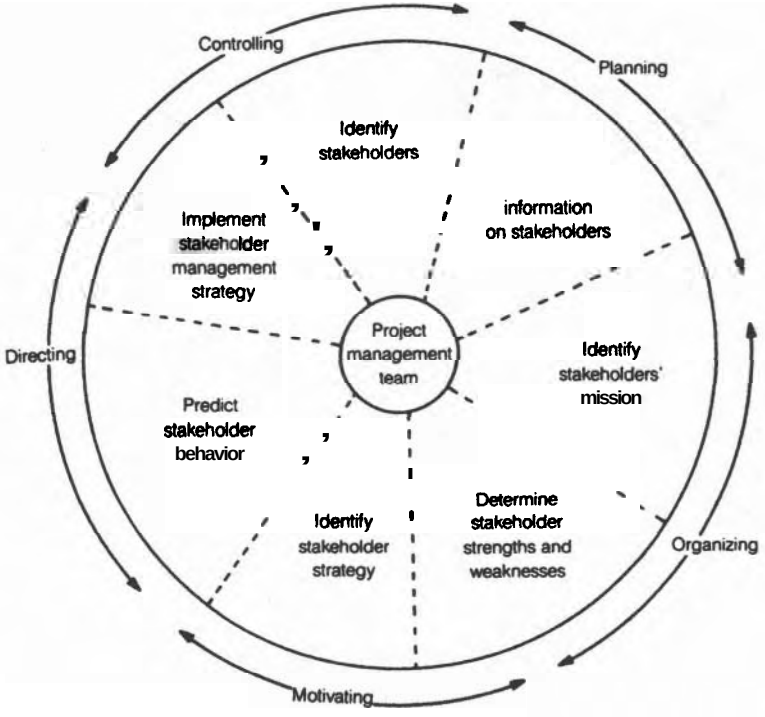

FIGURE 6.1 Project stakeholder management process.

because internal stakeholders are an integral part of the project team. A prudent project manager would ensure that these internal stakeholders play an important and supportive role in the design and development of project strategies. Such a supportive role is usually forthcoming because the project manager has some degree of authority and influence over these individuals.

Stakeholders are persons or groups that have, or claim, ownership, rights, or interests in a project and its activities: past, present, or future. Primary stakeholders are those persons and groups that have a legal contractual relationship to the project. Such stakeholders include the project owner, suppliers, functional groups, investors, and those from the public domain such as communities and institutions that provide infrastructures and markets, whose laws and regulations must be obeyed and to whom taxes and other obligations are owed. Secondary stakeholders are defined as those who influence or affect, or are influenced or affected by, the project but are not regularly engaged in transactions with the project and may not be essential for the project's survival.[27] The media and special interest groups are secondary stakeholders under this definition. These stakeholders have the capacity to mobilize public opinion in favor of or in opposition to the project's purposes and performance.

The management of a project inevitably entails bringing into the picture those persons and groups that have both contractual interests and vested interests in the management of the project as well as its outcome. These persons and groups come from a wide variety of organizational settings to include:

Senior organizational managers including corporate directors, general managers, functional managers, project managers, work package managers, and project team members

- Customers (users), suppliers, contractors, subcontractors, and vendors

Local, state, and federal agencies and commissions and judicial, legislative, and executive organizations

- Employees, private citizens, tourists, and families of employees
- Creditors and shareholders
- Social organizations, political organizations, environmentalists, "intervenor" groups such as the Sierra Club, and consumer groups
- Competitors
- Local communities and the general public
- Professional organizations, trade associations, and unions
- Institutions such as schools, universities, hospitals, churches, chambers of commerce, civic groups, minority groups, activists, and the American Civil Liberties Union
- News media

[27] The idea of primary and secondary stakeholders was first expressed in David I. Cleland, "Project Stakeholder Management," *Project Management Journal,* September *1986,* pp. 36–43. The concept of project stakeholders was further extended in David I. Cleland, "Project Stakeholder Community—A Revisit," in Jeffrey Pinto (ed.), *Project Management Institute's Project Management Handbook* (San Francisco: Jossey-Bass, 1998).

A model of the project stakeholders is shown in Fig. 6.2. In a sense the secondary stakeholder "organization" is a virtual organization-one that exists in essence or effect though not in actual fact, form, or name. The stakeholder virtual organization is an underlying entity that lurks under the surface—a sort of potential organization that exists between the lines and structure of the formal organizational entity. Although not existing in actual fact, form, or name, the secondary stakeholders that comprise the virtual organization can exert a powerful influence over the project's planning and outcome.

6.11 PRIMARY STAKEHOLDERS

Primary stakeholders are those persons or groups on the project team who have a contractual or legal obligation to the project team and have the responsibility and authority to manage and commit resources according to schedule, cost, and

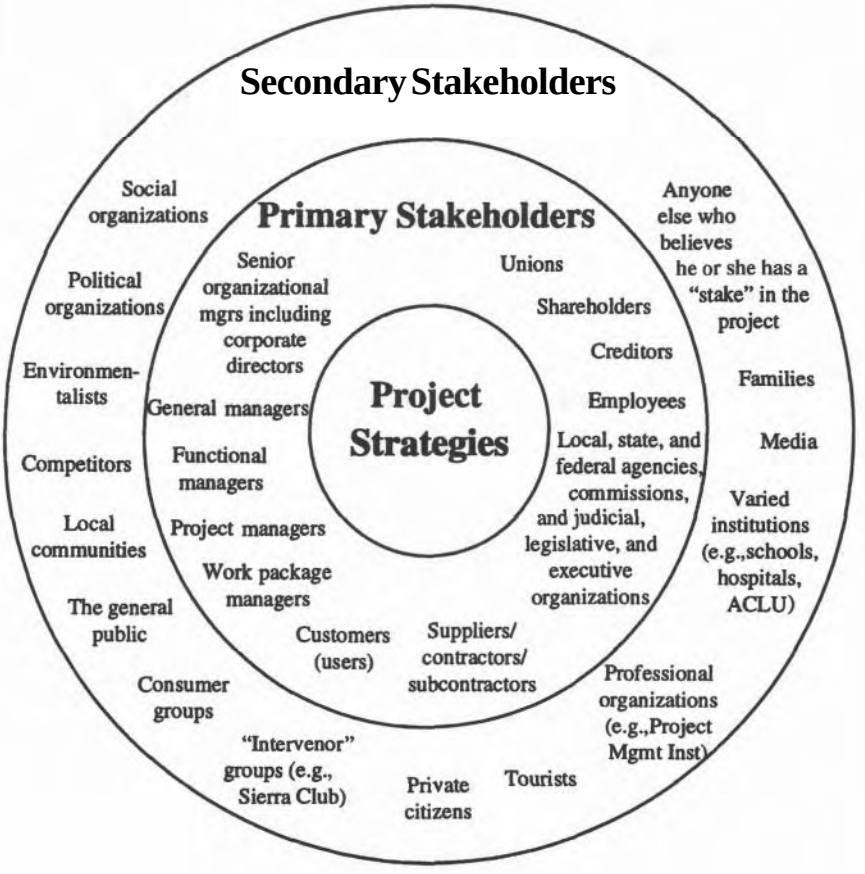

FIGURE 6.2 The project stakeholders.

technical performance objectives. Such stakeholders have direct strategic and operational roles through participating in the design, engineering, development, and construction (production), and after-sales logistic support of the project outcomes. In other words, the primary stakeholders belong to the project team and its supporting organizational infrastructure: functional managers, general managers, senior managers, customer and supplier officials, and so forth. These primary stakeholders have the residual authority and responsibility to use resources to support the project objectives. The key authority and responsibilities of these stakeholders include:

- Providing leadership to the project team.
- Allocating resources to be used in the design, development, and construction (production) of the project results.
- Building and maintaining relationships with all stakeholders.
- Managing the decision context in the design and execution of strategies to commit project resources.
- Leading by example to set the cultural ambience of the project, which brings out the best of people in providing high-quality professional resources to the benefit of the project.
- Maintaining ongoing and effective oversight of the project's progress in meeting its schedule, cost, and technical performance objectives, and where necessary, instituting reprogramming and reallocation of resources as required to keep the project on track.
- Periodically assessing the efficiency and effectiveness of the project team in doing the job for which it has authority and responsibility.

6.12 SECONDARY STAKEHOLDERS

Secondary stakeholders are those who have no formal contractual relationship to the project but can have a strong interest in what is going on regarding the project. These stakeholders belong to an informal project stakeholder organization. They include social organizations, competitors, local communities, the general public, consumer groups, private citizens, intervenor groups, professional organizations, the media, families, and varied institutions such as schools, universities, hospitals, churches, civic groups, and so forth (see Fig. 6.2).

The management of secondary stakeholders poses significant challenges for the project manager and other enterprise managers as well, because these managers have no legal authority or contractual relationship with those stakeholders. These secondary stakeholders can exert extraordinary influence over the project, supporting or working against the project and its outcome. "Management" of these secondary stakeholders can be particularly arduous, because no formal relationship exists with them. Consequently, the authority that the managers use is limited to their de facto authority — interpersonal capabilities, knowledge, persuasive powers, political savvy, expertise — in general, their ability to work with and

influence these secondary stakeholders. Some of the more important characteristics of these secondary stakeholders include:

- There are no limits to where they can go and with whom they can talk to influence the project.
- Their interests may be real--or are perceived to be real—because the project and its results may impinge in their "territory."
- Their "membership" on the project team is ad hoc—they stay as long as it makes sense to them in gaining some advantage or objectives involving the project.
- They may team with other stakeholders on a permanent or ad hoc basis in pursuing common interests for or against the project's purposes.
- The power they exercise over the project can take many forms, such as political influence, legal actions (such as court injunctions), emotional appeal, media support, social pressure, local community resistance, use of expert witnesses, or even scare tactics.
- They have a choice of whether or not to accept responsibility for their strategies and actions.

In managing the project stakeholders, the legal authority that has been delegated to the project manager is helpful but not enough to motivate people to give that extra commitment to carry out successfully the work required in dealing with the project stakeholders. Through de facto authority—that which comes to the project manager and the team members through competency—reciprocal confidence and commitment can be built with stakeholders to enhance the chances of gaining the loyalty and commitment of the stakeholders. For the project manager this is an exercise in the development and use of personal power in working successfully with project stakeholders. The development of this personal power requires competence, and also a great deal of energy and capacity to keep all stakeholders of the project moving in the right direction. When the team members feel right about the relationships that exist with their stakeholders, there is a greater likelihood of success.

6.13 GATHERING STAKEHOLDER INFORMATION

Gathering information about the project stakeholders is similar to collecting information on competitors.[28] To systematize the development of the stakeholder information means that questions such as the following need to be considered:

- What needs to be known about the stakeholder?
- Where and how can the information be obtained?
- Who will have responsibility for the gathering, analysis, and interpretation of the information?

[28] The techniques described here are paraphrased in part from W. R. King and D. I. Cleland, Strategic *Planning and Policy* (New York: Van Nostrand Reinhold, 1986), chap. 11, pp. 246–270.

- How and to whom will the information be distributed?
- Who will use the information to make decisions?
- How can the information be protected from "leaking" or misuse?

Some of the information collected on the project's external stakeholders may include sensitive material. One cannot conclude that all such stakeholders will operate in an ethical fashion. Consequently, all information collected should be assumed to be sensitive until proved otherwise and protected accordingly. This suggests the need for a security system patterned after a company's business intelligence system. Some information should be available only on a need-to-know basis, whereas some should be available to all interested parties.

The following precautions should be considered in planning for a PSM information system:

- One individual responsible for security
- Internal checks and balances
- Document classification and control such as periodic inventory, constant record of whereabouts, and prompt return
- Locked files and desks
- Supervised shredding or burning of documents no longer useful
- Strict security of offices containing sensitive information

Information on the stakeholders is available from a wide variety of sources.[29] In obtaining such information, the highest standards of ethical conduct should be followed. The potential sources of stakeholder information and the uses to which such information can be put are so numerous that it would not be practical to list all sources and uses here. The following sources are representative and can be augmented according to a particular project's needs:

- Project team members
- Key managers
- Business periodicals, such as The Wall Street *Journal,* Fortune, Business Week, and Forbes
- Business reference services—Moody *'s* Industrial Manual, Value Line Investment Security, and others
- Professional associations and trade associations
- Customers and users
- Suppliers
- Local press
- Trade press
- Annual corporate reports

[29]Ibid.

- Articles and papers presented at professional meetings
- Public meetings
- Government sources[30]
- Internet

Once the information has been collected, it must be analyzed and interpreted by the substantive experts. The project manager should draw on the company's professional personnel for help in doing this analysis. Once the analysis has been completed, the specific target of the stakeholder's mission can be determined.

6.14 IDENTIFICATION OF STAKEHOLDER MISSION

Once the stakeholders have been identified and information gathered about them, analyze the information to determine the nature of their mission or stake. This stake may be a key building block in the stakeholder's strategy. For example, the Nuclear Regulatory Commission manages the licensing of nuclear power plants to promote the safe and peaceful commercial use of the atom. A useful technique to better understand the nature of the external stakeholders' claim in the project is to categorize their stake as supportive or as adverse to the project. It is in the best interest of the project manager to keep the supportive stakeholders well informed of the project's status. Deal carefully with the potentially adverse stakeholders. Information on these stakeholders should be handled on a need-to-know basis because if such information is available to adversarial stakeholders on the project, it can be used against the project. However, communication channels with these stakeholders should be kept open, because this is critical to getting the project point of view across. Adversarial stakeholders will find ways to get information on the project from other sources, which can be erroneous or incomplete, giving the opportunity for misunderstanding and further adversarial behavior.

6.15 DETERMINING STAKEHOLDER STRENGTHS AND WEAKNESSES

Once the stakeholders' mission is understood, then the stakeholders' strengths and weaknesses should be evaluated. An assessment of stakeholders' strengths and weaknesses is a prerequisite to understanding the success of their strategies. Such analysis is found in nearly all prescriptions for a strategic planning process.[31] This process consists of the development of a summary of the most important strengths on which the stakeholders base their strategy and the most significant weaknesses they will avoid in pursuing their interests on the project. Identifying five or six

[30] Ibid.
[31] W. E. Rothschild, *Putting It All Together.*

strengths and weaknesses of a stakeholder should provide a sufficient database on which to make a judgment about the efficacy of a stakeholder's strategy.

An adversary stakeholder's strength may be based on such factors as:

- The availability and effective use of resources
- Political alliances
- Public support
- Quality of strategies
- Dedication of members

Accordingly, an adversary stakeholder's weaknesses may emanate from:

- Lack of political support
- Disorganization
- Lack of coherent strategy
- Uncommitted, scattered membership
- Unproductive use of resources

Once these factors have been developed, each proposed strategy for coping with the stakeholders can be tested by answering the following questions:

- Does this strategy adequately cope with a strength of the stakeholder?
- Does this strategy take advantage of an adversary stakeholder's weakness?
- What is the relative contribution of a particular stakeholder's strength in countering the project strategy?
- Does the adversary stakeholder's weakness detract from the successful implementation of his or her strategy? If so, can the project manager develop a counterstrategy that will benefit the project?

6.16 IDENTIFICATION OF STAKEHOLDER STRATEGY

For a proposed strategy to be successful, it should be built on a philosophy that recognizes the value of going through a specific strength-weakness analysis to develop project strategy. This can be done, however, only if there is a full understanding of the stakeholder's strategy.

A stakeholder strategy is a series of prescriptions that provide the means and set the general direction for accomplishing stakeholder goals, objectives, and mission. These prescriptions stipulate what resource allocations are required; why, when, and where they will be required; and how they will be used. These resource allocations include plans for using resources, policies and procedures to be employed, and tactics used to accomplish the stakeholder's purposes.

6.77 PREDICTION OF STAKEHOLDER BEHAVIOR

On the basis of an understanding of external stakeholder strategy, the project team can proceed to predict stakeholder behavior in implementing strategy. How will the stakeholder use resources to affect the project? Will an intervenor stakeholder picket the construction site or attempt to use the courts to delay or stop the project? Will a petition be circulated to stop further construction? Will an attempt be made to influence future legislation? These are the kinds of questions, when properly asked and answered, that provide a basis for the project team to develop specific countervailing strategies to deal with adversary stakeholder influence.

In some cases, a stakeholder will provide help to another stakeholder. For example, a group of dedicated nuclear advocates formed an industry association to ensure the nuclear operating safety that the Nuclear Regulatory Commission could not provide. This association, the Institute of Nuclear Power Operations (INPO), is dedicated to improving the safety of nuclear plants. INPO sets safety standards and goals, evaluates plant safety, and provides troubleshooting assistance to its sponsors. INPO oversees the training of plant operators and supervisors. In its role as a stakeholder of nuclear power, INPO works closely with the Nuclear Regulatory Commission. If INPO finds areas for improvement in a utility's operation, it is the utility that alerts the Nuclear Regulatory Commission.[32]

To better predict stakeholder behavior, the project team should take the lead in analyzing the probable impact of the stakeholder on a project. A step-by-step approach for analyzing such impact on a project would consist of the following, depicted in Fig. 6.3 and described below.

First, identify and define each potential strategic issue in sufficient detail to ascertain its relevance for the project. Next, determine the several key factors that underlie each issue and the forces that have caused that issue to emerge. These forces usually can be categorized into political, social, economic, technological, competitive, or legal forces.

Then, identify the key stakeholders that have, or might feel that they have, a vested interest in the project. Remember that several different stakeholders may share a vested interest in one strategic issue. Stakeholders usually perceive a vested interest in a strategic issue because of:

- ***Mission relevancy.*** The issue is directly related to the mission of the group. For example, members of the Sierra Club see the potential adverse effect of a nuclear power plant project on the environment.
- ***Economic interest.*** The stakeholders have an economic interest in the strategic issue. A union would be vitally interested in the wage rates paid at a project construction site.
- ***Legal right.*** A stakeholder has a legal right in the issue, such as the Nuclear Regulatory Commission, which has the power to grant operating licenses for nuclear generating plants.

[32] For more on the role of INPO see James Cook, "INPO's Race against Time," Forbes, February 24, 1986, pp. 54–55.

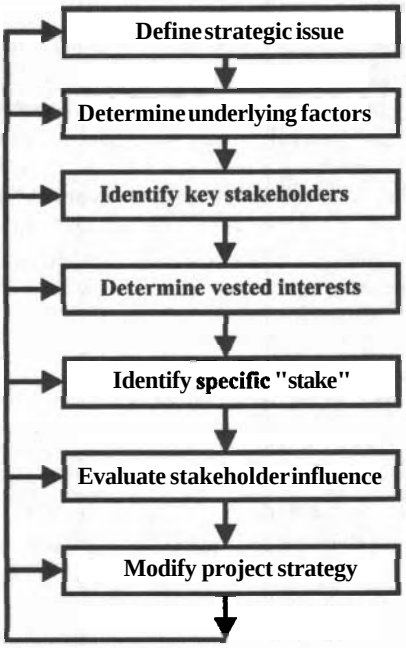

FIGURE 6.3 Stakeholder impact evaluation process.

- ***Political support.*** Stakeholders see the issue as one in which they believe there is a need to maintain a political constituency. A state legislator would be concerned about the transportation of toxic wastes from a power plant to a repository site within the state or the transportation of wastes across the state.
- ***Health and safety.*** The issue is related to the personal health and safety of the group. Project construction site workers are vitally interested (or should be) in the working conditions at the site.
- ***Lifestyle.*** The issue is related to the lifestyle or values enjoyed by the group. Sports groups are interested in the potential pollution of industrial waste in the forests and waterways.
- ***Opportunism.*** The issue is one that the group can rally others around, with the goal of increasing the group's political power at the expense of the project.
- ***Survival.*** The issue is linked to the reason for existence of a group of stakeholders. For example, members of the investment community see clearly the financial risks of nuclear plant construction today, considering the uncertainty in the licensing of a nuclear power plant.[33]

Once the stakeholders have been identified, clarify the specific stake held by each. Then judge how much influence each stakeholder might have on the project and its

[33] Paraphrased from Edith Weiner and Arnold Brown. "Stakeholder Analysis for Effective Issues Management," *Planning* Review, May 1986, pp. 27–31.

outcome. Table 6.2 summarizes such influences. This table should be completed by members of the project team. They are in the best position to identify the probable impact of a stakeholder's vested interest. By perusing the table, a manager can get a summary picture of which stakeholders should be "managed" by the project team. Stakeholders with high interest scores on the table should be studied carefully and their strategies and actions tracked to see what effect such actions might have on the project's outcome. Once the potential effect is determined, then the project strategy should be modified through resource reallocation, replanning, or programming to accommodate or counter the stakeholder's actions through a stakeholder management strategy.

6.18 PROJECT AUDIT

An independent audit of the project conducted on a periodic basis will also help the project team get informed and intelligent answers they need on strategic issues and stakeholder interests. Both internal and external audits performed by third parties to analyze the project's strengths, weaknesses, problems, and opportunities can

TABLE 6.2 Stakeholder Interests

	Stakeholders											
Stakeholder interest	1	2	3	4	5	6	7	8	9	10	11	12
Mission relevance												
Economic interest												
Legal right												
Political support												
Health and safety												
Lifestyle												
Opportunistic competitive survival												
Vested interest: H—high M—medium L—low												

shed light on how well the stakeholders are being managed. There is a symbiotic relationship between the project and its stakeholders. The project cannot exist without its stakeholders; conversely, the stakeholders rely to some extent on the project for their existence.

6.19 IMPLEMENTING STAKEHOLDER MANAGEMENT STRATEGY

The final step depicted in Fig. 6.1 in managing the project stakeholders is to develop implementation strategies for dealing with them. An organizational policy, which stipulates that stakeholders will be actively managed, is an important first step of such implementation strategies. Once this important step has been taken, additional policies, action plans, procedures, and allocation of supporting resources can be made to make stakeholder management an ongoing activity. Once implementation strategies are operational, the project team has to:

- Ensure that the key managers and professionals fully appreciate the potential impact that both supportive and adversarial stakeholders can have on the project outcome.
- Manage the project review meetings so that stakeholder assessment is an integral part of determining the project status.
- Maintain contact with key external stakeholders to improve the chances of determining stakeholders' perception of the project and their probable strategies.
- Ensure an explicit evaluation of probable stakeholder response to major project decisions.
- Provide an ongoing, up-to-date report on stakeholder status to key managers and professionals for use in developing and implementing project strategy.
- Provide a suitable security system to protect sensitive project information that might be used by adversarial stakeholders to the detriment of the project.

Henry F. Padgham, former president and chairman of the Project Management Institute, who has managed many successful large projects, believes, "Project management today demands that we pay attention to all who have a stake in our projects."[34]

6.20 TO SUMMARIZE

The major points expressed in this chapter include:

- Stakeholder management is an important part of the management of an enterprise and of the management of a project.

[34] Henry F. Padgham, *PM Network*, April 1991, p. 18.

- In recent years there has been an increase in laws that give stakeholders legal rights.
- Political stakeholders can have a major impact on a project. Examples were given of such impact.
- Project stakeholders can be managed. An important part of that management is to keep them informed of the status of the project, from its inception through to operational use.
- Stakeholders in the nuclear power industry have been particularly aggressive and are often called "intervenors."
- A project stakeholder management process was suggested, which provides a paradigm for applying management theory and practice to project stakeholders.
- Project stakeholders have been classified into two types: primary and secondary.
- Primary stakeholders are those persons or groups that have a legal contractual relationship to the project.
- Secondary stakeholders are those persons who influence or affect or are influenced or affected by the project, but are not regularly engaged in transactions with the project and may not be essential for the project's survival.
- Secondary stakeholders may be thought of as comprising a "virtual" organization that can exert powerful influence over the project's planning and outcome.
- Secondary stakeholders have a great deal of freedom in influencing the project — or ignoring the project and its outcome.
- Information on project stakeholders is available from a wide variety of sources.
- A project audit should include an assessment of the stakeholders to include their degree of satisfaction or dissatisfaction with the project and its planned and actual results.

6.21 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- R. Max Wideman, "How to Promote Projects to Stakeholders," chap. 15 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- E. Payson Willard, "The Demise of the Superconducting Supercollider: Strong Politics or Weak Management?" in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak (eds.), ***The Project Management Casebook,*** Project Management Institute. (First published in ***Proceedings,*** Project Management Seminar/Symposium, 1994, pp. 1–7.)

- Robert J. Graham and Randall L. Englund (contributor), ***Creating an Environment for Successful Projects: The Quest to Manage Project Management*** (San Francisco: Jossey-Bass, 1997). This book relates experiences of two consultants, who identify the need for upper management to create and sustain an environment that is supportive of project management. The authors assert that such an environment is essential to an organization's growth.
- Robert K. Wysocki, James P. Lewis, and Doug Decarlo (contributor), ***The World Class Project Manager: A Professional Development Guide*** (Cambridge, Mass.: Perseus Books, 2001). This book focuses on the project manager, who requires the knowledge, skills, and ability to deal with clients (stakeholders). The authors state the project manager must possess superior skills and competencies to survive in the modern project environment. Included in the book are several exercises and self-assessment tools to assist the reader in developing the proper skills.
- Cait Murphy, "How to Fix the Air Traffic Mess," ***Fortune,*** June 25, 2001, pp. 116–122. This article discusses the start-up airlines and their chances of success in a world dominated by large, established companies. Moreover, the article looks at the intricate weave of multiple interests in airport operation and change. San Francisco, for example, requires the approval of 31 different agencies just to reconfigure a runway. Building a new runway takes considerably more time and interaction with stakeholders.
- Jim Carlton, "Saga of the Santa Lucia Preserve Nears a Close," ***The Wall Street Journal,*** February 28, 2001, p. B16. This article shows the extent of planning and coordination required to successfully construct a "green housing project" that meets stakeholders' (environmentalists') requirements. The time and energy consumed gave this project the best chance of success and, when complete, proved that all the work was worth it.
- Anonymous, "Satisfied Customers Equal Business Success," ***Contractor,*** vol. 48, issue 6, Newton, Mass., June 2000, pp. 7, 38. This article addresses the importance of the customer as a major stakeholder in projects. The results of a study show the emphasis that is being placed on customer and client relationships to ensure satisfaction with the end product.

6.22 DISCUSSION QUESTIONS

1. What is meant by a ***project stakeholder?***
2. Describe a project management situation from your work or school experience, and list the project stakeholders.
3. Discuss the importance of keeping all project stakeholders informed on the issues relevant to them with respect to projects.
4. In the nuclear power plant described in the chapter, what could the project managers have done to prevent intervenors from disrupting the construction of the plant?

5. Why is it important for project leaders to develop a project stakeholder management (PSM) process? Discuss stakeholders' potential impact on the attainment of project objectives and goals.
6. List and discuss the objectives of PSM as described in the chapter.
7. List and describe the steps in the PSM process.
8. List some sources of information on project stakeholders.
9. What questions must management address to assess the potential impact of an adversarial stakeholder?
10. What factors indicate a vested interest by a stakeholder in a strategic issue of a project?
11. What additional steps must management take once stakeholders and their potential impacts have been identified?
12. What factors of organizational culture contribute to effective management of stakeholders?

6.23 USER CHECKLIST

1. Does your organization continually seek to identify project stakeholders? In what ways?
2. How does your organization manage the interrelationships among project stakeholders? Do any written policies exist that assist in the management of stakeholders?
3. In what ways does your organization seek to manage intervenors?
4. What stakeholder impacts are typical in your organization?
5. Describe a recent project in your organization that was successful in the management of stakeholders. What led to this success?
6. Describe your organizational philosophy and attitudes toward the PSM process.
7. Are there any formal ways that the project managers in your organization accept responsibility for the PSM process?
8. In what ways do project managers go beyond identification in assessing stakeholder impact?
9. What sources are used or can be used to gather information on the project stakeholders?
10. Do project managers attempt to predict stakeholder behavior? In what ways?
11. Are the project stakeholder issues addressed in project audits? What questions are asked or can be asked to help the project team identify and control strategic issues?
12. What proactive measures are taken to ensure continual management of stakeholders? How can the top managers of your organization support the PSM process?

6.24 PRINCIPLES OF PROJECT MANAGEMENT

1. Stakeholder management is a critical part of achieving successful projects.
2. Stakeholder management must be a concentrated effort that is built around a formal process.
3. Stakeholders can positively or negatively affect the progress of a project, depending upon the management of their interests and concerns.
4. Anticipating stakeholder reaction and planning to preempt or respond to actions can materially add to the project's value.

6.25 PROJECT MANAGEMENT SITUATION—STAKEHOLDER INITIATIVES

Projects of all sizes have stakeholders; some are directly involved in the project's work, whereas others have concerns that may be directly or indirectly related to the product of the project. Those directly involved are typically called "primary stakeholders," and they are concerned with the progress of the project, which includes all aspects of ensuring that the project is successful. Those indirectly involved are typically called "secondary stakeholders," and they are concerned with making some change to the direction that the project is taking.

The project's process may have adverse impacts on such items as quality of life. Construction crews operating heavy equipment to build a road can disrupt traffic flow, create loud noises, create dust clouds that carry to housing areas, disrupt the normal flow of drain water during storms, and mar the topsoil sufficiently to cause erosion. The trucks may be speeding through residential areas and posing a hazard to children playing near streets.

On the other hand, there is the product of the project. Construction of new homes in an area can negatively impact the local infrastructure through overloads to the existing system. New homes require water, electicity, telephones, sewage disposal, and gas. In addition, the new families will place new requirements on schools, stores, roads, libraries, fire departments, and other public facilities.

Stakeholders for the road project would want the road, but perhaps object to the inconveniences and hazards associated with building the road. Stakeholders would in this instance have two purposes: (1) improve their road system for a smoother flow of traffic and (2) cause the construction crew to exercise caution in how the work is performed. In this situation, one stakeholder could have two different views and support both in public hearings.

Stakeholders in the construction of new homes could be individual residents in the area, for example, trying to restrict expansion so their existing homes continue to rise in value. They could also be viewing the additional families as placing a burden on the public facilities that are already overcrowded. Stakeholder opposition to the new homes may be based on facts or the stakeholder's perception—in either case, the opposition can be disruptive to the home construction.

Stakeholder opposition to a project is not necessarily bad. Some opposition may cause change of plans that were not well developed with a full range of facts. Project managers should assess the facts of any opposition first before rejecting a stakeholder's position. The stakeholder may have a different approach that will assist the project in being better.

6.26 STUDENT/READER ASSIGNMENT

1. On the basis of the project management situation, what opposition would you take as a stakeholder in the building of residential homes? What actions would you take to prevent the homes from being constructed when there is insufficient water at this time to serve the existing homes?
2. As a project manager, what would you do to avoid conflicting information from being "leaked" to potentially hostile stakeholders in the community?
3. A nuclear power plant is to be constructed in your location. It has been approved as a safe, environmentally friendly design, but there are rumors that it would possibly vent radiation into the atmosphere. What action do you propose to resolve this apparent conflict in information?
4. Your company is proposing to build a new car that has less pollution emitted from exhaust fumes. The car is extremely light and would not fare well in a collision with an SUV. What type of information would you release to counter claims of this being an unsafe automobile?
5. You are a candidate project manager for a sensitive project that is expected to have many primary and secondary stakeholders. What is the process you would use to keep these stakeholders informed?

CHAPTER 7
STRATEGIC ISSUES IN PROJECT MANAGEMENT[1]

"Every advantage...is judged in the light of the final issue."
DEMOSTHENES, 384–322 B.C.

7.1 INTRODUCTION

In the management of a project, there are likely to be issues or contentions that can have a significant impact on what purposes the project fulfills—and how the project should be managed. Often project success or failure rides on these issues—and how they have been adequately considered during the planning for and execution of projects. The notion of strategic issues in the management of projects is another area of consideration that broadens the role of the project manager and his or her team members.

In this chapter, the nuclear power industry will be used to provide some representative examples of what is meant by strategic project "issues." How to identify issues, how to analyze the significance of issues, and how to manage project strategic issues will be suggested. Once the project team has identified the issue and analyzed its real or potential impact on the project, strategies can be developed and executed to deal with those issues that might have an important impact on the management of the project as well as its outcome. Also some insight into why projects succeed and why they fail because of strategic issues will be provided.

7.2 WHAT ARE STRATEGIC ISSUES?

The concept of "strategic issues" has emerged as a way to identify and manage factors and forces that can significantly affect an organization's future strategies and tactics. The importance of strategic issues has therefore appeared in the literature primarily in the context of the strategic management of an organization.

[1]David I. Cleland, "Strategic Issues in Project Management," Project *Management Journal*, March 1989.

King has put forth the notion of strategic issue management as an integral element of the strategic management of organizations: and Brown also has dealt with strategic issues in the management of organizations.[3]

This chapter describes an approach to the assessment and management of strategic issues facing project teams as well as some strategic issues that have had an impact on contemporary projects. Project owners need to be aware of the possible and probable impacts of strategic issues. The project team leader has the primary responsibility to focus the owner's resources in order to deal with project strategic issues. The authors suggest three key aspects of strategic issue management: a need to be aware of strategic issues facing a project, an approach for the assessment of the strategic issues, and a technique for the management of strategic issues.

7.3 SOME EXAMPLES

Sometimes the existence of strategic issues in an industry fosters the use of project management techniques in a fashion not previously used. For example, intense foreign competition in the U.S. automobile industry has prompted U.S. automobile manufacturers to develop innovations in the design of their cars. Cutting costs and cutting car design–development time are other key strategic issues facing U.S. producers. Their response to the need to reduce the time it takes to manufacture a car has, in part, been to use project management techniques in the form of an organizational alignment and a process of engineering manufacturing called simultaneous engineering or use of product design teams. The result: shorter car model product-development cycles with consequent cost savings, improved quality, and a more competitive product in the world car market.

When the Japanese automaker Nissan considered building a plant in the United States, it recognized that a strategic issue facing that project was the adaptability of the local community and the workers to the Nissan culture. By carefully selecting their employees and using exchange trips to Japan, and by orientation sessions at the plant in Tennessee, the Japanese managers were able to resolve this strategic issue, resulting in a successful production facility characterized by model employee-managementrelations.

