THE CERTIFIED Manager of Quality/Organizational Excellence HANDBOOK

FOURTH EDITION

Russell T. Westcott, Editor

Contributors – Milt Krivokuca, Jd Marhevko,
Heather McCain, Ken Sadler, Jan Tucker,
and Doug Wood

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THE CERTIFIED MANAGER OF QUALITY/ ORGANIZATIONAL EXCELLENCE HANDBOOK

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Fourth Edition

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Preface to the Fourth Edition

QUALITY MANAGEMENT—AN EVOLVING REQUISITE OF SOCIETY

Quality management has and continues to evolve from a rigid, structured function founded exclusively to monitor manufacturing processes to a more well-rounded function of total organizational performance. The traditional view of quality as a manufacturing-specific organizational cost center is rapidly becoming obsolete and being replaced by a more holistic approach to the functional definition of quality. The ASQ Futures of Quality study, conducted every three years, continues to reflect these perspectives of quality in our global society. The need for a holistic approach to quality is necessary to address the social responsibility, environmental, and sustainability concerns of society. This holistic approach extends an organization's place in society, going beyond providing products and services that are safe and reliable, to also being a respected member of the local community and global society. Organizations must recognize the expanded role of quality and how the principles of quality management have transitioned to those of organizational excellence. Any and every organization, from the sole proprietor entrepreneur to the largest multinational corporation, can benefit from the Certified Manager of Quality/Organizational Excellence (CMQ/OE) body of knowledge.

This increased complexity of societal expectations of organizations necessitates professionals who can demonstrate superior knowledge of the traditional functional areas of business while maintaining objectivity in assuring that organizations accomplish their mission and vision. The manager of organizational excellence understands how a delicate balance is necessary to meet customer satisfaction, global stakeholder concerns, and internal process efficiencies.

Since the inception of this certification, the title has been changed to reflect the current responsibilities of this profession. In this the fourth edition, significant changes have been made, and the body of knowledge has been revised, with additional emphasis placed in several sections.

CONTINUOUS LEARNING—PERSONAL EXCELLENCE AS A BASIS FOR ORGANIZATIONAL EXCELLENCE

The personal accomplishment of becoming a CMQ/OE provides professionals with the distinction of being formally recognized not only for superior knowledge, but also for exceptional comprehension of the complex issues affecting organizations and their performance. Additional opportunities are afforded those who possess formal recognition for their accomplishments, knowledge, and professionalism. These key CMQ/OE attributes are indicative of role models who thoroughly understand and are able to apply the principles of organizational excellence necessary to achieve world-class performance.

The body of knowledge is reviewed every five years through a very robust process. Extensive research related to the content of the body of knowledge and its applications is conducted utilizing a variety of quality methodologies. Conducting this analysis on a regular basis assures that the content of this handbook and the body of knowledge reflects the current responsibilities of mangers of organizational excellence.

The CMQ/OE body of knowledge remains in constant transition as global economic conditions, societal concerns, and technology continue to change. The transient nature of elements that impact organizational excellence requires that the CMQ/OE recertify every three years. Recertification assures that the CMQ/OE continues to have the most current knowledge of the issues and concerns of the global community.

Managers of organizational excellence will be tasked with applying critical, out-of-the-box thinking to solve complex issues facing organizations. The personal accomplishment of attaining the CMQ/OE recognizes that the fundamental skills and knowledge are in place to meet these challenges.

USE AND DEVELOPMENT OF THE FOURTH EDITION OF THIS HANDBOOK

This handbook is a comprehensive reference source designed to help professionals address organizational issues from the application of the basic principles of management to the development of strategies needed to deal with the technological and societal concerns of the new millennium. The content of the fourth edition is very similar to the previous edition, but theories and applications have been revised to reflect a more current global perspective. The residual value of this handbook is immeasurable. Although this handbook thoroughly prepares individuals for the ASQ CMQ/OE exam, the real value resides in post-exam usage as a day-to-day reference source for assessing quality applications and methodologies in daily processes. Along with the display of the CMQ/OE certificate, this reference source should be visible and readily accessible. The content is written from the perspective of practitioners, and its relevance extends beyond traditional product quality applications.

The contributing authors are all subject matter experts (SMEs) from the leadership team of ASQ's largest division, the Quality Management Division (QMD). This team consists of volunteers who are advocates for improving organizational performance. The royalties arising from the sale of this book are applied to the QMD operations budget and are used for funding additional activities designed to enhance QMD membership value.

For the fourth time, thanks to Russ Westcott and his six new contributors.

Milton Krivokuca, DBA
Chair—Quality Management Division
American Society for Quality

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Russ Westcott
Editor, Fourth Edition

Introduction

HISTORICAL PERSPECTIVE

In early agricultural situations, quality resulted largely from screening and culling inferior product, and grading the acceptable product. Careful selection of seed and breeding stock, attention to site, and good husbandry lowered the incidence of poor product, but did not eliminate the need to cull and grade. Farmers did their best, but their output was the result of natural processes mostly beyond their control. The "make it, then sort it" approach to quality is still prevalent in this industry.

Craft workers had somewhat more control over their inputs and processes. For example, potters recognized that their outputs varied depending on the type of clay, glaze, and firing method used. Inherent (undetectable or uncontrollable) variations in materials and methods still limited their ability to make a uniformly high-quality product. Their best work was excellent, but consistency varied. This craft-like method existed in the preindustrial era where sales, design, manufacturing, finance, and quality were integrated, and one worker performed all these functions, perhaps with the help of an apprentice or family members.

This tradition persisted until the development of the factory system, in which supervisors were placed to oversee workers. All employees were involved with production, but only the supervisor judged quality. A distinction between making product and checking it had been introduced. Factories developed into highly organized enterprises, with much specialization of labor. Quality was still tested in, and the testers and inspectors became a separate, specialized group. Usually, this group was part of manufacturing, close to the point of production and familiar with the needs of other workers.

These assumptions are still made by many: we can only make so much, it will come out in various grades, and better product is rare, so high quality is opposed to high productivity. If quality and productivity are opposed, then it is a conflict of interest for quality control workers and production workers to report to the same managers. To get independent judgment, the quality organizations became autonomous, reporting to their own managers rather than to managers of manufacturing. This was also institutionalized in government contracts.

The foundations of modern quality control were developed by Walter Shewhart, who published *Economic Control of Quality of Manufactured Product* in 1931 based on his years of experience at Western Electric. This book advocated techniques better than "make a lot and sort out the good ones." The concepts of measuring and controlling the process, reducing the variation in the system, and distinguishing between special causes and common causes contributed to a new approach for achieving quality.

During World War II (1940–1945), the military needed large quantities of highly uniform product. A three-second fuse needed to take exactly that long; the consequences of variation were quite unsatisfactory. The propellant charges for artillery shells had to be uniform to control trajectory. Tanks, airplanes, and other equipment had to have closely matched parts to function reliably. Thousands of personnel in the American war industries were trained in the practice of *statistical process control* (SPC).

For the most part, some engineers (not operators or statisticians) applied quality principles and technologies (especially SPC) and came to be called *quality engineers*. Because it was recognized that many of the problems experienced in production and service were due to design practices and decisions, a specialized group, reliability engineers, emerged. The experiences of the best-performing organizations made it clear that high levels of quality demand careful planning, analysis, and communication between functions, and close cooperation among all functions.

Present enlightened understanding recognizes that increased quality and productivity go hand in hand, so the need for independence and autonomy of the quality function is lessened. The enterprise is more integrated with the adoption of this new view. Each worker is responsible for work quality. Each worker must have the necessary training, tools, and power to perform work correctly. The production cycle is becoming similar to the days when each worker was master in the shop, often dealing with customers, making the product, and controlling its quality. Management of the total process or subprocess calls for many skills, requiring educated, motivated, and extremely competent workers.

OBSERVATIONS ABOUT THE QUALITY FUNCTION

In a manufacturing environment, the quality function and manufacturing are often organized in parallel, whether by product or by process. How this is done depends on the size and complexity of the operation, the nature of the customers or markets served, the variety and quantity of products involved, and the variety of processes used. If A employs several dozen people at one site to produce one or two products that are distributed locally, and B employs 10,000 people on four continents to make and support dozens of product lines, clearly, their quality functions will have to be very different.

