

Appendix

Work Project Answers

It is not the answer that enlightens, but the question.

—EUGÈNE IONESCO—

Chapter 1

1. Project tasks and departmental routines can usually be distinguished clearly from one another in four ways:

- a. Project tasks are exceptions to normal responsibilities or the range of functions of a department. Routines, by comparison, are defined by the scope of the department itself.
- b. Project activities are related to one another in some manner. Routines are related to the function of the department.
- c. Project goals and deadlines are specific and finite. Routine goals and deadlines tend to be more general, cyclical, and perpetual in nature.
- d. A project's end result is identified specifically. Routines are undertaken as part of the course of departmental work.

2. The three constraints for every project are the result, budget, and time. Project managers must ensure that the result is well defined before beginning to work on the project. They must devise, monitor,

and control the budget; and they must ensure that interim and final deadlines are met.

3. The *definition* phase of the project includes four segments:
 - a. Determining the project's purpose
 - b. Identifying tasks
 - c. Developing a schedule
 - d. Creating a budget

The *control* phase has five parts:

- a. Putting together the project team
- b. Coordinating work during each phase
- c. Monitoring progress
- d. Taking action to correct unfavorable variances or avoid scheduling delays
- e. Completing the project on time

Both the definition and control phases require careful organization. Without either, the project cannot be completed in time or within budget, and the desired result will not even be defined.

Chapter 2

1. Six Sigma has two different aspects. As a system for managing projects and developing quality control, it describes the steps needed to move through the project. As a part of the organizational culture, Six Sigma enables people of all ranks to adopt an enlightened view of responsibility, teamwork, and effective improvement within the organization.

2. Weak links may include poor input data, flaws in processing, or lack of control over output. In other words, they can take place at any part of the process. However, if you focus on any place in the process where steps move between people or departments, you will locate the majority of weak links. This is where they are most likely to occur.

3. DMAIC (define, measure, analyze, improve, control) describes the methodical approach to project management. You *define* the team, the process owner, the goal of the project, and the steps in the process. You *measure* by data collection and defect prevention. You *analyze* sources, processes, data, resources, and communications. You *improve* with alternative solutions, experimentation, and planning for future change. And, finally, you *control* with specific quality control steps, standardization, and the way in which you respond when defects occur.

Chapter 3

1. The direct team structure involves contact between the project manager and each team member. This is an appropriate organizational structure when you are working with a small team and there is no need for an intermediate reporting level. The direct team structure is simple and reduces bureaucracy. Direct contact also improves team coordination and communication.

2. The organizational team structure is appropriate for larger teams. As project manager, you'll need to delegate responsibility to middle ranks; otherwise, you'll spend too much time on the details of the project and won't have time for important monitoring and control functions. Actual supervision over phases is delegated to assistants in order to free up your time for oversight.

3. The agenda for the initial project meeting should set a tone and create a participative environment. The agenda may include:

- a. **A List of Problems the Team Will Solve.** Your initial list may be expanded through discussions with team members.
- b. **Solutions the Team Should Reach.** Again, team participation can increase the overall quality of problem solving through the group's identification of additional or alternative solution paths.
- c. **Information the Team Needs.** You may be aware of several possible sources for raw data or completed reports useful to your team, and the team members may be able to offer additional ideas that could save time and effort.

- d. **Initial Assignments.** You probably start out with a fair idea of who should execute specific tasks or phases. But remember, team members have recurring deadlines and tasks to complete as part of their departmental duties, and there could be a conflict. Team members might suggest shifting or sharing project tasks.
- e. **Advance Planning.** Map out responsibilities for each phase of the project in advance, subject to modification later. At this point, your goal should be to ensure that the team is complete and that the team members appreciate the scope of the project.

Chapter 4

1. Having your project team imposed on you, rather than selecting its members on your own, is a difficult beginning to your project. When this occurs, consider these steps:

- a. **Suggest a different approach.** Talk to the person who gave the assignment to you and explain why you believe it's essential that you are involved in selecting your team—subject to upper management's approval.
- b. **Do your best with what you are given.** Even when your team is not the right team in your opinion, you still need to give it your best effort. If the decision has been finalized, there is little you can do to change matters.
- c. **Give team members the chance to excel.** When you don't give someone the benefit of the doubt, you miss the chance to be surprised and to let that person develop and prove his or her skills.
- d. **Request team members who work out well.** Ask for people on the next project who were especially valuable on your last one.
- e. **Ask to take part in the selection process.** You may not be allowed to pick your team with complete independence, but a compromise is possible if management will listen to your ideas and recommendations.

f. ***Suggest that department managers be involved as well.***

The team member's immediate supervisor could be a valuable participant in the selection process.