Jaafari discusses the strategic issues in the management of macroprojects in Australia by first looking at the typical pattern of managerial relationships that occur and must be administered in such macroprojects. These occur between:

- Each participating owner and the joint venture or company acting as the collective body for owners (herein referred to as the owner)
- The owner and the government(s)
- The owner and the lenders
- The owner and purchasers of the end product(s)

[2]William R. King, "Strategic Issue Management," chap. 15 in W. R King and D. I. Cleland (eds.), *Strategic Planning and Management Handbook* (New York: Van Nostrand Reinhold, 1986).

[3]J. K. Bmwn, "This Business of Issues: Coping with the Company's Environment," *The Conference Board Report.* no. 758, 1979.

- The owner and insurer/underwriters
- The owner and project manager or engineer-constructor
- The owner and constructors/suppliers and fabricators
- The owner and the designer[4]

These relationships emerge as the project stakeholders are identified and the nature of their stake is determined. Stakeholders are those persons or organizations that have, or claim to have, an interest or share in the project undertaking. Strategic issues can arise from many different stakeholder groups: customers, suppliers, the public, government, intervenors, and so forth.

In a project, a strategic issue is a condition of pressure, either internal or external, that will have a significant effect on one or more factors of the project, such as its financing, design, engineering, construction, and operation.[5] Some examples of the way that contemporary projects have faced strategic issues follow.

On the U.S. Supersonic Transport Program, the managers had too narrow a view of the essential players or stakeholders and generally dismissed the impact of the environment-related strategic issues surrounding the program until it was too late. Environmentalists, working through their political networks, succeeded in stopping the U.S. supersonic program.[6]

The life cycle of the Tennessee–Tombigbee Waterway provides insight into the negative role that strategic issues can play.[7] On this waterway project, strategic issues played a role in the consideration of funding for this project over many decades. Political considerations, lawsuits, environmental factors, and social factors delayed approval and construction of the project for extended periods. Although the actual construction of this waterway took almost 14 years, the waterway was 175 years in the making. As far back as 1810, the citizens of Knox County in Tennessee petitioned Congress to provide a waterway to Mobile Bay. Congress finally authorized the first federal study in 1974, but the project was delayed through 22 presidential administrations, 55 terms of Congress, 8 major studies and restudies, and 2 major lawsuits. This waterway is one of the largest civil works projects ever designed and built by the Army Corps of Engineers. About 234 miles long, the project cost $2 billion and required more than 114 major contracts during its construction period.

In contrast to the handling of the Tennessee–Tombigbee Waterway, in the Midwest a Water Pollution Abatement Program costing approximately $2.5 million successfully faced challenging strategic issues at the outset and during the early years of the program. The development of a master plan for the project included the development of appropriate environmental impact statements. This master plan could not be changed without court and Environmental Protection Agency (EPA) approval. Because the funding for the project included EPA federal grants, state

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A. Jaafari, "Strategic Issues in Formulation and Management of Macroprojects in Australia," *International Journal of Project Management,* vol. 4, no. 2, May 1986.

Definition derived from W. R. King and D. I. Cleland (eds.), *Strategic Planning and Management Handbook* (New York: Van Nostrand Reinhold, 1986), chaps. 1, 4, and 15.

Mel Horwitch, *Clipped Wings: The American SST Conflict* (Cambridge, Mass.: The MIT Press, 1982).

Paraphrased from General Kenneth McIntyre, *The Tennessee–Tombigbee Waterway,* Stone & Webster Engineering Corporation, Boston. Paper presented at the Larger Scale Programs Institute, Colloquium on Research Priorities for Large Scale Programs, Austin, Tex., March 1985. This project is also described in Chap. 1.

grants, general obligation bonds, and tax district levies, the courts became involved in the planning and execution of the project. The Army Corps of Engineers reviewed all construction contract documents before bidding, reviewed all change orders to the construction contracts, reviewed completed construction, and audited contract administration procedures. All the work that received federal grant participation ultimately was audited by the EPA and Army Corps of Engineers, as well as state and local auditors. In addition, the General Accounting Office conducted periodic reviews of the project. All these stakeholder groups became involved in the legal and regulatory strategic issues that arose on this project. Successful management of this project included the management of not only the project team, but also the project stakeholders and the strategic issues that faced this project throughout its life cycle.

Sometimes a strategic issue arises from the attitudes of employees. For example, CEO George Fisher's key strategies for turning around Eastman Kodak included a three-phase plan: fist, reconfigure Kodak by selling all businesses unrelated to photography, repay most of the debts, and separate the embryonic digital–electronic imaging operations from the traditional chemistry-based silver halide photography division; second, set strict financial goals that included achieving virtual perfection in manufacturing quality; and third, require accelerated growth initiatives. In all of this CEO Fisher was convinced that his most urgent task was to eliminate resistance to change from employees.[8]

Strategic issues can emerge at any time during a project's life cycle. The following is an illustration of how costly it can be to ignore them. On a large nuclear power plant project, an offshore earthquake fault was discovered only a few miles from the plant site. This occurred midway through the project's life cycle. Although the discovery of this fault was obviously a significant strategic issue, there was little evidence that the senior managers of the owner organization demanded and received a "satisfactory accounting" or made any in-depth inquiry to determine its full ramifications. The potential strategic implications of the fault should have prompted the corporate board of directors to do the following:

- Ask for an immediate, in-depth study of its possible and probable effects on the design of the plant.
- Acknowledge the need to forthrightly resolve the effects of the earthquake fault on the seismic design of the plant.
- Order a full-scale audit of the current status of the plant.

The project owner was not able to provide any evidence that the board of directors or the executive committee of the board considered the available options of

- Withdrawing its license application or stopping work
- Significantly reducing work at the site pending a full-scale investigation of the implications of the fault
- Accelerating offshore investigations to speed resolution of any questions that might have been raised

[8] "Focus Kodak?" *Fortune,* January 13, 1997, pp. 77–79.

There was no evidence that the board of directors considered any options other than that of continuing work, so that after the plant was nearly completed, the board members were faced with the enormous costly problem of redesigning the plant so that it could function safely in spite of its poor location? Public concern over the seismic-geologic potential safety of this plant was expressed through the organized efforts of several intervenor or stakeholder groups acting through the courts to require reassessment, or even cancellation, of the plant.

The successful completion of any substantial public works project is dependent upon the recognition and management of strategic issues surrounding the social, political, legal, and economic aspects of the project as well as the cost, schedule, and technical performance aspects. On these public works the project can expect to encounter strategic issues such as:

- Land acquisition challenges
- Environmental impacts
- Political support or uncertainty
- Advocacy usually related to who conceives, champions, and nurtures the project and provides ongoing maneuvering to keep the project alive and well—a task partially fulfilled by the project managers
- Intervenors ranging from such organizations as local newspapers to vested interest groups such as the Sierra Club
- Competitors who would like to see the project fail so they could pick up some of or all the action

One of the major strategic issues facing the United States and other nations as well is the development of alternative means for generating electrical power. The energy crisis of 1974 pointed out the imprudence of depending on oil and gas as the principal fuels for generating electric power. Today, that crisis seems to be part of our forgotten past—but it has not gone away. Limited research is being carried out in projects leading to the development of alternative means of producing electrical power. In the judgment of the author, another energy crisis is forthcoming. It is not a question of whether such a crisis will emerge—it is a question of when. Although many people will disagree with the author's opinion in this regard, what if such a crisis does come forth? What alternative means for generating electrical power will be available? One such alternative source is nuclear power. But this source is not acceptable to most people because of the history at the Three Mile Island facility and the experiences at Chernobyl. Then, too, the poor management of the construction of nuclear power plants in the United States causes a lot of concern about whether or not the design and construction of plants in the future would do any better.

Jack Welch, General Electric Company's CEO for nearly 20 years, forged an entrepreneurial culture that kept the company at the forefront of U.S. industries. He once observed, "Managing success is a tough job. There's a very fine line

[9]Paraphrased from testimony submitted by David I. Cleland during litigation on the Diablo Canyon project, California Public Utilities Commission, Division of Ratepayer Advocate, application nos. 84-06-014 and 85-08-025, June 1988.

between self-confidence and arrogance. Success often breeds both, along with a reluctance to change." When Welch attempted to merge Honeywell with GE, this attitude seemed to be more than self-confidence and the merger met with failure.

Welch did not adequately assess the influence of the European Commission, and specifically the Commission's top antitrust official. Welch was confident of the outcome of the GE-Honeywell merger because of his successes in 1700 other mergers during his 20-year tenure. What was not considered was

- A growing sense of rivalry between the European and the U.S. aerospace companies
- Cultural sensitivities
- Tough top antitrust officials in Europe with a reputation for challenging large mergers
- A perceived arrogance on the part of GE by the Europeans
- European fears that GE would dominate the aircraft maintenance, repair, and overhaul operations in Europe

Observers of the situation attribute Welch's attitude and lack of understanding of the European culture, including the tough stand taken on large mergers in Europe. This attempted merger, initiated just prior to Welch's planned retirement, places a stain on his otherwise brilliant career and demonstrates that 1700 successes in the past do not assure success when fundamental areas are ignored.[10]

According to *The* Wall *Street Journal,* after years in the wilderness, the nuclear power industry is back on the march. The U.S. government's statements in early 2001 that nuclear power is an essential part of the energy mix for the United States have caused rethinking about new power plants. The Nuclear Regulatory Commission is expecting to receive applications soon for permission to build new power plants—the last application was in 1973.

Although Exelon executives and other nuclear energy backers maintain that they can build reactors that cost less and are far safer than the 1960s- and 1970s-era plants around the United States, it is uncertain whether the public accepts their argument. "We're not looking at this as a nuclear revival, but as a relapse," says Paul Gunter, head of the nonprofit Nuclear Information and Resource Service in Washington, D.C. He believes that the nuclear industry, which suffered from the gargantuan cost overruns as well as a handful of highly publicized safety problems like the Three Mile Island near-meltdown, represents the "biggest managerial disaster" in U.S. history. Gunter has noted

> **Reactor safety isn't the only outstanding issue standing in the way of the nuclear comeback..., there's still no approved plan governing the disposal of radioactive waste.**
>
> **The Price Anderson Act, which protects the nuclear industry against unlimited liability in the event of a nuclear accident, expires in August 2002. Unless it is renewed, say industry executives, it is unlikely any company would build a new plant.**

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[10]Paraphrased from Anthony L. Velocci, Jr., "GE's Own Arrogance Thwarted Bid to Acquire Honeywell," *Aviation Week & Space Technology,* July *9,2001.*

> Exelon believes that all these obstacles are minor compared with the benefits of widespread deployment of new-technology nukes that would make the nation more energy self-sufficient and reduce air-pollution emissions. Another plus is that the Nuclear Energy Commission has been streamlining its application approval process since the mid-1980s.[11]

Considerable emotion is involved whenever the subject of nuclear power comes up. Indeed, the potential and the problems for building a case for nuclear power are surrounded by formidable "strategic issues" that are shown in the material that follows in this chapter. Until these strategic issues are resolved, it is highly unlikely that any future program for starting nuclear power projects in the United States could be launched. In the material that follows, the strategic issues involved in nuclear power are discussed as a paradigm for how strategic issues can impact projects in this field.

7.4 AN APPLICATION OF THE CONCEPT OF STRATEGIC ISSUES: NUCLEAR CONSTRUCTION INDUSTRY

Strategic issues vary depending on the industry and the circumstances of a particular project. In the material that follows, the nuclear plant construction industry is used to illustrate the concept of strategic issues as applied to a select industry. This industry has been chosen because of the many strategic issues that have faced the industry—issues which relate to a particular project as well as to the many generic issues that confront project owners, managers, constructors, designers, regulators, investors, local communities, consumers, and other vested stakeholder groups.

A project that has as long a life cycle as a nuclear power generating plant will be affected by many issues (some of them linked) that are truly strategic in nature. For example, the typical strategic issues that a nuclear power plant project faces today include:

- Licensability
- Passive safety
- Power costs
- Reliability of generating system
- Nuclear fuel reprocessing
- Waste management
- Capital investment
- Public perception
- Advocacy

[11] Paraphrased from Rebecca Smith, "Nuclear Power: Revival or Relapse?" *The Wall Street Journal,* May 2, 2001, pp. B1, B4.

- Environment
- Safeguards[12]

The U.S. nuclear power industry has had extraordinary challenges in the past such as uncertain licensing procedures, project cost and schedule control problems, quality assurance disputes, intervenor actions, and other conditions that are strategic issues to be dealt with by a project team in managing a nuclear power plant project. A discussion of these issues follows.

Licensability

All U.S. nuclear plants, to be licensed, must meet federal codes and standards as well as the nuclear regulatory guides for the particular design. But many of these codes, standards, and guides are not applicable to a new concept and design that have not been licensed previously. The first of a kind becomes precedent-setting and will receive a commensurate amount of attention from the Nuclear Regulatory Commission (NRC) staff—so much so that joint groups will be set up with representation from the Department of Energy (DOE), NRC, and a bevy of consultant experts to answer the hundreds of questions posed by the NRC staff and to draft appropriate revisions to the existing federal codes and regulations as well as to set up future guides for the new concept.

This strategic issue can take years to resolve when one includes the judicial, state, and local hearing processes that a nuclear plant must face. The lack of firm and predictable policy emanating from the NRC now adds to the risk and uncertainty involved in the management of this strategic issue. Such issues and uncertainties are reflected in the increased costs and schedules for the project. The challenge facing the NRC is forthright—remove the uncertainty of the current licensing process that exists today. The NRC that licenses the plant and the state and local governments that conduct hearings to ascertain the proper allocation of costs for the utility's rate base are key stakeholders in the project.

Passive Safety

All the commercial reactors built and operated in the United States today require the activation, within a prescribed period, of an auxiliary shutdown system, either automatic or manual. At present, if one allows the reactor to operate without adding reactivity (a process similar to adding coal to a fire) and assuming that the cooling systems remain effective (the pumps operate, the valves open and close on cue, the heat exchangers transfer heat, etc.), the reactor should eventually bring the auxiliary system into operation. The difficulty comes when the auxiliary system cannot halt or lower the reactivity (like removing coal from the fire) and/or maintain the effectiveness of the cooling systems.

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[12] These strategic issues were developed during the conduct of a research project by D. I. Cleland and D. F. Kocaoglu, *The Design of a Strategic Management System for Reactor Systems, Development and Technology* (Argonne, Ill.: Department of Energy), with the assistance of A. N. Tardiff and C. E. Klotz of the Argonne National Laboratory.

Passive safety, as it relates to a nuclear power plant, refers to the plant's ability to take advantage of inherent, natural characteristics to move itself into a safe condition without the need to activate an automatic auxiliary safety system or a set of predetermined operator procedures to do the same.

Passive safety is the dominant strategic issue facing the nuclear power generating industry today. This issue is both social (it would help overcome fear of nuclear power) and technical (design and operating considerations). The nuclear accidents at Three Mile Island and Chernobyl have intensified the search for a nuclear power plant that promises passive safety. Nuclear vendors and utility companies are the key stakeholders interested in passive safety.

Power Costs

The components of power costs are capital costs, operations and maintenance (O&M), and fuel costs. For a typical nuclear power plant, the capital cost component is four times the O&M cost, which is approximately equal to the fuel cost. Hence it is evident that capital cost is the most significant component. One of the significant factors leading to the current hiatus in orders for new nuclear power plants is that these plants are extremely capital-intensive and have relatively low fuel costs. Coal- and oil-fired plants have a relatively low capital cost component, but their fuel costs are extremely high.

Construction times for many recent U.S. nuclear plants have exceeded 10 years. The U.S. licensing and judicial procedures have accounted for much of the delay, but other factors, such as imprudent project management, also have taken their toll. Whatever the reasons, the delays have an extraordinary impact on the resultant capital investment in these plants even before they have produced 1 kWh of electricity. The interest paid on the capital to build the plant commonly is greater than 50 percent of the capital investment in the plant. As a result, there has been an inordinate increase in the capital cost component so that nuclear power has now lost its competitive power cost edge over its closest competitor, coal.

Utilities, nuclear reactor manufacturers, architectural and engineering firms, plant constructors, and state regulatory commissions are the principal stakeholders concerned with the strategic issue of power costs.

Reliability of Generating System

The reliability of a nuclear power plant must be extremely high, particularly in the safety systems and components. There are reliability differences from one model to another; that is, one might have fewer moving parts, fewer systems, fewer components, and fewer things to go wrong.

Plants designed and constructed under stringent quality assurance controls will be more reliable than plants where the quality standards have been relaxed. Concepts that utilize more factory-built than on-site fabricated and assembled systems tend to be more reliable because quality assurance can be applied more easily at the factory. Gravity- and natural circulation–dependent systems tend to

be more reliable than forced-circulation systems. The importance of these and more reliable approaches to a nuclear power plant cannot be overemphasized, particularly in view of Three Mile Island, Chernobyl, and the resultant skeptical public attitude toward nuclear power. Utilities are the principal stakeholders here.

Nuclear Fuel Reprocessing

Commercial nuclear fuel reprocessing in the United States is limited. Instead, the U.S. government has agreed, for a price, to accept the spent fuel from U.S. reactors for long-term storage. Europe and Japan, however, have viable programs to recover for future use the nuclear fissionable fuel from spent fuel assemblies. Any concept, such as the breeder, which requires reprocessing technology, must carry the burden of developing this technology as well as the nuclear proliferation stigma attached to it. Thus any future nuclear plant in the United States may require the arrival of a liquid-metal reactor technology that provides for the use of reprocessed fuel. The time frame for such fuel reprocessing capability is circa 2040 by best current estimates. Utilities and reactor manufacturers are the principal stakeholders.

Waste Management

Public reaction to shipments of nuclear waste is becoming increasingly severe. Therefore, minimum waste streams and minimum movement of such wastes outside the plant boundaries are advisable. The waste disposal program conceived and managed by the U.S. government and the nuclear power industry to store radioactive fuel safely is being challenged under public pressure. Unreasonable management and cost overruns aside, one of the biggest issues for the nuclear power industry is what to do with over 1500 metric tons of lethal atomic waste that it produces each year. Utilities, states where storage sites are located, and the general public are vested stakeholders in this strategic issue.

Capital Investment

Closely akin to the strategic issue of power costs are the financial exposure and risks that investors of nuclear power plants have experienced over the last several years.

There have been awesome financial implications for all too many nuclear plants. One of the most sobering has been the experience of the Washington Public Power Supply System (WPSS). WPPSS's default on interest payments due on $2.5 billion in outstanding bonds can be laid on the failure of WPSS management. Management style in WPPSS did not keep pace with the growing size and complexity of the organization. Communication at senior levels of the organization, including the board of directors, tended to be "informal, disorganized, and infrequent."[13] To renew support of nuclear power in the financial communities, it is

[13] James Leigland, "WPPSS: Some Basic Lessons for Public Enterprise Managers," *California Management Review*, Winter 1987, pp. 78–88.

important that the current conditions change along the lines noted in the discussion of the power cost issue in this article. Investment institutions are the principal stakeholders as well as the state public utility groups that must rule on the acceptability of a capital investment cost into the utility's rate base.

Public Perception

Table 7.1 demonstrates the strategic issue of public perception. The experts rank nuclear power 20th in the list of high-risk items, whereas the other groups rank it first or close to first. Note that x rays and nonnuclear electric power fall into the same pattern. When the United States converted from direct current to alternating current in the early 1920s, a similar negative public reaction resulted. Some extensive innovative technical, social, and managerial approaches must be developed and implemented to change perceptions.

Aggravated by the nuclear accidents at Three Mile Island and Chernobyl, the increasingly negative public perception of nuclear power and its associated risks has made this strategic issue more acute, and the need for government research programs more pressing.

Advocacy

Not many government interest research programs can proceed through the government bureaucracy without a strong advocate who can gain substantial support for the program. The base of support must be broad and must include, as is the case with the research in the Advanced Reactor Development Program, key individuals within the DOE, the White House, the Office of Management and Budget, Congress and its staff offices, the nuclear community (the stakeholders), the scientific community (National Science Foundation, National Academy of Sciences, certain universities), the financial community, and others. With such backing, the public generally supports the program. A single-effect advocate also can be an essential ingredient. Military aircraft and the aircraft carrier had Billy Mitchell; the nuclear submarine fleet had Hyman Rickover; the space program had Werner von Braun—the list of successful efforts led by able champions is long. Thus a reactor manufacturer who contemplates obtaining government funds to research advanced nuclear reactors should determine what advocacy exists for such research, both in the government and in the corporation.

Environment

From an environmental viewpoint, the nuclear advocates had essentially convinced the general public that nuclear power plants were environmentally benign—until the media convinced the public otherwise after the Three Mile Island incident. The Chernobyl incident reinforced the sense that nuclear power was a serious threat to the environment and to life itself. Certainly, the environmental impact of the Chernobyl accident on its surrounding environment is as yet uncertain.

TABLE 7.1 High Risk: A Matter of Perception

Four groups rank "what's dangerous and what's not."
People were asked to "consider the risk of dying as a consequence of this activity or technology." (1 has the most consequence and 30 the least.)

Activity or technology	Experts	League of Women Voters	College students	Civic club members
Motor vehicles	1	2	5	3
Smoking	2	4	3	4
Alcoholic beverages	3	6	7	5
Handguns	4	3	2	1
Surgery	5	10	11	9
Motorcycles	6	5	6	2
x rays	7	22	17	24
Pesticides	8	9	4	15
Electrical power (nonnuclear)	9	18	19	19
Swimming	10	19	30	17
Contraceptives	11	20	9	22
General (private) aviation	12	7	15	11
Large construction	13	12	14	13
Food preservatives	14	25	12	28
Bicycles	15	16	24	14
Commercial aviation	16	17	16	18
Police work	17	8	8	7
Fire fighting	18	11	10	6
Railroads	19	24	23	20
Nuclear power	20	1	1	8
Food coloring	21	26	20	30
Home appliances	22	29	27	27
Hunting	23	13	18	10
Prescription antibiotics	24	28	21	26
Vaccinations	25	30	29	29
Spray cans	26	14	13	23
High school and college football	27	23	26	21
Power mowers	28	27	28	25
Mountain climbing	29	15	22	12
Skiing	30	21	25	16

Source: Decision Research, Eugene, Ore. ***(© The Washington Post. May 21, 1986).***

Reassuring the public that there will be no future Chernobyl-type accidents will be no easy task. Much work must be done to convince people that such an accident cannot occur in the United States. This certainly must be convincingly transmitted to the stakeholders who are the potential owners of nuclear power plants, the administration, Congress, and above all the general public itself. A most environmentally

benign and inherently safe nuclear plant would go a long way to settling this issue. Unfortunately, such a plant may be decades away.

Safeguards

The objective of nuclear safeguards is to keep fissionable material out of unauthorized hands. A nuclear plant security system that does this better than another should have a competitive edge. For example, if throughout the fuel cycle of a particular plant, the plant configuration prevents the fissionable fuel from being deployed and used as source material for a weapon, then one could say that the plant is proliferation-proof.

7.5 MANAGING PROJECT STRATEGIC ISSUES

Project strategic issues often are nebulous, defying management in the literal sense of the word. It is important that the project team identifies the strategic issues the project faces and deals with them in terms of how they may affect the outcome of the project. In the assessment of the issues, some may be set aside as not having a significant impact on the project. These would not be reacted to but would be monitored to see if any changes occur that could affect the project. Of course, some significant issues may not be subject to the influence of the project team.

The early identification of issues is important so that there can be an early decision on how issues are to be handled. An issue tends to go through a life cycle such as described in General Electric's approach to public issues, where phases of ***conversion, contention, legislation,*** and ***regulation*** are discussed.[14]

A useful technique to identify strategic issues facing a project is to keep a running tally of all issues that face the project and then take time to have the project team discuss these issues to see which ones are ***operational*** (short term) and which are ***strategic*** (in the manner described in this book). Once the project team has been acquainted with the notion of strategic issues, each member should be encouraged to note any emerging issues for discussion and review at one of the regular project team meetings. During this meeting all issues should be reviewed, selecting those that appear to be strategic and assigning a member of the team to follow the issue and keep the project team aware of it and its implications on the project's future. More serious issues may require the appointment of an investigative subproject team that will report back to the full team. An example of how one project team's awareness of strategic issues early in the project's life cycle proved useful appears below.

A kickoff meeting of the project team and the senior managers from the owner's organization was held to get the project team organized and to start preliminary project planning. During this 3-day meeting a tally was made of issues known to

[14] J. K. Brown, op. cit.

impact or have potential future impact on the project. Some issues were determined to be truly strategic, and the group decided to track them to determine their significance. If such a tally had not been done and if the preliminary discussions had not been carried out, it is highly probable that some of the more important issues might not have surfaced until the project was into its life cycle. By then an orderly and timely resolution of some of these issues would have been difficult, if not impossible. This suggests that an important part of any project review meeting is to discuss and update the current project issues to see which ones might be added. By the same process, those issues judged as no longer important could be put aside.

The project team requires a philosophy on how to manage strategic issues. A phased approach is suggested as portrayed in Fig. 7.1. These phases are discussed below.

7.6 ISSUE IDENTIFICATION

Identifying some of the issues often can come about during the selection of the project to support the organizational strategy. During the selection process the following criteria can be addressed to determine if the project truly supports organizational strategy:

- Does the project support a strength that the enterprise holds?
- Does it avoid a dependence on something that is a weakness of the enterprise?
- Does the project support an organizational need?

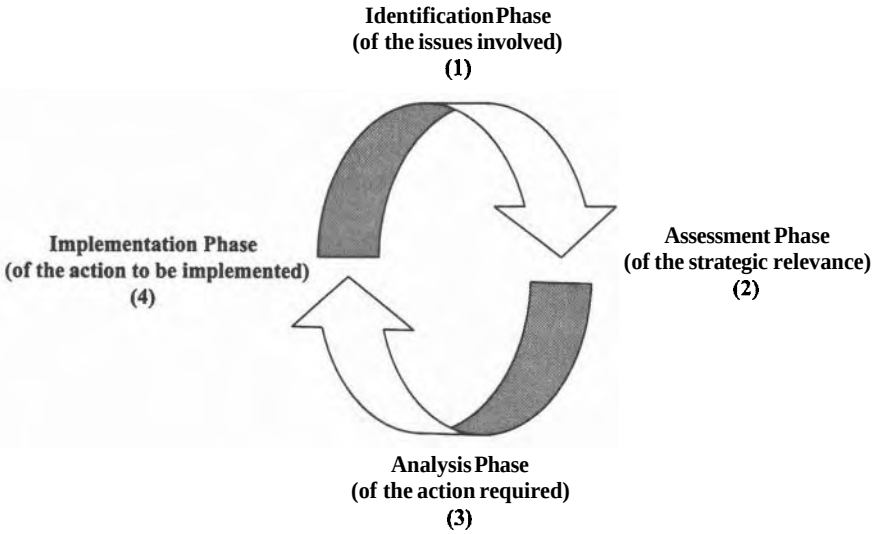

FIGURE 7.1 An approach for the management of strategic issues.

- Is there a customer who is willing to pay for the project?
- Can the project owner assume the risk that is involved in the project?
- Are the resources and management skills available to bring the project to completion on time and within budget?[15]

As the decision makers seek the answers to these questions, there will be some strategic issues that emerge naturally. Other issues can be identified by the project team during its planning, evaluation, and control meetings.

For example, during a customer review of a bid package for a new weapon system, an aerospace contractor's project proposal team discovered that the customer had serious doubts about the contractor's cost-estimating ability. This concern prompted the contractor to engage a consultant to conduct a survey of its customers to assess its image in two general areas: product image (price, quality, reliability, etc.) and organizational image (quality of personnel, responsiveness, integrity, etc.). Both structured and unstructured personnel interviews were conducted with key customer personnel. One significant outcome of this image survey was the perception by key customer personnel that the contractor's cost estimates were far too conservative, invariably resulting in excessive cost overruns. The contractor's key executives were shocked by the customer's perceptions of its cost performance credibility. This matter of credibility immediately became an urgent strategic issue within the contractor's organization. A task force was formed to investigate the issue and recommend a strategy on how to deal with it. In their deliberations the task force found that the contractor's cost performance was in fact quite credible, and that the perception held by the customer's key people was not valid. Consequently, the contractor mounted an advertising and indoctrination program to change the customer's viewpoint by working through the field marketing people and by visiting the customer's offices to present the actual facts on contractor cost performance. The result was a resolution of the strategic issue in the contractor's favor. Had the project proposal team not been alerted to this potential strategic issue, the contractor may well have lost future government contracts.

By maintaining close contact with the customer, an opportunity is provided to identify issues that can have an impact on the project. Another technique is to examine the stakeholders on the project to see if the nature of their claims suggests any strategic issues.[16] As each stakeholder group is reviewed, the following questions should be addressed:

- What claims do the stakeholders have in the project?
- How might the claims affect the outcome of the project?
- What resources and influence do the stakeholders have to push the satisfaction of their claims?
- Can the project live with the stakeholder's purposes and motivation?

[15] Paraphrased from D. I. Cleland and W. R King, *Systems Analysis and Project Management.* 3d *ed.* (New York: McGraw-Hill, 1985), pp. 67-68.

[16] D. I. Cleland, "Project Stakeholder Management," *Project Management Journal,* vol. 1, *no.* 4, September 1986, pp. 36–44.

- Can the outcome of the stakeholder's claim on the project be predicted?
- What can the project team do about these claims?

Other techniques can be used such as the nominal group technique[17] or brainstorming to aid in the identification of issues. Perhaps the best way to identify issues is to ensure that the project team is well organized, well managed, and well aware of the larger systems context (economic, political, social, technological, and competitive) of the project. If the team meets these conditions, there is a better likelihood that most of the important and relevant strategic issues will surface.

7.7 ASSESSMENT OF AN ISSUE

The act of assessing an issue entails judging its importance in terms of its impact on the project. King has suggested four criteria for first assessing an issue as strategic and then moving to subsequent states of management of the issue:[18]

- Strategic relevance
- Actionability
- Criticality
- Urgency

The strategic relevance of an issue relates to whether it will have a long-term impact (more than 1 year) on the project. Most of the strategic issues mentioned earlier in this chapter could be considered to be strategically relevant, such as licensability, passive safety, and power costs. Strategic relevance addresses the question: Will this strategic issue influence the project strategy or the likely consequences of the strategies that are being followed on the project? If an issue is strategy-relevant, then the project manager has two basic courses of action: Try to live with the issue's impact, or do something about the issue.

But some strategic issues will be beyond the authority and resources of the project manager to resolve. In such situations a third course is open to the project manager: Elevate the issue to senior managers for their analysis and possible evaluation. Even though senior managers are aware of the issue, the project manager retains residual responsibility to see that the issue is "tracked" and given due attention.

The actionability of a project issue deals with the capability of the project team and the enterprise to do something about the issue. For example, the issue of licensability of a new nuclear power plant is critical to the decision of whether to

[17] The process is explained in A. H. Van de Ven and H. L. Delbecq, "Nominal versus Interacting Group Processes for Committee Decision Making," Academy of Management Journal, vol. 14, no. 2, 1971.

[18] W. R. King, "Strategic Issue Management," in W. R. King and D. I. Cleland (eds.), Strategic *Planning and* Management *Handbook* (New York: Van Nostrand Reinhold, 1986), pp. 252–264.

fund such a plant. A company can help resolve the licensability of nuclear power plants by participating with the industry's groups that are trying to influence the Nuclear Regulatory Commission either directly or through congressional persuasion to do something about the uncertainties related to licensing. Such participation would be useful in influencing the strategic issue as well as for keeping informed about the status of the issue. The related strategic issue of funding support for a power-generating plant would be an issue that the enterprise would actively try to resolve by working with investment bankers in the financial community.

A project may face strategic issues about which little can be done. Keeping track of the issue and considering its potential impact on project decisions may be the only realistic action the team can take. Key project managers should always be aware that there are issues that may be beyond their influence.

The criticality of an issue is the determined impact that the issue can have on the project's outcome. The issue of growing congressional disenchantment with the U.S. Supersonic Transport Program arose from the concern of the environmentalists over the sonic boom problem. Proactive environmental groups along with the general public exerted political influence, which contributed to the termination of that program. Project advocates recognized too late that the sonic boom controversy was the critical fulcrum for the environmentalists to use for their public and congressional support. If a preliminary analysis of an issue indicates it is noncritical, then the issue should be monitored and periodically evaluated to see if its status has changed.

The urgency of an issue has to do with the time period in which something needs to be done. All else being equal, if an issue should be dealt with immediately, it must take precedence over other issues. Urgent issues emerging during the project planning should be considered a "work package" in the management of the project. Someone should be designated as the issue work package manager to look after the issue, particularly during its urgency status.

The accident at the Three Mile Island nuclear plant and the subsequent uncertainties over plant design and licensing posed serious and urgent strategic issues for all nuclear plants in the design and construction phases of their life cycle. Although most project managers would have considered this an urgent issue, there were limits as to what could be done, except to track the issue and try to influence the NRC and other government agencies through the industry's societies and political contacts.

H. Ross Perot's controversial contract for a project with the U.S. Postal Service faced a strategic issue soon after the award was announced. The contract immediately drew fire because it was awarded without competitive bidding. The General Accounting Office began an investigation, followed by a U.S. Senate resolution requesting that the contract be put on hold pending further study. The General Services Administration's Board of Contract Appeals nullified the contract. It is not known if the lack of competitive bidding with the U.S. Postal Service was ever considered a possible "strategic issue" by the Perot Systems Corporation team. But that is the way things have turned out. It has become an issue with considerable urgency affecting a major project for that corporation.

7.8 ANALYSIS OF ACTION

Identification and assessment of an issue are not enough; the issue has to be managed so that its adverse effect on the project is minimized and its potential benefit is maximized. The issue work package manager is in charge of collecting information, tracking the project, and ensuring that the issue remains visible to the project team. That manager should also coordinate decisions made and implemented regarding the issue.