If various parts of the organization are very different, then it may be beneficial to have quality functions at each location. The intent is to have what is needed where it is needed.

The larger the organization, the easier it is to justify the costs of specialized groups located in one central place to serve other dispersed groups. Some common examples are laboratories, calibration facilities, auditors, and trainers. It is often more cost-effective to divide the expense of central shared services among many users than to physically divide the function.

The notion of critical mass says that a certain threshold in size and amount of activity is required for some functions to work well. For example, if equipment used in the quality function requires calibrating only a few times per year, then it makes little sense to own all the necessary equipment and to have an underutilized expert in calibration. It might be better to make arrangements to outsource the activity. In some circumstances, the quality function might be spread over many other internal functions.

When *total quality management* (TQM) is successfully implemented, the distinctions between staff and line activities can become blurred as empowered teams become responsible for both plans and action as the layers of management decrease.

The role of the quality function may include:

- *Quality control (QC).* Providing techniques and performing activities that focus on controlling or regulating processes and materials to fulfill requirements for quality. The focus is on preventing defective products or services from being passed on.
- *Quality assurance (QA).* Planning systematic activities necessary to provide adequate confidence that the product or service will meet the given requirements.
- *Quality management system (QMS).* Defining the structure, responsibilities, procedures, processes, and resources for implementing and coordinating the QMS.
- *Metrology.* Ensuring that the measurements used in controlling quality are meaningful and accurate. Ensuring that measurement equipment is calibrated and traceable to the National Institute of Standards and Technology (NIST).
- *Inspection.* Managing or overseeing the inspection activities.
- *Training.* Providing training and/or training subject matter that supports employee skills training and education in quality-related topics. May also include training for suppliers and for customers.
- *Auditing.* Managing or overseeing the activities involved with auditing products, processes, suppliers, and the QMS to ensure that the organization's strategies, principles, goals, objectives, policies, and procedures relative to quality are followed.
- *Reliability engineering.* Working with design and production functions, determining the probability of a product performing adequately for a specified length of time under stated conditions with an aim of lowering total cost of ownership of the product, and satisfying customers.
- *Initiating and/or participating on problem-solving teams.* Working where needed to apply expertise, such as the tools of quality control and root cause analysis.
- *Supplier quality.* Managing or overseeing the activities that ensure that high-quality suppliers are selected and that incoming purchased parts and materials are acceptable in grade, timeliness, and other characteristics.

- *Product/service design.* Working with sales, design, and other functions to ensure quality in products under development.

The priority (importance and authority) attributed to the quality function is not based on the size of the quality department (budget, head count, floor space, or location in the organization chart), but on consideration of a number of factors, including:

- An organization's vision, mission, strategic goals and objectives, and the emphasis placed on quality principles and practices
- Total costs of quality and the allocation to the types of costs, that is, prevention, appraisal, and failure costs
- Resources allocated and the time spent on quality by management at all levels, especially the higher levels
- Senior leadership's visible and personal involvement in and support of quality efforts

The quality function is not:

- A prevention squad. When the quality department is viewed as the owner of quality, the rest of the organization tends to abdicate its role and responsibility.
- A policing function oriented primarily toward defect detection.
- A screen or barrier to protect the customer from problems and defects. Advertisements may emphasize that the customer can be confident of satisfaction "because we have *X* number of inspectors and testers checking the product." This could be viewed as an admission that an organization may not have dependable processes for making a good product.
- Just one more task among many. This occurs when managers and workers approach quality as another task on top of or after all the other tasks.

Quality is an extremely important function in an organization, but it is not the only important function. The quality function needs to practice humility and respect in dealing with other functions within the organization. Quality is not alone in bringing about success for the organization and is not exempt from blunders, mistakes, poor judgment, or human error. There are good and bad ways to work for quality. Thus, the quality function should be scrutinized just as any other function is evaluated, and continually improved.

BIG Q AND little q

Dr. Joseph M. Juran illustrated the difference between managing to achieve quality across the board, in all functions of the organization, and for all products and services (Big Q) and managing for quality on a limited basis (little q). Quality control activities are little q. Quality assurance may be little q or Big Q depending on how it functions within an organization.

LEVELS OF ORGANIZATIONAL MATURITY

To gain an overall perspective of the implications of applying quality principles and practices, scan Table I.1.

THINKING LIKE A QUALITY MANAGER/ DIRECTOR

The roles and responsibilities of the quality manager/director—and approaches to quality management—vary depending on the type of industry or the size of the business entity. The Certified Manager of Quality/Organizational Excellence (CMQ/OE) Body of Knowledge (BoK) (see Chapter 20) is a product of inputs from many sources and reflects areas of common interest and importance. The intention in the development of examination questions is to measure the level of knowledge and skill that a person possesses relative to each area of the BoK, and how to apply the BoK as an integrated system, regardless of each person's job, organization culture, or industry practice.

For individuals planning to take the ASQ CMQ/OE examination, getting into the mind-set of the role for which the certification was designed is a major key to a successful outcome. Some recommendations for establishing a successful mind-set in using this study guide and preparing for the examination include:

- Visualize or think of yourself as a corporate director of quality for a multi-facility organization, perhaps with locations globally. In reality, in businesses in which products and services are not highly regulated by government legislation, and in smaller business enterprises, the quality manager may not have a support staff to perform quality engineering–related tasks and make day-to-day quality decisions. As a result, you might spend the majority of time acting in the capacity of an engineer, and assume that mind-set in studying for and taking the exam. *That might not work well for you.* A wider and higher-level mind-set needs to be assumed for exam purposes.

  Individuals taking the CMQ/OE examination need to place themselves in the context of having to think strategically. For instance, after placing yourself in the role of a corporate director of quality for a multi-facility business, envision addressing such questions as "What can the quality function do to help the company identify or implement initiatives that will enable it to break into new markets, or gain a greater share of the present markets served?"

- Think of yourself as having to integrate the needs of the quality function with the needs of the management team and all other business processes. In addition to managing the quality department, the quality manager's role includes facilitating deployment of quality approaches, principles, and practices in other functional areas, such as supplier quality in purchasing and customer satisfaction in marketing/sales.

Table I.1 Levels of organizational maturity. What is your organization's level?

Level 1	Level 2	Level 3	Level 4	Level 5
Dysfunctional system	**Awakening system**	**Developing system**	**Maturing system**	**World-class system**
Economy of scale focus with long runs preferred. Time-consuming changeovers are the norm. The customers' voice is rarely heard, and then only at the top.	Quality steering committee has been formed; quality systems are assessed; quality initiatives are planned. A customer focus is a goal.	Tested practices are deployed to all major areas of the factory. Customer involvement is sought.	Seeks out and learns about best practices. Adapts improved practices for all areas. Customers, suppliers, and employees are integrated into the systems.	Retaining satisfied customers is key. Plant uses single-piece flow with cellular techniques. Improved throughput achieved through reduction of bottlenecks.
Rigid plant layout, nonintegrated systems, erratic workflow prevalent. Buffer stock everywhere. All jobs are rush. Firefighting is the norm.	Applicable lean management practices have been identified. Training is being conducted.	Flexible production layouts and cells are introduced. Cleanliness and neatness of individual work areas is stressed.	Production system allows short runs, greater product mix, speedy introduction of new products, and shorter cycle times.	Plant layout is agile and clean. Workers are self-inspecting their work. Lean manufacturing tools and techniques are liberally applied.
Machinery runs at maximum speed without regard for its life or performance quality. Workplace is unorganized and unclean.	A small project is under way to implement and test improved quality management practices.	Pull-type production system under test in one area. Employee qualification system is in place.	Operating information is provided immediately with computerized displays. Errors are prevented with mistake-proofing devices.	Preventive maintenance ensures availability and optimizes quality, efficiency, and lifecycle cost.