2. An area of responsibility includes a range of tasks falling within a defined skill level or emphasis. One employee may be especially skilled in analysis, interpretation, or writing, for example. The area of responsibility differs from the assignment of specific tasks in these ways:

- a. ***The project is defined not just by its phases but also by the type of effort.*** Team members better understand the desired end result when they are allowed to take responsibility over part of the overall project.
- b. ***Areas of responsibility are matched to skills of individuals or subgroups.*** You can achieve better results when you match tasks to skills and strengths, rather than just giving out tasks to a resource pool.
- c. ***The area of responsibility approach provides incentives.*** It allows team members to assume a sense of ownership over a phase or grouping of related tasks.

3. The outside department is assumed to have higher priorities than your project because:

- a. ***You need the manager's support.*** Be prepared to express your appreciation for the department's priorities, and recognize that assigning a member of that department to your project team creates hardships for the department manager.
- b. ***The department's work is permanent, whereas the project is only temporary.*** A project has a finite life, but the department's work continues month after month. From the employee's point of view, ongoing routines are higher priorities.
- c. ***Departmental tasks recur and often are tied to deadlines within the monthly cycle.*** Thus, the work of the department is likely to affect many other departments as well. Concede the point that the department's work has to come first. Anticipate

problems as far in advance as possible and work to avoid conflicts in the schedule.

Chapter 5

1. The percentage-of-completion shows your estimate of each phase’s portion of the total, based on labor expenses. This is a valid approach when labor represents most of your project budget. To calculate, divide the hours of each phase by total estimated project hours:

Phase	Hours	Percentage (%)	Cumulative Percentage (%)
1	28	10	10
2	63	24	34
3	76	29	63
4	97	37	100
Total	<u>264</u>	<u>100%</u>	

To calculate the dollar cost, multiply each team member’s hourly rate of pay by the budgeted hours in each phase:

Team Member	Hourly Cost	Phase			
		1	2	3	4
1	\$20	\$200	\$300	\$300	\$500
2	15	120	120	90	180
3	18	0	270	450	360
4	9	0	180	180	225
5	10	100	50	100	150
Total		<u>\$420</u>	<u>\$920</u>	<u>\$1,120</u>	<u>\$1,415</u>

3. Nonlabor expenses can be budgeted on the percentage-of-completion method, tied to labor. However, an adjustment is necessary if and when nonlabor costs do *not* follow the labor trend closely. On the assumption that expenses will follow the general trend of labor expenditures, calculate each phase’s expense levels by multiplying the percentage completed by the total—in the example, the total of ex-

penses. Assuming a total in nonlabor expenses of \$2,800, the budget would be calculated as follows :

Phase	Percentage (%)	Amount
1	10	\$280
2	24	672
3	29	812
4	37	1,036
Total	<u>100%</u>	<u>\$2,800</u>

Chapter 6

1. The following points are important when confronting delays:

- a. ***Every delay affects scheduling for the remainder of the project.*** Thus, if the first five phases are delayed by two working days each, you are ten days off schedule for the final deadline.
- b. ***To meet your deadline, delays need to be absorbed in later phases.*** It is unlikely that you will have the luxury of plenty of time since projects often are assigned with pressure for speedy completion. You need to plan for absorption of delays even when you have little or no scheduling flexibility.
- c. ***Though it's desirable to meet the final deadline, that is not practical if the outcome would be incomplete, inaccurate, or short of the desired result.*** You need to balance the importance of the deadline against the quality of the outcome.
- d. ***Staying on schedule and meeting the final deadline is your job as project manager.*** This means you must carefully track each and every phase—not only to avoid delays as they occur, but also to anticipate and prevent problems before they cause schedule delays.

2. Phases 1, 2, and 3 could be executed within the same time span. Even though it is important to define them as separate phases for the sake of clarity, they can be executed concurrently. The same approach will work for phases 5 and 6.