In the analysis of action required to deal with an issue, seeking answers to a series of questions like the following can be helpful:

- What will be the probable effect of the issue in terms of impact on the project's schedule, cost, and technical performance and the owner's strategy?
- Who are the principal stakeholders who have an interest in the project? What will be the impact on their probable strategy?
- How influential are these stakeholders?
- What strategy should the project team develop to deal with these issues?
- What might be the real cost in relation to the apparent cost to the project owner, and will other projects being funded by the project owner be affected?
- What specific action will be required, and what will it cost the project owner?

The action developed to deal with the issue may, at the minimum, consist of simply monitoring the issue and giving status reports to the project team. Some issues, however, may require a more aggressive approach. The issue work package manager may find it useful to think of the issue as having a life cycle, with such phases as conception, definition, production, operations, and termination, and to identify the key actions to be considered and accomplished during each phase. The manager should be specific and should stipulate what will be done, when it will be done, how to do it, where, and who will be in charge of implementing the action leading to resolution of the issue.

7.9 IMPLEMENTATION

However it is dealt with, the resolution of an issue or the mitigation of its effects requires that a ***project plan of action*** be developed and implemented. Indeed, the resolution of a strategic issue can be dealt with as a miniproject requiring the execution of the management functions—planning, organizing, motivating, direction, and control—and all these functions entail some degree of work breakdown analysis, scheduling, cost estimating, matrix responsibility, information systems, design of monitoring and control, and so on. What resources are to be used to resolve the issue and who should take the leadership role in resolving that issue and the crucial questions to be answered should be considered.

The potential for the success or failure of a project can have strategic issue implications. In the material that follows, a brief review of some of the reasons for project success and failure is given to remind the leader that such issues are very real and should be considered during the project's life cycle.

7.10 STRATEGIC ISSUES OF PROJECT SUCCESS AND FAILURE

In 1945, Mayo observed that the United States is technically competent, but we have considerable social incompetence.[19] Another perspective is offered by two researchers who found that for the overwhelming majority of failed projects there was not a single technological issue to explain the failure—rather, it was sociological in nature.[20] Thamhain and Wilemon found in their research that newer project management approaches require more extensive human skills and competence. Some of the skills they found that were associated with building multidisciplinary teams involved motivating staff people, developing a healthy work climate, managing conflict, and communicating effectively at all levels."

What are the key critical factors in successful projects? One study identified a general set of critical success factors that could be applied to any project regardless of its characteristics or development methodology. It was recognized that timing was evident in the factors. The top factors identified were those concerned with establishing adequate planning to include goals and the general philosophy and mission of the project, as well as the commitment to these goals. Factors associated with user involvement tended to take up the middle of the rankings. Finally, at the low end of the factors were the project management and technical factors to include the selling of the system, the monitoring of progress, and troubleshooting activities usually found during project development activities.[22]

Another study about project success formulates a conceptual framework to assess the impact of success factors on the success criteria of a technology transfer project. The study drew from a sample of 40 automation industry firms and 48 successful and not so successful cases. The dominant importance of involvement for the success of a technology transfer project became evident. Technical characteristics are the second most important factor in determining project success. One key outcome of this study was a list of policy implications and recommendations to enhance the technology transfer process.[23]

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[19] E. Mayo, *The Social Problems of an Industrial Civilization* (Boston: The Graduate School of Business, 1945).

[20] Tom DeMarco and Timothy Lister, *Peopleware: Production Projects and Teams* (New York: Dorset House, 1988).

[21] H. J. Thamhain and D. L. Wilemon, "Developing Project/Program Managers," *Proceedings.* PMI Seminar/Symposium, Toronto, Ontario, October 1982, p. II-B.2.

[22] James J. Jiang, Gary Klein, and Joseph Balloun, "Ranking of System Implementation Success Factors," *Project Management Journal,* December 1996, pp. 49–53.

[23] Raykun R Tan, "Success Criteria and Success Factors for External Technology Transfer Projects," *Project Management Journal.* June 1966, pp. 45-55.

Florida Power and Light management identified what it thought to be the 10 most important factors in completing the St. Lucie 2 Nuclear Power Plant essentially on schedule, within cost, and without major quality-related problems:

- Management commitment
- A realistic and firm schedule
- Clear decision-making authority
- Flexible project control tools
- Teamwork
- Maintaining engineering ahead of construction
- Early start-up involvement
- Organizational flexibility
- Ongoing critique of the project
- Close coordination with the Nuclear Regulatory Commission[24]

The potential for a project failure or success usually has strong overtones of a strategic issue. If a product development project fails, the strategic viability of the enterprise can be threatened. Conversely, if a project succeeds, a significant contribution to the future viability of the enterprise has been made. Project managers, team members, and senior managers should be aware of how strategic issues can impact the success or failure of a project.

7.71 PORTFOLIO MANAGEMENT FOR PROJECTS

The design and implementation of a portfolio for projects is a strategic issue within an enterprise. Portfolio management of projects is a strategy that moves the selection and implementation of projects from a random process to one with structure and discipline. Project portfolio management is used to align projects with strategic goals and objectives for a more effective and efficient organization.

Portfolio management is often viewed in the financial community as a balance between the investments through stocks, bonds, and cash. Within the stocks, there are a wealth of categories that include high, medium, and low risk; speculative and stable stocks; emerging companies and mature companies; and dividends and capital realization. Similarly, projects may be categorized into areas that have specific parametric variables, which permit characterization and classification of projects.

Many project may be selected on the basis of criteria that are not in alignment with the organization's purpose or mission or goals and objectives, or the strategy for the organization's growth. Projects are sometimes selected on the basis of

[24] *Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants,* NUREG-1044, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984.

profitability estimates alone—without regard for any of the multiple factors that can affect the outcome or for an alignment with the organization's strategic direction. Random selection of projects without consideration for the enterprise's strategic direction can have adverse consequences.

To ensure the best outcome for the organization, projects need to be reviewed and assessed for their contributions to the organization and for future business. Ideally, there would be a balance of projects that includes such considerations as risk, profitability, size, and strategic fit.

Project Portfolio

What is the proper balance of projects defined by their multiple characteristics for an organization? If projects are the building blocks to the future of an organization, then an organization needs to understand the types and characteristics of projects in order to select the best ones for success. Selecting the wrong projects can have the effect of diverting funds and resources in a direction that limits organizational growth.

Following are some examples of types of projects that have been observed:

- An energy transport company selected most of its projects on the basis of repairing or upgrading the existing natural gas lines. This focus on repairing and upgrading the existing system proved to be most effective because the natural gas was transported to the consumers more efficiently and effectively. A secondary purpose for projects was to serve new customers. Note that if current customers were poorly served, new customers would only degrade the existing service.
- An insurance company selected software projects on the basis of perceived need for new efficiencies to better serve its customers. Many of the projects were changes to existing practices/procedures that were not fully coordinated; that is, work was being accomplished on top of work to change an old system. The larger picture was not considered when projects were approved, which suboptimized the organization's resultant capabilities derived from the individual projects. The organization did struggle through many duplicate efforts and sometimes conflicting outcomes.
- A telecommunication company's future was dependent upon what the sales force could sell to consumers. Each salesperson targeted different aspects of telecommunications services and "sold" projects on the basis of expected revenue. The cost of the projects was optimistically low and the actual revenue estimate way optimistically high. Less than 1 of 18, or 5 percent, of the projects exceeded revenue, and failures (expenditures exceeded revenue) were many. Project selection was dependent upon a salesperson's business cases—which were typically optimistic—with the salesperson being rewarded for a sale rather than a successful project.
- A major manufacturer of paper products selected and approved projects on the basis of availability of budget and the implied need for the projects. Although all the projects appeared to be valid requirements, several projects were implemented

for products that were not needed until several months after scheduled delivery. This resulted in many projects consuming resources early and the end result being products that could not be used for several months following delivery.

Project Selection Criteria

Ideally, an organization will select projects that align with the strategic goals and ones that build on current capability. Each project selected and implemented should be a building block that promotes the organization's purpose and that positions the organization for an improved future capability. Any project not aligned with the strategic goals may well detract from the organization's purpose and delay its growth.

Each organization should develop a model for assessing project fit within the strategic goals and objectives. This model could, perhaps, be a part of the strategic plan for the organization. A model would construct a generic combination of "best-fit" projects to guide senior management in approving new project work that aligns with the strategic direction. See Chap. 4 for additional information on project selection.

Some considerations for constructing an organization's model for a portfolio of projects follow:

- Projects are typically approved for the purpose of developing and delivering new products and services or effecting organizational change. These projects should be used in a balanced manner to advance the organization. In these turbulent times, an organization needs to focus on rapid delivery of products and services as well as changing the organization's processes to obtain more productivity for future work.
- Projects need to have a balance between providing products and services today and as future building blocks to position for tomorrow's work. For example, an organization might have an R&D program using projects to redesign or develop new products in anticipation of retiring some existing product lines.
- Projects are the means for action and implementing strategic plans. Well-designed and well-implemented projects can contribute to an organization's success today and in the future.
- Core competencies drive which projects should be selected and successfully implemented. Making a decision to conduct a project outside of one's core competencies adds risk and introduces a level of risk that may be unacceptable for the organization.

What are the variables and characteristics that an organization needs to consider for developing a balanced portfolio of projects? A selection model allows consistent application of criteria for an informed project selection process that can optimize and support the strategic goals and objectives. Random selection of apparently attractive projects typically results in less than optimum results.

All projects are "discretionary" in their implementation. Some will argue that a few projects are "must have" types and cannot be avoided. In viewing all projects, the senior managers making the selection have discretion of either delaying, not selecting, or implementing a project. The consequence of the decision may dictate

a certain action based on the enterprise's goals. However, objective selection criteria should provide a better understanding of the project under consideration and its promised benefits.

Table 7.2 gives several critical aspects of a project that need to be considered in context with the strategic goals and objectives of the organization. Some of the items may be more important to an organization than others. Only the organization can determine the importance and weight of each item as it fits with their business and strategy.

TABLE 7.2 Elements of a Project Selection Process

Variable*	Comments
Profit margin	Organizations need to earn a profit on their project work when the resultant outcome is a product or service being sold. Organizations typically set a profit goal for projects on the basis of factors such as risk, degree of difficulty to complete the project, the type of work, and whether there is a usable by-product of the project.
Project risk	Organizations must assess the risk of the project. The risk may be whether the product will meet market expectations or whether the project can be completed within established goals for cost, schedule, and technical performance.
Process change	Organizations may use projects to optimize their organizational processes. Using projects to upgrade or establish new processes may be the most cost- and time-effective method.
Resources	Human and nonhuman resources need to be considered. Human resources may or may not have the requisite qualifications to perform on a project. Special material resources or tools may or may not be available to complete the project. In some instances, current human resources may be insufficient in quantity to complete the project within the required time frame.
Financial considerations	Cash flow may be negatively impacted by large initial expenditures on a project. The cost of labor or outsourcing of work can also have major financial impacts for an organization.
Building block	Question whether the project is a building block for the organization by further development of core competencies and contributing to the organization's success. Or is the project something that neither contributes to building the organization nor is within the organization's overall purpose?
By-product	Question whether there are by-products that can be used in subsequent projects or whether by-products may be used to enhance the organization's future capabilities.
Technology	Question whether the technology is one that the organization understands and is building a business based on it. Also the degree of maturity of a technology or whether the technology is to be developed is key to the project selection.

TABLE 7.2 Elements of a Project Selection Process (Continued)

Variable*	Comments
Project duration	Question whether the project duration fits into the normal work arrangements and whether there are only long- or shortduration projects in the organization.
Size (relative to organization)	Question whether the size (dollar, resource, duration) is right for the organization. Organizational structure may find the project to be too large for the capability or too small for the type of management used.
Corporate image	Question the image that the corporation will get when taking on a project.
High competition	Question the degree of competition for the project or the product and whether this project is a declining market area.
Client	Question whether the new project is for an existing client or a new one. Determine whether the organization's business is centered around one or two clients where any loss of a client would have a major impact on the organization.
Life-cycle phases	Question whether the project's life-cycle phase provides for continuity of work or whether there is interrupted flow of work. Interrupted flow of work typically requires more resources and costs more.
Core competency	Question whether the project is within the organization's established core competencies or whether it is initiating a new core competency. Existing competencies are easier to perform than starting new ones.
Urgency of need	Question the urgency of need to determine whether delivery is possible within the time frame desired. Also, determine whether there will be resources available to complete the project.
R&D	Question R&D projects to see if there are too many/too few and whether their focus is on the right/wrong areas. Determine whether new projects duplicate effort or lead to enhanced or new projects.

***These variables are purposely in a random order. This is designed to show that the table has not placed any weight on a variable or that a variable may apply to an organization's strategy. Further, organizations must develop their respective model and may use any or all of the above variables.**

Once project selection criteria are established for the type of projects determined by an organization's portfolio of needs, a review of all projects can be made. Using a model of what is ideal for the organization, one can then compare the differences to establish a direction for change. Seldom will the model replicate the actual situation.

An example of project selection criteria in a portfolio has been developed on the basis of a generic situation. It does not directly represent an organization, but

serves to show what might be used in an organization to define the characteristics of desirable projects. Criteria for a portfolio of projects may have some of the characteristics shown and explained in Table 7.3.

An example of what an ideal organization's project portfolio might be is depicted in Table 7.4. Although this is an example, it provides the reader an idea of what to look for in a portfolio of projects.

TABLE 7.3 Organizational Project Portfolio Selection (Example)

Characteristic	Criteria
Project size	Project mix will consist of small (less than $10K), medium (between $10K and $100K), and large (more than $100K) projects • Small projects will represent 50 percent of the business. • Medium projects will represent 40 percent of the business. • Large projects will represent 10 percent of the business.
Core competencies	Projects will be selected on the basis of fit into one of the organization's competencies. Exception to this will require approval of the board of directors.
Business risk	Projects (products) will have a high degree of success (90 percent or more) before being selected.
Project risk	Project goals will have a 70 percent or greater chance of success.
Technology	Projects requiring new technology will be compatible with existing core competency growth plans.
Profitability	Projects will have an expected profitability of greater than 15 percent.

TABLE 7.4 Organizational Project Portfolio (Example)

Item	Target	Actual
Small-sized projects	32	27
Medium-sized projects	12	17
Large-sized projects	4	7
High-risk projects	2	3
Medium-risk projects	6	0
Low-risk projects	40	45
Projects related to competencies	48	29
Number of project customers	>12	7
High-technology projects	2	0
R&D projects	5	3

Table 7.4 depicts information on the basis of what the organization sets as its target goal. Some discussion is required to show how the portfolio is out of balance and needs some future fine tuning.

- Project size shows a tendency to creep toward the larger projects. This would need a review to determine whether the organization can manage 48 projects at one time with 6 projects moving into the next category (excess of 5 in the medium category and 1 in the large category).
- Project risk exceeds the high category by one, whereas five additional projects are in the low category. If the high-risk projects are all large projects, this may have some impact on the organization—assuming that there will be some risk events that could have significant negative impacts.
- Project-competency connection seems to be out of balance with the goals. Slightly more than one-half of the projects are within the organization's core competencies. This would raise the question: What is the correct mix of core competencies for the organization? When the projects outside the core competencies are examined, one may find a significant disconnect with the business purpose.
- Number of project customers is not meeting the target goal. This needs a review and determination if this could lead to problems in the future.
- There are no high-technology projects. This may indicate a stagnation of technology growth to meet the marketplace or it may indicate a change in the business.
- R&D projects are not maintaining pace with the target. Possible causes are that resources are being used on existing projects or there is no need for R&D this year.

Reviewing Project Portfolio Management

Project portfolio management adds a dimension to an organization's capability and plan for growth. It first establishes criteria for selecting a project—whether internal or bidding on project work for clients. These criteria guide the organization to a model that supports the strategic goals and objectives while optimizing the balance of various characteristics of projects. Senior managers charged with selecting projects have an objective means of making informed decisions when using the selection criteria.

Building a model of what the organization should have in terms of projects provides a means of assessing the balance of the types of projects. One would not want all high-risk projects because of the potential for driving the organization into bankruptcy. The same goes for having all low-risk projects that typically have small profit margins, which will not support the organization's growth potential.

Managing by project portfolios provides high visibility to the organization's total projects without focusing on just one project at a time. It seeks to balance the many characteristics of projects to optimize the organization through alignment with strategic goals and objectives. A portfolio of projects improves any project-driven organization through improved visibility.

7.12 TO SUMMARIZE

The major points expressed in this chapter include:

- In a project, a strategic issue is a condition of pressure, either internal or external, that will have a significant effect on one or more factors of the project, such as its financing, design, engineering, construction, and operation.
- Examples were given of how strategic issues impacted some of the projects in the past and in contemporary times.
- Sometimes a strategic issue is subtle, as in the case of Eastman Kodak, where the CEO felt that his most urgent task was to eliminate the resistance to change from employees.
- A major issue facing the United States and other nations is continued dependence on oil and coal for the production of electrical power.
- The principal strategic issues facing potential projects for the construction of nuclear power plants were presented to keynote the importance of effectively managing the strategic issues in a project.
- Strategic issues on a project can arise from within the enterprise, and from outside, such as major concerns that the project stakeholders have about the project.
- A paradigm was suggested on how best to manage the strategic issues facing a project.
- Project success and project failure were suggested as major strategic issues that face a project.
- Prescriptions were given on how project strategy could be managed to increase the likelihood of project success or project failure in the conduct of a project.
- Potential strategic issues likely to impact a project during its life cycle should be identified during the early planning stages for the project.
- The matter of strategic issues should be given due consideration during the life cycle of a project.
- Project portfolio managers adds value to any organization by understanding the types of projects selected and maintaining a balance of projects consistent with the strategic goals and objectives.
- Project portfolio management highlights adverse trends for an organization when too much risk is accepted through individual projects.

7.13 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and

expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Kim LaScola Needy and Kimberly L. Petri, "Keeping the Lid on Project Costs," and Lewis R. Ireland, "Total Customer Satisfaction," chaps. 9 and 26 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- Regula A. Brunies and Ross Brophy, "Minimizing Construction Claims under the Project Management Concept," and Randall L. Speck, "The Legal Standards for 'Prudent' Project Management," in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (Originally published in ***Proceedings,*** PMI Seminar/Symposium, Montreal, Canada, 1986, pp. 198–212; ***Proceedings,*** PMI Seminar/Symposium, Milwaukee, Wis., 1987, pp. 566–576.)
- John D. Sterman, ***Business Dynamics: Systems Thinking and Modeling for a Complex World*** (Burr Ridge, Ill.: McGraw-Hill, 2000). It is not enough to identify the strategic issues in projects, but one must be able to solve those issues through analysis and application of working models. This book provides the basis for strategic thinking in the context of business, engineering, and social and physical sciences.
- Stephen G. Haines, The ***Systems Thinking Approach to Strategic Planning*** (Boca Raton, Fla., Saint Lucie Press, 2000). This book is a practical application to systems thinking and improves on the systems thinking concept first introduced by Peter Senge in the ***Fifth Discipline*** (Doubleday, 1990). This book focuses on planning strategies and the change management process in support of customer satisfaction.
- Anonymous, "Seattle Light Rail in Question," ***Railway Age,*** June 2001. This article describes the cost overrun and schedule delay of the Seattle Light Rail Transport System. It introduces the issue of cost and schedule growth by approximately one-third and the challenges associated with this project.
- Anonymous, "Thinking Outside the Box," ***Chain Store Age,*** May 2001. This article addresses numerous issues that face organizations when considering doing business in a particular state, county, or municipality. If a project was being planned for a particular location, the list of challenges to good business would be invaluable. With projects bridging several communities, such as a telecommunication tower project, the issues described would apply and require resolution for the best outcome.
- William R. Bigler, "The New Science of Strategy Execution: How Incumbents Become Fast, Sleek Wealth Creators," ***Strategy & Leadership,*** May–June 2001, pp. 29–34. This article focuses on the delays in implementing strategies for firms and the resultant chaos. Discussion centers on the identification of opportunities and rapid implementation to achieve the desired outcome.

- Robert Buttrick, ***The Interactive Project Workout: Reap Reward from All the Business Projects,*** 2d ed. (Englewood Cliffs, N.J.: Prentice Hall, 2000). This book covers a variety of subjects for managing projects; most notable is the framework of projects. One chapter is devoted to managing a portfolio of projects. Other chapters deal with reviewing the project and ensuring that it follows generally accepted practices for project management.

7.74 DISCUSSION QUESTIONS

1. Define a strategic issue.
2. Select a project management situation from your work or school experience, and list the strategic issues.
3. What methods might project managers employ to identify the strategic issues of a project?
4. What approaches can be used by project leaders to assess the impact of a strategic issue?
5. What management techniques can be used to address strategic issues?
6. Why is project success or failure considered to be a strategic issue?
7. What roles do environmental issues play in projects such as power plants and other major construction projects?
8. List and define the elements of the phase approach to dealing with strategic issues.
9. In identifying the strategic issues of a project, management can ask questions pertaining to the project stakeholders. What kinds of questions should be asked?
10. What is meant by the strategic relevance of an issue?
11. How can management assess the criticality and urgency of a strategic issue?
12. How can managers ensure that project team members are aware of and understand the project strategic issues?
13. What trends can be recognized when project portfolio management categorizes projects?
14. Discuss the use of project portfolio management when an organization has not fully developed and announced its strategic goals and objectives.
15. What advantages do you see for using project portfolio management in your organization?
16. How does project portfolio management affect the allocation of resources in your organization?

7.15 USER CHECKLIST

1. Do the project managers of your organization understand the concept of strategic issues? How do they manifest this understanding in managing projects?
2. Do any formal methods exist in your organization for strategic issue management? What are they? How are they used?
3. Do the project managers of your organization attempt to identify project interfaces that can seriously impact the outcome of a project? Explain.
4. Does top management use any postproject appraisals to help uncover strategic issue-related problems? Does management see the value in post-project appraisals?
5. Does the management of your organization recognize the importance of understanding public perception? In what ways do project managers control public perception?
6. Are there any outside advocates that can be or are effective in altering public opinion in favor of your organization's projects?
7. Do project managers assess the environmental impacts of projects? In what ways?
8. Could the phase approach to managing strategic issues be used effectively in your organization? How?
9. Are current project managers kept informed of the factors likely to impact project success or failure?
10. Does management seek to identify the relevant issues for each project stakeholder?
11. Does management identify the strategic relevance of each issue and determine the actionability, criticality, and urgency? In what ways is this done? What other methods could be used?
12. Are project team members made aware of strategic issues? How? Do they then attempt to monitor these issues as they relate to their own work packages?

7.16 PRINCIPLES OF PROJECT MANAGEMENT

1. Strategic issues may adversely impact project success through inadequate attention being paid to the issues.
2. Large, long-term projects have a great potential for cost overruns and schedule delays.
3. Relationships between the project owner and others are critical to the success of the project.

4. Large projects have diverse stakeholders who do not agree on the risk of the project or the benefits of its product.
5. Anticipating and addressing strategic issues materially improves the chance for successful projects.

7.17 PROJECT MANAGEMENT SITUATION—SOME STRATEGIC ISSUES

When an organization changes from its present type of work to a new competency, there are typically uncharted courses taken. The obvious impediments to change are easy to identify and resolve through some routine planning or contingency action. It is the unanticipated issues that will create problems--emerging when other activities are taking the time and resources or slowly materializing in a fashion so that it is difficult to characterize the issue.

Anticipating issues for a major change of direction for an organization may be unsuccessful for several reasons. There may not be someone knowledgeable available to review the plans and identify potential problems. Also, the organization's plan for change may have weak goals that are unclear or not understood. This anticipated change is probably a new venture for the organization that is based more on a desire to reposition than the facts regarding difficulty for the change.

One of the more challenging situations is to assume that because the competition has made a similar change this organization can also transition to the new position with relative ease. It must be remembered that the competition will neither share the difficulty of the transition nor share information on the success of their transition. It is not in a competitor's interest to help another position to compete for a part of the market.

Strategic issues may be a part of the operating environment, such as performing work in a foreign country using indigenous unskilled labor or conforming with laws or customs of the foreign country, that must be considered during the decision-making process. The best method of meeting strategic issues and resolving them through various means is to be well armed with information.

Issues that affect relationships in a foreign country may be derived from religious followings, language barriers and language translations, work ethics, local and federal laws, customs of the population, labor unions, trade barriers, and human skill levels. It takes an expert on the country to identify these differences from what is current practice in the United States. Some issues may arise from what one would assume is a favorable situation for the local population.

For example, apparently favorable situations such as employment and good wages can cause competition among those seeking jobs and possible sabotage of the work by those not employed. Some countries require that groups of people be hired for jobs—rather than the typical model of hiring one person at a time. These same groups may require that the leader be paid, but that he will not be required to work or supervise. If work instructions are given in English, the worker may often use lack of communication as the excuse for poor performance.

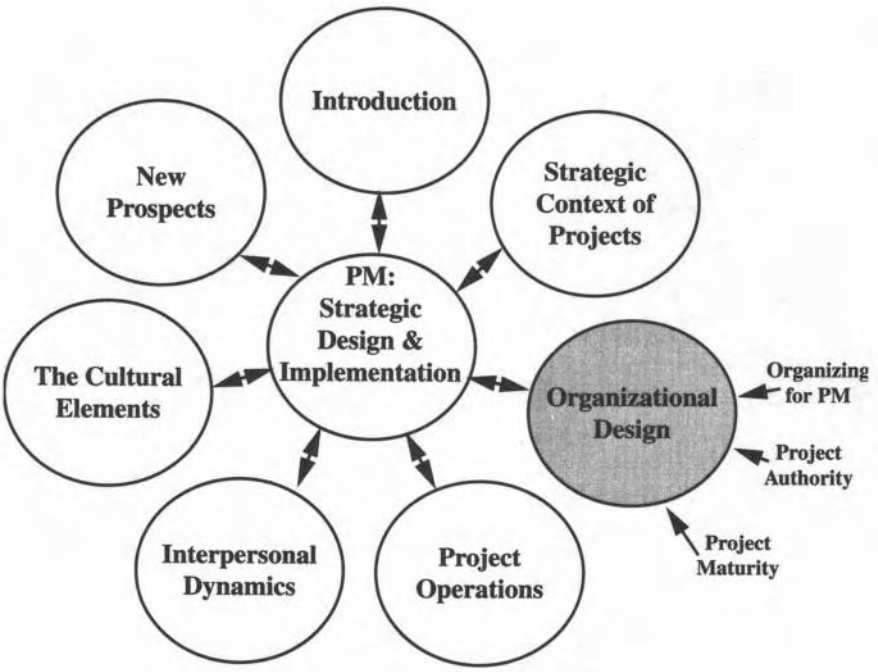
Initiating a venture that can develop strategic issues can be difficult to complete without thorough planning with a lot of information and a process to handle emerging issues. Failed projects may be the outcome when the organization is overcome by issues that seem to have no immediate answer.

7.18 STUDENT/READER ASSIGNMENT

1. You are the project manager for a light manufacturing firm and it has been decided that the work can be done at less overall cost if the items are manufactured in Dalian, China. What issues do you anticipate with manufacturing the products in China?
2. A competitor has a major coffee-growing effort in Ethiopia and seems to be doing well. Management has decided to invest in a project in Ethiopia start a major wool-growing effort that will provide cheap wool for the world market. What issues do you see in this venture?
3. Your organization, an experienced mine operator in the United States, has been invited to participate in a major mining operation in northern Canada. You have been tasked with identifying any issues associated with partnering on the new mine. What are the issues?
4. Your organization has been awarded a contract to build an airfield in the Sudan. All construction equipment will be transported to the location. One of the issues is that heavy equipment operators are not available from the indigenous labor force. What are some of the means to resolve this issue?
5. While working in a foreign country, you identify the issue that the computers are not working properly because of the difference in frequency of the local electricity (50-Hz current versus 60-Hz current in the United States). Your project management scheduling tools as well as clocks are not working properly. What action should you take to resolve this issue?

P · A · R · T · 3

ORGANIZATIONAL DESIGN FOR PROJECT MANAGEMENT



CHAPTER 8
ORGANIZING FOR PROJECT MANAGEMENT

"...to our worship of quantity and indifference to quality, to our unthinking devotion to organization, standardization...."

DANIEL GREGORY MASON. 1873–1960

8.1 INTRODUCTION

How many times has the reader been in situations in which the lack of a clear organizational design has created problems? The authors suggest that the lack of a clear organizational design has created manifold problems in the attainment of the organizational "choice elements," and has been an ongoing source of frustration in all too many organizations. In the project-driven organization, special care has to be given in designing and implementing suitable organizational models to provide the basis for the delegation of authority and responsibility.

In this chapter, a citation of probable organizational deficiencies that do not adequately describe individual and collective roles in the organization will be noted. Then the various forms of project organizations will be presented to include the controversial "matrix" design that has long occupied the attention of theorists and professionals. The relative authority of the project managers vis-à-vis the functional managers will be portrayed, along with a description of the basic project-functional interface typical of the project-driven organizational unit. Organizational networking, the role of the project management office, and administration will be provided.

8.2 PROJECT-DRIVEN ORGANIZATION

This chapter examines the project-driven organization, including its alternatives in coping with the use of cross-functional teams that are characteristic of the matrix organization. Some suggestions are offered on how to deal with the

matrix organization. A project-driven organization has the following characteristics:

- It has an organizational design that defines the use of a "matrix organization" structure which provides a focus for the management of projects.
- It supports the linkage of projects as building blocks in the design and execution of organizational strategies.
- The organization has senior executives that are committed to the use of projects in the design and execution of enterprise strategies.
- It constantly reinforces the role of project management as the means for dealing with product, service, and process changes in the enterprise--carried out through the management of a project portfolio that prepares the organization for the future—as if that future mattered.
- An explicit culture of project management is evident in the organization, and means are constantly used to reinforce this culture.
- Project management experience has become an explicit consideration for promotion to higher levels of responsibility in the enterprise.

  Teamwork has become a key characteristic of the culture of the enterprise.

  The management of stakeholders is a key task of the project team's endeavors.
- Project management is a core business process in the enterprise.

8.3 SELF-MANAGEMENT IN ORGANIZATIONS

One of the biggest trends of all in the field of management is the rethinking and reevaluation that is under way in the application of management theory reflected in the major changes in the organizational design and empowerment strategies used today. Many organizations of all kinds are starting to abandon the revered "chain of command" where authority and responsibility were placed, in favor of empowering employees to "manage themselves." In order for the employees to manage themselves, an organizational design is needed. The use of the alternative team organizational structure has provided the basis for such an organizational design.

As employees serve on alternative teams and are properly empowered to do so, they are freed of being closely directed and controlled, as was the case in most traditional organizations where first-level supervisors and other managers often exercised "command and control" over their subordinates. In modern organizations that use alternative teams, these traditional supervisors are gone and even if still around, they carry out different strategies in their new role of maintaining oversight of the employees. Such new supervisors become teachers, mentors, facilitators, coaches, and the like, where they work with the teams rather than supervising them in the traditional sense. Employees are free on the teams to figure out how to get the job done without central planning and control. Sometimes this new paradigm is called "self-management and organization."

The new organizational design embracing teams is akin to the biological world, where uncontrolled environments and actions produce remarkable results of efficiency and effectiveness through a process of self-management and adaptation. In such environments the teams are encouraged to design and execute their own strategies, to experiment, and to seek information and assistance wherever necessary to include organizational members, suppliers, customers, and other stakeholders. New streams of performance information are created and disseminated so that team members as well as other organizational stakeholders can see what is going on and what is working positively for the enterprise's goals and objectives.

Employees serving on these teams express new dimensions of eagerness and enthusiasm, anxious to take on new dual responsibilities: first, discharge of their obligations for the technical work needed by the enterprise, and second, the management of that technical work. For example, in a furniture factory in rural Virginia, productivity soared after workers took over production scheduling and problem solving. At a refinery in the Middle West, those who traditionally had carried out specific work procedures came up with their own policies and procedures, resulting in huge gains in output. Even the process of strategic planning has been changed in some companies through the reduction of staff people to do the planning and dependence on teams of employees to keep in touch with major stakeholders such as customers and suppliers to discern trends that need to be factored into the overall strategic planning being carried out for the enterprise. Yet, there have been some real contemporary organizational deficiencies.

8.4 ORGANIZATIONAL DEFICIENCIES

Here are a few examples of how deficiencies in the organizational design affect project success (and failure):

- On the Shoreham Generating Plant project of the Long Island Lighting Company, the organizational arrangement left lines of authority and responsibility blurred and unclear from the start. The lack of adequate organization was a major deficiency that significantly prejudiced the utility's ability to manage the project. Over the life of the project, despite repeated complaints about role confusion and tangled lines of authority and unclear accountability, the senior managers of the utility failed to create an organizational framework that allowed its managers to direct and manage the construction of the plant efficiently.[1]
- An investigation of the Trans-Alaska Pipeline System (TAPS) project indicated that organizational structure significantly influenced project performance.[1]

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[1] Paraphrased from Recommended Decision by Administrative Law Judges William C. Levey and Thomas R. Matias, *Long Island Lighting Company–Shoreham Prudence Investigation,* case no. 27563, State of New York Public Service Commission, March 13, 1985.

[2] T. F. Lenzner, *The Management, Planning and Construction of the Trans-Alaska Pipeline System* (Anchorage, Alaska: Pipeline Commission, 1977).