Continued

Table I.1 *Continued.*

Level 1	Level 2	Level 3	Level 4	Level 5
Dysfunctional system	**Awakening system**	**Developing system**	**Maturing system**	**World-class system**
No teamwork. Fiefdoms fiercely guarded from encroachment by other functions. No linkage between any overall strategy and production scheduling.	Bottlenecks and non-value-added functions in process flow are being examined. An equipment maintenance program is under development.	Cross-functional teams promote adherence to standards and ensure continuous improvement.	Teams, some self-managed, aid adherence to high standards, the focus on customers, and continual improvement.	Management is personally and visibly involved in continual improvement. Quality of information and decision making at all levels is exemplary.
Management by command. Poor workforce commitment and involvement.	A cross-functional team is being initiated to work on cycle time reduction.	Systems are implemented to provide data for performance measurement, improvement.	An effective strategic planning process is instituted.	All employees are highly motivated, involved, and empowered.
Communication is one way (downward) with few or no feedback loops.	Weekly production review meetings are held, chaired by the VP manufacturing.	A supplier certification program is in place.	Overall strategy is linked to production planning and process improvement.	Supplier relations are based on collaborative communication and partnerships.
Adversarial supplier relationships focus on price.	A supplier qualification approach is under study.	Overall performance is about equal to industry norms.	Plant benchmarked by others in industry.	Plant benchmarked by others outside industry.
Customers frequently get poor quality and delivery.	Overall performance remains below industry norm.		Performance is above industry norm.	Performance is world-class.

- Think in the context of the *plan–do–check–act* (PDCA) model. Constructed response questions are purposely designed to assess the ability of the test taker to integrate and apply the BoK from a broader perspective. Therefore, using PDCA to structure responses will often help ensure more complete answers to many of the described situations.

  Keep uppermost in your mind that your role as test taker in answering constructed response questions is not to solve the problem, but to define a process, based on the principles of quality management, that would enable the issues presented to be effectively addressed. The planning step of the PDCA cycle often also involves first assessing the current situation, as well as past efforts, before moving forward.

- Develop an understanding of how all the elements of the BoK are interrelated. A good way to practice the use of critical-thinking skills that will further aid in answering constructed response questions is to select two or more elements or sub-elements of the BoK and consider how they are related, such as the linkages between leadership and strategy development/deployment, or how quality control methodologies can lead to customer satisfaction.

  A link in one direction is that leadership of the organization is ultimately responsible for both defining and carrying out the strategic management process. Viewed from the reverse direction, when defining strategy, the characteristics and processes of leadership that currently exist in the organization should be considered in light of how they will support or block implementation.

STRUCTURE OF THIS HANDBOOK

The handbook follows the body of knowledge scheme as set forth in Chapter 20. Throughout each section of this handbook, the categorical BoK requirements associated with good quality management practices for that section are shown in a box preceding the pertinent text. These BoK requirements represent the range of content and the cognitive level at which multiple-choice questions can be presented. Also, there is a separate BoK pertaining to constructed response questions in Chapter 20.

There is some overlap of topics within the BoK. An attempt has been made to cover a given topic in depth in one section and where necessary provide cross-references to that one explanation.

Additional references to material for each chapter are presented in Appendix A. When a topic is new to a test preparer, or knowledge has faded, the test preparer is urged to seek more information from one or more of the resources listed. There is no way this single handbook can provide the depth and breadth of knowledge you should have on any given topic in the BoK. A few years back, one test preparer referred to the BoK as "a mile wide and an inch deep." The new 2013 BoK is updated where needed, and wider and deeper than before. On the subject of reference material, do not forget the wealth of information available via the internet—most of it free! That includes a sample test and the extensive, wide range of information on the ASQ website and available from the ASQ Knowledge Center, www.asq.org or (800) 248-1946.

In order to provide a broad perspective of quality management, this book has specifically been written to address:

- Historical perspectives relating to the evolution of particular aspects of quality management, including recognized experts and their contributions
- Key principles, concepts, and terminology relevant in providing quality leadership, and communicating quality needs and results
- Benefits associated with the application of key concepts and quality management principles
- Best practices describing recognized approaches for good quality management
- Barriers to success, including common problems that the quality manager might experience when designing and implementing quality management, and insights as to why some quality initiatives fail
- Guidance for preparation to take the Certified Manager of Quality/Organizational Excellence examination.

Not every quality manager will equally possess expertise in each BoK section and topic. The handbook's primary purpose is to help readers properly focus their study efforts in preparation for the examination. However, this handbook should prove useful as a reference guide back on the job.

TERMINOLOGY

The ISO definition of *product* as "the result of a process" includes categories of hardware, software, services, and processed materials. The word *product* is used throughout the handbook, with and without the accompanying clarification that it also applies to services. It is expected that the reader will have the flexibility to interpret the words in the context in which they are used and to substitute terms that are more apropos for their own industry or experiences to help them clarify the material.

DISCLAIMER

The body of knowledge for the Certified Manager of Quality/Organizational Excellence is largely based on conceptual ideas and models rather than on exact mathematical formulas or tangible items that can be held up as correct. For some of the areas of the BoK, there could be multiple correct views because of differences in industry, organizational maturity, geographic location, competitors' strategies, and so on. Even the gurus of quality differ in their philosophies, priorities, and approaches to quality. For example, multiple-choice questions often may appear to have at least two right answers. It will be your task to choose the one answer that best applies to the content and context of the question. (No one ever said that making decisions as a manager/director is simple.)

Furthermore, you should know that ASQ policy maintains a strict separation between the people who prepare the examination, those who score the completed examination papers, and those who present material (in whatever medium available) for people preparing to take the examination. As a result of this separation, the content presented in this handbook may differ from the intent of the creators of the BoK and/or the writers of the examination questions. Therefore, any questions you may have regarding BoK intent or details about answer scoring can not be answered by the editor of this handbook nor by course instructors.

Success as a quality manager requires experience and a mature understanding of the various principles, concepts, and practices, as well as the specific knowledge obtained from this or any other reliable source. The best to you in your quest to become a Certified Manager of Quality/Organizational Excellence. *Good luck!*

Russ Westcott, Editor

Part I

Leadership

Chapter 1 A. Organizational Structures
Chapter 2 B. Leadership Challenges
Chapter 3 C. Teams and Team Processes
Chapter 4 D. ASQ Code of Ethics

1. *The only definition of a leader is someone who has followers.*
2. *An effective leader is not someone who is loved or admired. Popularity is not leadership.*
3. *Leaders are highly visible. They . . . set examples.*
4. *Leadership is not rank, privileges, titles, or money. It is responsibility.*

—**Peter F. Drucker**

Leadership is not so much the exercise of power itself as the empowerment of others.

—**Warren Bennis and Burt Nanus**

If you want one year of prosperity, grow grain.

If you want ten years of prosperity, grow trees.

If you want one hundred years of prosperity, grow people.

—**Chinese Proverb**

Chapter 1

A. Organizational Structures

It's appropriate that a book on the management of quality begin with the subject of leadership. Perhaps no other factor has a greater impact on an organization than how well it is led on both a strategic and an operational basis. Additionally, leadership is not solely the responsibility of those who reside at the higher levels of the hierarchy, but is instead an activity in which anyone involved in the success of an organization can take part.

Strategic leadership includes defining the structures to achieve the overall vision and mission of an organization and its strategies and systems.

> Define and describe organizational designs (i.e., matrix, flat, and parallel) and the effect that a hierarchical management structure can have on an organization. (Apply)
>
> **Body of Knowledge I.A**

ORGANIZATIONAL DESIGN

A major role of leadership is to ensure that an organization is designed to carry out its mission, goals, and strategies. Understanding leadership requires a fundamental understanding of organizations and the design factors that must be considered.

The design of an organization is the formal framework for communication and authority, and is determined by three major factors:

- *Complexity.* The number of different entities (for example, job titles, reporting levels, functional departments, and physical work locations) that will exist in the organization.
- *Formalization.* How much the organization will rely on standard guidelines and procedures to instruct and direct employee activities.
- *Centralization.*[1] Whether decision-making authority is located primarily at upper management levels or is delegated to lower levels.

These three aspects can be combined to create many different organizational designs. Purposes of organizational design are to:

- Divide the total work required into logical functional groupings (for example, departments, work units) and the jobs within the functions.
- Assign specific tasks and responsibilities to each individual job.
- Allow better coordination of diverse organizational tasks.
- Establish relationships among individuals, work units, and functions.
- Establish formal lines of authority and decision making.
- Allocate and deploy organizational resources.

To create an appropriate design, a decision must be made as to how work activities will be organized both vertically and horizontally. The vertical structure typically categorizes positions as top managers, middle managers, first-line managers, and operations personnel. Creating the vertical structure includes determining these categories and defining the interaction between the levels by deciding who reports to whom, and who has the authority to make what types of decisions.