3. To eliminate delays, consider the following solutions:
 - a. Execute phases concurrently, even if your original plan called for consecutive scheduling. Look for instances where all or part of a phase can overlap another.
 - b. Double up the team's effort to absorb delays. This makes the most sense in later phases of the project as the final deadline approaches.
 - c. Begin preliminary steps on future phases to save time later.
 - d. Look for ways to speed up later phases, without sacrificing quality.

3. Delays can be eliminated in at least three ways. First, you can double up on processes that can be executed at the same time. There is not always a requirement that each phase has to wait until the previous one has been completed. Second, when the schedule falls behind, you can accelerate it by asking team members to put in more time to get back on schedule. Third, you can reduce future time constraints by seeking ways to speed up future steps in the schedule.

Chapter 7

1. Work Breakdown Structure (WBS) in outline form is a starting point for more detailed scheduling activity. WBS provides three important benefits:

- a. ***It allows you to identify responsibility by team member or subgroup.*** Once the outline exists, specific phases can be assigned individually.
- b. ***It provides the means to control time on a detailed level.*** From the outline, you can estimate time requirements for each phase and save time by identifying phases that can be worked concurrently.
- c. ***It helps identify weak links.*** These are points where work and responsibility pass from one person or group to another, and where delays are most likely to occur.

2. Project management is well suited to automated processing, assuming you also follow these guidelines:

- a. ***Solve the problems of project management as a first step.*** Don't make the mistake of believing that actual management can be replaced by automation.
- b. ***Identify recurring processes that might be better handled with an automated system.*** Don't assume that all project management tasks will work well within a program. Some management functions have to be handled one-on-one and cannot be reduced to software solutions.
- c. ***Automate for processing and record-keeping efficiency.*** Don't expect automation to replace your direct involvement with your team.
- d. ***Don't confuse project objectives and automation objectives.*** The project schedule and budget are achieved by team effort, which can be aided and made more efficient with the right software.
- e. ***Don't change procedures to compensate for software limitations.*** Remember, your priorities include getting the results you need. If a particular software program doesn't conform to what you need, then automation defeats your intended purpose.
- f. ***Develop practical and efficient systems for managing your project manually.*** Then look for ways to improve efficiency, including automating aspects of the job that make sense, such as schedule charting, work assignments, and budgeting.

3. Setting rules for how you'll prepare your project's flowchart can clear up confusion when trying to represent a complex procedure in visual form. The following guidelines will help:

- a. ***The precedence method should always be used.*** Every activity must be preceded by a logical activity or event.
- b. ***The activity and event paths have to make sense.*** Every process contains a logical flow that's identified by (1) defining what an activity should achieve, (2) understanding what is needed to get to that point, and (3) knowing what has to come next.

- c. ***An activity cannot occur until a preceding activity or event has been completed.*** For example, action cannot just start up in the middle of a process without any connection to a prior activity or event.
- d. ***Concurrent events have to be plotted, explained, and controlled with great care.*** The team may be involved in two or more phases at the same time, which is a challenge to your organizational abilities.
- e. ***Controlling weak links is the key to effective scheduling.*** Concentrate on ensuring that delays do not occur at weak links and you will prevent the majority of likely schedule delays.
- f. ***Decision points have to be flowcharted with great care to avoid confusion.*** Accompany decision points with narrative explanations and supervise these points closely to ensure that workflow continues on schedule.

Chapter 8

1. An *activity* includes all of the action steps required within a phase, which consists of several activities. An *event* is the result or outcome that is developed from a series of activities. Remember these points about activities and events:

- a. The action of preparing a report is an activity; the report itself is an event.
- b. Receiving a report from another department is an event, which leads to a subsequent activity or series of activities.
- c. Any information received from the outside represents an event. For the purpose of flowcharting definition, the tangible item (e.g., report, raw data, records) is called an event, and what is done with that item is classified as an activity.

2. Vertical flowcharting may be a necessary step in defining the logical sequence of phases. However, this method provides little for scheduling control and has several flaws, including:

- a. ***It lacks time requirement elements for each activity or phase.*** The network diagram solves this problem by linking each activity to a time line.
- b. ***There's no breakdown by area of responsibility.*** The network diagram is a superior tool for orienting your team because it shows workflow for the entire project and by area of responsibility.
- c. ***There's no breakdown of concurrent activity.*** The Gantt chart is a better tool for visualizing how work can proceed and for showing overlapping phases.