- A Rand Corporation study of "new technology" process plant construction found that the most prominently mentioned management-related reason for increased costs was "diffused decision-making responsibility for a project."[3]
- The fatal launch of ***Challenger*** is an example of some difficulties that had their genesis in a faulty organizational design. NASA's leaders were preoccupied with raising money for NASA from Congress. The organizational components of NASA were supposed to work together, but the Marshall, Kennedy, and Johnson Space Centers behaved more like baronies, not communicating with each other or with the top of NASA. The flow of information up and down the NASA hierarchy was, according to ***Fortune*** magazine, as flawed as the now notorious "O" rings.[4] The Marshall Space Center had an ambiguous chain of command with a reporting relationship to the Johnson Space Center in Houston, but not under Johnson's management control. The Marshall Center also reports to the Office of Space Flight at NASA headquarters and in theory cooperates closely with the Kennedy Center in Florida. However, the anomalies in the organizational reporting relationships were further blurred by cultural factors, which allowed jealousy and rivalry to exist among Marshall, Johnson, and Kennedy Centers. Also, there was resistance to NASA headquarters' oversight of their operations.[5]

Project management has led the way in the formalization of the erosion and crossing of organizational boundaries. In today's competitive world, the crossing of many boundaries—functional, geographic, organizational—is showing promise of becoming a way of life. Jack Welch, CEO of General Electric, says that "to create what we call 'boundaryless' companies, we no longer have the time to climb over barriers between functions like engineering and marketing, or between people—hourly, salaried, management, and the like. Geographic barriers must evaporate. We've got to simply delegate more and simply trust more. We need to drive self-confidence deep into the organization. We have to convince our managers that their role is not to control people and stay on top of things, but rather to guide, energize, and excite."[6] Surely project managers, who have had to survive in boundaryless organizational designs, are well equipped to provide leadership in reaching the boundaryless companies envisioned by Jack Welch.

Some of the shortcomings of traditional organizational hierarchies and organizational design follow:

- Formal enterprise hierarchies tend to be slow, inflexible, and bureaucratic.
- Formal structures can create barriers between the enterprise and the customer.
- It is difficult for enterpreneurship to flourish in a bureaucracy, particularly in the front-line operating units.
- Structure is only one part, a small part, of systems-oriented organizational change.

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[3] Rand Corporation, *A Review of Cost Estimation in New Technologies: Implications for Energy Process Plants*, Santa Monica, Calif., July 1978.

[4] Michael Brody, "NASA's Challenge: Ending Isolation at the Top," *Fortune*, May 12, 1986.

[5] Ibid.

[6] 1992 General Electric Annual Report.

- A traditional organization looks more to the higher headquarters and less to the customer, suppliers, and other key stakeholders.
- The inadequacies of innovation in the traditional structure gave rise to the creation of "skunk works" where innovation could thrive unimpeded by traditional bureaucracy.
- Scant attention was given to horizontal processes within organizations, and to dealing with outside stakeholders.
- Organizations were viewed more as structures than as processes.
- The successful traditionally organized enterprises were able to foster a culture that encouraged bottom-up ideas and initiatives.

Project management has changed some of these shortcomings.

8.5 THE PROJECT ORGANIZATION

The term project organization is used to denote an interorganizational team pulled together for a specific purpose. Personnel are drawn from the organization's functional units to perform a specific task; the organization is temporary, built around the purpose to be accomplished rather than on the basis of functional similarity, process, product, or other traditional bases. When such a team is assembled and superimposed on the existing structure, a matrix organization is formed. The matrix organization encompasses the complementary functional and project units. Figure 8.1 is a model of the matrix organization.

Before we examine the matrix organization, a brief review of other means of organizing is needed. Organizational theorists have developed various ways of dividing the organization into subunits to improve efficiency and to decentralize authority, responsibility, and accountability through a process of departmentalization, with the objective of arriving at an orderly arrangement of the interdependent parts of the organization. Departmentalization is integral to the delegation process. The most widely used system of departmentalization includes:

- ***Functional*** departmentalization, where the organizational units are based on distinct common specialties such as finance, engineering, and manufacturing
- ***Product*** departmentalization, by organizing into distinct units responsible for a major product or product line
- ***Customer*** departmentalization, where organizational units are designated around customer groups such as the Department of Defense
- ***Territorial*** departmentalization, with people located in units based on geographic lines, for example, western U.S. marketing zone
- ***Process*** departmentalization, where the human and other resources are based on a flow of work such as an oil refinery

In the late 1950s and early 1960s, these traditional forms of organizing resources were proving inadequate to cope with the need to integrate the disparate organizational

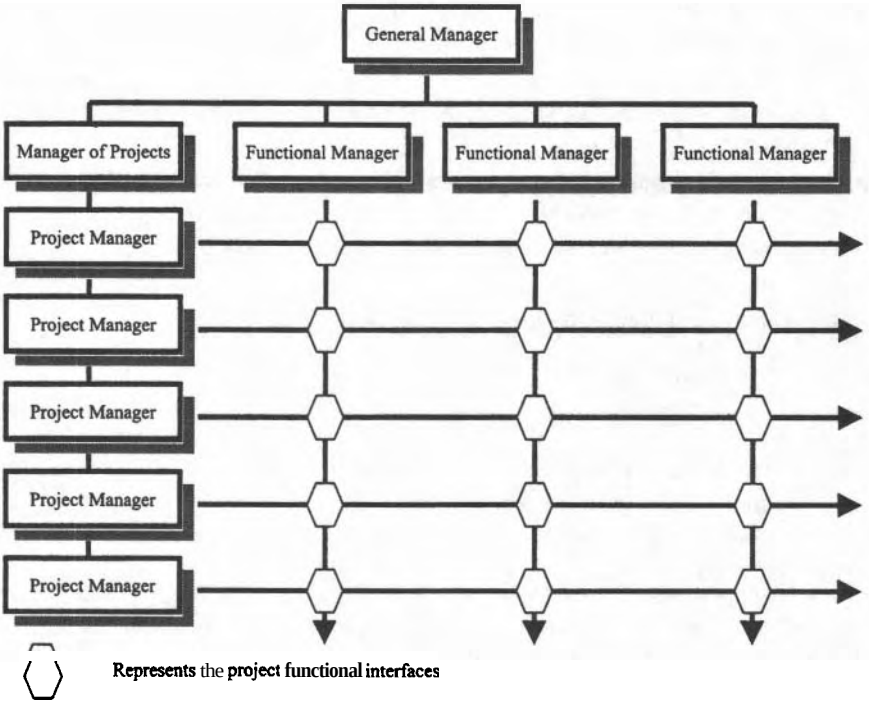

FIGURE 8.1 A basic project management matrix organization.

activities required of such ad hoc endeavors as a project. Experimentation with alternative, more flexible forms of organization was used to meet the demands of the evolving, dynamic "projects" business. The result was a blend of the functional structure and a designated focal point for managing a project within an enterprise. The ***project-driven*** matrix ***organization*** evolved as essentially a network of interactions between a project team and the traditional functional elements of an organization.

8.6 VARIOUS FORMS OF THE PROJECT ORGANIZATION

A variety of project-driven organizational forms exists. At one extreme is the ***pure project organization,*** where the project manager is given full authority to run a project as if it were a one-product company; at the other extreme is the pure functional organizational department on a traditional basis, reflecting the traditional hierarchy. A functional department is a hierarchical organization where each employee normally has only one superior. Employees are grouped on the basis of the functions to be carried out, such as marketing, engineering, production, finance, and so forth. In a functional organization the managers provide for the use

and integration of resources, maintain oversight over the use of such resources, and assign people to jobs on the basis of the need to provide resources to support department needs. Sometimes project managers are assigned to manage projects which are carried out within the functional department—but with common resource support from some other departments such as human resources, finance, or procurement support. Functional groups are becoming more and more specialized resource pools with special capability to nurture the state-of-the-art expertise needed to support project purposes. In the middle lies a variety of project-functional combinations of the matrix organization. Each of these forms has certain advantages and disadvantages; no one form is best for all projects, or even best for one project throughout its entire life cycle. The essence of project organization is flexibility. The project can be built around the organizational strategy; as the strategy changes, so must the focus of the organization.

In one study of the significance of project management structure on the success of 546 development projects, it was found that projects relying on the functional organization or a functional matrix were less successful than those that used a balanced matrix, project matrix, or project team. The project matrix outperformed the balanced matrix in meeting schedule and outperformed the project team in controlling cost.

Basic definitions of the types of structures in this study were similar to the types described in research by Larson and Gobeli:

- ***Functional organization.*** The project is divided up and assigned to relevant functional areas with coordination being carried out by functional and upper levels of management.
- ***Functional matrix.*** A person is designated to oversee the project across different functional areas.
- ***Balanced matrix.*** A person is assigned to oversee the project and interacts on an equal basis with functional managers.
- ***Project matrix.*** A manager is assigned to oversee the project and is responsible for completion of the project.
- ***Project team.*** *A* manager is put in charge of a core group of personnel from several functional areas who are assigned to the project on a full-time basis.[7]

Earlier in this chapter the term matrix was introduced. In the material that follows, a detailed examination of the matrix organizational design will be made. Before such examination is done, a brief review of the pure project organizational approach is needed to set the stage for the explanation of the matrix design.

In the pure approach, the project is truly like a minicompany. The project team is independent of major support from any major functional units or departments. Minor functional support in such matters as industrial relations, payroll, and public relations is provided by a functional element that takes care of the entire organization.

[7]Erik W. Larson and David H. Gobeli, "Significance of Project Management Structure on Development Success," IEEE *Transactions on Engineering Management,* vol. *36,* no. 2, May 1989, pp. 119–125.

The major advantage of the pure project organization is that it provides complete line authority over the project personnel; the project participants work directly for the project manager, with the chief executive (or some other general manager) in the main line of authority. One of the strongest disadvantages of this type of organization is that the cost is increased because of duplication of effort and facilities. In addition, because there would be no reservoir of specialists in a functional element, there might be a tendency to retain personnel on the project long after they were needed. A functional group is needed to look toward the future and work to improve the company's technical functional capability for new projects.

The matrix organizational design is a compromise between the hierarchical structure of the traditional functional organization and the project team design where an explicit sharing of authority, responsibility, and accountability is carried out. As the matrix organizational design has continued to evolve, the use of self-managed work teams has also evolved, resulting in enhanced empowerment of teams as elements of enterprise strategy.

8.7 THE MATRIX ORGANIZATION

A mixed project and functional structure, or matrix organization, is desirable for managing certain projects within desired cost, schedule, and performance standards. The mixture can lie anywhere between the pure project and the pure functional extremes, the exact structure being determined by the particular project requirements.

The matrix organizational design emerged in the early 1960s as an alternative to the traditional means of organizing people serving on project teams. The matrix enjoyed popularity in the 1970s and early 1980s. Original concepts of the matrix organizational design emphasized the individual and collective roles of members of the project team. In some cases, companies went too far in trying to escalate the matrix organizational design throughout the breadth and length of the organization. Texas Instruments pulled back from the extensive matrix organizational design, citing it as one of the key reasons for the firm's economic decline.[8] Xerox Corporation reportedly abandoned the matrix form, claiming that it created a deterrent to product development?[9] Other signs of disenchantment with the matrix organizational design appeared. One of the more assertive statements was offered by Peters and Waterman in their book *In Search of Excellence.* They claim that the matrix was complicated and ultimately an unworkable structure, which "degenerates into anarchy and rapidly becomes bureaucratic and noncreative."[10] Yet, in spite of its challenges the matrix design continues to gain advocates.

The growing use of the matrix organizational design has provided legitimacy to the use of alternative horizontal organizational designs that complement the earlier traditional organizational structure aligned along functional lines. The use of alternative horizontal organizational designs is supported by several basic ideas. First

[8] "An About Face in TI's Culture:' *Business Week.* July 5, 1982, pp. 21–24.
[9] "How Xemx Speeds Up the Birth of New Products," *Business Week.* March 19, 1984, pp. 58-59.
[10] Tom Peters and Robert Waterman, In *Search of Excellence* (New York: Harper and Row, 1982). p. 49.

is organizing the enterprise around emerging projects and organizational processes such as order entry, inventory management, and information management. Instead of creating the enterprise around functions or departments, it is built around key processes required for the delivery of value to customers. An individual is assigned as an owner of each process, and a project manager or process manager is appointed to maintain oversight over the development and management of the process as appropriate.

Advocates of the matrix organizational design offer many reasons for its efficiency and flexibility in marshaling and using the resources to support a project. Critics are quick to point out that the matrix arrangement is cumbersome, costly, and difficult to understand. As mentioned earlier, Larson and Gobeli offer a description of the different forms of matrix design in terms of the relative influence of the project and functional managers, that is, the functional matrix, the balanced matrix, the project matrix, and the project team. They also offer an insightful description of the advantages and disadvantages of the different matrix structures. They conclude that although the matrix has its disadvantages in terms of being cumbersome, chaotic, and anarchical, its popularity is not diminishing, but rather is the dominant mode for completing development projects."[11] Follow-on research by Larson and Gobeli leads them to conclude that different management structures can be applied at different phases of the project life cycle, and that there is no one best way to organize the project team except that the functional matrix and the functional organizational design for managing projects are less effective than a form that provides strong project leadership."[12]

Prescription of the expected formal individual and collective roles to be expected in the matrix organization is needed. Table 8.1 suggests a boilerplate model that can be used as a guide to such formal prescription. The use of the linear responsibility charting technique outlined in Chap. 9 is a productive way to develop these roles and in that development educate the people as to how they should operate in the matrix organization.

TABLE 8.1 Organizational Design for Project Management

Project manager	Functional manager
• What is to be done?	• How will the task be done?
• When will the task be done?	• Where will the task be done?
• Why will the task be done?	• Who will do the task?
• How much money is available to do the task?	• How well has the functional input been integrated into the project?
• How well has the total project been done?	

[11] Erik W. Larson and David H. Gobeli, "Matrix Management: Contradictions and Insights," *California Management Review*, Summer 1987, pp. 126–138.

[12] Erik W. Larson and David H. Gobeli, "Organizing for Product Development Projects," *Journal of Product Innovation Management*, vol. 5, 1988, pp. 180–190.

Many roles are carried out by the project manager. These roles arise at different times during the life of the project. At the beginning of the project the following roles are likely to be played out:

- A strategist provides leadership for the design and development of a project plan.
- A recruiter obtains the best possible talent to serve on the project team.
- A negotiator garners high-quality resources for the team.
- A visionary finds and communicates a vision to the project team and to other stakeholders.
- A designer maintains oversight over the design of the organizational structure for the project and the configuration of the anticipated project results to include all supporting systems.

During the execution of the project the project manager, in addition to continual reinforcement of these roles, executes additional roles as follows:

- A mentor who provides counseling and consultation to members of the project team when required.
- A coach who instructs and trains the team performers in the fundamentals of project management.
- An integrator who forms the project resources into a product, service, or process.
- An expediter who keeps people and other resources moving on the project.
- A conflict manager who helps resolve the conflicts over the use of resources that naturally arise during the life of the project.
- An influencer who sways stakeholders to support the project purposes.
- A decision maker who works with the project stakeholders in the removal of uncertainty concerning how resources will be used on the project.
- Finally, a diplomat who builds and maintains alliances with project stakeholders for the continuing support of the project and its role in the operational and strategic management of the enterprise.

Matrix organizational designs emerged to deal with the enigma and perceived inconsistency of having two or more "bosses"—a reflection of the fascination that conventional wisdom held concerning the impropriety of violating Fayol's principle of "unity of command." In today's team-driven organizations, authority-responsibility-accountability relationships are complex, ever changing, and based as much on individual (or group) ability to influence other people as on the formal authority of a defined organizational position. Given these considerations, what is the general nature of the matrix organizational design? Several observations can be offered:

- A formal matrix organizational design should be described along the demarcation suggested in Table 8.1. This formal design should not be inflexible, but should be offered as a way in which the authority-responsibility-accountability patterns should normally operate.

- The ability to influence other people through the continued demonstration of one's knowledge, skills, and attitudes is the final determining factor in achieving successful integration of individual and collective roles in the matrix design. However, one could make much the same statement about a management position in any type of organization.
- The growing use of alternative forms of teams in contemporary organizations will continue to make the matrix organizational form more acceptable and more flexible and will provide for bringing a philosophy of bringing people together regardless of their "home" organization into a focus to accomplish organizational purposes.

  Matrix, then, is more a state of mind to encourage people to work together to create value for themselves and for the organization.
- As an organization works in the matrix context, the structural form of the matrix will tend to erode and become institutionalized into the overall manner in which people relate to each other in their individual and collective roles. In such organizations, matrix is described as "simply the way we do things around here," truly a key element in the organization's culture.
- In the matrix organization people relationships work in many directions and are usually dominated by those relationships with (1) team members, (2) functional personnel, (3) upper-level management, and (4) internal and external stakeholders.
- When the company is organized into traditional functional departments, everything involving the project runs the risk of falling between the cracks in the organization structure. By having a project team appointed, a major step has been taken to put together the functional horizontal pieces of the ad hoc effort into a unified, harmonious whole. Projects that cross functional boundaries tend to be orphans, because they lack someone to act as a "champion" for pulling together their functional parts. Because projects require difficult, time-consuming work directed to communicating the need to synergize the project, the work to support the project can easily be deferred or be entirely forgotten. But when a project manager has been appointed, a champion should come into play to integrate the parts of the project into a synergistic whole.[13]

From the project manager's perspective an understanding of the role of the knowledge of the functional manager is important.

8.8 FUNCTIONAL AREA KNOWLEDGE

Because members of a project team come from different functions that are required on the project, questions can arise concerning the degree of knowledge and skill required of the project manager in leading the project team. Indeed, the same

[13] Benson P. Shapiro et al., "Staple Yourself to an Order," *Harvard Business Review,* July–August *1992,* pp. 113–122.

questions can arise when a "general manager" assumes the leadership of an organization that consists of different functions and activities. A few guidelines are suggested that can help clarify the leadership required of project managers—and general managers—in this respect.

Each functional manager is required to have the knowledge and skills necessary to provide the leadership of the functional technology involved. For example, the manager of an engineering design functional element would be expected to have sufficient knowledge and skills to command the technology involved in support of the enterprise's mission. A project manager, or a general manager, would depend on that individual to develop the strategies and oversee the application of that function in the organization. A project manager, or a general manager, would be expected to have only the knowledge and skills in those disciplines that support the project or enterprise to the following extent:

- Be able to ask the right questions and know if the right answer is being given regarding the discipline. A command of the functional area would not be necessary.
- Have a general understanding of the function and the role that such functions have in regard to the overall organizational effort under way.
- Be able to know if the individual that has the responsibility for the function is able to make the contributions necessary to support the overall activity.
- Be able to define and understand the general part that the functions play in the overall activity.
- Have an oversight perspective of a conceptual model of what the function is expected to carry out.
- Be comfortable with the knowledge and skills of the team member representing the function, and be able to trust the individual's competencies in supporting the overall activity.
- If required, be able to select additional functional people to support the project, perhaps in a consulting capacity.

An individual who is an expert in some specialty or function, and assumes responsibility as a general or project manager, makes an important step toward obsolescence in that field. If that individual tries to keep abreast of that function, and wants to continue to "command" that function, erosion of the required general manager or project manager knowledge and skills can occur.

8.9 FOCUS OF THE MATRIX DESIGN

Managers should heed the advice given more than 30 years ago by one of the early writers in the then-emerging field of project management. Middleton offered the advice that neither the role of the project manager nor that of the functional manager should dominate in using project management. He further briefly described the general relative roles of these managers and charged top management with the

responsibility for resolving the conflicts between them.[14] Middleton's advice is particularly appropriate to those managers who are considering the use of the matrix organization.

The matrix form of organization demands attention, for many managers do not have a clear, consistent concept of what it means. Although the matrix is used in a wide variety of different organizations, there is not a full understanding of its structure, processes, and impact on the parent organizational system. In its basic form a matrix organization is a network of interfaces between a project team and the functional elements of an organization. As additional project teams are laid across an organization's functional structure, more interfaces come into existence. The authority, responsibility, and accountability patterns found in these interfaces are delineated in subsequent portions of this chapter.

In its most elementary form, a matrix organization looks like the model in Fig. 8.2, where the interface of the project and functional elements comes about. The interface of these elements centers on the project work packages. The underlying concept of the work package is simply that of management by objectives and the decentralization of authority, responsibility, and accountability. Implementation of the project requires that the total job be broken down into components (hardware, software, and services) and that these components be further broken down into assignable work packages. Each work package is basically a "bundle of skills" that

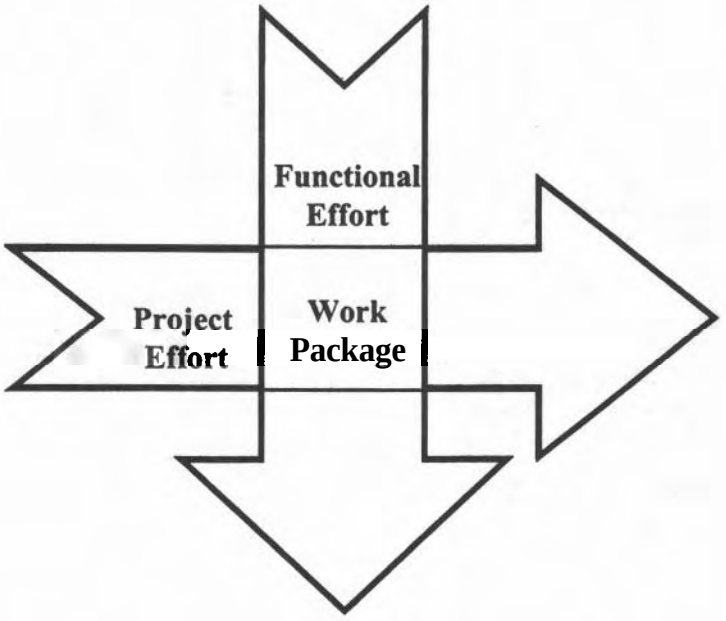

FIGURE 8.2 Interfaces of the project and functional effort around the project work packages.

[14] C. I. Middleton, "How to Set Up a Project Organization," *Harvard Business Review*, April 1967, p. 82.

an individual or individuals have to perform in the organization. A work package is negotiated with, and assigned to, a specific manager or professional. The individual who accepts the work package agrees to specific objectives and goals that are measurable, and to detailed task descriptions, specifications, milestones, budget for the work package, and so forth. This work package manager or professional is then held fully responsible for the work package meeting its objective on time and within budget.

The underlying premise of the matrix organizational form is that project objectives can best be reached if the organization's resources can be directly oriented toward those objectives without regard to traditional organizational structures and constraints. The organizational form of the matrix is used as a means to an end; it can be readily adapted to a changing environment. As the organizational need for new projects changes, the matrix structure tends to be fluid. Because organizations are organized around specific projects, the matrix is in a constant state of flux as projects are completed and resources are deployed to new or other current projects.

When the matrix organizational design is used in the management of projects, there will be modifications in the existing patterns of authority-responsibility-accountability. Reporting relationships will be modified, members of the project team will take on added authority and responsibility for the project work packages, and the role of the functional manager will be modified. The cultural changes coming out of the matix organization will have reverberations throughout the enterprise as people take on new roles. Working across organizations to deal with stakeholders will also cause modifications in the culture and project teams need to recognize this and accept the reality that what they do as members of the focal point to manage the project can have influences beyond the project itself.[15]

8.10 IMPORTANCE OF WORK PACKAGES

The key to the successful matrix organization is a careful definition of the ***work breakdown*** structure (WBS) for the project and the development of an organizational structure that most appropriately fits the WBS.[16] Within that WBS the work packages provide the focal point for the matrix organization. One large program, the Water Pollution Abatement Program[17] in Milwaukee, Wisconsin, consisted of five major project elements or work packages:

Jones Island wastewater treatment plant rehabilitation and expansion

- South Shore wastewater treatment plant expansion
- Conveyance systems

[15] For further insight into the cultural issues of project management see Chap. 19 and Patrick Brown, Sheila Grove, Richard Kelly, and Satyendra Rana, "Is Cultural Change Important in Your Project?" PM *Network*, January 1997, pp. 48–51.

[16] The concept of the WBS and the work package is discussed in Chap. 11.

[17] The program was defined as the entire undertaking in this effort, a $2.2 billion effort that consisted of many projects.

- Solids disposal
- Hydraulics and controls

8.11 THE PROJECT-FUNCTIONAL INTERFACE

Projects are essentially horizontal; the functional organization, as exemplified by the traditional organization chart, is vertical. The basic dichotomy found in matrix organizations centers around a project-functional interface reflected in Table 8.1. The syntax of the statements in that table is to provide a simple set of key words, as indicated by italics in the following list:

The "demarcation" described in Table 8.1 is a very broad way of portraying the authority and responsibility relationships in the matrix organization which can be used as a point of departure to develop an understanding of the ***web of relationships*** found in the matrix organization.

The interface clearly describes how project managers accomplish project ends by managing relationships within the total organization. There are few things project managers can do alone. They must rely on the support and cooperation of other people within the organization. They must look to functional managers for specific support. Indeed, project managers ***get things done by working through others*** in the classic sense of the phrase, which is often used as a definition of successful management.

This managing of organizational relationships is three-dimensional. Upward, project managers must relate to their boss, who is either a general manager or a ***manager of projects.*** Horizontally, they relate to members of their project team. Diagonally, they relate to functional managers and to representatives of other organizations, for example, the customers.

Managing these sets of relationships is a most demanding task. It is nearly impossible if care has not been taken to describe the formal authority and responsibility relationships that are expected within the organization. This means making explicit the network of relationships that project managers have in each of the three dimensions. To whom do they have to relate? What are the key relationships? What is the work breakdown structure around which action is expected? Who works for whom?[18]

The matrix provides a sound basis for balancing the use of human resources and skills within the total organization as people are shifted from one project to another. A project can be viewed as a small business within a larger enterprise whose ultimate goal is to go out of business when the project is terminated. Hence, as the enterprise has a stream of projects that is flowing through the organization,

[18] David I. Cleland and William R. King, *System Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983), p. 351.

each project is in a different phase of its life cycle. The opportunity exists for the general manager to balance human resources in the organization and apply these resources where necessary to keep the stream of projects flowing freely and effectively in the organization.

The key to making the matrix work effectively is to recognize the complementary roles that exist and to carefully delineate the relative authority, responsibility, and accountability for the people filling these roles.

The characteristics of an effective matrix organization include the following:

- First, appropriate empowerment to include appropriate documentation is instituted so that authority, responsibility, and accountability are shared as team members perform their individual and collective roles on the project team.
- Second, lines and methods of communication are well established, and people understand and accept their obligations to communicate freely information team members and stakeholders need.
- Third, functional managers accept and are committed to the matrix organizational design and are committed to the provisioning of functional resources to support the project needs.
- Fourth, there is an explicit understanding of the interdependent roles of the functional managers and the project managers working together to support the project purposes.
- Finally, there is a prevailing culture in the enterprise that basically supports the organizational design of the matrix as a way of sharing scarce resources in the enterprise. People agree that the matrix reflects "simply the way that we do things around here."

8.12 A CONTROVERSIAL DESIGN

The matrix organizational design and the matrix organizational concept have had problems and abuses. Part of the problem in the use of the matrix design has been characterized as caused by, or corrected through, a weak or strong matrix design. A weak matrix is one characterized by the following:

- A failure on the part of key participants to understand the basic principles and roles involved in the matrix
- An inherent suspicion and distrust of any organizational design that departs from the management principle of ***unity of command*** in which one individual is expected to receive orders and direction from only one individual
- Functional managers who feel threatened by an apparent superiority of the project objectives and goals over those of the functional entity
- A failure on the part of senior management to see to it that some basic documentation is prepared to describe the formal and reciprocal roles of the key

managers involved on the project: the project manager, functional managers, and work package managers

- A lack of appreciation on the part of the project manager and key staff to understand and respect the role of the functional professionals and their authorities and responsibilities in the management of the project
- Poor selection of project and functional managers
- The project manager who sees his or her role as simply a coordinator rather than as a manager in the truest sense of the word
- A project manager who fails to understand the many stakeholders on the project, even those outside the parent organization, who have to be "managed" to fulfill the project ends
- Lack of trust, integrity, loyalty, and commitment on the part of the project team members
- Failure to develop and maintain the project team
- Putting the functional managers on report to senior managers rather than working out the conflict and challenges that are bound to occur in the management of the project
- Indecisiveness on the part of the project manager who would rather defer decisions to the senior managers than make as many decisions as possible on the project, referring only those that must be made by the senior executives

Conversely, a strong matrix exhibits these characteristics:

- Care has been taken by senior managers to define the individual and collective authority-responsibility roles of the project manager, functional managers, and work package managers.
- The project manager and the other key managers feel a strong sense of personal ownership and responsibility for their work and are willing to share ownership and responsibility, their resources, and the rewards to be gained from the successful projects.
- The project manager is given full authority and responsibility and is expected to exercise managerial prerogatives in managing the project so that it is completed on time and within budget and satisfies its technical performance objectives.
- The project manager knows how to delegate, demands excellent performance by the functional managers and the members of the project team, and is willing to accept full responsibility for the project.
- The project manager is prompt and judicious in resolving conflicts and disputes that will inevitably arise in the program.
- Project problems are taken to senior management as a last resort, but senior management is informed at all times of the status of the project.
- High performance and quality standards are expected from the functional entities participating on the project.

- The project team does not interfere in the prerogatives of the functional managers and does not permit the functional managers to interfere in the management of those portions of the project that lie within the jurisdiction of the project team.
- The project manager remains focused on the prudent and reasonable management of the project and appreciates that the project is basically a building block in the strategic management of the enterprise.

Clearly, there are many more projects that are successful using the strong matrix than those using the weak matrix.

The bottom ***line*** is to select project managers and other key managers who will be dedicated to their jobs, understand them, and seek unambiguous definition of their roles, and are willing to assume responsibility for the project. Such selection will help ensure that a strong mamx emerges.

8.13 NO ONE BEST ORGANIZATIONAL DESIGN

The best organizational design to use in the management of projects is dependent on the particular circumstances of the project and its organizational and stakeholder environment. Tracey Kidder, in his Pulitzer Prize–winning book Soul of a ***New Machine,*** describes a product development effort at Data General on the Eagle Team in the development of a new standard in miniframe computers.[19] The book describes the massive effort carried out by a project team of specialists protected from organizational politics and interruptions and engaged in creating something that had not been done before.

There are many alternative ways to organize for the management of a project. One approach is to have a functional organization manage the project using an individual acting as a focal point in the functional entity. A functional organization is simply an organizational unit of work, configured on a hierarchical basis, with each person having one superior. People are grouped by specialty such as marketing, engineering, finance, and construction. Sometimes no single individual is designated as having overall project responsibility. Rather each department and section within the function performs its work needed to ensure input into the project. There is no one person maintaining oversight for the management of the project except the functional manager, who is likely to be busy maintaining oversight over the operation of the total functional organizational unit. Some of the likely problems that such an organizational design can create include (1) interdepartmental politics and territorial battles, (2) avoidance of conflict resolution, (3) overdependence on the existing formal communication networks, (4) having to depend on people to provide schedule and cost control support who lack the proper credentials, (5) dependence on accounting and financial information systems that are based on department needs and are fiscal year oriented rather than project oriented, (6) propensity of department

[19] Tracey Kidder, *Soul of a* New *Machine* (Boston: Little, Brown, 1981).

personnel to compromise schedule and cost needs in order to meet quality standards, and (7) general lack of concern for what goes on relative to the project.

What can be done to reduce harm to the project's needs when the functional organizational design model is used? Insist on having the project managed on a total systems basis. Insist on having a specific designation of relative authority and responsibility for the project. The use of rigorous established early planning on the project could help. Make sure that representatives from the functional organization help in developing the project plan. Finally, take some time to train the functional representatives that are working to support the project in the basics of project management processes and techniques done within the context of the matrix design.

8.14 GLOBAL PROJECT ORGANIZATIONS

As global competition intensifies, there will be more global projects and strategic alliances among companies and countries. Project managers will no longer be concerned solely with a "domestic" project--each domestic project has a good likelihood of becoming global in nature.[20] Each global project, like a domestic project, is unique—ne of the key characteristics of projects. But global projects will be distinctive in that the project team, working across companies and countries, will encounter situations in which boundaries will cause new challenges in customs, cultures, and practices. The traditional matrix structure common to the project-functional interface will take on a global nature. Granted that the matrix structure in a domestic project is complex, in the global project this structure becomes even more complex. It is important that the formal role of the project manager be carefully delineated and that the roles of the team members be specific in terms of their authority, responsibility, and accountability. The chances of project success in the global project depend on many major forces and factors. If care is not taken at the outset of the project to clearly stipulate to all the stakeholders understanding the managerial and leadership role of the project manager and the project team, the opportunity for a successful project is clearly diminished. Organizational design arrangements for "managing" the customer need to be considered.

8.15 PROJECT-CUSTOMER RELATIONSHIPS

The interactions between a customer project office and industry agencies can be appreciated by reviewing Fig. 8.3. The interactions suggested by the figure are only a partial illustration of the number, size, and intensity of the project interrelationships. For example, on a major government project the project manager and

[20] See David I. Cleland and Roland Gareis, *Global Project Management* (New York: McGraw-Hill, 1993), for a comprehensive review of the management of global projects.

office personnel interact with the highest levels of government and industry. Contractors doing business with these organizations tend to develop project offices, which mirror the skills of the government project office. The relationship of the two organizations—the military department and the defense contractor—revolves around the two project managers, as illustrated. Although we use an example drawn from the defense industry, the same basic model could be used to describe any customer–project management situation.

Unifying the parts of the organizational components of the project and its stakeholders is a necessary activity of organizing the project. Unification is particularly important between the project prime contractor and the project owner. A prudent project owner will want to have a sound organizational design through which the owner's needs and the needs of the project contractor can be planned, understood, and met. This organizational design must reflect the reciprocal authority and responsibility tied to the work packages of the project, essentially providing answers to the specificity of individual and collective roles and the level of involvement of each party in the management of the project.