VERTICAL ORGANIZATIONAL DESIGN

One concept used in creating the vertical structure is *unity of command*, or the idea that a subordinate should be directly responsible to only one superior.[2] Although structures such as a matrix organization do not follow this rule, the basic intent of vertical design is to avoid conflicts, misunderstandings, or misuse of resources. Organizational designers also must determine the types and amount of authority and responsibility that organizational members will have. Authority refers to the rights inherent in a managerial position to expect orders to be followed, and are related to the position, not the person. Traditionally, authority is delegated downward to subordinate managers, giving them certain rights while specifying limits within which to operate.

There are also different forms of authority: line and staff. *Line authority* is the superior–subordinate relationship extending from the top of the organization to its lowest levels (along a chain of command). A manager with line authority has the right to direct the work of subordinates and to make certain decisions without consulting others. As organizations become larger and more complex, however, line managers may lack the time, expertise, or resources to do their jobs effectively. In response, staff functions are established, such as human resources (see Chapter 8, Section 4) that have the authority to support and advise.

Organizations now recognize that one does not have to be a manager to have influence, nor is influence always correlated to organizational level. Authority is an important concept in organizations, but focusing exclusively on authority produces a narrow, unrealistic view of sources of influence in organizations. Today, authority is recognized as one aspect of the larger concept of power.[3] For example, some individuals in an organization may have considerable informal authority due to their knowledge or personality.

Span of control is another design factor and refers to how many subordinates a manager can effectively and efficiently supervise. Although no consensus exists on an ideal number, many managers favor small spans—typically no more than six—in order to maintain close control.[4] The level at which this decision is targeted affects this number. As managers rise in the organizational hierarchy, they deal with a greater variety of complex and diverse problems. Typically, top executives have a smaller span of control than do middle managers, and middle managers require a smaller span than do supervisors. Therefore, to a large degree the span of control determines the number of levels and managers in an organization. Other things being equal, the wider or larger the span of control, the more efficient the organizational design.

Today, many organizations have reduced the number of managerial positions through restructuring while increasing the spans of control. The optimum span of control is increasingly determined by issues such as:

- Amount of employees' training and experience
- Similarity of subordinate tasks
- Complexity of the tasks
- Physical proximity of subordinates
- Degree to which standardized procedures are in place
- Sophistication of the organization's management information and internal communication systems
- Strength of the organization's culture
- Preferred style of the manager[5]
- Employee turnover
- Available resources
- Financial and competitive pressures
- Organizational beliefs and values

HORIZONTAL ORGANIZATIONAL DESIGN

In addition to a vertical dimension, an organization's design also has a horizontal dimension that determines how work activities are organized at each level of the organization. This involves answering questions such as "How will work activities be allocated?" or "What form of departmentalization will work best?"

Division of labor means that rather than an entire job being performed by one individual, it is broken down into a number of steps, with separate individuals completing each step. In essence, individuals specialize in doing part of an activity rather than the entire activity. Assembly-line production, in which each worker repeatedly does a standardized task, is an example of division of labor. Fast-food companies use the concept of division of labor to standardize the process of taking a customer 's order and filling it quickly and properly. Because some tasks require highly developed skills, while unskilled workers can perform others, division of labor makes efficient use of the diverse skills and capabilities of employees. If all workers in an organization were engaged in each step of the production process, every worker would need the skills to perform both the most demanding and the least demanding jobs. The result would be that except when performing the most highly skilled or highly sophisticated tasks, employees would be working below their skill levels. Because skilled workers are paid more than unskilled workers and their wages tend to reflect their highest level of skills, paying highly skilled workers to do easy tasks would be an inefficient use of resources.

Historically, management has viewed the division of labor as an unending source of increased productivity. Eventually, certain drawbacks of division of labor exceed the economic advantages, including problems such as boredom, job stress, low productivity, poor quality, increased absenteeism, and high turnover. Organizations have discovered that by giving employees a variety of activities to do, allowing them to do a whole and complete piece of work, and putting them together into teams, jobs are more interesting, and higher quality often results.

CENTRALIZATION/DECENTRALIZATION

Centralization/decentralization refers to how much decision-making authority has been delegated to lower management levels. Few organizations could function effectively if all decisions were made by a select group of top managers, nor could they do so if all decisions were delegated to the lowest levels of the organization. Fayol lists centralization as one of his 14 principles of management and notes that the proper amount of centralization or decentralization depends on the situation.[6]

Organizations have traditionally been structured as pyramids, with authority and power concentrated at the top and with relatively centralized decision making. As organizational environments became more complex and dynamic, many organizations began to decentralize decision making. Many executives now believe that decisions should be made by those people with the best information to make the decisions, regardless of their level in the organization.

More decentralization might be needed under one or more of the following conditions:

- The environment is complex or uncertain.
- Lower-level managers are capable and experienced at making decisions.
- Lower-level managers want a voice in decisions.
- Decisions are relatively minor.
- Corporate culture is more open to allowing managers to have a say in what happens.
- The organization is geographically dispersed.
- Effective implementation of the organization's strategies depends on managers having more involvement and flexibility to make decisions.

Organizational designers should select the amount of centralization/decentralization that best allows management to implement goals and strategies. What works in one situation might not be best for another.

TYPES OF ORGANIZATIONAL STRUCTURES

In resolving issues such as distribution of authority, reporting relationships, span of control, and centralization/decentralization, the structure of the organization will result. It is worth noting that the current tendency is to move to flatter organizations having fewer hierarchical levels and more flexible reporting arrangements. Although a flatter organizational structure implies a wider span of control, information technologies have greatly simplified the processes of communication and decision making, allowing authority to be more widely dispersed.

Organizations are becoming managed more as horizontal processes (for example, as a part of the supply chain or value chain), rather than vertical hierarchies. A *matrix structure* is one way of formalizing a structure that provides both effective horizontal, operational decision making as well as allowing development of functional specialties. Another structure often used when an organization desires to implement a significant change is to create a temporary *parallel* or *collateral organization*, which consists of a group of employees (often a diagonal slice of the organization) who meet on a regular basis in order to guide the change process. Once the organization has made the transition, the parallel structure is dissolved.

Earlier, some of the aspects that affect organizational design—such as division of labor, distribution of authority, span of control, and employee knowledge and experience—were discussed. Many different structures can result from these decisions, and which one an organization selects is also impacted by larger factors, both internal and external.

Each organization has its own way of grouping work activities (departmentalization). Groupings may be according to the:

- Work functions performed
- Product or service provided
- Customers served
- Geographic area or territory covered
- Product–customer process flow

The method(s) used should reflect the grouping that would best contribute to the attainment of the organization's strategic goals and objectives as well as the objectives of individual units. Following is a discussion of each of these structures, plus additional forms in which boundaries are more fluid.

- *Functional.* One of the most common ways to group activities is by the function performed. A manufacturing plant might be organized by separating engineering, accounting, manufacturing, human resources, and purchasing specialists into departments as shown in Figure 1.1. Functional departmentalization can be used in all types of organizations, with the name of the functions changed based

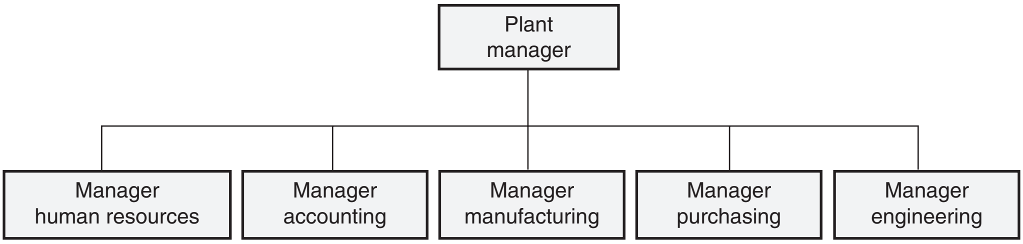

Plant manager
Manager human resources
Manager accounting
Manager manufacturing
Manager purchasing
Manager engineering

Figure 1.1 Functional departmentalization.