3. Weak links are points in your schedule where delays are most likely to occur, usually as the consequence of poor communication. The weak link is the greatest threat to keeping your project on schedule. The network diagram helps you to identify and anticipate each weak link; it occurs whenever the activity link goes from one area of responsibility to another.

Chapter 9

1. Quality control and value often cross over. By reducing time requirements as part of quality control initiatives, for example, value is added to the overall process. However, value may exist on its own simply as a result of greater efficiency from improved processes, without adding quality. When value is created without improvements in quality, one danger may be a *loss* of quality due to more efficient (but more relaxed) internal controls.

2. Organizational morale defines how motivated team members will be and how cooperatively outside resources are going to react to your requirements and to your recommended changes. Low morale kills spirit and infects others, and it is fixed only by improved communication and honest dealings from top management as well as from managers up and down the chain of command. As project manager, overcoming low morale can be among the most daunting of tasks. It often requires that you focus on isolating pockets of team members to focus on immediate tasks and to ignore larger organizational problems.

3. Making suggestions at the start of your project for methods of measuring success is wise because it helps management and your team to set and reach goals. At the same time, flexibility is important because specific goals might change; so these established interim goals might change as the project develops and moves forward.

Chapter 10

1. This series of activities involves two team members, so it should be divided into two separate sections. One solution is to show the sequence of actions, divided by team members, as shown in Figure A-1.

2. Loops are points in the network diagram where decisions need to be made. They are divided into three general types:

- a. Verification loops ask questions that are answered with a “correct” or “incorrect” response. For example, an activity requires checking math on a worksheet. If correct, proceed to the next activity; if incorrect, go to the previous step and find and correct errors.
- b. A decision loop is answered with a “yes” or “no.” For example, a rough draft of a form is submitted to the project manager for review. A “yes” response (i.e., approval) leads to the next activity. A “no” response (i.e., changes needed) leads the team member back to the drafting phase.
- c. A repetition loop is used when one activity is repeated several times. It is characterized by a response of “complete” or “not complete.” For example, an activity calls for checking the work of three employees. It needs to be repeated three times before proceeding to the next step.

3. An area of responsibility should not be difficult to define. As the project manager, you need to develop a concise definition of which team members or subgroups will be responsible for a range of tasks. Arrive at this definition through three methods:

- a. **Type of Work.** A specific activity requires exposure to the sources of specific types of information. Certain team members

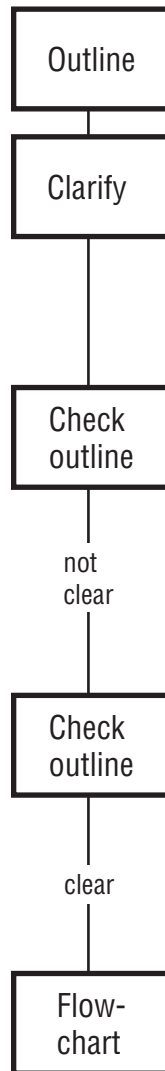
Figure A-1. Loops between two team members.

Team Member 1

- a. Prepare an outline of task and give it to team member 2.
- b. Team member 2 asks for clarification. Review the outline and clarify.

Team Member 2

- a. Check the outline submitted by team member 1.
- b. Is the outline clear? If not, ask team member 1 for help.
- c. When team member 1 has answered your question, return to previous step (check outline).
- d. The outline is clear. Proceed to the next step.
- e. Prepare a flowchart summarizing the steps in this procedure.



will have experience or expertise. For example, accounting employees are capable of working with numerical analysis and research, whereas marketing employees are more suited to market-related activities.

- b. **Individuals.** Certain team members are selected because of their experience and knowledge, especially if demonstrated on past projects or within your department. For example, you know that one person has the ability to organize a large body of information; that person would be a valuable team member if your project required that talent.
- c. **Phases.** Some phases of your project dictate the types of employees needed to execute them. For example, an employee with systems analysis training would be a valuable team member for a project involving the design and implementation of new software.