8.16 ORGANIZATIONAL NETWORKING

A project manager is at the focal point of an interconnected network of alliances with members of the project team and with a varied set of people inside and outside the organization, in short, the stakeholders. A network is a set of reciprocal relationships that stabilizes the project work, giving it predictability and synergism. Networks stretch horizontally, vertically, and diagonally to the project's internal and external stakeholders. The strength and viability of these networks depend much on the ability of the project manager to build and maintain alliances with the many people who can help, hinder, or be indifferent to the needs of the project. These networks of relationships with all the project's stakeholders are a

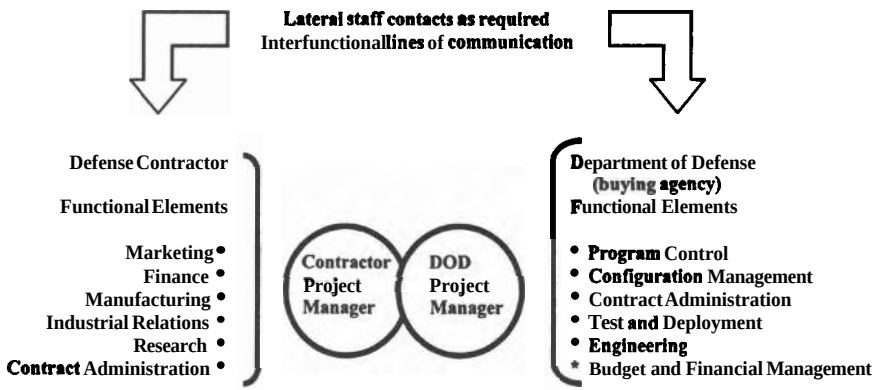

FIGURE 8.3 Customer–project manager relationships. *(Source: Adapted from David I. Cleland, "Project Management—An Innovation in Management Thought and Theory," Air University Review, January–February 1965, p. 19.)*

valuable asset that the project manager possesses in meeting the opportunities and problems of a project.

A project manager must network with the project stakeholders for one compelling reason. The project manager depends on these stakeholders and cannot get the project finished without them. The project manager's ability to build and maintain these networks depends on the project manager's authority and how that authority is perceived by the project stakeholders. The project manager's reputation, alliances, position, favored standing, diplomacy, influence, communication skills, and persuasive skills all help facilitate the building and maintenance of the network. The project network connects like tentacles with diverse project stakeholders, establishing relationships and quid pro quo designed to support the project needs.

The art of networking is one of the most unceasing challenges facing the project manager. Most of the project manager's daily activities deal with the ongoing discovery and creation of relationships directed toward supporting project needs. The project team members need freedom in pursuing their technical expertise, on one hand, and yet must be brought together and unified in supporting the project needs, on the other. A healthy and successful team is marked by healthy relationships. Without this relating that leads to networking, the team weakens and may stumble along as a collection of individuals, but die as a team. Interacting, interfacing, and building networks in harmony with others, the team should become a unity of cooperative effort.

Most successful relationships in a project team are an ongoing process of trial and error, negotiations, resolution of conflict, authority, responsibility, evaluation, planning, execution, commitment, accountability, organizing, control, and communication. The elements are as complex as any scientific formula. Team members must approach these relationships as a creative challenge requiring concentration, innovation, and careful tending and cultivation. Networking requires an open mind and courage and flexibility to compromise when the project team's well-being and the project's outcome are at stake. It demands that the team members seek maximum fulfillment of their technical expertise, yet tolerate disappointment when their technical position is reduced to preserve the overall synergy of the project. Such disappointment and even feelings of rejection require that the team members nourish the attitude that they will try again and again without any guarantee that future disappointments will not happen. The project manager and the team members must continuously work at the skills required for building and maintaining relationships necessary for effective networking.

The experts who are members of a project team can impair the team ambience by always insisting that they are right and by being afraid to reveal their imperfections. Team members all too often see this as something they must do, lest they lose the respect of their contemporaries and their status. So strongly are team members affected by the need to hide their imperfections that they may even run the risk of destroying the valued relationships that make the team effective and a winner. Rigidly adhering to their rightness, the team members (including the project leader) stifle discussion and exasperate others on the team who grow weary of always hearing about "the world according to me." The project team all too often fails to see that nothing has been gained if the final result means being fearful of building relationships, of networking, and of confronting issues.

In the past several years there has been a growing appreciation of the "project office" as an organizational unit in the project-driven organization.

8.17 THE PROJECT MANAGEMENT OFFICE

In the project-driven enterprise, the use of project management concepts, processes, and techniques tends to dominate the culture of the organization. In maintaining an active portfolio of projects, many of the methods and processes of how these projects are dealt with during their various life cycles should be done in an efficient and effective manner so that costs are minimized and maximum profits accrue to the enterprise. During the evolution of the use of project management as a key enterprise strategy, consideration should be given to the establishment of a project management office (PMO) as a strategic initiative of the enterprise. Such an office can be a focal point through which both programs and projects are managed as products, services, and organizational processes change in the enterprise.

The basic organizational design of the project-driven enterprise will consist of (1) the key functional elements that provide support to the portfolio of projects such as design, engineering, finance, marketing, research and development, and production or construction; and (2) the project management office. The organizational units suggested in (1) and (2) would be expected to report to the senior executive, such as the president or general manager. The functional departments would be expected to provide technical support to the portfolio of projects, and the PMO would provide management support to the programs and projects under way in the enterprise. The PMO would further be expected to provide the following support to the enterprise's programs and projects:

- Manage the portfolio of programs and projects strategically as core components in the enterprise's strategies, to include how well this portfolio supports organizational goals, objectives, and mission.
- Provide a focus for the development, publication, and use of enterprise resources, policies, procedures, protocols, and systems to support programs and projects.
- Facilitate the development of modified and new enterprise products, services, and organizational processes.
- Assist in the development of a cultural ambience in the enterprise that supports the use of programs and projects as key organizational initiatives in the strategic management of the enterprise.
- Provide consulting services to enterprise program and project managers for the improvement of the management strategies being used in support of enterprise purposes.

The reader is cautioned that the material presented in this chapter does not reflect the broader context in which organizations—and the organizing process—are found. Figure 8.4 portrays the larger context in which organizing a project is

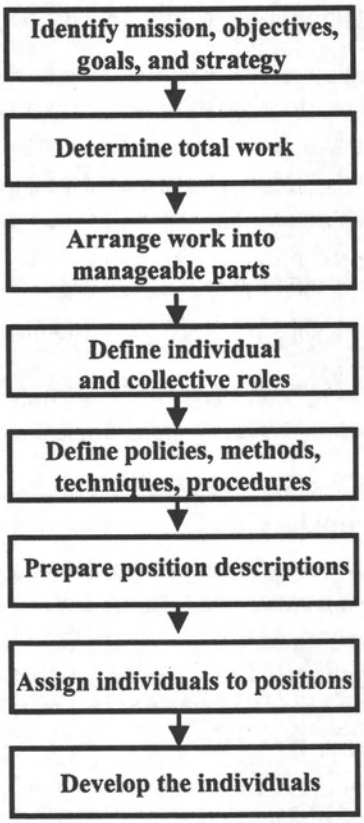

FIGURE 8.4 The organizing process. *[Source: David I. Cleland and Harold Kerzner,* Engineering Team Management *(New York: Van Nostrand Rheinhold, 1986), p. 171.]*

found. Explaining all the elements implied in this figure would be beyond the scope of this chapter.

8.18 PROCUREMENT AND CONTRACT NEGOTIATIONS/ADMINISTRATION

The procurement function is an important area of specialization that supports the management of projects in the enterprise. Sometimes the procurement activities come under the direct oversight of the project manager. In other cases, procurement is considered to be another of the enterprise functions that is linked to the project through some variation of the "matrix" organization. Whatever case is used, the project manager's role in project contract negotiations

and administration activities is important. The project manager's role varies, depending on the policy wishes of the enterprise managers. Project managers should be involved in the contract negotiation and administrative processes. Project managers should understand some of the key elements that are involved in such processes, namely,

- General guidance should be obtained from the organization's legal office regarding the best way to deal with contract negotiation and administration matters.
- Recognize that the project manager may at times become the de facto contract manager when dealing with the project stakeholders.
- Learn to appreciate the legal aspects and responsibilities that a project manager has regarding the project.
- Understand when his or her knowledge in contracting is limited—and learn to seek counsel from the procurement experts or the legal office when needed.

Warranties and Indemnification

A couple of areas that require special understanding by the project manager in dealing with contract negotiation and administration are ***conrtact warranties*** and ***indemnification.***

The concept of a ***warranty*** is that the seller's verbal or written commitment means that the deliverables of the project will meet certain standards. The warranty imposes a duty on the seller, who can be held liable by the buyer if this commitment is breached. The buyer can bring legal action to recover damages or rescind or cancel the contract. Two basic types of warranties exist: First, the ***verbal or written warranties,*** which pledge a specific commitment to perform on the contract. Second, ***implied warranties,*** which are assurances or promises that are a matter of law and general usage, rather than a specific promise made in the contracts. Implied warranties arise from specific laws or what is by precedence expected in the product or service. The implied warranty of a product or service holds that such deliverables must be reasonably suited for the ordinary purpose for which they are used.

Indemnification is the act of protection to guard against legal suit or bodily injury to a person or the organization for a loss incurred by that person or organization. There are two types of indemnification: common law and contractual. Indemnity provisions vary considerably from contract to contract as to the extent of the liability transferred. These provisions are generally of three types:

- ***A broad form,*** which obligates the indemnitor to indemnify and hold harmless the indemnitee against all loss arising out of the contract
- ***An intermediate form,*** which holds the indemnitor responsible for all claims or suits arising out of the contract except those arising out of the sole negligence of the indemnitee

A limitedform where one party agrees to indemnify the other only for the claims arising out of the indemnitor's negligence

Contract Administration

Project contract administration includes several activities: (1) oversight of the work to be done under the terms of the contract; (2) preparing and processing contract changes that come about; (3) providing interpretation of contract language and forms; and (4) approving invoices as the work is performed. Several key standards regarding contraction administration include:

- All required signatures, comments, and approvals have been obtained and documented before the contract is issued.
- No work should be performed before the contract is issued; however, pending the finalization of the contract, a formal letter of authorization to proceed may be provided.
- Contract and performance documentation should be stored in a secure place, be organized in a rational manner, and made available to those people who have a need to know.
- A policy and procedure for contract change should exist, and be followed closely in changing the contract.

If unique circumstances occur, seek the counsel of the legal office or contract specialists before taking action.[21]

8.19 TO SUMMARIZE

The major points that have been expressed in this chapter include:

- In modem organizations, managing across organizational hierarchies and boundaries is as important as managing up and down the hierarchy.
- Enterprises are organizing more and more using teams to manage around the core processes required to create and deliver value to customers.
- Examples were given of situations where a failure to prescribe an appropriate organizational design for projects caused serious problems in the ability of the project team to accomplish project objectives.
- Some organizations operate effectively without any discernible structural hierarchy.
- In terms of being responsive to contemporary challenges, the traditional organizational design has serious shortcomings.
- The project-driven matrix organizational design has a distinctive structure, which at first assessment seems to contradict some basic management principles, such as unity of command.
- Several different kinds of project organizational designs have been studied by researchers in the field.

[21]Material on contract administration is paraphrased from David I. Cleland and Lewis R Ireland, ***Project Manager's Portable Handbook (New*** York: McGraw-Hill, 2000), pp. 6.36–6.40.

- The matrix design is a compromise between the pure project organization and the traditional functional organizational design.
- In spite of its perceived shortcomings, the matrix design has growing support from contemporary theorists and practitioners.
- Table 8.1 offers a basic prescription of the complementary role of the project manager and the functional manager.
- Project managers have helped show the way for the appointment and use of process managers, who have responsibility for managing an organizational process, such as order entry, across organizational boundaries and extending to process stakeholders.
- In the matrix, organization relationships exist among the project manager, team members, work package managers, functional managers, general managers, senior managers, members of the board of directors, and stakeholders such as suppliers, customers, and regulators.
- In its most elementary form, the interface between the project effort and the function effort constitutes the key focus of the matrix organization carried out through the project work package.
- The characteristics of a weak and a strong matrix organizational design were described.
- The project manager occupies a unique position as the key interface between the project team and the customer organization, working through the customer's project manager.
- "Networking" is an important role—not to be neglected by the project manager.
- Today, there is a growing interest in the project office.
- Procurement is a functional area in which the project manager needs to gain some familiarity.
- The project manager must understand warranty and indemnification issues to avoid problems.

8.20 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Charles J. Teplitz, "Making Optional Use of the Matrix Organization," chap. 14 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- F. Paul Khuri and H. M. Plevyak, "Implementing Integrated Product Development: A Case Study of Bosma Machine and Tool Corporation"; P. Kayes, "How ICL Used Project Management Techniques to Introduce a New Product

Range"; and Max P. Shrontz, George M. Porter, and Norman L. Scott, "Organizationand Management of a Multi-Organizational Single Responsibility Project," in David I. Cleland, Karen M. Bursic, Richard M. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI). (Originally published in ***Project Management Journal,*** September 1994, pp. 10–15; ***International Journal of Project Management,*** October 1995, pp. 321–328; and ***Proceedings,*** PMI Seminar/Symposium, Chicago, Ill., 1977, pp. 258–264.)

- David I. Cleland, ***Matrix Management Systems*** (New York: Van Nostrand Reinhold, 1984). This handbook, the first of its kind when it was published, provides managers and professionals with a reference guide for the design and implementationof matrix management systems in their organizations. The book provides a pragmatic explanation of what matrix management is all about. Alternative forms of the matrix organization are presented in this book from practitioners who have been successful in setting up and using effectively the new matrix organization approach.
- Stanley M. Davis, Paul R. Lawrence, and Harvey Kolodny, ***Matrix*** (Reading, Pa.: Addison-Wesley, 1977). This book, one of the first to appear on the subject of ***matrix,*** suggests a new alternative to what the authors call the 1-boss command structure that evolved from the industrial revolution. The matrix structure that is described in the book is one that grew out of the unique management problems of the American space effort of the 1960s. In the foreword, the then chairman of Citicorp-Citibankmakes a key point that "matrix represents a sharp break with traditional forms of business organizations" and offers us another choice in the selection of organization models.
- C. J. Middleton, "How to Set Up a Project Organization," ***Harvard Business Review,*** April 1967. This was an early and classic article that describes a strategy for establishing the project organization. The author reviews the need for a balance of power in the matrix organization between the project manager and the functional managers. He describes the relative roles of the project manager vis-8-vis the functional managers, and the responsibility that the sponsoring general managers have for the resolution of conflict between these two managers.
- John F. Mee, "Matrix Organization," ***Business Horizons,*** Summer 1964. This very short article is truly a "classic." Professor Mee set forth what is believed to be the first basic definition of the matrix organization and what it looks like. According to him, the emerging matrix organization was creating new relationships of established organizational concepts and principles. Professor Mee believes that the matrix organization entails an organizational system designed as a "web of relationships" rather than a line and staff relationship of work performance. There have been many articles and books published which describe the matrix organization. None of these publicationshas done it any better than Professor Mee did back in 1964.
- Edward J. Morrison, "Defense Systems Management: The 375 Series", ***California Management Review,*** Summer 1967. This article describes the

United States Air Force (USAF) basic documentation on the concept and process of managing projects in that organization. This article provides an excellent summary of development projects and systems. One key USAF publication is described, namely, System Program *Office* Manual, AFSCM 375-3, which sounds much like some of the recent publications on the Project Management Office that have appeared in the project management community. A perusal of this article will give the reader considerable insight into how project management emerged in the USAF—where the credit must be given for major contributions to the emergence of the theory and practice of project management.

8.21 DISCUSSION QUESTIONS

1. Discuss the importance of an adequate organizational design in the management of a project.
2. For what reasons might an organization need to modify its organizational design?
3. Discuss the range of matrix organizational forms.
4. What factors contribute to the dynamic nature of a matrix organization?
5. Discuss the various forms of traditional departmentalization. In what situations would each of these forms be advantageous?
6. List and discuss the weaknesses of the pure functional organization. What kinds of failures could result from using this form of organizational design on a large project?
7. Discuss the advantages and disadvantages of the pure project organization. In what situations might this form be best?
8. Describe the matrix organizational form. What are its advantages and disadvantages?
9. What are some of the unnecessary characteristics of a successful matrix organization?
10. Discuss the advantages and disadvantages of the alternative forms of the matrix organization. In what situations would each work best?
11. Why is it important for project managers to develop networking skills?
12. It has been stated that the matrix organization is a state of mind in the mature project organization. Why is this so?

8.22 USER CHECKLIST

1. Do the project managers in your organization understand the interrelatedness of organizational forces? Why or why not?
2. Does the current design of your organization leave lines ,of authority and responsibility clear? Why or why not?

3. Project organizations range from pure functional to pure project. Where does your organization's design fit? Is it appropriate?
4. Are the factors that contribute to a dynamic organization present within your organization? Why or why not?
5. How is your organization departmentalized? Is this the most efficient departmentalization possible? What design might improve organizational efficiency?
6. Does the management of your organization understand the advantages and disadvantages of the various organizational forms? How does it use this knowledge in designing organizational structure?
7. Are the work packages of each project carefully related to the organizational structure? Is the organizational design appropriate for managing the work breakdown structure?
8. Is the use of human resources and skills balanced within the total organization? Explain.
9. Is there an effective means for conflict resolution over organizational roles established within your organization? How are conflicts handled?
10. Is your current organizational design successful and effective? Why or why not? What criteria for success are lacking?
11. Has the management of your organization considered possible alternative forms for structuring the organization? What other forms might be effective?
12. Do the project managers within your organization understand the notion of networking? Are they effective at forming alliances with project stakeholders?

8.23 PRINCIPLES OF PROJECT MANAGEMENT

1. The project-driven organization has distinct characteristics not found in the traditional organization.
2. The matrix organization provides for the organizational design of project teams superimposed on the traditional organizational hierarchy.
3. The project-functional interface in the matrix organization provides for the individual and collective roles in that organizational design.
4. Authority and responsibility are matched pairs in the matrix organization if the roles of the project manager and the functional managers have been accurately designated.
5. The project work package is the organizational unit around which the authority and responsibility between the project manager and the functional manager are designated.
6. Managing across organizational hierarchies and boundaries is as important as managing up and down the hierarchy.

8.24 PROJECT MANAGEMENT SITUATION—UNDERSTANDING THE MATRIX ORGANIZATION

When the matrix organization came into use, many managers, and professionals, were uncomfortable with the "web of authority and responsibility relationships" that emerged when a matrix organizational design was used. Much of this discomfort came from the perceived violation of Henri Fayol's principle of "unity of command," which meant that an individual should receive direction and orders from only one individual. Then too, those people who were disenchanted with the matrix organization claimed that "parity of authority and responsibility," another principle put forth by Henri Fayol, was also violated.

Even today, after we have learned much about the matrix organization and how it operates, some organizations have difficulty understanding and using an effective design of this nature. People seem to long for the more simple authority-responsibility work relationships found in the classical, bureaucratic organizational design. Yet if all organizations would revert to that design, great difficulty would be experienced in using project management as a focus for integrating the work of the many diverse stakeholders that are characteristic of modern organizations.

8.25 STUDENT/READER ASSIGNMENT

To develop a further understanding of the matrix design, the student/reader should try to answer the following questions about this design:

1. What were the reasons that an alternative organizational design like "matrix" emerged in modern organizations? If the matrix design were not used, what would be an effective altemative design?
2. In the organization in which the student/reader works has there been an adequate effort made to define why the matrix design is used—and how that design changes the working relationships in the organization?
3. Has the student/reader ever been in a situation when there was no definition of what his or her specific role was to be? How did the student/reader cope with such a situation?
4. What really helps us influence the people with whom we work—the assigned authority we have over those individuals or our interpersonal skills in working with those people?
5. The matrix organizational design seems to be working today, yet it is still emerging in theory and practice. What might be the key characteristics of the organizational design of the future, which might replace the current matrix design?

CHAPTER 9
PROJECT AUTHORITY[1]

"We trained hard...but it seemed that every time we were beginning to form up into teams, we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganizing and what a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralization."

PETRONIOUS, ARBITER
GREEK NAVY, 210 B.C.

9.1 INTRODUCTION

In their consulting experiences, the authors have often heard project managers and functional managers lament their lack of sufficient authority to do their jobs. Such laments are not restricted to people in the project environment; others who work in today's complex organizations often have the same complaint. The authors believe that such complaints have as their root causes the lack of understanding of what authority is, how it is defined, and how to develop the ability to exercise more authority in today's organizations.

Accordingly, in this chapter authority is defined as consisting of two elements: (1) the legal defined authority; and (2) the authority that one has as a function of knowledge, skills, and attitudes in working with people associated with projects. Authority's documented definition, how to delegate authority, and the pitfalls of "reverse" delegation are provided in this chapter. In addition, the roles of responsibility and accountability—as key forces in the management of projects—are delineated. The linear responsibility chart (LRC) is suggested as a way to more accurately define individual and collective roles in a matrix organization. The key role that the project work packages play in defining roles in the matrix environment is described, along with a prescription of how to develop and use the LRC as a way to provide a better understanding by people of what is expected of them as they work with and support the project purposes.

[1]Some of the ideas in this chapter have been paraphrased from David I. Cleland, "Understanding Project Authority," *Business Horizons*, Spring *1967*.

9.2 AUTHORITY, RESPONSIBILITY, AND ACCOUNTABILITY

In the previous chapter, we described several organizational design alternatives for managing projects. These descriptions dealt with the structural alignment of the matrix organization. In this chapter we will broaden the concepts of authority, responsibility, and accountability.

Authority is essential to any group or project team effort. The legal authority that is exercised by an individual comes from the organizational position occupied by the individual. Such authority is granted or delegated from a higher authority level in the organization. The ultimate source of authority in organizations can be traced to the owners of the organization. In a business organization, the shareholders elect the board of directors of a company. These directors have the authority given to them by the corporate charter and bylaws to manage the corporation on behalf of the shareholders. The authority of the board of directors is broad, is of a fiduciary nature, and is the starting point for the delegation and redelegation of authority within the organizational structure. The board of directors' authority role in project management is to study and approve key strategy proposals, particularly those risky projects that involve a substantial portion of corporate resources, and to maintain surveillance of the project during its life cycle.

Project managers face a unique authority challenge in the management of their projects. Usually project managers have only a few people working directly for them—their small administrative staff. Yet the project manager has to practice a subtle form of delegation in letting others—the functional specialists—become the experts and provide the technical input to the project team.

Sometimes the authority of the project manager is very explicit. For example, at Honda the project team that developed new vehicles had engineers, designers, financial analysts, marketing experts, and manufacturing people all report to a single project leader who had line authority over them and their work. Chrysler, in contrast, was divided by functional disciplines, as departments with their functional agendas competed. The result? The Chrysler system took longer, cost more, and sometimes led to compromises such as in quality.[2]

There is little doubt that the degree of control through using legal grants of authority that can be exercised by the traditional line manager is greater than what can be used by the project manager. In the traditional organization the manager would typically have de jure, or legal, authority to schedule and control work, evaluate performance of subordinates, reward and discipline employees, and hire and fire people. Because project teams typically operate in a complex interdisciplinary setting and possess limited command and control authority, the degree of control managers have is limited. Lacking such traditional line authority, project managers and other members of the project team rely on informal modes of authority through a variety of influence bases.

[2]Bradley A. Stertz, "Detroit's New Strategy to Beat Back Japanese Is to Copy Their Ideas," *The Wall* Street Journal, October 1, 1992.

In a survey conducted by two individuals from the project management community involving the polling of 283 project specialists, project managers, and their functional managers in a variety of technology-oriented organizations, those skills and competencies that are required to effectively lead cross-functional multidisciplinary project teams were identified. A key conclusion of this study was that dealing effectively with project team members and subordinates in today's project organization requires high levels of managerial competency. An effective project leader needs to be highly analytical to understand technical subtleties, cope with system inconsistencies, and develop insight to manage technical projects effectively?

A project manager has to watch someone else provide the technical input in which the project manager may have experience and expertise. The project manager must be patient when someone accomplishes a task less proficiently than the project manager might be able to. The project manager must shift from the role of specialist to generalist, a leader in the management functions of planning, organizing, motivating, directing, and controlling. This takes the project manager away from the technical aspect of the project, allowing the project team members to be the experts in the technical work they represent.

9.3 DEFINING AUTHORITY[4]

Authority is a conceptual framework and, at the same time, an enigma in the study of organizations. The authority patterns in an organization, most commentators agree, serve as both a motivating and a tempering influence. This agreement, however, does not extend to the emphasis that the different commentators place on a given authority concept. Early theories of management regarded authority more or less as a gravitational force that flowed from the top down. Recent theories view authority more as a force which is to be accepted voluntarily and which acts both vertically and horizontally.

Although authority is one of the keys to the management process, the term is not always used in the same way, Authority is usually defined as a legal or rightful power to command or act. As applied to the manager, authority is the power to command others to act or not to act. The manager's authority provides the cohesive force for any group. In the traditional theory of management, authority is a right granted from a superior to a subordinate.

There are two types of project authority. One, de jure project authority, is the legal or rightful power to command or act in the management of a project. Inherent in this authority is the legal right to commit or withdraw resources supporting the project. The legal authority of a project manager usually is contained in some form of documentation; such documentation of necessity must contain, in addition, the complementary roles of other managers (e.g., functional managers, work package managers, general managers) associated with the project.

[3]Richard *G*. Donnelly and Deborah S. Kezsbom, "Overcoming the Responsibility-Authority Gap: An Investigation of Effective Project Team Leadership for a New Decade," *Cost Engineering.* May 1994, pp. 33–41.

[4]Portions of this material have been taken fmm David I. Cleland and William R. King, *System Analysis* and *Project Management,* 3d ed. (New York: McGraw-Hill, 1983). chap. 12.

Having legal authority is a start. However, to be a successful manager, an individual must develop capabilities in the de facto aspects of authority.

The second type of authority, de facto project authority, is that influence brought to the management of a project by reason of a particular person's knowledge, expertise, interpersonal skills, or personal effectiveness. De facto project authority may be exercised by any of the project clientele, managers, or team members. In another study it was found that project managers and project personnel believe that expertise and reputation are the most helpful sources of influence in the management of technical projects. It was further determined that technical expertise and organizational expertise are two sources of influence that are available to project managers. Expert power comes to the project manager through background and experience, technical achievement, participation in past projects, and longevity.[5]

Ford and McLaughlin in their research remind us that classical management theory holds that parity of authority and responsibility should exist. In project management there may not be such parity across the various stages of the life cycle. They note that few empirical data have been collected to test the hypothesis that parity does not exist and that this lack of parity is the cause of many management problems. In their research report collected from 462 information system managers, the data indicated that in the majority of cases parity did not exist.[6]

A major part of de facto authority is the ability of the project manager to influence others whose cooperation and support are needed to provide timely resources to support the project. Part of the ability to influence is the competence to work effectively with project team members, functional managers, general managers, and project stakeholders. A project manager must have some technical skill in the technology embodied in the project, not only to participate in the rendering of technical judgments but also to gain the respect of team members who have in-depth technical knowledge and skills. Interpersonal skills provide power to the project manager in influencing the many professionals and managers with whom the project manager works. Developing and maintaining a successful track record that gets people to work with the project manager are, in themselves, a form of power in influencing. The ability to influence is directly related to how others perceive one's expertise.

Another source of power is to pay attention to and recognize the performance of other people who work with you, such as team members, managers, and stakeholders. In other words, acknowledge the performance of other people just as you would like to have your own good performance recognized. This recognition can take many forms, such as letters of appreciation, phone calls to thank the person, a public thanks in a meeting, comments to a person's manager, a citation in the person's personnel file, stopping by the person's desk to say, Thanks for your help, a personal note of thanks, or some token of appreciation such as a lunch, a book, flowers, or pen and pencil set. Sometimes praising a person's work to members of the peer group works well; inevitably that praise will be reported to the person.

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[5]Christopher G. Worley and Charles J. Teplitz, "The Use of 'Expert' Power as an Emerging Influence Style within Successful U.S. Matrix Organizations," *Project Management Journal,* March 1993, pp. 31–34.

[6]Robert C. Ford and Frank S. McLaughlin, "Using Project Teams to Create MIS Products: A Life Cycle Analysis," *Project Management Journal,* March 1993, pp. 43–47.

The ability to exercise de facto authority is dependent on the competency of the individual. This competency is essentially a combination of the knowledge, skills, and attitudes that an individual possesses. Figure 9.1 portrays these elements of competency within the context of project management. The reader should note that the elements of knowledge, skills, and attitudes reflected in this figure are described in various chapters in this book.

9.4 POWER

The theory of power can be traced back to sociologist Max Weber. He described three kinds of authority: charismatic, traditional, and bureaucratic. Charismatic authority is where people follow the leader because of his or her inspiration, exemplary character, or behavior, for example, Jesus Christ, Martin Luther King, or Thomas Edison. Often those people who represent this kind of authority are change leaders such as Trotsky. Traditional authority is where obedience is given to an individual who occupies a traditional or inherited position such as in theocracies, patriarchies, and family businesses like the House of Windsor or Anheuser-Busch. Bureaucratic authority (or the role of law) is where power is vested in a hierarchical position and where the authority comes from, say, an elected person who holds office, such as a person holding military rank, or one who occupies an organizational position in the enterprise. All of these sources of power do not provide enough clout to get the job done in today's complex organizations, particularly in those organizations that use alternative teams in their organizational design. Modem organizations depend on the personal power that an individual is able to wield using sources of knowledge, skills, expertise, track record, interpersonal skills, attractiveness, dedication, networks, alliances, and tenacity, to name a few.

Knowledge + skills + attitude = competency

Knowledge (Familiarity, awareness, or comprehension acquired by study or experience)	Skills (The ability to apply knowledge)	Attitude (A state of mind or feeling)
• Project "technology" • Strategic management Project management theory and practice • Project management processes • Project management systems model	• Interpersonal skills • Communication skills • "Systems" application • Political sensitivity • Style • Building conceptual models	• Maslow's hierarchy of needs • McGregor's theory X and theory Y • Authority and responsibility • Emotional intelligence • Trust

FIGURE 9.1 Individual competency model.

Power coming from the position that one occupies is not enough to get the job done. Hierarchy confers less power because there is less of it in modern organizations. The collective authority that comes from the team and the knowledge and skills of its cross-functional and cross-organizational networks and working arrangements is effective power. In such situations the team depends on many people over whom there is no formal authority, and peer and stakeholder networks are more important. Indeed, in today's complex organizations, power is all about empowerment of people to the lowest possible level, which will enable them to carry out their responsibilities without having to check with the boss. The act of empowering people through the delegation process actually results in an increase of power for the one who delegates. In such environments politics, networking, and listening are the core of people skills matter.

Empowerment is like a coin—it has two sides. On the one side is the official authority or legal power that is given to an individual who is occupying an organizational position, such as a project manager and the positions that the members of the project team hold. On the other side of empowerment is the influence that an individual has with regard to the organization's stakeholders. The first side of empowerment stated above is granted through documentation such as a position description, letters of appointment, a project charter, a policy, and procedure documents. The second side cannot be delegated. It depends on the knowledge, skills, and attitudes of the individuals and the competency that they are able to develop and sustain in the management of the project and in their dealings with project stakeholders.

9.5 MATRIX IMPLICATIONS

The matrix organizational design to support the management of projects has been given much attention in the project management literature. Whatever controversy and disenchantment that the matrix design has caused, it cannot be forgotten that the different alternative uses of the matrix that have been tried have been a search for how authority and responsibility could be shared by those organizational entities cooperating in bringing about a focal point to manage the sharing of resources to support organizational projects. Most failures in the use of the matrix have been caused by one or more of the following relative authority-responsibility factors:

- Failure to define the specificity of authority and responsibility of the project and functional people relative to the work packages for which each is solely and jointly responsible.
- Negative attitudes on the part of project, functional, and general managers and team members who support a sharing of authority and responsibility over the resources to be used to support organizational projects.

  Lack of familiarity with the theoretical construction of the matrix and the context in which that organizational design is applied.

- Failure on the part of senior managers to bring about the development of some basic documentation in the organization that prescribes the formal and relative authority of managers and team members associated with a project team.
- Failure to do adequate project team development to include how the team will operate in a cultural ambience of the enterprise where project resources, results, and rewards are shared.
- Existence of an organizational culture that believes and reinforces the traditional command and control notions of authority and responsibility being primarily vertical in their flow downward through the organizational hierarchy.
- Failure on the part of organizational leaders to recognize that the traditional organizational model in the vertical flow of authority and responsibility is rapidly being eroded by the increasing use of computer and communication technology, the increasing pace of change, and the success which alternative organizational designs are enjoying such as found in the use of self-directed teams, quality teams, task forces, and the growing use of participative management to include employee empowerment.
- Failure to modify the traditional pyramid to a design that has fewer levels, with more options for personal movement and flexibility among and within organizational levels. This modification includes the reduction in the number of middle managers and the changes in their roles from one of approval and control to problem solving and facilitation of the means for people to work together to accomplish organizational ends.
- And finally, the failures of managers to promote synergy and unity within and between organizational levels and with outside stakeholders so that resources, results, and rewards can be shared. This type of promotion requires true teamwork, discussion, cooperation of all organizational members, education, and the opening and maintenance of many lines of communication.

When project management is introduced in an organization, it is essential that these authority roles be understood and accepted by general managers, project managers, and functional managers. This understanding can be facilitated if all the managers concerned jointly participate in the development and publication of a policy document containing a description of the intended authority and responsibility relationships characterized by Fig. 9.2.

During the early days of the matrix organization, it was not uncommon to hear people express their dissatisfaction with the matrix because it was against their religion, and they would quote the biblical phrase about not serving two masters. There was some basis for their concern.

Conceptual guidance for the relationship of the project team member to the project manager and the functional manager can be found in the Bible. Verse 24, Chapter 6, Matthew, states:

No man can serve two masters: for either he will hate the one, and love the other; or else he will hold to the one, and despise the other. Ye cannot serve God and mammon.

This verse probably provides the basis for the evolution of the principle expressed by Henri Fayol as unity of command in which one is expected to receive orders from only one individual. The unity of command principle has provided a key basis in the design of the traditional organizational structure in which authority, responsibility, and accountability flow from the senior person through an organizational hierarchy to the worker who is doing the work of the organizational entity. Violation of this key management principle of unity of command, along with the key principle of parity of authority and responsibility, was considered to be serious, potentially laying down the basis for impairment of the efficiency and effectiveness of the enterprise.