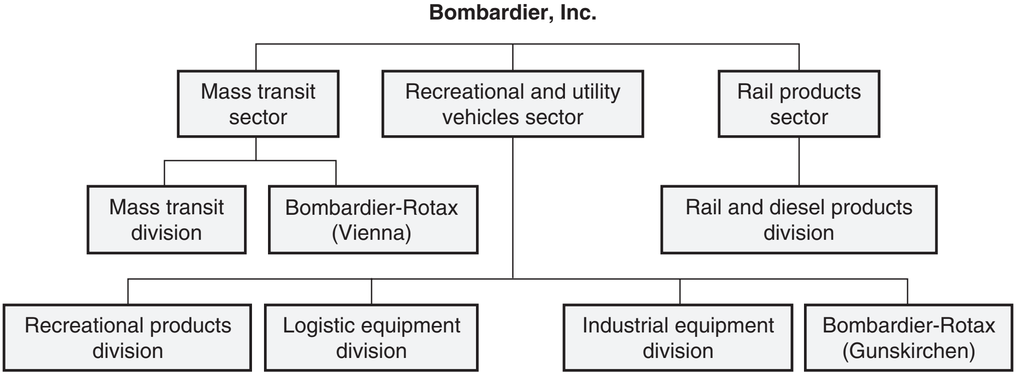

Bombardier, Inc.
Mass transit sector
Recreational and utility vehicles sector
Rail products sector
Mass transit division
Bombardier-Rotax (Vienna)
Rail and diesel products division
Recreational products division
Logistic equipment division
Industrial equipment division
Bombardier-Rotax (Gunskirchen)

Figure 1.2 Product departmentalization.

on the types of skills required to achieve organizational objectives. For example, a university hospital might have departments devoted to health research, patient care, facilities management, and finance.

- *Product.* Figure 1.2 illustrates the product departmentalization structure. Each major product group is placed under the authority of an executive who specializes in and is responsible for all aspects of that product line. A clothing retailer also uses product departmentalization, basing its structure on its varied product lines, such as women's and men's footwear and apparel and accessories. This type of structure allows portions of the organization to focus on particular categories of product, allowing greater expertise to be gained of the market and product technology.

- *Customer.* The particular type of customer an organization seeks to serve can also be used to define structure. The sales activities shown in Figure 1.3 for an office supply firm can be broken down into three departments: those serving retail, wholesale, and government customers. Textbook publishers often organize by customer, such as those serving primary schools, high schools, and college or university levels. The assumption underlying customer-stratified organizations is that customers in each grouping have a common set of problems and needs that will best be met by specialists who can focus on their needs.

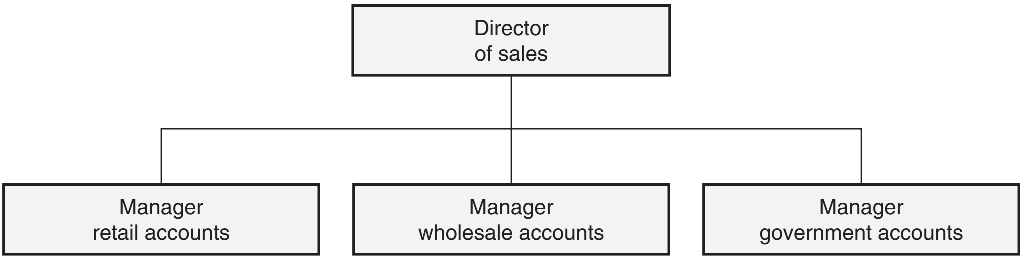

Director
of sales
Manager
retail accounts
Manager
wholesale accounts
Manager
government accounts

Figure 1.3 Customer departmentalization.

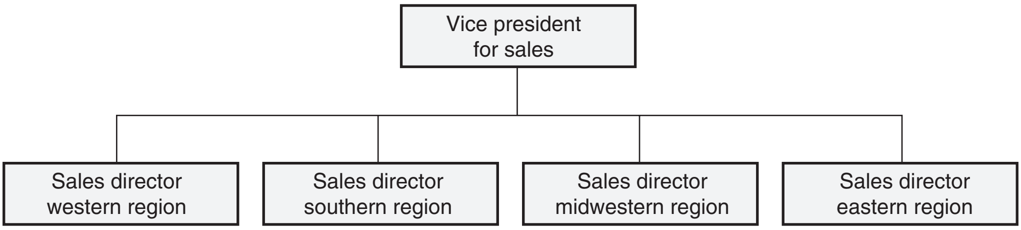

Vice president
for sales
Sales director
western region
Sales director
southern region
Sales director
midwestern region
Sales director
eastern region

Figure 1.4 Geographic departmentalization.

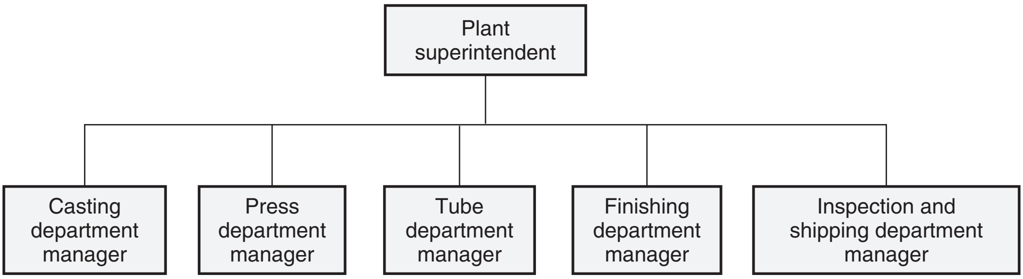

Plant
superintendent
Casting
department
manager
Press
department
manager
Tube
department
manager
Finishing
department
manager
Inspection and
shipping department
manager

Figure 1.5 Process departmentalization.

- *Geographic.* Another way to organize is by geography or territory. An organization's sales function might have western, southern, midwestern, and eastern regions, as shown in Figure 1.4. A large school district might have six high schools to serve each of the geographical areas within its district. Geographic organization is valuable when an organization's customers are scattered over a large area, allowing the specific needs of the location to be addressed, as well as reducing business costs such as logistics.

- *Process.* A flow form of departmentalization is shown in Figure 1.5, which illustrates the various production departments in an aluminum extrusion processing plant. Each department specializes in one specific phase (or subprocess) in the production of aluminum tubing. The metal is cast in huge furnaces and sent to the press department, where it is extruded into aluminum pipe. It is then transferred to the tube mill, where it is stretched into various sizes and shapes of tubing. It then moves to finishing, where it is cut and cleaned, and finally arrives in the inspect, pack, and ship department.

- *Team.* The competitive drive for improvement has made organizing by teams more common. This structure often overlays or replaces the rigid boundaries of departmentalization, bringing together individuals with needed competencies for a particular mission. In a team-based structure, the entire organization consists of work groups or teams that perform the organization's work. Employee empowerment is crucial because no rigid line of managerial authority flows from top to bottom. Team members are free to design work processes in the way they think best, and are held responsible for all work activity and performance results in their areas. For example, an insurance company reorganized its customer representatives into eight-person teams trained to expedite all customer requests. Rather than switching customers from one specialist to another, a team now takes care of every aspect of a customer request.

- *Matrix.* A matrix structure assigns specialists from different functional departments to work on one or more projects led by a project manager. This arrangement was developed in the 1960s by the U.S. aerospace industry to cope with the demands of managing a number of concurrent projects. Figure 1.6 shows a sample matrix organizational structure. In a typical matrix organization, specialists report to a line or project manager to integrate their expertise with those of other specialists. They also report to a functional manager responsible for departmental human resource issues such as hiring, skill enhancement, assignments to line or project units, and performance reviews.

- *Cells.* Parts of an organization may be structured in work cells. A *cell* is a self-contained unit dedicated to performing all the operations to complete a product or process or major portion of a product (see Figure 14.12).

- *Boundaryless.* A different view of organizational structure is called the boundaryless organization (also referred to as a *network organization*, *modular corporation*, or *virtual corporation*). It is not defined by, or limited to, the boundaries imposed by a predefined structure. The *boundaryless* organization breaks down the artificial boundaries created by a design such as departmentalization and hierarchies, and the external boundaries separating the organization from its suppliers, customers, and other stakeholders (see *virtual teams* in Chapter 3).

Many factors have contributed to the rise of the boundaryless organization. One is the need to respond to rapidly changing, highly competitive global markets. Another factor is new technology that permits organizations to work more effectively. For example, a world leader in credit card authorization systems has no corporate headquarters, secretaries, or paper mail. The chief executive officer calls his organizational structure the "blueberry pancake model, very flat, with all blueberries equal."[7] Employees have a vast amount of information at their fingertips through the company's e-mail network.