Chapter 11

1. Review involves the same elements in projects and departments. However, because the project is short term, it demands more concise definition and follow-through. The three issues involved are:

- a. **Defining a Standard for Performance.** Team members are expected to play a precise role in your project, so you need to provide them with guidelines for achieving the outcome you expect. This extends beyond schedule and budget requirements. Standards should include guidelines for quality of results, cooperation between team members, and the final result.
- b. **Finding Appropriate Applications of the Standard.** You need to develop a testing method for review and then determine what each test reveals. You measure and judge performance consistently only if you have a clear standard against which to make determinations.
- c. **Deciding What Actions (if Any) You Must Take.** Upon completing your periodic review, do you need to correct problems, either existing or anticipated? You may need to identify prob-

lems underlying scheduling delays related to teamwork, morale, or ability.

2. The project, unlike your department, involves a group of people who do not work together regularly. Their roles may not be well defined. Review is a constant requirement because problems can rise unexpectedly. The exceptional nature of projects places an added demand on you and your team that is not commonplace in the department.

3. When reporting to management on the status of your project, include these sections in your report:

- a. A brief description of the project
- b. The current status of the schedule and budget
- c. Explanations where needed (i.e., reserve this section for explanations of unsolved problems; don't take up space unnecessarily)
- d. Your expectations for the future (e.g., Will the project be completed on time and within budget? If not, what are the causes, and what can be done to overcome this problem? What delays, if any, do you anticipate to face between now and completion?)

Chapter 12

1. Establishing and maintaining communication with your core team members is difficult in and of itself. In addition, you must keep open the lines of communication with others, including:

- a. **The Assignment.** The executive who gave you the assignment may have a far different idea about what your project is meant to achieve. Only by ensuring that you are both on the same track will you be able to complete your assignment as expected. A second problem arises when the project's scope or definition are changed after you have started, which might occur without your being told. You are more likely to be told of any such changes if you keep in touch with your superiors.

- b. **Other Departments.** You cannot expect managers of other departments to adopt your project priorities at the expense of continuing work in their department. The department manager lives with a set of priorities, too, so your project takes second place. You can resolve many difficulties throughout the project by keeping this important point in mind.
 - c. **Outside Resources.** When you need the participation of other divisions, subsidiaries, vendors, or consultants, you need to remember this important reality: Your priorities aren't shared by others. They will not always appreciate the urgency of your requests or the importance of your deadlines.
2. Approach the communication challenge in dealing with other departments with a checklist of steps, which includes:
- a. **Visiting the Other Manager Before You Finalize the Schedule.** Make sure your proposed schedule will not cause conflicts for the other manager. Be willing to make adjustments when problems arise. Include the manager in your decision to improve communication and cooperation.
 - b. **Keeping in Touch While the Project Is Under Way.** The communication task is not limited to the early phases only. Communicate regularly with all department managers whose employees are part of your team.
 - c. **Working with the Manager to Anticipate Problems.** Think of the other department as a team member, never as an adversary. Just as individuals split their time between their department and your project, the department is being asked to split its resources between its priorities and yours.
 - d. **Remaining as Flexible as Possible.** Other departments face unexpected demands and scheduling problems for their work. This could affect your ability to stay on schedule, especially if employees are prevented from working on your project as a result. Maintain flexibility and understand that department managers cannot anticipate the unexpected; your schedule and use of resources is subject to constant revision.

- e. **Confronting the Problem, Not the People.** When dealing with outside departments, you can expect conflicts to arise in some form. Try to speak directly with managers to resolve these problems. Avoid confronting people, which is counterproductive. Instead, emphasize the problem and how you can work together to resolve it.
3. Set goals and express them as part of your agenda. Encourage action-oriented discussions and resolutions, and don't allow your meetings to end without resolving the problems. Your objectives should be to:
- a. **Express the goals of your project.** These define and add context to every discussion. They keep everyone on the subject at hand so your agenda isn't sidetracked.
 - b. **Explain the level of team commitment you need.** Even when conflicts between project and department arise, it is possible to arrive at a compromise that solves the problem.
 - c. **Specify deadlines for phases and final completion.** If deadlines are not taken seriously in your company, it's probably because they are missed most of the time. In a project, though, each phase deadline is critical. Phase deadlines and your final project deadline should be considered important.
 - d. **Identify "critical" phases that must be completed before the next step can begin.** Prepare a network diagram and identify these pivotal periods during the project. Remember, delays in critical phases have the greatest impact, because they prevent the project from proceeding.
 - e. **Point out the likely problem areas.** Remember to be proactive in anticipating and preventing problems.
 - f. **Agree on priorities for your project.** Make sure that every team member knows what is expected and what the project is supposed to accomplish.