As one reads further in the Bible, another insight is gained in how to deal with this apparent violation of a couple of key management principles. In Verse 21, Chapter 22, Matthew, the bible states, "Render therefore unto Caesar the things which are Caesar's, and unto God the things that are God's." By taking license in paraphrasing this verse related to the matrix organization, one could say that the project team members should render unto the project manager the things that are the project manager's, and unto the functional manager the things that are the functional manager's. How to do this is explained in Fig. 9.2, in which the relative roles and authorities of the principal players in the matrix organization are portrayed.

A significant measure of the authority of project managers springs from their function and the style with which they perform it. Project managers' authority is neither all de jure (having special legal foundations) nor all de facto (actual influence exercised and accepted in the environment). Rather, their authority is a combination of de jure and de facto elements in the total project environment. Taken in this context, the authority of project managers has no organizational or functional constraints but rather diffuses from their offices throughout and beyond the organization, seeking out the things and the project stakeholders to influence and control.

9.6 THE POWER TO REWARD

Not only do teams change the culture and the modus operandi of the organization, but also they change the manner in which organizational rewards are provided to people. As people serve on teams and rotate from team to team, performance evaluations are more difficult. In most organizations the team does not yet assume a major part in appraising team performance.[7] Of the organizations surveyed by Development Dimensions International, the Association for Quality and Participation, and Industry Week, 46 percent indicated that leaders outside the team handle appraisals, 17 percent said that the responsibility is shared, and 37 percent responded that the team takes the lead in appraising performance: On the basis of these surveys, team performance appraisal is changing—teams are accepting such appraisal responsibility—and at the same time management is moving slowly in relinquishing appraisal prerogatives.

[7] Richard S. Wellins, William C. Byam, and Jeanne M. Wilson, Empowered *Teams* (San Francisco: Jossey Bass, 1991), p. 3.
[8] Ibid.

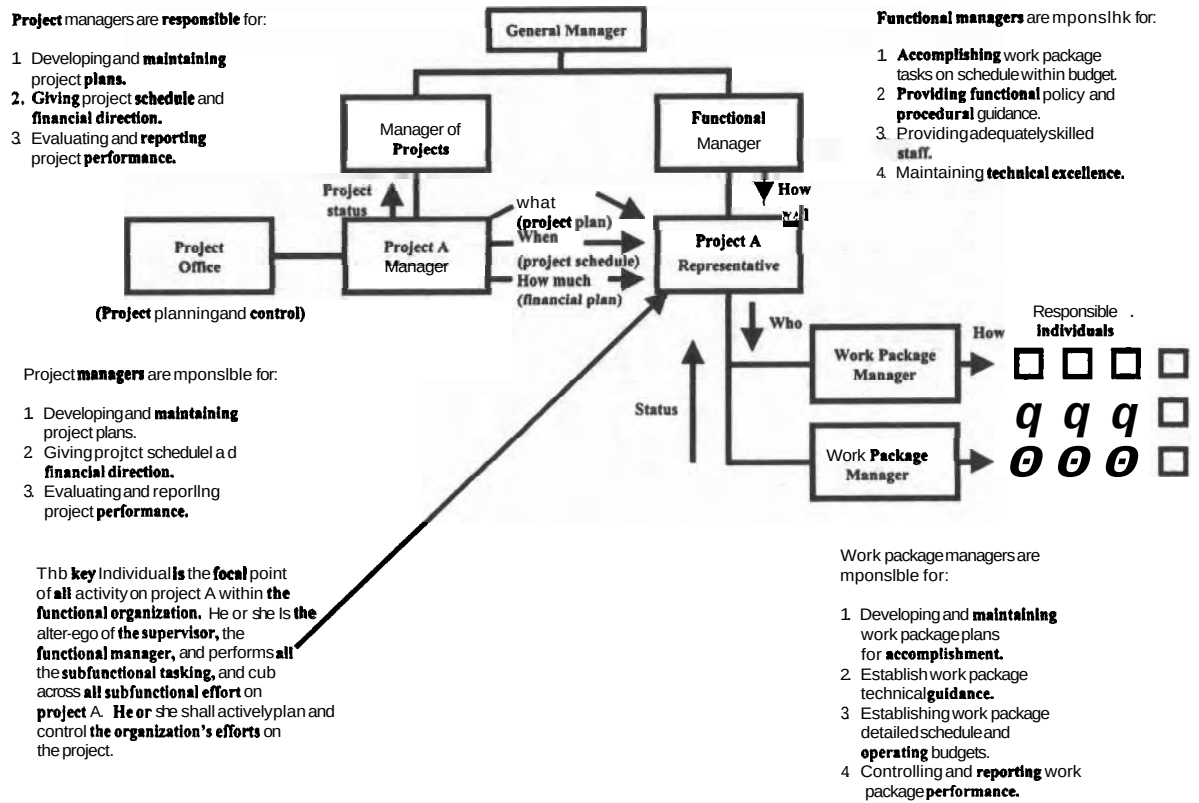

FIGURE 9.2 Project-functional organizational interface. *[Source: David* I. *Cleland and William R. King,* Systems Analysis and Project Management *3d ed. (New York: McGraw-Hill, 1983), p. 353.1*

In the project-driven organization, people and teams have considerable mobility. It becomes a challenge to keep abreast of where people are on teams. Cypress Conductor, a San Jose, California, maker of specialty computer chips, developed a computer system that tracks its 1500 employees as they crisscross functions, teams, and projects?

9.7 REVERSE DELEGATION

The effectiveness with which project managers exercise authority depends to a large degree on their legal position as well as on their personal capabilities. But there are ways in which project managers can operate to enhance their basic authority. One way is to guard against reverse delegation, which occurs when the person to whom authority has been delegated gives authority back to the delegator. This reverse delegation usually happens under the following conditions:

- The team member wants to avoid risky decisions.
- The team member does not feel that the functional manager is adequately supporting the project.
- The team member lacks confidence, wants to avoid criticism, or feels that the necessary information and resources are lacking to do the job.
- The team member feels that the project manager wants to keep involved in the details of the project.
- The project manager has not been explicit in establishing what is expected of the team member in supporting the project.

Effective delegation is a necessary but not sufficient condition to ensure an effective organizational design to support the project. Organizing a project means many things, one of which is the establishment and maintenance of meaningful authority, responsibility, and accountability relationships among the project team members and other people having a vested interest in the project. Without an adequate, committed process of delegation, there is no effective organization and things can easily fall through the cracks in the project.

9.8 DOCUMENTING PROJECT MANAGER'S AUTHORITY

Project managers should have broad authority over all elements of their projects. Although a considerable amount of their authority depends on their personal abilities, they can strengthen their position by publishing documentation to establish their modus operandi and their legal authority. At a minimum, the documentation

[9] Brian Dumaine, "The Bureaucracy Busters," Fortune, June 17, 1991, pp. 36–50.

(expressed in a policy manual, policy letters, and standard operating procedures) should delineate the project manager's role and prerogatives in regard to:

- The project manager's focal position in the project activities
- The need for a defined authority-responsibilityrelationship among the project manager, functional managers, work package managers, and general managers
- The need for influence to cut across functional and organizational lines to achieve unanimity of the project objectives
- Active participation in major management and technical decisions to complete the project
- Collaborating(with the personnel office and the functional supervisors) in staffing the project
- Control over the allocation and expenditure of funds, and active participation in major budgeting and scheduling deliberations
- Selection of subcontractors to support the project and the negotiation of contracts
- Rights in resolving conflicts that jeopardize the project goals
- Having a voice in maintaining the integrity of the project team during the complete life of the project
- Establishing project plans through the coordinated efforts of the organizations involved in the project
- Providing an information system for the project with sufficient data for the control of the project within allowable cost, schedule, and technical parameters
- Providing leadership in the preparation of operational requirements, specifications, justifications, and the bid package
- Maintaining prime customer liaison and contact on project matters
- Promoting technological and managerial improvements throughout the life of the project
- Establishing a project organization (a matrix organization) for the duration of the project
- Participation in the merit evaluation of key project personnel assigned to the project
- Allocating and controlling the use of the funds on the project
- Managing the cost, schedule, and technical performance parameters of the project[10]

The publication of suitable policy media describing the project manager's modus operandi and legal authority will do much to strengthen his or her position in the client environment. In practice, we find many types of de jure authority documentation. A sample of a project/program management charter appears in Table 9.1.

As in the example, care should be taken to delineate the legal position of the project manager. This constitutes an obvious source of power in the project

[10]David I. Cleland and William R King, *Systems Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983), pp. 337–338.

TABLE 9.1 Typical Charter of Program Project Manager (Matrix Organization)

Position Title: Program/Project Manager

Authority

The progrdproject manager has the delegated authority from general management to direct all program activities. He or she represents the company in contacts with the customer and all internal and external negotiations. Project personnel have the typical dual-reporting relationship: to functional management for technical performance and to the program manager for contractual performance in accordance with specifications, schedules, and budgets. The progradproject manager approves all project personnel assignments and influences their salary and promotional status via formal performance reports to their functional managers. Travel and customer contact activities must be coordinated and approved by the program/project manager.

Any conflict with functional management or company policy shall be resolved by the general manager or his or her staff.

Responsibility

The program/project manager's responsibilities are to the general manager for overall progmdproject direction according to established business objectives and contractual requirements regarding technical specifications, schedules, and budgets.

More specifically, the program/project manager is responsible for (1) establishing and maintaining the progmdproject plan, (2) establishing the program organization, (3) managing and controlling the program/project, and (4) communicating the program/project status.

1. ***Establishing and maintaining the programlproject plan.*** Prior to authorizing the work, the program/project manager develops the program plan in concert with all key members of the program/project team. This includes master schedules, budgets, performance specifications, statements of work, work breakdown structures, and task and work authorizations. All of these documents must be negotiated and agreed upon with both the customer and the performing organizations before they become management tools for controlling the program/project. The program/project manager is further responsible for updating and maintaining the plan during the life cycle of the programlproject, including the issuance of work authorizations and budgets for each work package in accordance with the master plan.
2. ***Establishing the programlproject organization.*** In accordance with company policy, the program/project manager establishes the necessary program/project organization by defining the type of each functional group needed, including their charters, specific roles, and authority relationships.
3. ***Managing the programlproject.*** The program/project manager is responsible for the effective management and control of the program/project according to established customer requirements and business objectives. He or she directs the coordination and integration of the various disciplines for all program/project phases through the functional organizations and subcontractors. He or she monitors and controls the work in progress according to the program/project plan. Potential deficiencies regarding the quality of work, specifications, cost, or schedule must be assessed immediately. It is the responsibility of the program/project manager to rectify any performance deficiencies.

TABLE 9.1 Typical Charter of Program/Project Project Manager (Matrix Organization) *(Continued)*

Position Title: Program/Project Manager
4. ***Communicating the program/project status.*** The program/project manager is responsible for building and maintaining the necessary communication channels among project team members to the customer community and to the firm's management. The type and extent of management tools employed for facilitating communications must be carefully chosen by the program/project manager. They include status meetings, design reviews, periodic program/project reviews, schedules, budgets, data banks, progress reports, and team collocation.

Source: Harold Kerzner and Hans J. Thamhain, *Project Management Operating Guidelines* (New York: Van Nostrand Reinhold. 1986). p. 68.

environment. Although this gives project managers the right to exercise that power, the significance of authority under the project-functional interface cannot be understated. Even though project managers may have the final, unilateral right to make decisions in the project, it would be foolhardy for them to substitute their views without fully considering the crystallization of thinking of the other stakeholders in their project. Project managers rarely hope to gain and build alliances in their environments by arbitrarily overruling the team members who contribute to a project. They may not have the control for such arbitrary action. Even if they did, they should be most judicious in using authority in such a manner that the culture in which the project team is operating is not adversely affected.

Authority operates in the context of responsibility and accountability. These concepts are presented in the following material.

9.9 WHAT IS RESPONSIBILITY?

Responsibility, a corollary of authority, is a state, quality, or fact of being responsible. A responsible person is one who is legally and ethically answerable for the care or welfare of people and organizations. A person who is responsible is expected to act without specific guidance or being told to do so by a superior authority. To be responsible is to be able to make rational decisions on one's own, to be trusted to make such decisions, and to be held liable for one's decisions. Archibald, a noted author in the field of project management, notes the following concerning the project manager's responsibility:

> If the project manager's responsibilities are divided among several persons (such as one man for engineering, another for scheduling, a third for cost, a fourth for contract administration, etc.) such division is the most common cause of projects not achieving their objectives. Unless one person integrates the efforts of the project engineer, the project contract administrator, and so on, it is not possible to evaluate the project effectively to identify current or future problems and initiate corrective action in time to assure that the project objectives will be met.

The project manager cannot actually perform all the planning, controlling and evaluation activities needed, any more than he can perform all the technical specialty activities required. Project management support services must be provided to him, and he must direct and control these support activities. The hazard is that the support activities may exist, but in the absence of an assigned project manager, they are not properly used."

Some companies are very explicit about their project manager's responsibilities. For example, within the Fluor Corporation, a major engineering/construction company, project managers have total responsibility for the execution of the project from its earliest stages right through to completion.[12]

9.10 WHAT IS ACCOUNTABILITY?

Accountability is the state of assuming liability for something of value, whether through a contract or because of one's position of responsibility. A professional is held accountable for excellence in the quality of the service rendered to the organization. Project managers have dual accountability: They are held answerable for their own performances and for the performance of people who comprise the project team. One of the basic characteristics of managers is that they are held accountable for the effectiveness and efficiency of the people who report to them.

Authority, responsibility, and accountability can rest with a single person or with a group of people. An example of pluralism in this sense is found in the use of a plural executive at the top-management level of organizations such as a management council or the board of directors. The plural executive serves as an integrator of top-management decision making and implementation. The increasing complexity and size of many large organizations have created managerial responsibilities beyond the capabilities of one individual. The plural executive that has been created by organizations usually acts in an advisory capacity to the chief executive by providing stewardship for the strategic management of the company. The specific authority of such plural executives depends on the character establishing such a body. Authority, responsibility, and accountability within the matrix context are the cohesive forces that hold the organization together and make possible the attainment of the organization's cost, schedule, and technical performance objectives. Figure 9.3 is one way of portraying these forces. The existence of cost, schedule, and technical performance objectives in this figure means that the degree of completeness of authority, responsibility, and accountability at each level in the model can influence any or all of the parameters.

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[11]R. D. Archibald, *Managing High-Technology Programs and Projects* (New York: Wiley, 1976), p. 39.

[12]Robert M. Duke, "Project Management at Fluor Utah Company, Inc.," *Project Management Quarterly*, vol. 8, no. 3, September 1977.

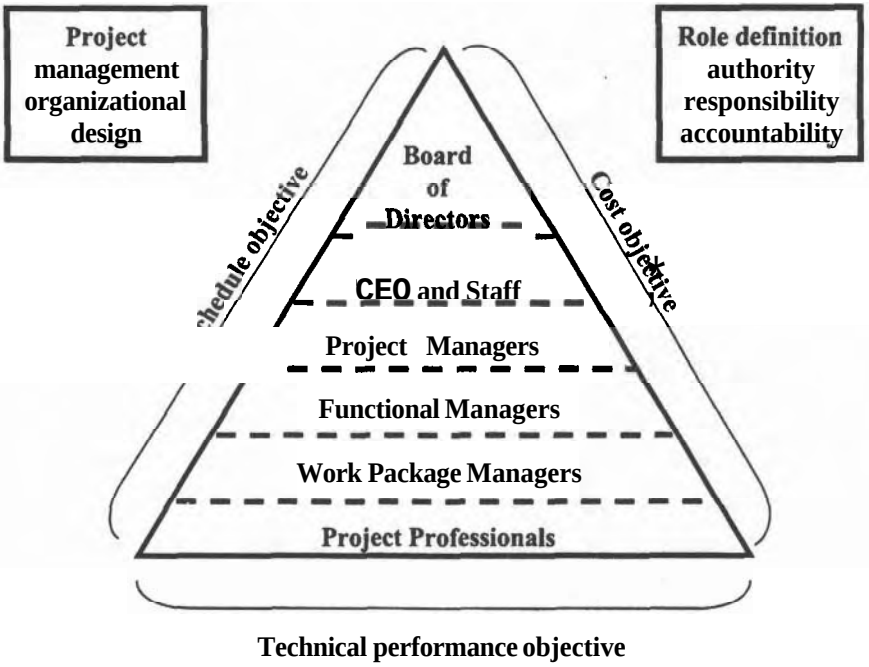

FIGURE 9 3 Project management organizational design.

9.11 PROJECT ORGANIZATION CHARTING"

The organizational model that is commonly called the organizational chart is derided in the satirical literature and in the day-to-day discussions among organizational participants. However, organizational charts can be of great help in both the planning and implementation phases of project management.

9.12 TRADITIONAL ORGANIZATIONAL CHART

The traditional organizational chart is of the pyramidal variety; it represents or models the organization as it is supposed to exist at a given time. At best, such a chart is an oversimplification of the organization and its underlying concepts, which may be used as an aid in grasping the concept of the organization.

"Some of the ideas in this section have been paraphrased from the following articles: David I. Cleland and Wallace Munsey, 'Who Works with Whom?" *Harvard Business Review.* September-October 1967: Dundar F. Kocaoglu and David I. Cleland, "A Participative Approach to the Development of Organizational Roles and Interactions," *Management Review,* October 1983, pp. 57–64.

Unfortunately, too often the policy documentation describing the role of a project manager will describe this manager's relationship with the functional organizations as a "dotted line" relationship, which can mean anything one wishes it to mean. In this respect, Davis and Lawrence note that for generations managers have lived with the fiction of dotted lines to describe secondary reporting relationship in the organization.[14] One suspects that managers use a dotted line on an organizational chart because at the time the chart was developed the relationship had not been completely defined. The use of a dotted-line technique in depicting authority and responsibility gives a manager a great deal of flexibility. The price of this flexibility is confusion and unclear understandings of reciprocal authority and responsibility.

Usefulness of the Traditional Chart

The organizational chart is a means of visualizing many of the abstract features of an organization. In summary, the organizational chart is useful in that:

It provides a general framework of the organization.

- It can be used to acquaint the employees and outsiders with the nature of the organizational structure.
- It can be used to identify how the people tie into the organization; it shows the skeleton of the organization, depicting the basic relationships and the groupings of positions and functions.
- It shows formal lines of authority and responsibility, and it outlines the hierarchy that fills each formal position, who reports to whom, and so on.

Limitations of the Traditional Chart

The organizational chart is something like a photograph. It shows what the subjects look like, but tells little about how individuals function or relate to others in their environment. The organizational chart is limited as follows:

It fails to show the nature and limits of the activities required to attain the objectives.

- It does not reflect the myriad reciprocal relationships between peers, associates, and many others with a common interest in some purpose.
- It is a static, formal portrayal of the organizational structure; most charts are out of date by the time they are published.
- It shows the relationships that are supposed to exist but neglects the informal, dynamic relationships that are constantly at play in the environment.

It may confuse organizational position with status and prestige; it overemphasizes the vertical role of managers and causes parochialism—a result of the blocks and lines of the chart and the neat, orderly flow they imply.

[14] Stanley M Davis and Paul R Lawrence, "Problems of Matrix Organizations," *Harvard* Business Review, May–June 1978, p. 142.

Role definition within the project team is a key consideration in developing the team. When a new team is formed, or when new objectives and goals are developed for the team, or when any key circumstance about the team or its mission changes, such as additional responsibilities, then the definition and understanding of individual and collective roles become important. If the team is intended to be interactive and synergistic, role understanding is critical. Allocating authority and responsibility to the team is an important first step. But the team must understand the authority and responsibility associated with both individual and collective roles, must be committed to those roles, and must be proactive in developing the personal influence that gives added power to the execution of these roles.

How can the individual and collective roles of the project team be established, particularly as team members work with the project stakeholders? Two organizational charts are needed: the traditional chart, which portrays the general framework of the organization, and the linear responsibility chart, which is useful to determine the specificity of individual and collective roles in the organization.

9.13 LINEAR RESPONSIBILITY CHART

The linear responsibility chart (LRC) is an innovation in management theory that goes beyond the simple display of formal lines of communication, gradations, or organizational level, departmentalization, and line-staff relationships. In addition to the simple display, the LRC reveals the work package position couplings in the organization. The LRC has been called the linear organization chart, the responsibility *interface matrix*, the matrix responsibility chart, the linear chart, and the *functional* chart.

Six key elements make up the form and process of an LRC:

- An organizational position
- An element of work—a work package—to be accomplished to support organizational objectives, goals, and strategies
- An organizational interface point—a common boundary of action between an organizational position and a work package
- A legend for describing the specificity of the organizational interface
- A procedure for designing, developing, and operating LRCs for an organization
- A commitment and dedication on the part of the members of the organization to make the LRC process work

The LRC shows who participates, and to what degree, when an activity is performed or a decision made. It shows the extent or type of authority exercised by each position in performing an activity in which two or more positions have overlapping involvement. It clarifies the authority relationships that arise when people share common work.

Figure 9.4 shows the basic structure of an LRC, in terms of an organizational

position and a work package, in this case "conduct design review." The symbol "P" indicates that the director of systems engineering has the primary responsibility for conducting the system design review.

9.14 WORK PACKAGES

The work elements of the hierarchical levels of the work breakdown structure are called work packages. They are used to identify and control work flows in the organization, and they have the following characteristics:

- A work package represents a discrete unit of work at the appropriate level of the organization where work is assigned.
- Each work package is clearly distinguished from all other work packages.
- The primary responsibility of completing the work package on schedule and within budget can always be assigned to an organizational unit, and never to more than one unit.
- A work package can be integrated with other work packages at the same level of the work breakdown structure to support the work packages at a higher level

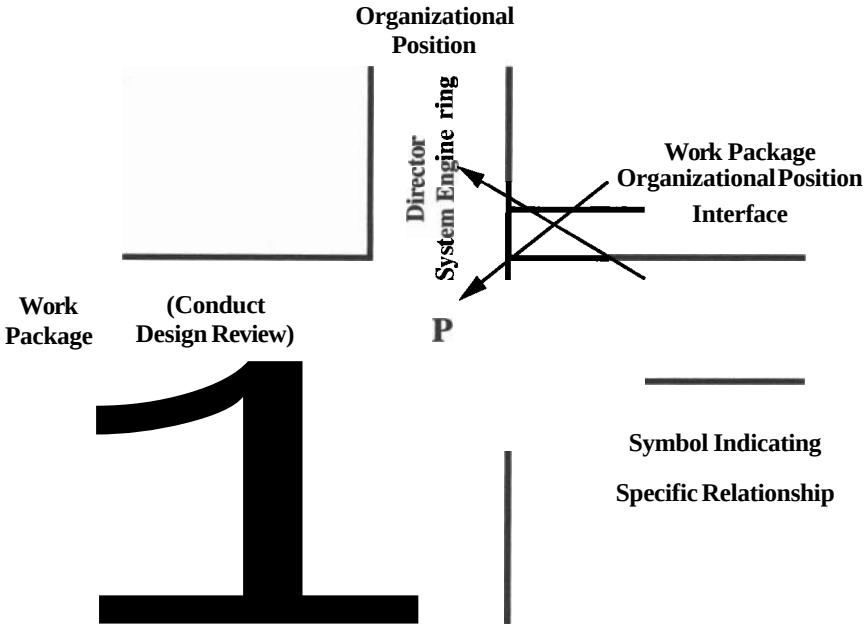

FIGURE 9.4 Essential structure of a linear responsibility chart.

of the hierarchy.

Work packages are level-dependent and become increasingly more general at each higher level and increasingly more specific at each lower level.

9.15 WORK PACKAGE–ORGANIZATIONAL POSITION INTERFACES

The organizational positions and the responsibilities assigned to them in carrying out the work package requirements constitute the basis for the LRC. It is developed by specifically identifying responsibilities on each of the work packages. The responsibilities are defined at the work package–organizational position interfaces, by using symbols or letters to depict relationships.

The LRC is a valuable tool as a succinct description of organizational interfaces. It conveys more information than several pages of job descriptions and policy documents by delineating the authority-responsibility relationships and specifying the accountability of each organizational position. However, by far the most important aspect of the LRC is the process by which the people in the organization prepare it. If the LRC is developed in an autocratic fashion, it simply becomes a document portraying the organizational relationships. But if it is prepared through a participative process, the final output becomes secondary to the impacts of the process itself. The open communications, broad discussions, resolution of conflicts, and achievement of consensus through participation provide a solid basis for organizational development and managerial harmony. By the time the LRC is developed in this way, the organization goes through such an "education" that the chart becomes secondary.

9.16 A PROJECT MANAGEMENT LRC

The LRC can be very useful for project managers to use to understand their authority relationships with their project team members. For a simple project, these relationships may be easy to depict; for more complex projects, a series of descending charts from the macrolevel of the project to successively lower levels may be necessary.

Table 9.2 shows an LRC for project-functional management relationships within a matrix organization. The development of such a chart, combined with the discussions that usually accompany such a development, can help greatly to facilitate an understanding of project management and how it will affect the day-to-day lives and activities of the team members.

In the table the legend depicts the appropriate relationships among the listed positions. Note that there will typically be more than one project manager and more than one functional manager. This table will serve as a guide to developing specific relationship, based on the organization and the projects.

TABLE 9.2 Linear Responsibility Chart of Project Management Relationships*

Activity	General manager	Manager of projects	Project manager	Functional manager
Establishment of department policies and objectives	1	3	3	3
Integration of projects	2	1	3	3
Project direction	4	2	1	3
Project charter	6	2	1	5
Project planning	4	2	1	3
Project-functional conflict resolution	1	3	3	3
Functional planning	2	4	3	1
Functional direction	2	4	4	1
Project budget	4	6	1	3
Project WBS	4	6	1	3
Project control	4	2	1	3
Functional control	2	4	3	1
Overhead management	2	4	3	1
Strategic projects	6	3	4	1

***Legend: 1: actual responsibility; 2: general supervision; 3: must be consulted, 4: may be consulted; 5: must be notified. 6: approval authority.**

9.17 DEVELOPING THE LRC

The development of the project LRC is inherently a group activity—getting together with the key people who have a vested interest in the work to be done. The following plan for the development of an LRC has proved useful:

- Distribute copies of the current traditional organizational chart and position descriptions of the key people.
- Develop and distribute blank copies of the LRC.
- At the first opportunity, get the people together to discuss
  - The advantages and shortcomings of the traditional organization chart.
  - The concept of a project work breakdown structure (WBS) and the resulting work packages.
  - The nature of the linear responsibility chart, how it developed, and how it is used.
  - A simple way of establishing a code to show the work package—rganizational position relationship (getting a meeting of the minds on this code is very important because individuals who believe the code to be either too fine or too coarse will find it difficult to accept).

  - The makeup of the actual work breakdown structure with accompanying work packages.
  - The fitting of the symbols into the proper relationship in the LRC.
- Encourage an intensive dialogue during the actual making of the LRC. In such a meeting, people will tend to be protective of their organizational "territory." The LRC by its nature requires a commitment to support and share the allocation of organizational resources applied to work packages. This commitment requires the ability to communicate and decide. This process takes time, but when the LRC is completed, the people are much more knowledgeable about what is expected of them.[15]

Much of the success of project management depends on how effectively people work together to accomplish project objectives and gain personal satisfaction. The development of a project LRC can greatly contribute to achieving this.

Once assembled, the LRCs can become a "living document" to

- Portray formal authority, responsibility, and accountability relationships.
- Acquaint newcomers with how things are done in the organization.
- Get people committed and motivated so they know specifically what is expected of them.
- Bring out real or potential conflict over territorial prerogatives in the organization.
- Permit people to see the "big picture"—how they fit into the larger whole.
- Facilitate teamwork so people have greater opportunity to see their specific/individual roles on the project in the enterprise.
- Provide a standard against which the project managers and other managers can monitor what people are doing.

9.18 TO SUMMARIZE

The major points that have been expressed in this chapter include:

- Authority is a force that is essential to the functioning of any organization.
- Authority is like a coin. On one side is the legal or de jure authority that is delegated to the organizational position that a person occupies. The other side of the coin is the de facto authority that an individual has by reason of influence in the organization in which he or she works.
- Great care should be taken to prescribe in appropriate documentation the legal authority that attaches to an organizational position.
- The de facto authority that an individual has comes from knowledge, expertise, interpersonal skills, experience, and ability to work cooperatively with the people associated with the project team to include stakeholders.

[15] David I. Cleland and Dundar F. Kacaoglu, *Engineering Management* (New York: McGraw-Hill, 1981), pp. 47–50.

- Power is an element of authority and can come from several sources.
- A conceptual framework for the proper delineation of roles in the matrix organization can be found in the Bible.
- Project managers—and all managers—should be aware of some of the techniques that people can use to avoid responsibility through the reverse delegation process.
- Some examples of how to document de jure authority in the matrix organization were provided in the chapter.
- Responsibility, a corollary of authority, is a state, quality, or fact of being responsible.
- Accountability is the state of assuming liability for something of value.
- Definitions of the project management role of all principals in the enterprise were given.
- There are serious limitations to the traditional organizational chart—particularly in understanding how individual and collective roles are carried out in the enterprise.
- The material in this chapter includes an identification of the six key elements that make up the form and process of the linear responsibility chart (LRC).
- Individual and collective roles in the project team are key considerations in understanding how the project team is expected to operate in the matrix organizational context.
- An appropriate legend must be developed to use in the LRC to describe the relationships between the work package responsibilities and the organizational position.
- A methodology for how to develop the LRC was provided in the chapter.

9.19 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- Robert J. Yourzak, "Motivation in the Project Environment," and Stephen D. Owens and Francis M. Webster, Jr., "Negotiating Skills for Project Managers," chaps. 19 and 21 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, 1997).
- Tony Yep, "Quality Management Works"; E. A. O'Connor, "Real World Challenges to a Multinational Project Team Building a Manufacturing Facility in India"; and D. H. Stamatis, "Total Quality Management and Project Management:' in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Managment Casebook,*** Project Managment Institute (PMI). (Originally

published in PMI Canada 1996 Symposium, pp. 40–45; ***Proceedings,*** PMI Seminar/Symposium, Vancouver, Canada, October 1994, pp. 377–380; and ***Project Management Journal,*** September 1994, pp. 48–54.)

- David I. Cleland and Lewis R. Ireland, ***Project Manager's Portable Handbook*** (New York: McGraw-Hill, 2000). This portable handbook describes project management, including the major topic areas of the discipline with summaries, figures, and tables. Appropriate additional references that support the summaries in a topic area of project management are provided for the reader who wishes to learn more. The book presents the concepts and processes, as well as the strategic context of projects, and how they fit into the overall vision of the enterprise. Today's abundance of literature on project ***management*** makes it difficult to find a single source to keep abreast of the knowledge, skills, and attitudes required to manage projects. This book provides that single source.
- Kimball Fisher, ***Leading Self-Directed Work Teams*** (New York: McGraw-Hill, 1993). There are many similarities between a project team and a "self-directed" team. This book explains how team leadership skills such as coaching, facilitating, group dynamics, and many more of the issues likely to confront the project manager—and the members of the project team-can be managed. The author profiles the most innovative team leader practices from known and successful industrial organizations. The reader should be able to recognize how the knowledge expressed in this book can be applied to the management of a project team.
- David I. Cleland, "Understanding Project Authority," ***Business Horizons,*** Spring 1967. This is believed to be the first article that describes management authority and its use in the matrix organization. The focus of the article is a description of the means for the determining how and to whom the "legal right to act" is delegated in those organizations that use project management. Cleland describes "project authority" as applied in the horizontal sense to accommodate the means for empowering the project managers, functional managers, and members of the project team.
- Christopher G. Worley and Charles J. Teplitz, "The Use of 'Expert' Power as an Emerging Influence Style within Successful U.S. Matrix Organizations," ***Project Management Journal,*** February 1993, pp. 31–34. The authors briefly review the theory behind the matrix structure and the necessary requirements for its successful implementation. They then review the matter of power and influence in the matrix organization, including a description of prior research on the subject. Then the authors report on the results of a survey of project managers and teams within U.S. matrix organizations.
- Valerie Lynne Herzog, 'Trust Building on Corporate Collaborative Project Teams," ***Project Management Journal,*** March 2001, pp. 28–35. This article looks at collaborative team trust building. The article recommends strategies for building corporate team trust. A specific model for trust building in project management is suggested. The author makes the strong point that integrating trust-building strategies into a team environment will help teams and their respective companies become more competitive.

9.20 DISCUSSION QUESTIONS

1. Describe a project management situation from your work or school experience. What role did project authority play in the management of the project? Did authority ambiguities exist?
2. Discuss the importance of dear definitions of project authority.
3. Define authority. Discuss the changing view of traditional authority. Discuss the difference between de jure and de facto authority. What is power?
4. What difficulties do project managers often face in exercising project authority?
5. Discuss the project-functional interface. How can clear lines of authority help in managing this interface?
6. What is meant by reverse delegation? Under what conditions might it be present? How can it be avoided?
7. Discuss the importance of negotiation between project and functional managers.
8. What is the purpose of documenting project authority?
9. What is the difference between authority, responsibility, and accountability?
10. What role does power play in project management? List and discuss some power sources.
11. What are some of the advantages of the traditional organizational chart? What are its limitations?
12. Define the linear responsibility chart in terms of its structure.
13. Define each of the symbols used to describe the responsibilities at the work package–organizational position interface.
14. List the steps involved in the development of the LRC.
15. Why is it important for this development to be a group effort?

9.21 USER CHECKLIST

1. Do the managers in your organization understand the limitations of the traditional chart for managing projects? How do they address these limitations?
2. Are the responsibilities and roles of project team members clear to the project manager and other managers? Are they clear to the team members themselves?
3. Are discussions held between the project managers, team members, and other project stakeholders to clarify authority, responsibility, and accountability? Why or why not? How can these discussions contribute to the success of the project?
4. Think about the various projects within your organization. How is project authority managed? Are there authority ambiguities?
5. Do you think that the authority of the project managers in your organization is clearly defined? Why or why not?