The authors of *The Boundaryless Organization: Breaking the Chains of Organizational Structure* discuss the means for structuring a boundaryless organization attuned to the needs for integrating resources to serve the customer, strengthening the value chain, and crossing geographic boundaries.[8] Authors of *The Virtual*

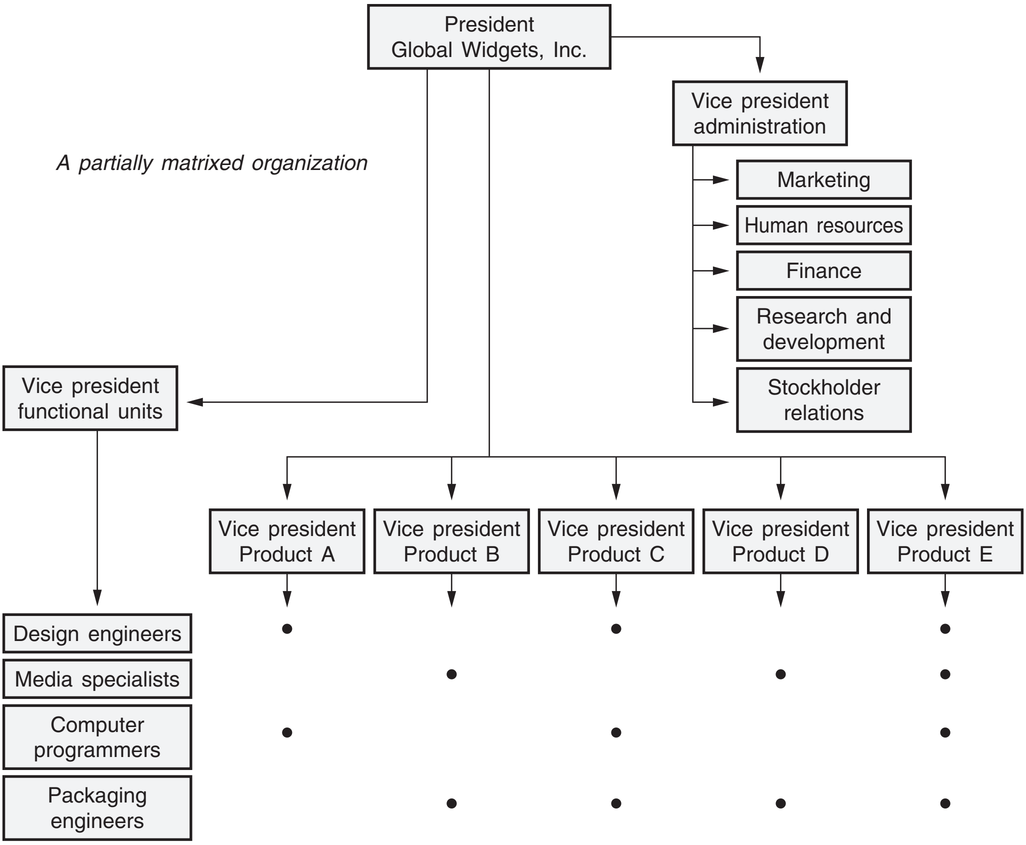

President
Global Widgets, Inc.
Vice president administration
A partially matrixed organization
Marketing
Human resources
Finance
Research and development
Stockholder relations
Vice president functional units
Vice president Product A
Vice president Product B
Vice president Product C
Vice president Product D
Vice president Product E
Design engineers
Media specialists
Computer programmers
Packaging engineers

Figure 1.6 Matrix organization example.

Corporation focus on the powers of information, new technologies, and a new kind of worker.[9]

Beyond the ways an organization groups its work activities, there are other factors to consider. They are:

- *Strategy.* Since organizational structure will impact the ability to achieve strategic objectives, structure should be based on the organization's strategy (see Chapter 5). This means that if the strategy significantly changes, structure will likely need to be modified to support the change. A low-cost provider strategy may utilize a functional structure sharing the same support resources with many facilities (for example, centralized purchasing, human resources, and engineering), while a strategy to develop close, long-term customer relationships would call for a more decentralized structure (for example, sales offices for each major customer or geographic location).
- *Size.* The size of the organization affects structure due to the fact that a larger organization will tend to have more specialized and diverse activities to

be managed. This increased differentiation can easily lead to narrowly focused or transactional management, although this may be mediated by where the company's product is in its life cycle. For example, a company that has grown large as a result of gaining a significant market share in a new product line may find a need for transformational management as the product enters the mature, low-growth stage.

- *Technology.* Another factor affecting structure is the range of technologies used by the organization. Every organization uses various forms of technology to convert inputs into outputs, and the type of technology will impact organizational structure. For example, a chemical firm using continuous-flow processes will be organized differently than a hospital or a law firm. The management styles are also likely to differ, since professionals in a hospital or law firm are knowledge workers who would expect a freer reign than employees whose job is to load and unload railcars of raw material and finished goods.

- *Core competencies.* Organizations can be structured to focus on the core competencies that differentiate the organization from its competitors. Core competencies may consist of unique capabilities of its workforce, specialized technologies, the knowledge and experience of its management, track record for innovation, world-class service policies and practices, a unique niche the organization's products and services fulfill, and so on.

- *Regulatory, legal, and other requirements.* Constraints and mandates due to regulations, laws, and standards may influence organizational structure. For example, ISO 9001 registrar organizations must clearly separate their registration auditing organization and services from their consulting services organization. Certain customers may specify that the products they purchase be produced in facilities and by workers separate from products their supplier produces for other customers to protect proprietary designs and processes. Because of potential contamination, laws may prohibit the commingling of production of certain products, for example, food products and chemicals. The types and levels of security mandated for certain industries, for example, products and services for the U.S. military, will influence organizational structure. Regulations governing occupational health and safety affect organizational structure, and laws governing allowable emissions are critical to certain industries.

- *Union.* Employees represented by a union are a kind of parallel organization within an organization. In an ideal situation, the union leader participates with top management of the organization in strategy development as well as decisions affecting the ongoing business of the organization. In the more traditional situation, and, sadly, still the more prevalent situation, the union and organization management may coexist in an adversarial relationship.

Union leadership may influence organization structure and reporting relationships, job design, work standards and practices, compensation and benefits, purchasing decisions, supplier selection, employee disciplinary actions, facility expansion or closure, process improvement initiatives, and so on. Disagreement over the terms of the labor–management contract can result in a production slowdown or strike.

- *Competition.* The competitive environment in which the organization operates will also affect organizational structure, as a higher pace of change requires a more flexible organizational design that can quickly adapt to new market opportunities. In this environment a team structure and participative style (see Chapter 8) are more likely to succeed than a functional structure with autocratic management.

- *Workforce issues.* Availability of sufficient workers and/or of skilled workers is a factor affecting organizational design. All of the considerations necessary to attract and retain the workforce are factors, for example, availability of housing, transportation, schools, religious entities, shopping, entertainment, and adequate community infrastructure.

- *Facilities.* The present and future availability of land, buildings, utilities, rail service, roadways, airport, and so on, are important considerations.

- *Other environmental factors.* The prevailing weather patterns, the political climate, and the presence or absence of crime all are factors.

- *Combinations.* Most large organizations will utilize a combination of methods of organization and management. At the local facility level they might be organized in teams or in functional or process groups, and at the division level organized by product. At higher levels there may be a geographic structure that allows focusing on a particular part of the world (for example, United States, Europe, and Asia).

MANAGEMENT HIERARCHY AND INFLUENCE ON THE ORGANIZATION

To ensure that an organization achieves its desired outcomes, someone must plan, allocate resources, and monitor results. These are major activities for which management personnel have responsibility. *Top management* (also called *senior management* or *executive management*) is responsible for providing direction in defining the vision, mission, strategies, goals, structures, policies, systems, and objectives. These managers are also responsible for managing the boundaries between the organization and its major stakeholders, such as investors, business partners, and the communities in which the organization is located.

Middle managers are responsible for carrying out the policies and procedures necessary for achieving the mission, goals, and strategic objectives. Their emphasis is more operationally than strategically oriented, playing a key role in day-to-day communication and decision making. Middle management's role also parallels that of top management in the sense of being responsible for leadership of a particular part of the organization.