Chapter 13

1. Leadership action in a project environment is not the same as that in a department. Projects are exceptions, have finite lives, and may

involve people who do not normally report to you. Organize your project with these actions:

- a. **Define the goals and purpose of the project.** It could take considerable effort to pin down management to the point of definition, yet this step is essential if the project is to succeed.
 - b. **Organize a schedule.** A complex project with many phases and a large team has to be organized carefully. Use your initial schedule to locate potential trouble spots, and devise solutions before your schedule is finalized.
 - c. **Develop a team approach.** When you bring your team together, encourage each member to take an active role in developing the schedule, meeting deadlines, and observing the budget.
 - d. **Resolve conflicts.** Problems arise, either due to scheduling delays or personality clashes. You need to anticipate these problems and resolve them diplomatically.
 - e. **Keep the lines of communication open.** Be continually aware of the overall network affecting your project. Team members, outside resources, other departments, and top management are all involved, and you need to remain in touch with everyone.
 - f. **Meet budgets and deadlines.** The project is judged by standards of performance—namely, the budget and the schedule. Making a sincere effort to meet these standards defines your capabilities as a project manager.
 - g. **Train and supervise team members.** You function not only in the role of controller and organizer, but also as the project supervisor. Ensure that all team members know their assignments and how to proceed. Provide all of the supervision and training each person requires.
2. As a successful project manager, you need to master these skills:
- a. Understanding and practicing the team approach
 - b. Applying a standard that isn't necessarily the same as you'd apply in your department
 - c. Organizing a multiple-level effort

- d. Remaining flexible when it comes to scheduling, priorities, and assignments
- e. Communicating with all affected people and departments

3. No single series of rules or standards applies to every project.

Among the variables that will affect your style are:

- a. ***The Makeup of the Team.*** If your team comes exclusively from your department, it is not difficult to operate the project. The real test comes when you need to work with team members from outside your department.
- b. ***Scope of the Project.*** As you might expect, longer-term projects with larger, more diverse teams are more difficult to coordinate. Thus, the ideas you employ to define, organize, and monitor your project should be altered based on the project's scope and composition.
- c. ***Cooperation From Other Departments.*** If you establish and maintain clear lines of communication and keep other managers informed, you minimize possible problem areas. However, no matter how much effort you give, you have no guarantee that other managers will cooperate. Conflict may still occur, and they'll vary based on your management style and on the motives and interests of other managers.
- d. ***Time Demands.*** Deadlines are the norm, and coordinating them with the desire for quality is the difficult part. Style has to take a lower priority in crunch situations.

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Glossary

area of responsibility The specific person, department, or other resource responsible for the execution of a task or process as part of the project; a team member or stakeholder involved in the project and its execution or in a process that is the subject of the project.

assumptions The underlying set of beliefs supporting a budget, schedule, or other effort involving calculation of future requirements; referred to in order to identify the causes of variances in budgets or time.

bar chart A chart based on a series of bars representing value or time, and prepared vertically or horizontally; the Gantt chart is a type of bar chart used to track the planned and actual schedules of project phases.

budget An estimate of the costs and expenses involved in the project; the financial road map used to monitor and control expenses of the project; the means of the financial monitoring of a project and a measurement of success based on planned and actual costs and expenses.

budget variance The outcome when the actual expenses of a project are higher (unfavorable) or lower (favorable) than the budgeted amount for the same time period.

Business Process Management (BPM) A process used to describe how work flows through the organization in a series of steps; the basis for preparation of a flowchart and for assigning tasks and processes among the project team.

control (a) The action of monitoring a process to reduce errors or to improve productivity; (b) a system designed to improve processing in terms of time and quality.