6. Do the managers of your organization understand the need for definition of authority relationships? Explain.
7. Do the managers of your organization use both de jure and de facto authority? How?
8. Is the project-functional interface effectively managed within your organization? Why or why not? How can clearer lines of authority assist in this management?
9. How is project authority granted within your organization?
10. What barriers to delegation exist on the projects within your organization? How can these barriers be better managed?
11. Is project authority documented? How?
12. What power tactics are used by managers in your organization? Is the use of power tactics productive or destructive toward achievement of organizational and project goals?

9.22 PRINCIPLES OF PROJECT MANAGEMENT

1. There are two types of project authority: de jure and de facto.
2. De jure authority is the legal or rightful power to command or act in the management of a project.
3. De facto authority is the influence brought to the management of a project by reason of a person's knowledge, skills, and interpersonal skills.
4. Authority and responsibility are shared in the matrix organization among the project manager, functional manager, the general manager, the work package manager, and the professionals on the project team.
5. The focus of authority and responsibility is at the project-functional interface, and centers around the project work package.
6. Project managers should have broad authority over all elements of their projects.
7. The authority and responsibility that is shared in the matrix organization should be documented.
8. Responsibility, a corollary of authority, is a state, quality, or fact of being responsible.
9. Accountability is the state of assuming liability for something of value.
10. The linear responsibility chart is an effective way to determine and assign the authority and responsibility for the management of the project.
11. Authority is a force that is essential to the functioning of any organization.
12. The project manager should have a balance between assigned de jure authority and the capability to exercise de facto authority.

9.23 PROJECT MANAGEMENT SITUATION—PRESCRIBING PROJECT MANAGEMENT AUTHORITY

Authority is the legal right to make decisions that affect the organization and the people in that organization. Responsibility is the obligation to make decisions that will impact the organization and the people in that organization. Authority and responsibility are matched pairs in the management of any organization. Authority and responsibility are provided to other people through the process of delegation. When a manager assumes a new position in an organization, one of the first things the manager should be concerned about is what authority and responsibility he or she has for making and implementing decisions on the project.

There are two basic types of authority defined and discussed in this chapter: (1) de jure, or the legal right to make decisions; and (2) de facto, or the influence that an individual brings by reason of her or his competency. Indicated below are some of the sources of de jure and de facto authority portrayed in the context of project management:

De jure:
- Policy/procedure manuals
- Project charter
- Letter of appointment as a project manager
- Contractual provisions
- Project plan
- Position dscription

De facto:
- Interpersonal skills
- Ability to communicate
- Expertise
- Team-building skills
- Negotiating skills
- Political skills
- Attitude
- Image with project stakeholders
- Ability to resolve conflict
- Coaching abilities

9.24 STUDENT/READER ASSIGNMENT

Assume that you have just been assigned as a project manager of a large product development project. One of the first questions that you have is what authority and responsibility you will have in making and implementing decisions on this project. In

order to gain insight into this question, you decide to design a "model" that will describe the specific strategies/actions you would take to capitalize on both the de jure and de facto sources of authority. Describe such a model, and be as specific as you can.

Note that the authors make the strong point that integrating trust-building strategies into a team environment will help teams and their respective companies become more competitive.

CHAPTER 10
PROJECT MANAGEMENT MATURITY

"It takes a long time to bring excellence to maturity."
PUBLILIUS SYRUS, CIRCA 42 B.C.

10.1 INTRODUCTION

The project management discipline continues to ripen in its progression as a building block in general management theory and practice. Theorists and practitioners in the field have offered various project management maturity models. These models are preliminary—but show promise of becoming an effective means of describing where project management has been and where it is today, and give insight into where it is likely to go in the future.

In this chapter a total organizational capability maturity model is presented. Then, instructions are provided for how to assess contemporary project management maturity. Insight into how to build a mature capability in the context of project management is suggested. The roles of benchmarking and competitive analysis are also offered as a means of providing insight into project maturity. In addition, benchmarking and competitive intelligence are described as strategies for improving organizationaleffectiveness through collection of business information about competitors.

10.2 ORGANIZATIONAL PRODUCTIVITY IMPROVEMENTS

Organizations continue to search for better means of improving their productivity and profit through changes to the manner in which work is done and the type of work being done. Project management is being embraced, to some extent, by most companies as the best way to develop and deliver new or improoved products, services, and organizational process changes. Enhanced capability to conduct project management is often sought through adopting new, innovative ways to perform project management and through the use of new tools and techniques.

Recent initiatives to improving an organization's project management capability are through capability maturity models. These models provide a structure for an organization to follow that will lead to more efficient and effective operations. Several models have been described in literature, each containing similar features and approaches to implementing the process.

Other efforts preceded the maturity models for improving organizational capability. Using different names and having different focuses, each of the initiatives made significant contributions to advancing productivity and profit for businesses.

- In the early 1980s, there was a concerted effort within organizations to improve quality. This movement had several different titles, but total quality management (TQM) seems to be the most enduring and lasting label. This TQM movement consists of the right approach to how we do our work and how we achieve good products by doing things right. The quality movement stimulated other activities, directly or indirectly, that improved American productivity.
- Philip Crosby, a quality guru who is instrumental in spreading the word about quality, made a significant contribution to improving products, services and processes in all forms of industry. His book ***Quality Is Still Free*** has provided thousands of organizations a framework for pursuing and attaining businesses that changed their quality focus.
- Another quality guru who changed the face of quality in American is Dr. W. Edwards Deming—a statistician by training and education. Dr. Deming, from his initial quality work in Japan during the 1950s to his lectures around the United States in the 1980s, consistently emphasized the use of data to support decisions—management by fact—and continually improve products and processes—remove the variances from the processes.
- In 1988, the National Institute of Standards and Technology (NIST) partnered with the American Society for Quality (ASQ) to establish The Malcolm Baldrige National Quality Award Program. The purpose of the program is to recognize U.S. organizations that meet rigorous criteria in seven core areas:

  1. Leadership
  2. Strategic planning
  3. Customer and market focus
  4. Information and analysis
  5. Human resource focus
  6. Process management
  7. Business results[1]

The Software Engineering Institute–Capability Maturity Model (SEI CMM) is a derivative from Philip Crosby's "The Quality Management Maturity Grid," as outlined in ***Quality Is Still Free.*** This grid provides the basis for five stages of

[1] ***Baldrige National Quality Program 2001: Criteria for Performance Excellence, 2000,*** National Institute of Standards and Technology, Bethesda, Md., 67 pages.

maturity and understanding the advances made at each stage. Crosby's quality grid is summarized in Table 10.1.[2]

These landmark quality efforts have made a major difference in how some companies look at quality and what has changed for the better within the organizations. The successful efforts of Crosby, Deming, and NIST and ASQ—and others—have changed how quality is perceived and improved through dedicated effort.

All these efforts through quality improvement programs focus on what it takes to improve parts of the business, and all of these parts are important. It may be more effective to keep the total system in focus and improve those parts that are holding the business back or keeping the business from achieving its best. A total systems perspective should be used to "fix" those parts that are operating at less than full efficiency and effectiveness.

In Chap. 1, choice elements are described as being integral components of an organization's approach to using project management as the process for conducting business. Figure 10.1 (also Fig. 1.2) depicts the choice elements of an organization using project management as its primary approach to building products, services, and organizational change processes.

Figure 10.1 consists of several interlocking nodes that must work in harmony to provide a process solution for any business that represents the optimal structure. It is intuitively obvious that weaknesses in any node will adversely affect the other nodes. For example, if the mission statement is flawed, it would be nearly impossible to develop relevant and supportive objectives and goals. Any implementing strategy would also be difficult to implement for achieving the desired results that move the organization ahead in the best manner.

This diagram and brief explanation demonstrate the need to address the entire organizational concept though a maturity model approach rather than selecting random weaknesses to repair. The randomly identified weaknesses can yield some dramatic results, but have greater value if the entire organization is fine-tuned to support projects as the building blocks.

TABLE 10.1 Quality Management Maturity Grid

Stage	Title
I	Uncertainty--unknown status of quality in the organization.
II	Awakening—realization that quality is important and there are quality issues.
III	Enlightenment—program initiated and progress made in correcting quality issues.
IV	Wisdom—uality culture in the organization and everyone works toward quality.
V	*Certainty*—quality initiatives working and organization producing products and services for clients

Source: Paraphrased from Philip Crosby's *Quality* Is *Still Free: Making Quality Certain in Uncertain Times* (New York: McGraw-Hill, 1996), pp. 32–33.

[2]Paraphrased from Philip Crosby's *Quality Is Still Free: Making Quality Certain in Uncertain Times* (New York: McGraw-Hill, 1996), pp. 32–33.

FIGURE 10.1 Choice elements of strategic management.

10.3 PROJECT MANAGEMENT MATURITY MODELS

The continual evolution and advancement of maturity models provide examples of the thinking and the direction that maturity models are taking. These efforts to define and implement a project management maturity model emphasize the challenges and successes of developing such a model.

Carnegie Mellon University's Software Engineering Institute (CMU/SEI) defined a capability maturity model for software in an effort to improve the success rate for software projects. This initiative resulted in a five-level model to characterize the behavior of maturity as it progressed from an ad hoc stage to one of continuous improvements. The resultant levels are defined as follows:

Level 1—initial level. The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort.

Level 2—repeatable level. Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.

Level 3--defined level. The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. All projects use an approved, tailored version of the organization's standard software process for developing and maintaining software.

Level 4—managed level. Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.

Level 5--optimizing level. Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

CMU/SEI also developed key process areas (KPAs) for the different levels of maturity. Key practice areas follow:

Level 1 key process areas—none developed because this is the initial stage of entry for an organization. There are no standard process requirements. An audit is required to identify those processes in use and how well they are being accomplished.

Level 2 key processes:

- Requirements management
- Software project planning
- Software project tracking and oversight
- Software subcontract management
- Software quality assurance
- Software configuration management

Level 3 key processes:

- Organizational process focus
- Organizational process definition
- Training program
- Integrated software management
- Software product engineering
- Intergroup coordination
- Peer reviews

Level 4 key processes:

- Quantitative process management
- Software quality management

Level 5 key processes:

- Defect prevention
- Technology change management
- Process change management[3]"

The CMU/SEI capability maturity model only supports software development although the model provides a general framework for any capability maturity model. This same model has been translated to a project management capability

[3]Mark C. Paulk, Bill Curtis, Mary Beth Chrissis, and Charles V. Weber, *Capability Maturity Model*(sm) *for Software,* Version 1.1, CMU/SEI-93-TR-024, February 1993.

[4]Mark C Paulk, Charles V. Weber, Susanne M Garcia, Mary Beth Chrissis, and Marilyn Bush, *Key Practices of the Capability Maturity Model*(sm) Version 1.1, CMU/SEI-93-TR-025, February 1993.

maturity model with different criteria for achieving levels of maturity. Typically, the new models use the nine functional areas of the Project Management Institute's ***Guide to the Project Management Body of Knowledge.***

The Federal Aviation Administration (FAA) put in place a Software Process Improvement Program, which follows the CMU/SEI capability maturity model. In a December 2, 1999, presentation, Dr. Linda Ibrahim of the FAA described the what, why, and how of software improvements.

1. ***What is the meaning of integrated process improvement?*** Both improving integrated processes and improving process integration are essential. An integrated process was further defined by Ibrahim: "An integrated process requires the participation of experts from more than one functional area or discipline." The integrated process involves multidiscipline—not just software. FAA's examples of processes that needed improvement are (1) requirements, (2) acquisition management, and (3) outsourcing.
2. ***Why improve integrated processes?*** The objectives are to improve the effectiveness and efficiency of the FAA systems.

   a. Effectiveness:

      (1) Avoid suboptimization because it may be a system problem, not a software problem.
      (2) Do not focus too much on development measures because that may adversely impact maintenance.
      (3) Address interfaces and interrelationships of the parts of the system.
      (4) Mark importance of hardware-software interfaces.
      (5) Obtain integrated product teams that perform integrated processes.
      (6) Align processes with business objectives before integration across the business.
      (7) Enhance the corporate culture of continuous improvement.
      (8) Conduct teamwork across lines of business and from executive to practitioner.

   b. Efficiency:

      (1) Conduct training and appraisal, resulting in fewer processes to improve.
      (2) Reduce complexity of processes and systems.
      (3) Pursue common goals of vision, focus, and clarity.
      (4) Get everyone involved to pursue the same goals.

3. ***How to achieve integrated process improvements.*** Be prepared to change when an opportunity emerges for integrated process improvement.

   a. Prepare process improvement guidance that relates to actions across the enterprise.
   b. Have enterprisewide vision and goals.
   c. Have a strategy and plan to take advantage of opportunities.
   d. Have the right resources to implement the change.

The FAA-iCMM[sm] is the model for FAA activities to improve its processes throughout facilities conducting such vital services as air traffic control. Derived from the CMU/SEI capability maturity model, FAA-iCCM has reduced the 53 separate process areas of the CMM to 23 integrated process areas. There is only one appraisal compared to the three of the CMM.

The FAA went beyond software improvements to the more robust thinking of ***system integration.*** Software improvements are one step forward in an uncoordinated way, whereas system integration considers the enterprisewide positive and negative impact of change. It is the goal of the FAA to achieve greater improvements through a systems approach rather than just focus on software improvements.[5]

The Project Management Institute has been researching and developing an organizational project management maturity model that includes both a staged and continuous approach. This work, conducted under the direction of John Schlichter, is progressing toward a fully capable model as defined by the Project Management Institute. Reports of progress have been made by Margaret Combe in 1998 on preliminary results.[6] In 1999, Schlichter and Duncan (PMI Standards Committee) reported on their interpretation of what project management maturity means to them.' The outcome of the Project Management Institute's efforts will certainly have a major influence on the future of project management maturity models and will provide a baseline for further evolution of the concept of maturity measurements for project management capability.

10.4 TOTAL ORGANIZATIONAL CAPABILITY MATURITY MODEL

Building a capability maturity model by leveraging the work that has been done for software (SEI CMM) and integrated processes (FAA-iCMM) permits structuring to engage all elements of a business. The SEI CMM and FAA-iCMM's strengths in selected areas demonstrate the need for improving business for better productivity and profit. Business in general needs a model from which to leverage its strengths and to advance in a competitive marketplace.

Figure 10.1 provides the framework for balancing business initiatives by first establishing the mission with its objectives and goals within an overall vision of where the company wants to be. Any capability maturity model must consider that these choice elements flow down the requirements of what the business must accomplish and when the goals will be met.

The company's strategies, or the means by which the business will be achieved, are critical to success. Unrealistic strategies to fulfill the objectives and goals, such as use of resources that are beyond the capacity of the organization, will materially

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[5]Paraphrased from Dr. Linda Ibrahim, "Integrated Process Improvement: Is Software Improvement Enough?" SPI 99 Conference, December 2, 1999, Barcelona, Spain, 52 slides. (No copyright.)

[6]Margaret W. Combe, "Standards Committee Tackles Project Management Maturity Models," ***PM Network*** August 1998, p. 21.

'John Schlichter and William R. Duncan, "An Organizational PM Maturity Model," PM ***Network,*** February 1999, p. 18.

affect implementation through projects and programs. The first order of any maturity model must be an examination of (1) vision, (2) mission, (3) objectives and goals, and (4) strategies. These top-level business elements cannot have any significant flaws or the implementation will be impacted.

A total organizational capability maturity model could be structured as follows:

- ***Vision.*** Establishes an image of a future position for the enterprise that is favorable to its business.
- ***Mission.*** A broad, umbrella statement of the business that the company is pursuing that establishes the guidelines, in general terms, that focus the organization's use of resources.
- ***Objectives and goals.*** Establish narrow areas of work to be achieved and, by doing so, represents a detailed elaboration on the enterprise's mission.
- ***Strategies.*** Establish the means through which the objectives and goals will be pursued.
- ***Projects and prograrns.*** Sharply focus objectives and goals that give the organization the methodology, techniques, and tools to achieve selected products, services, or processes.
- ***Operational plans and organizational design.*** Align the organization and its resources to accomplish work through project management or other appropriate means.
- ***Policies, procedures, protocols, and systems.*** Align practices through published guidance and establishment of a systems approach to performing work.

A total organizational capability maturity model would examine the top-level guidance to determine the adequacy for the business being pursued. Table 10.2 outlines some of the questions that might be asked.

The questions posed in Table 10.2 should all be answered yes to have a solid foundation from which to conduct further examination of an enterprise. If the answer is no, can the projects be expected to be successful? Any capability maturity model must have a foundation that provides the stable basis for project actions.

There are typically two types of maturity models being described in current literature: the continuous project management maturity model and the staged project management maturity model. These two models form the overall framework for improving project management through a structured approach.

- ***Continuous project management maturity model.*** A model that establishes a baseline for an organization through an assessment; specific elements are then used as criteria to establish what will be improved and at what rate. Figure 10.2 depicts the continuous project management maturity model.
- ***Staged project management maturity model.*** A five-step model that establishes criteria for each step. This permits incremental improvements in all areas being addressed for projects. All areas are considered essential to project maturity and given similar weight for improvements. Figure 10.3 depicts the staged project management maturity model.

TABLE 10.2 Strategic Element Evaluation

Vision
- Is there a vision for the organization?
- Does that vision convey the future business in a clear fashion?
- Do the people in the organization understand and agree with the vision?

Mission
- Does the mission statement clearly define what business the enterprise is in?
- Does the mission statement match what the enterprise is pursuing for business?
- Is mission a broad statement of what business the enterprise is in?

Objectives
- Do the objectives provide guidance on what will be achieved?
- Do the objectives tell what is to be achieved?
- Are the objectives an elaboration of the details of the mission?

Goals
- Are the goals milestones to be achieved in executing the mission?
- Are the goals time-focused and specific as to the expected results?
- Are the goals consistent with the business the enterprise is pursuing?

Strategies
- Are the strategies the means by which the enterprise will achieve the objectives and goals?
- Are the strategies realistic within the resource constraints of the enterprise?
- Are the strategies success-oriented?

Source: Adapted from the discussion of the term "strategic choice," which was previously used in William R. King and David I. Cleland, *Strategic Planning and Policy* (New York: Van Nostrand Reinhold, 1978), chap. 6.

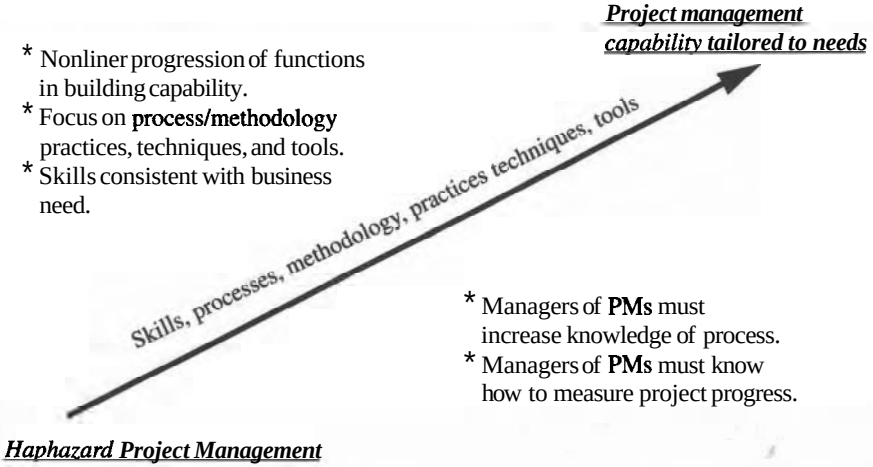

FIGURE 10.2 Continuous project management maturity .model. *(Source: Lewis* R. *Ireland, "Executive Project Management Training Course," prepared for PMI® Pikes Peak chapter training course, Colorado Springs, Colo., 1998.)*

The continuous improvement model has to be tailored to fit the organization's needs. For example, some organizations do not include procurement in their model because it is not a critical part of their projects. There would be little or no gain for the organization to divert resources to improving an element not essential to the business. The development of an improved project management capability also needs to be consistent with the advancement of capability. Training in project management must be consistent with the organization's needs.

At the lower end of Figure 10.2 is the label "Haphazard project management." This is identified as such because the work is done in a random manner and each project manager has a different methodology for projects. The inconsistent approach does not maximize the effort to achieve the best results. Following an assessment of the current practices and the organization's project management needs, a plan for a continuous improvement model can be established and implemented.

The staged project management maturity model has criteria for levels 2 through 4; level 1 is the unaudited current situation in an organization. The capability at level 1 can have significant strengths and weaknesses in the capability to implement project management. Bringing the strengths and weaknesses into balance for a full capability will require leveraging the strengths and eliminating the weaknesses.

Both models have used the Project Management Institute's division of project management into nine functional areas—integration, scope, time, cost, human resources, risk, communications, quality, and procurement. These elements are widely recognized as the standard for project management areas and defined in the ***Guide*** to ***Project Management Body of Knowledge,*** published by the Project Management Institute.

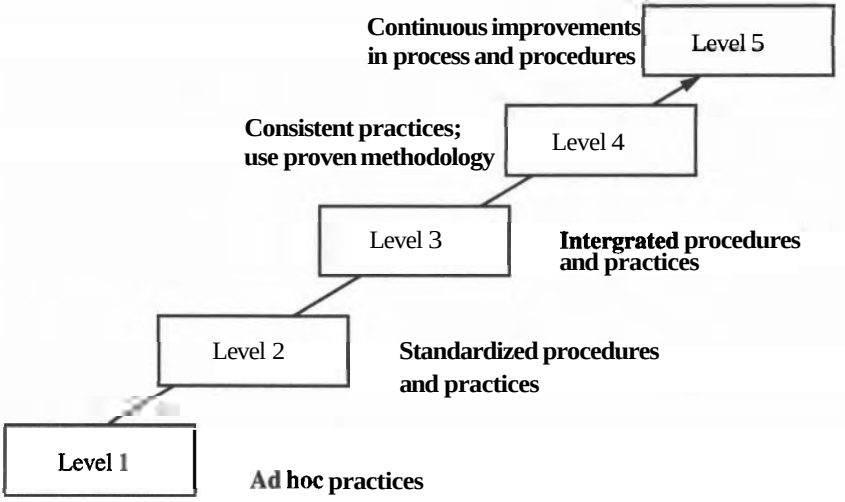

FIGURE 10.3 Staged project management maturity model. ***(Source: Lewis R. Ireland, "Executive Project Management Training Course," prepared for PMI" Pikes Peak chapter training course, Colorado Springs, Colo., 1998.)***

Each area must be assessed against a standard practice and criteria to provide consistent results for sequential audits. The criteria need to be developed on the basis of business needs to achieve a tailored solution specifically for an enterprise.

Table 10.3 gives a layout for the responses to a questionnaire that may be used to collect information regarding project element maturity. The questions are developed to evaluate the element and to determine the degree to which certain practices are employed. Subelements are questions that specifically relate to the element, for example, Scope: Do you consistently develop a scope management plan?

General questionnaires would be supplemented by interviews with project stakeholders to obtain information on the project management practices and their effectiveness. Organizational guidance and project documents would be assessed for their completeness and effectiveness. Any assessment should also determine whether the published guidance is used.

Interviews are typically conducted to follow up on items in the general questionnaire that are either skewed to one side or the other, lack answers or have insufficient responses to determine what is the true situation, or have answers uniformly distributed across a range of solutions. Interviews should focus on resolving the data that give no clear indication of the situation. Interviews may also probe into areas that appear to be important following the general questionnaire analysis. Interviews may be the only means of resolving apparently conflicting results from the questionnaires.

Document review should be conducted in order to assess the highest level of guidance to the project level. Conducting a document review may find the following weaknesses in the system.

- Organizational documents are nonexistent, provide inadequate guidance, are not being used by the project team, are not available to the project team, or are overly detailed and cumbersome to use.
- Project charter may either be nonexistent, inadequate in detailing responsibilities, or overly restrictive for the project manager.
- Project plan may have too little or too much detail. It should include:
  - Scope statement.
  - Specification for product.
  - Statement of work.
  - Schedule.
  - Budget.
  - Risk plan.
  - Communication plan.
  - Procurement plan, if needed.
  - Human resource plan.
  - Quality assurance and quality control plan.
  - Other plans tailored to the project.

TABLE 10.3 Evaluation Elements and Subelements (Example for Questionnaire)

Element and questions	Score* N/A	1	2	3	4	5
Integration						
1. Do you consistently prepare an integration plan?						
2. Are integration activities included in the WBS?						
3. Are integration activities included in the schedule?						
4. ...						
Scope						
1. Do you consistently develop a scope management plan?						
2. Is the scope management plan used on the project?						
3. Is the scope management plan updated to reflect changes to current practices?						
4. ...						
Time						
1. Is the schedule based on a WBS?						
2. Is a schedule developed for each project to reflect the tasks/activities and their durations?						
3. Are schedules realistic and based on sound estimates of the work to be done?						
4. ...						
Cost						
1. Is a cost estimate done for each project?						
2. Does each project have a time-phased budget?						
3. Are expenditures controlled through a positive process?						
4. ...						
Risk						
1. Is a risk management plan developed for each project?						
2. Has a risk assessment been conducted for each project?						
3. Have contingency and management reserves been established for risk?						
4. ...						

TABLE 10.3 Evaluation Elements and Subelements (Example for Questionnaire) (Continued)

Element and questions	Score* N/A	1	2	3	4	5
Quality						
1. Have quality control and quality assurance plans been developed for each project?						
2. Is there a quality assurance process in place for each project?						
3. Are quality validation procedures in place for each project (tests, demonstrations, audits)?						
4. ...						
Communications						
1. Is there a communication plan prepared for each project?						
2. Have meeting procedures been established to most effectively manage the meeting time?						
3. Have standard reporting procedures been established for each project?						
4. ...						
Procurement						
1. Is there a project procurement plan in place for each project?						
2. Is there an established procedure for requesting goods and services?						
3. Is there a procurement expert identified to support your needs?						
4. ...						
Human resources						
1. Is there a human resource plan developed for each project?						
2. Are all the skill requirements identified for the project during planning?						
3. Do the skill requirements typically match the available resources?						
4. ...						

*Legend: N/A: not applicable in my organization; 1: never done in my organization; 2: infrequently done in my organization; 3: about half the time done in my organization; 4: done most of the time in my organization; 5: always done in my organization.

Source: Adapted from presentations to PMI® chapters (Colorado Springs, Colo.; Denver, Colo.; Tacoma, Wash.; and Seattle, Wash.), Lewis R. Ireland, "Assessing Project Management Maturity," November 2000.

- Training records reflect the wrong training for the project team or inadequate knowledge and skills training.
- Active issues logs, action item logs, configuration change logs, and reports may not be current and prosecuted.
- Contractor and vendor agreements may be inaccurate or out of date.
- Time cards or time reports may be inaccurate and poorly administered.

10.5 ASSESSING PROJECT MANAGEMENT MATURITY

Assessing project management levels of maturity is accomplished through a series of audits. The first audit establishes where the organization is currently in terms of maturity and identifies areas for improvement. Audits are typically conducted in the following sequence:

- Identify and adopt the capability maturity model for the organization.
- Identify the areas to be audited and the criteria for each area of audit.
- Select an audit team either from internal resources or external sources.
- Conduct a briefing for the audit team to set expectations regarding how and when the audit will be accomplished.
- Conduct the audit.
  - Administer questionnaires to selected personnel.
  - Interview selected personnel.
  - Review project documents.
  - Collect artifacts from projects.
- Prepare audit report.
- Brief audit results.

Senior management sets the tone for any audit—it is a fact-finding effort, not a fault-finding effort. To obtain full cooperation from those persons being audited, the questionnaires and interviews should be confidential and reports should not make direct reference to anyone or any group. The only exception to any audit confidentiality is that unsafe or unlawful acts must be acted upon; all persons being interviewed should understand this.

Conduct of the audit must be professional and made without comment to the persons being interviewed. No "results" type of information should be released to individuals because emerging results do not consider all aspects of the audit and may be misleading. The final report should be prepared and briefed to senior executives. Those individuals participating in the audit should also be provided feedback on the results.

10.6 BUILDING A MATURE CAPABILITY

Recognizing opportunities for improvement is the first step in building a mature organization. Any weakness at the top of the organization will limit the ability of elements at lower levels. Take, for example, outdated or erroneous guidance in the organization's policies and procedures that are being used by project managers. This guidance can cause a wide variance from the most favorable path and consume resources for no benefit.

Selecting the right model and assuring that it is a fit with the strategic focus of the enterprise initiates the process. Using the model's criteria and developing new criteria will align the model to the organization's vision and mission as well as validate the objectives and goals.

Starting at the top of the organization to correct weaknesses will yield better results than correcting the small items within projects. For example, training seems the obvious and immediate need in order to enhance knowledge and skills within projects. If the methodology is not in place, training would not be appropriate for any particular method of performing project work. Further, once trained individuals use a specific method, it takes more effort to change them to a new method. Vision, mission, objectives, goals, and strategies need to be validated first.

An audit will identify many of the opportunities for improvement and point out strengths and weaknesses. There needs to be a plan for when, how, and why the changes will be made. Some changes may eliminate weaknesses in other areas. For example, a change to the scheduling software may improve resource management on projects when resource allocation has been identified in the resource management area.

Table 10.4 summarizes actions needed to build an improved project management capability.

10.7 BENCHMARKING

Benchmarking may be a tool in developing maturity criteria for any organization that is tailoring a capability maturity model for its use. The dynamic nature of business often dictates that an organization find new and better practices that meet the competition's approach. Benchmarking is also presented in Chap. 21.

Benchmarking is a strategy for measuring organizational products, services, and organizational processes against top-of-the-line competitors and industry leaders. This measurement is accomplished to determine whether an organization is using best-in-class practices for business operations and for development of new performance standards against which to evaluate the enterprise.

The use of benchmarking varies among industries. Some reports claim that benchmarking is as low as 5 percent within an industry, whereas others claim that it is a widespread practice. One claim is that there was a savings of $7.3 million

TABLE 10.4 Actions to Build on Project Management Capability

Item	Action
Select maturity model.	Evaluate project management maturity model that meets the needs of the organization's business.
Review vision, mission, objectives, goals, and strategies for alignment and focus.	Senior management conducts a review or has an outside consultant review the organization for strategic alignment with business.
Audit project management functions.	Identify strengths and weaknesses to determine opportunities for improvement within the overall strategic focus of the business.
Audit project management support functions.	Identify strengths and weaknesses of support to projects to determine opportunities for improvement.
Plan for improvements.	Prepare a business improvement plan that establishes priority and criteria for implementing changes.
Perform improvements.	Initiate changes and assess impact of changes.
Conduct follow-on audits.	Validate effect of changes and effect of improvements on the business.
Position for continuous improvement.	Change the culture over time to encourage continuous improvements in both product and process.

in oil exploration operations because benchmarking found a more efficient method for drilling. Another claim by a university is that benchmarking was used to develop the curriculum for an MBA program.

Some examples of benchmarking results demonstrate the effects of programs within major industries:

- General Motors has pushed benchmarking in a big way. Every new operation must be benchmarked against the best in the class, including companies not in the car-making business. A project team of 10 people from GM helped coordinate GM's worldwide benchmarking strategies.[8]
- When Digital Equipment benchmarked its manufacturing operations, it discovered that its costs were 30 to 40 percent too high?
- Ma Bell's Global Information Solutions (GIS) constantly benchmarks itself against rivals and surveys customers constantly, turning the results into a measure

[8]Alex Taylor, III, "GM's $11,000,000,000 Turnaround, Fortune, October 17, 1994, pp. 54–74.
[9]Stratford Sherman, "Are You as Good as the Best in the World?" Fortune. December 13, 1993, pp. 95–96.

of "customer delight" on a scale of one to seven. Key characteristics of the culture at GIS include vision, trust, rewards, and compassion—all the tools of enlightened leadership.[10]

Benchmarking is accomplished through teams and is used in several different yet complementary contexts:

- ***Competitive benchmarking.*** The five or six most threatening competitors are studied and evaluated to gain insight into their strengths, weaknesses, strategies, and performance capabilities. This insight is then compared to the strategies and performance of the enterprise.
- ***Best in industry.*** The strategies, practices, and performance of the best performers in selected industries are studied and evaluated. Sometimes those enterprises selected for further study may or may not be in the same industry.
- ***Best in class.*** When information on a process is not typically available within an industry, the best source may be another organization that is not considered either within the industry or a competitor. The search is then on the process and who performs that process most efficiently and most effectively. For example, a medical manufacturing company may find the best process for delivery services in a food company.

Any benchmarking effort should consider the following questions in developing sources of information:

- Who are the most relevant competitors to examine?
- Who are the best performers in the industry to examine?
- Who does the best job of a certain type of service?
- What processes should be examined and to what depth?
- How will the benchmarking information be used to improve the enterprise's operations?

Every endeavor needs a plan to lay out the procedures for conducting the work effort. Develop a benchmarking plan that identifies what is being sought and how the information will be used. This plan should include:

- Purpose of benchmarking effort
- Anticipated results of benchmarking examination of other industries/businesses
- Anticipated organizations to be examined
- Sources of information about organizations identified
- Benchmarking team to collect information
- Relevant information
- Information analysis

[10] Thomas A Stewart, "How to Lead a Revolution," Fortune, November 28, 1994, pp. 60–61.

- ***Best competitor*** practices, ***best-of-industry*** practices, and ***best-of-class*** practices
- Dissemination of results to organizational units

Information useful for benchmarking can come from a wide variety of sources, both in the private and public domains. Company records, site visits, interviews, customers, suppliers, regulatory agencies, periodical literature, seminars and symposia, investment bankers, and brokerage firms are a few key sources for information. Use of the Internet has facilitated the ability to do effective benchmarking. There is usually more information available than can be reasonably collected and analyzed; therefore, information needs and the collection processes must be studied carefully before launching the benchmarking.

Many of the websites are transitory and new ones will emerge. Finding information on the Internet is best accomplished by using the "search" function for the category that a person is seeking. A "benchmarking" search will identify several websites and then a person can select the sites providing the appropriate information.