First-level supervision (line management) is responsible for overseeing the workforce assigned to produce the products and/or services for which the organization is designed. Supervisors, while usually considered to be part of management, have the difficult role of thinking and behaving like a manager and at the same time dealing empathetically with the concerns and problems of the workers. In this role, supervisors must communicate downward the vision, mission, principles, and strategic objectives of the organization, take the actions necessary for their work unit to respond appropriately to those objectives, monitor and maintain the processes and people under their supervision, and be accountable for the quality and quantity of product and service required. How effectively supervision establishes a motivational environment has a direct effect on the stability of the workforce and the outcomes achieved by the organization.

In some structures, a quasi-supervisory role exists: the lead operator. Not an official member of management, the lead operator is often charged with the responsibility for some scheduling, instructing, and inter–work unit liaison activities in addition to performing production work.

The role of supervisor, and to some extent the middle manager, may not be needed in some types of organizational structures, for example, where teams are the predominant structural element in a virtual organization, or when information technology has adequately bridged the gap between the workers and management.

Organization culture has an overarching influence on organization structure (see Chapter 8, Section 2 for discussion of culture).

ENDNOTES

1. S. P. Robbins and M. Coulter, *Management,* 5th ed. (Upper Saddle River, NJ: Prentice- Hall, 1996).
2. H. Fayol, *Industrial and General Administration* (Paris: Dunned, 1916).
3. D. Kipnis, *The Power Holders* (Chicago: University of Chicago Press, 1976).
4. L. Urwick, *The Elements of Administration* (New York: Harper & Row, 1944), 52–53.
5. D. Van Fleet, "Span of Management Research and Issues," *Academy of Management Journal* 26, no. 9 (1983): 546 –52.
6. Fayol, *General Administration*, 19–42.
7. T. Peters, "Successful Electronic Changeovers Depend on Daring," *Springfield Business Journal* (August 8, 1994): 15.
8. R. Ashkenas, D. Ulrich, T. Jick, and S. Kerr, *The Boundaryless Organization: Breaking the Chains of Organizational Structure* (San Francisco: Jossey-Bass, 1995).
9. W. H. Davidow and M. S. Malone, *The Virtual Corporation* (New York: Edward Burlingame/Harper Business, 1992).

See Appendix A for additional references for this chapter.

Chapter 2

B. Leadership Challenges

I believe leadership lies more in character than in technical competence, but these two are interwoven. As people grow in competence, they gain awareness of a new dimension of their character. Then, as they begin to develop that aspect of their character, they find that their competence also increases.[1]

—Stephen R. Covey

When is a manager not a leader? When is a leader not a manager? The answer to these questions begs for a precise definition of *leader* and *manager.* Yet, try as we often do to differentiate between the two roles, ambiguity creeps in to blur the line of demarcation. The fuzziness is exacerbated by common usage (or "misuse," depending on your point of view). One observation is that the title "leader" is rarely found on organizations' lists of position titles, although occasionally "team leader" may appear. Does this mean that a leader is some ethereal entity that doesn't truly exist in the real world? Not so.

A *leader* is an individual recognized by others as the person to lead an effort. One can not be a leader without one or more followers. A leader might or might not hold an officially designated management-type position or officially have people reporting to her or him. A leader leads people. An organization can also be referred to as a leader, in the sense that it is on the leading edge (in technology, innovation, products, services, market share) compared with its contemporaries.

A *manager* is an individual who manages and is responsible for resources (people, material, money, time). This is a person officially designated with a management-type position title. A manager is granted authority from above, whereas a leader's role is earned by having followers. Managers manage organizations, processes, systems, projects, and themselves.

According to Deming, "The job of management is not supervision, but leadership."[2] The roles of leader and manager can be fulfilled by the same individual. It's really what the individual does, how he or she does it, and from where the individual derives the power to act that relate to which term is most applicable in a given situation.

Leadership focuses on doing the right things; management focuses on doing things right.[3]

—Stephen R. Covey

This chapter discusses techniques and tools available to leaders/managers that include those used to overcome organizational roadblocks (change management). Also discussed are techniques and tools used in applying, evaluating, and creatively using interpersonal skills (motivating, influencing, negotiating, resolving conflict, and empowering). These are leadership challenges.

Strategic leadership involves creating both technical and social systems that are effectively integrated and that address the needs of both customers and employees. Operational leadership requires ensuring that organizational processes are effectively carried out on a day-to-day basis, monitoring performance, and addressing constraints. It involves ensuring that employees understand what is to be done and that they are provided with the appropriate authority, responsibility, requisite skills, tools, and work environment with which to do it.

The levels of employee motivation and empowerment and how conflict is resolved shape as well as serve to measure the organizational culture. Leadership must effectively attend to these softer issues that also affect organizational performance.

1. ROLES AND RESPONSIBILITIES OF LEADERS

> Describe typical roles, responsibilities, and competencies of people in leadership positions and how those attributes influence an organization's direction and purpose. (Analyze)
>
> **Body of Knowledge I.B.1**

Debate continues as to whether leaders are born or made. A consensus, but with no conclusive evidence, indicates both are possible.

Much effort and countless pages of print have been expended in attempting to develop a universal profile for a leader. It appears to be an endless and (perhaps) pointless task, each effort adding but another viewpoint on what constitutes a leader. It has already been stated that the line between the roles of a leader and those of a manager tend to be blurry and often overlap. Let's explore some of the attributes that tend to identify an individual as a leader, under several different situations:

- *Organization leader.* Most often holding a position with managerial or supervisory responsibilities, this individual exhibits leadership qualities that enable her or him to accomplish more than the position calls for. This individual may be perceived as a leader by his or her subordinates, peers, and bosses for exhibiting one or more of these attributes:
  - Knowledge

  - Skills
  - Experience
  - Charisma
  - Action
  - Convincing speech
  - Empathy
  - Ethics
  - Empowerment
  - Collaboration
  - Support
  - Trust
  - Multidimensional personality
- *Cause leader.* May work either behind the scenes or be highly visible to followers. Through personal motivation and power of persuasion, this leader gathers followers to a common goal, sometimes inciting the followers to take physical action against a targeted group. This type of leader has the ability to communicate in the language of the followers to stimulate their emotions, the stamina to build and sustain a high level of personal energy, and the ability to be seen as a fellow group member with issues the same as or similar to those of the group. This person is usually from the worker ranks of an organization or, sometimes, a ″hired gun″ who looks and talks like the followers.
- *Transactional leadership.* A transactional style is one in which the manager views the relationship as one of getting the work done through clear definition of tasks and responsibilities, and providing whatever resources are needed. This view might be likened to a contractual relationship, with rewards (positive or negative) being associated with achieving the desired goal.
- *Transformational leadership.* Transformational leadership is a style whereby a leader articulates the vision and values that are necessary in order for the organization to succeed. It is sometimes equated to charismatic leadership, but is aimed more at elevating the goals of subordinates and enhancing their self-confidence to achieve those goals. Bob Galvin accomplished this transformational leadership at Motorola with the Six Sigma program, an approach that positioned Motorola to become a high-quality, reliable competitor in its market.
- *Other kinds of leaders.* Bass identifies several additional leadership types, namely:[4]
  - Educational leaders

  - Public leaders
  - Opinion leaders
  - Legislative leaders

To be a leader, one has to believe in oneself, but with reasonable doubt and humility. One has to have a zeal for the role and genuinely care for people (the latter does not apply to ruthless dictators who lead through fear). "Leaders of the future can no longer afford to maintain insularity. It is simply not an option in increasingly boundaryless organizations driven by customer power . . . now they must destroy those walls and replace them with bridges."[5] Key roles of a leader include being a:

- Facilitator
- Appraiser
- Forecaster
- Adviser[6]
- Enabler[7]
- Follower[8]

Requirements for good leadership are similar, regardless of the functional department a manager oversees. Some specific requirements for quality managers in leadership roles include the following:

- Personal commitment to process, product, and organizational quality
- Strong sense of value for others' work and leadership
- Skilled application of a broad base of knowledge of the quality field and an understanding of how to apply this knowledge in functional areas
- Wisdom about both people and things, and an understanding of how to integrate them to get work accomplished (see Section 3)
- Absence (or control) of temperamental or emotional characteristics that might interfere with the ability to work with others

Some critical personal attributes that leaders in the quality management area should exhibit include creativity, patience, flexibility, and self-discipline. Good listening skills, excellent coaching and training skills, sensitivity to customer and employee issues, and a personal commitment to excellence are all essential. Finally, a leader must be a mentor, capable of leading change, and willing to empower followers.