Critical Path Method (CPM) Method for tracking processes through a series of network paths and involving multiple participants, includ-

ing start and end dates for each segment of the overall process; a visualization of the project schedule.

decision loop A pattern within a process in which a decision may result in the process's continuing or being sent back to be fixed, repeated, or checked.

decision tree A visual tool in either outline or flowchart format used to analyze various outcomes of a proposed course of action; analyzes probable outcomes and the cost or benefit of each alternative.

diagram/narrative combination A technique for describing a process or task, in which a series of steps are shown via flowchart boxes and accompanied with written explanations.

DMAIC The action plan in a Six Sigma project, whose initials represent five specific steps: define, measure, analyze, improve, control.

Failure Mode and Effects Analysis (FMEA) The process of determining precisely what can go wrong and deciding how to reduce it, a concept used in Six Sigma-based project analysis; a risk management and prevention aspect of the Six Sigma approach to project management.

favorable variance The condition when actual expenses are lower than budgeted for a specified period of time or activity (project phase, for example).

flowchart A visual representation of a schedule prepared with great detail and in vertical or horizontal form; identifies the process, the responsible department or person (area of responsibility), and time requirements, and highlights potential weak links.

Gantt chart A type of scheduling chart named for its originator Henry Gantt; each phase is shown on a vertical plane from start to finish; also visually demonstrates phases that overlap. Additionally, planned and actual phase outcomes can be distinguished with the use of color variation (for example, white boxes representing the plan and black boxes the actual).

horizontal flowchart A type of flowchart representing the processing of information from left to right, including different rows for each area of responsibility and time requirements for each task or phase; the network diagram of a project.

loop A point within a process in which the path may need to be re-

peated based on one of three criteria: verification, decision, or repetition.

network diagram A left-to-right flowchart showing tasks, area of responsibility, and time requirements for a project.

process owner In Six Sigma projects, the individual or department that benefits from an improved process or system or that is involved directly with the input, processing, or output.

Program Evaluation and Review Technique (PERT) A diagramming system employed for project scheduling, in which time requirements are weighted to graphically demonstrate the overall time demands for the project and its phases.

quality control Any procedure designed to improve and maintain the highest possible level of quality and reduction of defects in a process. Systems such as Six Sigma are formalized varieties of quality control efforts.

repetition loop A pattern within a process in which completed tasks are moved forward to the next step and incomplete tasks are returned for further processing.

risk management The controls, planning, and preventive measures required to address and prevent threats, known or unknown, through specific measures: insurance, transfer, mitigation, and transfer.

schedule The document prepared by the project team to map out the steps in the project and to track progress toward a specified completion date; the means for controlling the overall time and deadline issues of a project, used to anticipate time delays and to take steps to avoid them.

SIPOC A process map used in Six Sigma projects to describe the chain of events that include five key elements: suppliers, input, process, output, and customers.

Six Sigma A quality control and project management system designed to quantify processes in terms of the rate of defects and, in addition, to train personnel within an organization in broad-based team attitudes. Defects are quantified by the study of the statistical value of sigma (σ) in order to track improvements in processes through the reduction of defects and variances. A six sigma is as close as

possible to a defect-free process, with fewer than four defects per million operations.

stakeholder Any department, company, or individual with a direct interest in the project and its outcome.

standard deviation A statistical calculation used to estimate the rate of defects in an operation; the standard used to identify the change in defects used in Six Sigma projects.

tabular format A WBS-based method for outlining a project by phase and task, in which vertical breakdown is developed, often as a preliminary step in developing more detailed flowcharts.

unfavorable variance The condition when actual expenses are higher than the budget for a specified period of time or activity (project phase, for example).

value chain A concept defining levels of both quality control and process management, used to ensure both quality and value as part of the improved final result.

verification loop A pattern within a process in which an outcome is checked; if the result is correct, the process continues and if it is not, the outcome is returned to be revised.

Voice of the Customer (VOC) In Six Sigma projects, an overlay of customer requirements as part of defining the project and its goals.

weak links Locations within a process where errors or defects are most likely to occur, usually found when processes are passed from one area of responsibility to another; identifying weak links is the key to deciding where control emphasis should be focused to make projects more effective.

Work Breakdown Structure (WBS) A system used to list and identify the specific task involved in the project, by way of flowcharts or outlines; the WBS is designed to ensure that all tasks and phases are included in the schedule and that these are planned out in a rational sequence for execution.

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