One Internet site lists more than 600 best practices of industry available for accessing information. Major categories of this website are:

- Customer service
- Human resources
- Internet and e-business
- Knowledge management
- Sales and marketing
- Business operations

Many companies have websites that list the basic information on their business. These websites may only reveal top-level information, but it is a good place to start identifying organizations, what they do, what products they sell, and their focus.

10.8 COMPETITIVE INTELLIGENCE

Competitive intelligence (CI) is the process of monitoring the competitive environment. CI enables senior managers in companies of all sizes to make informed decisions about everything from marketing, R&D, and investing tactics to long-term business strategies. Effective CI is a continuous process involving the legal and ethical collection of information, analysis that doesn't avoid unwelcome conclusions, and controlled dissemination of actionable intelligence to decision makers."[11]

Competitive intelligence refers to the collection of information on other businesses. It has been called business intelligence, but the current usage is competitive intelligence. This field has grown to the extent that a professional association has

[11] Parafrased from Society for Competitive Intelligence Professionals. 1700 Diagonal Road, Suite 600, Alexandria, VA. 22314. See www.scip.org.

been formed—Society of Competitive Intelligence Professionals (SCIP)—and publishes a bimonthly magazine—Competitive Intelligence Magazine.

Competitive intelligence, when properly collected, analyzed, and utilized, provides early warnings or alerts to shifts in trends. This intelligence aids senior managers in making the right decisions in a timely manner to maintain a competitive edge and for strategic positioning of the enterprise.

Intelligence refers to competitive and environmental data that have been evaluated to be useful in a specific situation, project, or class of situations found today in the global marketplace. The types of information about competitors that can be considered to be fair game for collection include a wide range of information on market pricing, discounts, terms, specifications, market volume, historical performance trends, estimates of competitor's share, reverse engineering of competitive products, marketing policies, major strengths and weaknesses, to name a few. Marketing information, production and product information, organizational and financial information, are additional areas on which competitive intelligence is needed.

To systematize the competitive intelligence process means that questions such as those that follow need to be answered and the answers melded into the competitive strategies of the enterprise:

- What needs to be known?
- Where can the data be obtained?
- Who will gather the data?
- How will the data be gathered?
- Who will analyze and interpret the data?
- How will the data collected be stored and disseminated?
- Who will use the data?
- How will the information collected be protected from "leakage" and sabotage?

The enterprise competitive data collection should be organized on a program basis. Interdisciplinary and interorganizational project teams can serve as the organizational design for the collection of competitive intelligence. The operation of these teams should follow the conceptual framework for the development of a project management process, and the execution of those processes should be similar to what would be done for any project.

An important part in the analysis of data and the formulation of the intelligence results is an analysis of the credibility and reliability of information. This means that experts from the different disciplines and functions of the enterprise should be able to accomplish two key appraisals of information: (1) appraisal of the source and (2) appraisal of the content.

Competitive intelligence is vital information in the strategic management of the enterprise. All intelligence data gathering, analysis, and use should be done to ensure the maximum value and credibility of the decisions being made and executed by the strategic managers.

10.9 TO SUMMARIZE

The major points that have been expressed in this chapter include:

- Several capability maturity models have been developed, most notably the SEI CMM, FAA-iCMM, and a variety of similar models.
- Capability maturity models, like the quality movement, improve productivity and competitiveness in the marketplace.
- The SEI CMM is a software improvement model developed through the Department of Defense by Carnegie Mellon University.
- The FAA-iCMM started as a software improvement model but evolved to a system model for the FAA.
- All maturity model implementation requires that assessments be made of the situations and compared to maturity criteria in order to advance within the model.
- Benchmarking is a means of identifying the best practices of other organizations and applying them to the enterprise's situation to achieve better results.
- Benchmarking provides the best practices for industry, class, and competitive analysis.
- Competitive intelligence is analyzed information about competitors and potential competitors that contributes to the decision-making process.
- Competitive intelligence was formerly called business intelligence and focuses on collection, analysis, dissemination, and use of intelligence.

10.10 ADDITIONAL SOURCES OF INFORMATION

The following additional sources of project management information may be used to complement this chapter's topic material. This material complements and expands on various concepts, practices, and theory of project management as it relates to areas covered here.

- John E. Martin and Pierre-Francois Healume, "Risk Management: Techniques for Managing Project Risk," chap. 12 in David I. Cleland (ed.), ***Field Guide to Project Management*** (New York: Van Nostrand Reinhold, **1997).**
- Francois Lacasse, "Goal Definition and Performance Indicators in Soft Projects: Building a Competitive Intelligence System," chap. 1 in David I. Cleland, Karen M. Bursic, Richard J. Puerzer, and Alberto Y. Vlasak, ***Project Management Casebook,*** Project Management Institute (PMI).
- Michael O. Tingey, ***Comparing ISO*** 9000, ***Malcolm Baldrige, and SEI-CMM for Software*** (Englewood Cliffs, N.J.: Prentice Hall, **1997).** This book's comparison of three leading programs for organizational improvement brings out the best practices to provide a framework to apply to any capability maturity

model. The author highlights the strengths of each program, such as ISO 9003 having the best process orientation and Malcolm Baldrige for having the best approach to leadership. This book serves as a guide through the competing frameworks and allows the reader to select the optimum approach for an organization. As an added bonus, the author discusses the "whats" and "whys" behind each program to clarify and promote understanding.

- Christopher E. Bogan and Michael J. English, ***Benchmarking for Best Practices: Winning through Innovative Adaptation*** (New York: McGraw-Hill, *1997).* The authors, experienced in benchmarking practices and quality, describe their nine-step benchmarking model that leads through the fundamentals to world-class quality. This book focuses on successful benchmarking to change corporate attitudes to bring an end to "not invented here." The book contains many examples and suggestions for how to select benchmarking targets, organize for rapid learning, and implement strategies. One theme in the book is "learn by borrowing and adapting approaches" to improve practices.
- Charles Halliman, ***Business Intelligence Using Smart Techniques,*** Information Uncover, Houston, Tex., ***2001.*** This book explores environmental scanning and business analysis with ideas that can potentially improve an organization's strategic outlook. It shows how to examine the business environment for threats and opportunities. It explains the environmental forces: regulatory, marketing, foreign, management, and competitor. There are examples of business concepts and competitor activities presented.
- Scott Campbell, "Benchmarking Centers Pushed by Support Net, IBM," ***The Newsweekly for Builders of Technology Solutions,*** May ***21, 2001,*** p. ***92.*** This article describes how benchmarking centers are being encouraged by Support Net and IBM. These facilities are expected to cost $1 million each and will store information to be accessed for business purposes. The reported heavy investment demonstrates the value assigned to benchmarking and its anticipated payoff through the sale of information to various consumers.
- Sandra Bolan, "Competitive Calibration," ***Computing Canada,*** May ***4, 2001,*** p. ***24.*** This article describes benchmarking as a way of calibrating an organization against competitors to discover and adopt best practices. It reports that only 5 percent of companies have active benchmarking programs and that companies must "do it right" with up-to-date internal analysis and external metrics. An assertion is made that companies that perform annual benchmarks typically have a ***20*** percent higher improvement ratio than other companies.
- Stephen H. Miller, "Competitive Intelligence—An Overview," ***Competitive Intelligence Magazine,*** Society for Competitive Intelligence Professionals, Alexandria, Va. (available through ***www.scip.org***). This article provides an overview of what competitive intelligence is and isn't. It demonstrates the value of competitive intelligence and identifies some of the people involved in competitive intelligence activities such as financial planners, business development people, strategic planners, and marketing planners. This is a quick look at the role of competitive intelligence in an organization and SCIP.

10.11 DISCUSSION QUESTIONS

1. Discuss the concept of a capability maturity model for a company that you are familiar with and have knowledge of its project management system.
2. Discuss the requirements for a basic repeatable process within an organization using project management as its primary approach to developing and delivery of products.
3. Compare the continuous improvement model to the staged project management maturity model and identify the benefits of both in a given organization.
4. Identify some criteria for attaining each level of maturity in the five-stage model.
5. Create five criteria for project management maturity at the repeatable level in the SEI CMM system.
6. Discuss the functions that are pertinent to improving one's project management capability. Are the nine functions from PMI appropriate for your situation?
7. Discuss the efficacy of using only a software capability maturity model for an organization and what effect it may have on other project management functions not related to software?
8. Benchmarking requires that sources of information be available. Identify six sources of information that are quick to access.
9. Benchmarking for better practices can be done in any industry. Discuss why a practice in one industry may be applicable to a business in another industry.
10. Benchmarking plans have specific goals. Discuss some goals that may be appropriate for benchmarking a product distribution system.
11. Competitive intelligence relates to the business information collected from other companies to aid in assessing current information for strategic uses. Discuss what type of information might be appropriate for strategic planning.
12. Competitive intelligence is collected from what another company may consider its trade secrets or proprietary information. Discuss the legal and ethical merits of collecting such information.

10.12 USER CHECKLIST

1. What efforts are being made in your organization to formalize improvements to project management capability and why?
2. What maturity model has your organization selected for improving its capability? If there is not one being used, does your company plan to adopt a capability maturity model in the near future?
3. Why and when would you use the continuous project management maturity model over the staged model? What advantages are there to the continuous model over the staged model?

4. For your organization, what elements would you select to improve on a continuous improvement model? Why those elements?
5. What strategic choice elements would be assessed in your selection of a capability maturity model and its implementation? Why?
6. Who in your organization is aware of the need for an improved or more mature project management capability? What authority or influence does that person have on implementing such a program?
7. If you are not currently implementing a capability maturity model, where do you think your organization is with respect to the five-level staged model? Why do you believe that (what evidence)?
8. Where is the strategic linkage of the project management capability maturity model within your organization? Who is managing this linkage?
9. What recent uses have been made of benchmarking to collect practices for adaptation to your environment? If none, why hasn't benchmarking been done?
10. What areas within your organization would you determine need a benchmarking program to improve practices, methods, or procedures? What would be the results of your benchmarking program?
11. What items would you include in a benchmarking plan if you were going to improve your administrative procedures for hiring technical people? Why would your hiring be different from what it is today?
12. Does your organization collect competitive intelligence to support planning and marketing efforts? How does this help your organization improve decision making?

10.13 PRINCIPLES OF PROJECT MANAGEMENT

1. A capability maturity model provides the means to enhance the organization's project management capability through top to bottom assessment and alignment of practices.
2. Capability maturity models are evolving to meet the needs of the total organization, not just software or just projects.
3. Assessing an organization identifies strengths and weaknesses for improvement opportunities.
4. Benchmarking supports project management initiatives through gathering and applying better practices of an industry, other organizations of a like type, or organizations unrelated to the operating industry.
5. Competitive intelligence is valuable in developing strategies for the organization or the project.

10.14 PROJECT MANAGEMENT SITUATION-GAINING PROJECT MANAGEMENT MATURITY

Semtac Corporation has been struggling with its project management capability. About half the completed projects are considered successful and provide the anticipatedbenefits. The best results seem to be obtained by a set of project managers who are "movers and shakers" in the organization. The not so successful project managers are quiet and appear to be efficient.

Senior management immediately concluded that the weakness was in the knowledge and skills of the project managers. Everyone agreed that training was the answer to the problem. The HR department was instructed to coordinate a training program for project managers to raise their competency in leading projects to success.

Everett Smith was tasked with developing the training program. Everett decided to first identify the shortfall in knowledge and skills by administering a comprehensive questionnaire on project management as a means of determining who would receive the training and what knowledge or skills were needed.

When the results of the testing was completed, there was no discernable difference between the "movers and shakers" and the other project managers. Everett then had the problem of sorting through the task that he was given. It was specific: 'Train those individuals in project leadership who need to upgrade their knowledge and skills." This appeared to be everyone tested.

The problem changed for Everett from training several project managers to convincing senior management that the problem was not in a shortfall of knowledge or skills on project management. There was another underlying cause of the failures on projects. Training for all project managers would have made some minor improvement to the situation, but not the dramatic shift in success rates desired by senior management.

10.15 STUDENT/READER ASSIGNMENT

1. In the project management situation above, it was assumed that a shortfall in skills and knowledge could be corrected by training. What could be the contributing causes of project failures?
2. If the problem with project success is not the project manager, but the system that project managers must operate within, what would you recommend to senior management?
3. If the project management process is a random one that depends upon the behavioral style of the project manager, what is the solution to correct the situation and increase success rates?
4. Describe how you would conduct an assessment of the Semtac Corporation to determine their level of project management maturity capability.
5. What model for capability maturity would you select and what modifications would you make to apply to Semtac's situation?

P · A · R · T · 4

PROJECT OPERATIONS

CHAPTER 11
PROJECT PLANNING

"Amid a multitude of projects, no plan is devised."
PUBLILIUS SYRUS, CIRCA 42 B.C.

11.1 INTRODUCTION

The most important responsibility of the project team is to develop the project plan in consort with other supportive stakeholders. Project planning is reflective thinking about the project's future in relationship to its present role in the design and execution of enterprise strategies. The project plan must be harmonious with the strategic plan of the enterprise, the functional plans, and, where appropriate, with the plans of the relevant stakeholders. If adequate project plans are developed, then an important standard for monitoring, evaluating, and controlling the application of project resources is available. If the project plans are inadequate, then the review of the project during its life cycle is greatly impaired.

In this chapter, a conceptual model of project planning is offered, along with a description of planning processes, considerations, and results that can be expected from adequate planning. The work breakdown structure is put forth as an absolute preliminary initiative to build on for the development of other project plans—such as schedules, scheduling techniques, planning charts, and networking techniques. A summary is given of the project planning elements, along with life-cycle planning, cost estimating, statement of work, project specification, and supporting functional plans. A citation of the generic work packages of project planning is offered as a template to guide the development of more specific planning work packages for individual projects. Included in the chapter content is a summary of the planning for project partners and outsourcing of project management, two growing areas of interest to project-driven organizations today.

11.2 THE IMPORTANCE OF PLANNING

Project planning is an important part of the "deciding" aspect of the project team's job to think about the project's future in relationship to its present in such a way

that organizational resources can be allocated in a manner which best suits the project's purposes. More explicitly, project planning is the process of thinking through and making explicit the objectives, goals, and strategies necessary to bring the project through its life cycle to a successful termination when the project's product, service, or process takes its rightful place in the execution of project owner strategies. This chapter offers an overview of the project planning function placed in the context of enterprise planning.

In Chap. 1, strategic and organizational planning is covered. The context or planning within the organization is depicted in Fig. 1.2. This figure shows the hierarchical relationship for the enterprise, with projects subordinate to the organization's mission, objectives, goals, and strategies. The operational plans and organizational design influence how project planning will be accomplished. For purposes of this chapter, project and program planning are considered the same.

Three types of plans are interrelated in an enterprise: the strategic plan, the functional plans, and the project plans. Project planning involves the development of a strategy for the commitment of resources to support the project objectives and goals. The project plan reflects the strategic plan of the enterprise in providing guidance in the likely forthcoming "strategic fit" of the "stream of projects" in the enterprise. The functional plans provide detailed guidance on how resources will be used to support the project purposes. All three plans are essential guides for the use of resources, as well as providing reciprocal guidance on how the three plans work together during their execution in creating value for the enterprise.

Project planning is a rational determination of how to initiate, sustain, and terminate a project. McNeil and Hartley define the basic concepts of project planning as developing the plan in the required level of detail with accompanying milestones, and the use of available tools for preparing and monitoring the plan.[1]

Project planning and controls are interrelated. Planning prescribes the path to be followed in executing the project, whereas the controls are the means to collect, analyze, compare, and correct. Project controls are an integral part of project planning. A useful flowchart model (Fig. 11.1) shows this interrelationship and shows the sequence in which planning is required.

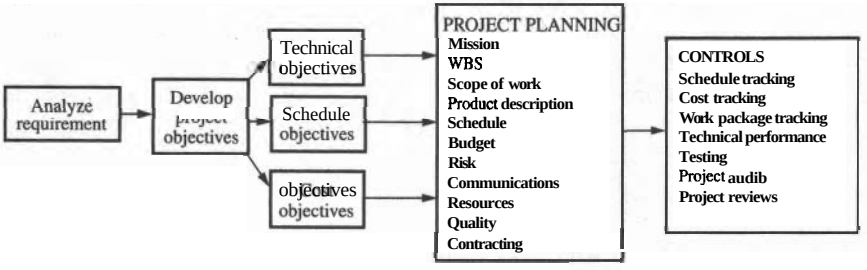

FIGURE 11.1 A flowchart of typical planning and control functions.

[1] Harold J. McNeil and Kenneth O. Hartley, "Project Planning and Performance:' Project *Management Journal,* March 1986, p. 36.

Project planning has played a key role in the outcome of successful nuclear power plant projects in an industry where many projects have had grave difficulties. For example, at the Erie Nuclear Power Plant project, an overall plan was prepared at the project beginning. This plan provided the basis for controlling and coordinating the activities of the participating parties.[2]

At Florida Power and Light's St. Lucie Unit 2 plant, adequate project planning contributed to project's success by calling for the appointment of a project management organization in the early stages of the project, an early total project schedule, and the planning, scheduling, and implementation of an effective start-up program.[3]

11.3 PLANNING REALITIES

The planning ethos of the 1970s, rooted in the extrapolation of history, has been discredited by the "bends in the trends" exemplified by the oil crises and the political and social upheavals of the late 1980s and early 1990s. It is giving way to a new approach to strategic planning. This new approach is based on a visionary view of the future gained by a growing awareness of the possibility of long-term strategic alliance building, project partnering, sharing of risk in exploiting new technologies and processes leading to earlier commercialization, and continuous improvement of product, service, and process development and implementation in maintaining a competitive edge.

Planning is the most challenging activity for a leader or manager. Planning starts with the development of a vision—the ability to see something that is invisible to others. People in general find that it is more comfortable to do the work than to plan. All too often people equate activity with progress. Taking time to think through a plan of action for the future is not considered active management or leadership. Planning involves thinking through the possibilities and the probabilities of the future, and then developing a strategy for how the organizational resources will be positioned to take advantage of future competitive conditions.

Planning is a responsibility of the project leader. Finding ways to get the full-hearted cooperation of team members and other stakeholders will facilitate the planning process and improve the chances of the development of a project plan to which members of the project team are committed.

Planning for the use of resources precedes the monitoring, evaluation, and control of resources. Insufficient front-end planning, unrealistic project plans, failing to estimate the degree of complexity, and lack of consideration for the project's objectives will lead to reduced accomplishment of project objectives. When planning is done by an active, participating project team, the interactions and communications give greater insight to the project work. Interactions among the

[2]Barry M. Millet and Charles D. Williams, 'Management Action through Effective Project Controls: A Case Study of a Nuclear Power Plant Project," *Proceedings*, PMI Seminar/Symposium, Los Angeles, October 1978, vol. 2, pp. G.1-G.5.

[3]Paraphrased from W. B. Derrickson, "St. Lucie Unit 2—A Nuclear Plant Built on Schedule," *Proceedings*, PMI Seminar/Symposium, Houston, October 1983, vol. 5, pp. E.1-E.14.

team members help develop the team and give the team members greater ease in dealing with each other. This guides the future use of organizational resources.

11.4 A CONCEPTUAL MODEL OF PLANNING

Project planning is preceded by comprehensive organizational strategic planning, because projects are integral elements of organizational strategies. A conceptual model, depicting the strategic context of organizational planning that includes both strategic planning and strategic implementation, appears in Fig. 11.2.[4]

Strategic considerations are addressed in Chap. 1 and will not be restated here. This section will address the project and how planning is accomplished, It is well to remember that projects are building blocks of the enterprise and that all projects must contribute to the organization's mission, as connected through organizational objectives and goals that are implemented through organizational strategies.

11.5 PROJECT PLANNING MODEL

Project planning begins within the framework of strategic planning in the organization. For example, the strategic planning phase at a steel corporation led to the approval of a comprehensive facility feasibility study for the location and configuration of the steel plant. As a result of this feasibility study, which evaluated seven alternative sites, the plant location was fixed at Cleveland, Ohio. During the planning for this facility, several options were considered, ranging from turnkey contract to construction management consultant to the owner acting as its own general contractor with subcontractors and/or in-house personnel. These options were considered in detail before final project planning was carried out with approved cost estimates and milestone schedules.

The strategic context of organizational planning, depicted in Fig. 11.2, sets the stage for project planning. Projects must adhere to the strategic "umbrella" to assure flow down of the enterprise's mission, vision, objectives, goals, and strategies. Using these concepts, project planning becomes an elaboration of the overall approach to business and provides for consistently building on the enterprise's capability to perform work through projects.

Understanding the strategic approach to business and linking that to the project planning will provide the means to pursue work that supports the organization's objectives and goals by using strategies that are adopted and used by the organization. Ensuring that projects, as building blocks for the business, contribute to the organization's growth and improvement is critical to future well-being.

Table 11.1 depicts the hierarchical approach at the project level and establishes an overall framework for project planning. This is an extension of the concepts in Fig. 11.2, which provides the umbrella for project planning. The definitions provide an understanding for each key element.

[4] Adapted in part from David I. Cleland and William R King, *System Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983), p. 63.

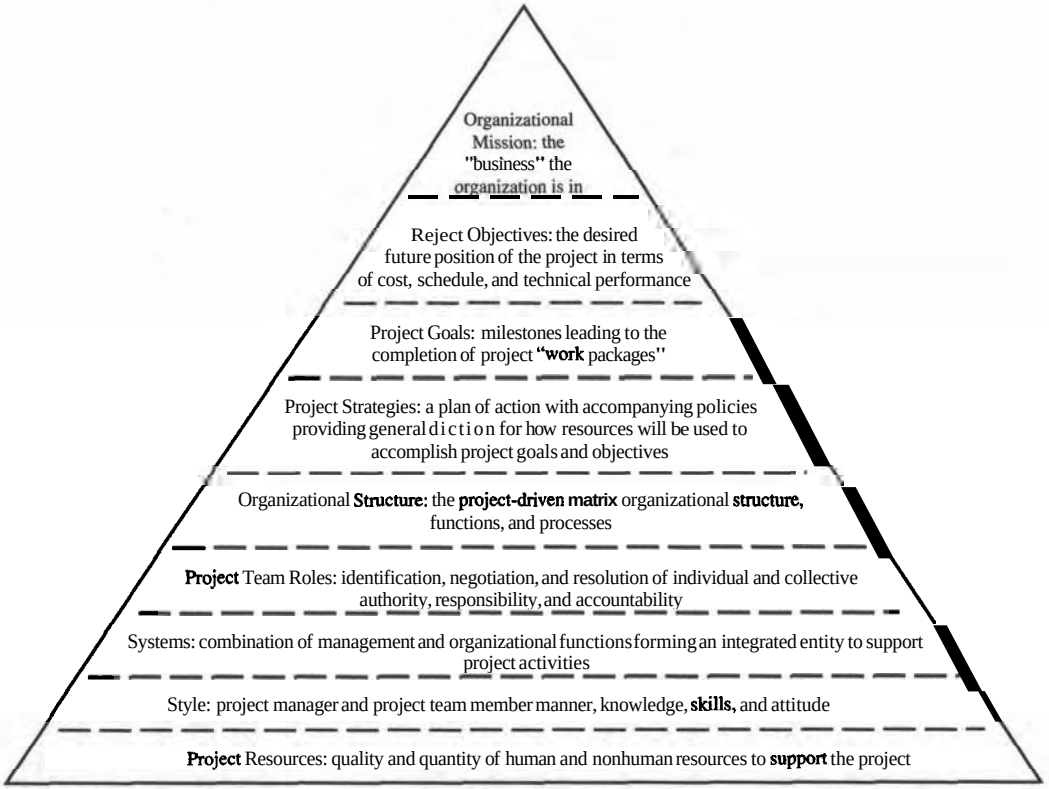

FIGURE 112 Elements in the project-driven matrix management philosophy.

TABLE 11.1 Project Planning in a Strategic Context

Strategic vision, mission, objectives, and goals for the enterprise that drives project planning	
Project planning element	Definition
Project mission/purpose	The central reason for the project, such as creating a product, service, or organizational process change.
Project objectives	The desired future position of the project in terms of cost, schedule, and technical performance.
Project goals	Milestones leading to the completion of the project's "work packages."
Project strategy	A plan of action with accompanying policies providing general direction of how resources will be used to accomplish project goals and objectives.
Organizational structure	The project-driven, matrix organizational structure, functions, and processes.
Project team roles	Identification, negotiation, and resolution of individual and collective authority, responsibility, and accountability.
Style	Project manager and project team member manner, knowledge, skills, and attitudes.
Systems	Combination of management and organizational functions forming an integrated entity to support project activities.
Project resources	Quality and quantity of human and nonhuman resources to support the project.

11.6 PROJECT PLANNING PROCESS

Projects often extend for many years into the future. Thus a project plan for such projects becomes both operational (short term) and strategic (long term). It follows that the project planning process requires both operational and strategic thinking. Creativity, innovation, and the ability to "think prospectively" form the basis for the project planning process. The real value of such a process is a framework of things to consider for a project's life cycle. A project planner's philosophy encompasses characteristics such as:

- The need to search out objective data that provide the basis for project planning decision making
- The value of questioning assumptions, databases, and emerging project strategies to test their validity and relevance
- An ongoing obsession with where the project should go and how it is going to get there

- A demonstrated ability to view project opportunities in the largest possible context and to constantly seek an understanding of how everything fits together during the project's life cycle
- A faith that, given ample opportunity, a ***bisociation*** will occur: the fitting together of separate events or forces on the project.[5]

Individuals making key project planning decisions today will have a long-term strategic impact on the organization. Generally, the strategic roles of key individuals involved in project planning are as follows:

- The ***board of directors*** reviews and approves (or redirects for further study) key project plans and maintains surveillance over the implementation of the plans.
- *Senior* ***management*** directs the design, development, and implementation of a strategic planning system and a project planning philosophy and process for the corporation.
- ***Functional managers*** are responsible for the integration of state-of-the-art functional technology into the project plans.
- The ***project manager*** is responsible for integrating and coordinating the project planning activity.
- The ***work package manager*** is responsible for providing input to the project plans.
- Professionals participate as required in contributing to the project planning processes.

By involving these individuals in the roles as described, key people are afforded the opportunity to participate in project planning. Of course, such participation requires relevant knowledge, skill, and insight into both the theory and the practice of project planning. By maximizing the participation of key individuals in project planning, the overall value of the project plan should be improved. One large project-driven organization recognized the value of project planning like this:

- During the early 1960s, after hundreds of projects had been completed, it became apparent that many projects successfully achieved their basic project objectives, whereas some failed to achieve budget, schedule, and performance objectives originally established.
- The history of many of these projects was carefully reviewed to identify conditions and events common to successful projects, vis-8-vis those conditions and events that dccurred frequently on less successful projects. A common identifiable element on most successful projects was the quality and depth of early planning by the project management group. Execution of the plan, bolstered by strong project management control over identifiable phases of the project, was another major reason why the project was successful.[6]

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[5] Arthur Koestler, *The Act of Creation* (London: Hutchinson, *1964).* He explains creativeness as the result of bisociation, of puning together unconnected facts or ideas to form a single new idea.

[6] Robert K. Duke, H. Frederick Wohlsen, and Douglas R. Mitchell, "Project Management at Fluor Utah, Inc.," *Project Management Quarterly,* vol. 3, no. 3, September 1977, p. 33.

Thus, project planning is the "business" of many individuals in the organization. Understanding planning concepts and how to develop realistic plans adds value to the organization and its ability to reach into the future to lay out a path for success.

Project planning may be considered a form of information development and communications. As the project team develops the project plan, the project team should learn more about the project goals, strategies, and team member roles. The project objectives then can be decided in terms of cost, schedule, and technical performance. Satisfaction of project goals is accomplished through the completion of the project work packages. The project strategy is a plan of action with accompanying policies, procedures, and resource allocation schemes, providing general direction of how the organizational effort will be used to accomplish project goals and project objectives.

Simultaneous project planning is the process of having the project team consider all aspects, issues, and resources required for the project plan on a concurrent basis. Concurrent planning means that everything that can or might impact the project is reviewed during the planning phase to ensure that an explicit decision is made concerning the role that all resources, however modest, might have on the project. Project start-up workshops can be useful in the planning phase of a project to help identify and get people committed to the notion of thinking through all probable and possible aspects of the project to be reflected in the project plan.[7]

11.7 PROJECT PLANNING CONSIDERATIONS

Many projects are started before the requirements are fully defined and understood. The lack of requirements, which may be the specification for a product, can allow the planners to drift away from the customer's needs. Once project planning starts in the wrong direction, it is difficult to correct. Like many other phenomena, the first 20 or 30 percent of the planning effort establishes a direction for the project.

The customer's requirements define what the project should be. Planners who understand the customer's requirements can collect the information to plan the project and apply appropriate project management practices and techniques to build a "road map" to project implementation, control, and closeout.

All too often, when people think of project planning they perceive the use of only techniques and concepts such as PERT or CPM networking. These concepts are briefly discussed in this chapter. The footnote references can serve as useful guidelines in using PERT and CPM networking.[8] These techniques are important to use in the development of a project schedule; however, project planning includes a much wider scope of activity. Such concerns as objective and goal setting,

[7] For a meaningful description of the role that planning workshops can play in project planning, see Alexander Walton, "Concurrent Planning Workshops: The Best Way to Communicate during Project Planning," *Proceedings*. Project Management Institute, 26th Annual Seminar/Symposium, New Orleans, October 1996, pp. 357–366.

[8] Joseph J. Moder, "Network Techniques in Project Management," in D. I. Cleland and W. R King (eds.), *Project Management Handbook* (New York: Van Nostrand Reinhold, 1983), chap. 16, pp. 303–309; and James J. O'Brien, *CPM in Construction Management*, 3d ed. (New York: McGraw-Hill, 1984).

cost estimating and budgeting, scheduling, resource usage estimating, and specification of deliverables are key concerns. Project planning also involves a delineation of the organizational design to support the project as well as the information system and the control system, which are used to model, evaluate, and reallocate resources as required during the execution of the project plan.

Project planning deals with the determination of the activities and resources that have to be utilized to ensure that the project is adequately executed. Authority, responsibility, and accountability have to be planned so that members of the project team know what their specific roles are and how they relate to other members of the project team who are involved in executing work package activity. The following key questions need to be answered:

- When is activity due?
- What is the time duration of each activity?
- What human and nonhuman resources are needed to execute each activity on the project?
- What are the estimated costs?
- How are the budget and financial plans to be established to support the cost considerations of the budget?

One of the changes under way in contemporary organizations is that more people are involved in and carry out the management functions.

Participative planning has been used effectively by AT&T. Participation is obtained through the use of workshops that include the entire project team and even customers in joint planning sessions. A planning process facilitator helps guide the activities and keeps the project planning moving forward. The purpose of these workshops is to have the participants agree on high-level project plans, schedules, and project monitoring and evaluation strategies. Held at the beginning of a project, the workshops achieve the benefits of early planning, including overcoming planning problems and getting the team members involved early in the planning, which leads to more commitment and dedication to their role on the project. In addition, team members are given an early exposure to their individual and collective roles in the project and an opportunity to identify any interpersonal anxieties that might hinder team development and operation at a later date. These start-up workshops have been successful in producing planning deliverables, developing planning skills, and building team interaction and cohesiveness?

The project manager is responsible for initiating action to bring about the development of a plan. In discharging the project leadership role, the project leader has the final responsibility for ensuring that "the right things are done" about the project plan. The complexities of deciding what the details of the project should be and doing things right rest with the specialists, who are members of the project planning team. Planning becomes a method for coordinating and synchronizing the forthcoming project activities. Project planning should be undertaken

%an Ono and Russell D. Archibald, "Project Start-up Workshops: Gateway to Project Success," Proceedings, PMI Seminar/Symposium, San Francisco, September 17–21, 1988, pp. 500–554.

after the project has been positioned in the overall strategy for the enterprise; then the detailed planning can be carried out with a high degree of assurance that the project planning team is working on the right areas.

Because planning involves thinking through the probabilities and possibilities of the project's future, a detailed cookbook recipe for planning cannot be provided. However, certain key work packages and planning tools have to be addressed in the development of the project plan of action. These planning considerations are described in the next section.

11.8 WORK BREAKDOWN STRUCTURE

The most basic consideration in project planning is the work breakdown structure **(WBS).** The **WBS** divides the overall project into work elements that represent singular work units, assigned either to the organization or to an outside agency, such as a contractor.

The **WBS** process is carried out in the following manner: Each project must be subdivided into tasks that can be assigned and accomplished by some organizational unit or individual. These tasks are then performed by specialized functional organizational components. The map of the project represents the collection of these units and shows the project manager the many organizational and subsystem interfaces to be managed.

The underlying philosophy of the work breakdown structure is to divide the project into work packages that are assignable and for which accountability can be expected. Each work package is a performance-control element; it is negotiated and assigned to a specific organizational manager, usually called a work package manager. The work package manager is responsible for a specific measurable objective, detailed task descriptions, specifications, scheduled task milestones, and a time-phased budget in dollars and work force. Each work package manager is held responsible by both the project and the functional managers for the completion of the work package in terms of technical objectives, schedules, and costs.

The work breakdown structure is a means for dividing a project into easily managed increments, helping ensure the completeness, compatibility, and continuity of all work that is required for successful completion of the project. The **WBS** provides the basis for a fundamental understanding of the scope of the project and helps ensure that the project supports organizational objectives and goals.

The process of developing the **WBS** is to establish a scheme for dividing the project into major groups, and then dividing the major groups into tasks, subdividing the tasks into subtasks, and so forth. Projects are planned, organized, and controlled around the lowest level of the **WBS.** The organization of the **WBS** should follow some orderly identification scheme; each **WBS** element is given a distinct identifier. With an aircraft, for example, the **WBS** might look like the information shown in Fig. 11.3.

[10]Paraphrased from D. I. Cleland and W. R. King, *Systems Analysis and Project Management,* 3d ed. (New York: McGraw-Hill, 1983), pp. 255–258.