Kouzes and Posner describe a three-phase model of leadership strategy called *VIP—vision–involvement–persistence*.[9] The leader has visions of an exciting, highly favorable future for the organization. The leader involves many others in the organization in making the vision a reality. This takes hard work and the persistence to stay the course.

Just as organizational structures, processes, and priorities have changed in recent decades, so too have the defined roles and characteristics of an effective leader. Some writers have defined the difference between management and leadership as being the amount of control exercised over people. Kouzes and Posner define leadership as a shared responsibility, and state the difference as "managers . . . get other people to do, but leaders get other people to want to do."[10] Warren Bennis defines the differences between the two as doing the right thing (leadership = effectiveness) versus doing things right (management = efficiency). Others have recognized that the type of leader needed often depends on the particular situation, such as the organization, its mission, strategies, and competitive environment, and the makeup of the individuals being led.[11]

Some issues that make leadership difficult to define include:

- Leadership of an organization may be an appointed role (for example, president or department manager).
- Leadership may be taken on at various times by different people who are working together on a particular project. That is, the role of leadership is based on who has the competence necessary during a particular phase of a project.
- Increasingly, in a knowledge-based environment the person being led has more knowledge of the tasks to be accomplished than the individual who is regarded as the leader.
- The increase in virtual teams, in which a group of individuals is jointly responsible for a particular outcome, but where team members do not have face-to-face contact (for example, where technologies are used to communicate).[12]
- Schein described paradoxes of leadership when stating that leaders of the future will be persons "who can lead and follow, be central and marginal, be hierarchically above and below, be individualistic and a team player, and, above all, be a perpetual learner."[13]
- Deming described the primary responsibility of leaders as "transformation of the organization."[14]
- Another leadership role is to ensure that the organization works effectively with respect to the interactions between individuals, groups, and business units both within and outside the organization, and that behaviors meet accepted standards for business ethics.

The traits and actions of leaders will, or should, vary based on the contingencies they face. Hersey and Blanchard's situational leadership model focuses on three factors:

1. Task behavior
    - The level of work-related detail and guidance a leader must provide to a performer

  - The extent to which direct action must be taken with the performer

2. Relationship behavior
   - The extent of the communication required with the performer
   - The amount of interpersonal support given a performer
3. Employee maturity or readiness
   - The ability a performer has to assume a task
   - The willingness of the performer to assume the task

Considering the maturity factor, the task and relationship behaviors comprise four situational leadership styles:

1. *High task, low relationship*. Specific instructions and close supervision of performance are indicated (a telling mode). For example, a new or transferred employee is assigned a task for which he has no prior training and needs continual supervision until skill is developed.
2. *High task, high relationship*. Decisions are explained and there is opportunity to clarify and ask questions (a selling mode). For example, a newly trained operator is trying to apply the training to the task at hand, but doesn't understand the need to follow the prescribed sequence of steps and requires supervisory support.
3. *High relationship, low task*. Ideas are shared, encouragement is provided, and the leader acts as a coach (a participating mode). For example, a trained operator is hesitant to assume full responsibility for the entire task assigned and needs help to build confidence.
4. *Low relationship, low task*. Responsibility for decisions and implementation are turned over to the employee (a delegating mode). For example, an experienced operator knows what to do and how to do it, as well as how to troubleshoot a problem should one occur, and assumes full responsibility for the task assigned without requiring direct supervision.

The keys to effective situational leadership are:

- Being able to determine, situation to situation, the leadership style most appropriate to apply in working with performers
- Realizing that one style does not fit all situations
- Realizing that the style used last with a performer may not be the best next time
- Realizing that there are other factors that can influence performance, such as:
  - The performer's physical and/or mental health
  - Events in the performer's personal life

  - Influence of coworkers
  - Lack of material, tools, equipment, and so on
  - Inadequate working conditions

Another aspect to leadership is the emotional competence of the incumbent leader. Daniel Goleman identifies five dimensions, three personal and two social, and related competencies:[15]

1. Self-awareness
   - Emotional awareness
   - Accurate self-assessment
   - Self-confidence
2. Self-regulation
   - Self-control
   - Trustworthiness
   - Conscientiousness
   - Adaptability
   - Innovation
3. Motivation
   - Achievement drive
   - Commitment
   - Initiative
   - Optimism
4. Empathy
   - Understanding others
   - Developing others
   - Service orientation
   - Leveraging diversity
   - Political awareness
5. Social skills
   - Influence
   - Communication
   - Conflict management
   - Leadership
   - Change catalyst

- Building bonds
- Collaboration and cooperation
- Team capabilities

Good leaders challenge the status quo. They inspire and enlist others. They encourage collaboration and enable others to take action. Effective leaders share their power and information to strengthen others. They look for and recognize people who are doing things right. Respected leaders set an example, recognize others' contributions, and celebrate successes. Exemplary leaders continually strive to improve both their intellectual intelligence (cognitive capacity) and their emotional intelligence. Leadership is a daily balancing act: juggling responsibilities and withstanding pressures.

2. ROLES AND RESPONSIBILITIES OF MANAGERS

> *The inherent preferences of organizations are clarity, certainty, and perfection. The inherent nature of human relationships involves ambiguity, uncertainty, and imperfection. How one honors, balances, and integrates the need of both is the real trick of management.*[16]
>
> —**Richard Pascale and Anthony Athos**

> Describe typical roles, responsibilities, and competencies of people in management positions and how those attributes contribute to an organization's success. (Analyze)
>
> **Body of Knowledge I.B.2**

What Managers Do

Managers attend to the work and resources of the organization—a stewardship role. This may include obtaining, allocating, distributing, using, disposing, and accounting for the resources that fall within the purview of the position to which they are assigned. Primary categories of resources include:

- Money
- Time
- People
- Material
- Physical assets: equipment, facilities, land, and water
- Information
- Intellectual property

Managers may be assigned a variety of different position titles, some of which are:

- Chief executive officer, chief operating officer, chief finance officer, chief information officer
- Vice president of ____________________
- Director of ____________________
- General manager of ____________________
- Manager of ____________________
- Superintendent of ____________________
- Supervisor of ____________________
- Staff supervisor of ____________________
- Designer of ____________________
- ____________________ engineer
- Purchasing agent/buyer for ____________________

Labor laws differentiate between exempt employees (employees free from certain laws pertaining to hours and compensation) and nonexempt (employees covered by laws relating to hours worked and compensation). Generally, management employees are exempt (however, the nature of one's work and compensation received are key determinants of exempt versus nonexempt status; for example, some management employees receive overtime pay as nonexempt employees do).

As stated earlier, there is often overlap between the roles and responsibilities of a leader and a manager. A significant difference is that the manager's role is mandated by some higher authority and is in effect as long as the higher authority so states. The role of leader is less permanent and, in fact, may either be shared through rotation or acquired through acceptance by followers. Being recognized as a leader often has no relationship to an organizational position title. Thus, a manager may or may not be recognized as a leader. A worker may be recognized as a leader without having any managerial-type title or responsibility. Organizations often interchange the two terms, for example, calling someone a project leader when the intention is really project manager. A chairperson may be a leader and/or a manager, depending much on the influence he or she may have on an organization and the decision authority granted.

Managers' roles may include:

- *Strategist*. Establishes direction for the enterprise through strategic planning and deployment of the plan's goals and objectives
- *Architect*. Builds an enterprise structure that supports the strategic goals and objectives
- *Organizer.* Organizes, people, ideas, and things to achieve the enterprise's objectives

- *Business generator*. Grows and sustains a viable business by creating and retaining satisfied customers
- *Value creator*. Adds value to the enterprise's processes, products, and services
- *Innovator*. Continually seeks ways to introduce, improve, or replace processes, products, and services to further the strategic goals of the enterprise
- *Administrator*. Optimizes the use of and results obtained from resources available
- *Entrepreneur*. Redeploys resources from activities producing poor results to activities where improved results may be obtained
- *Supporter*. Provides visible support, personal involvement, and reinforcement in furthering the efforts of the workers in fulfilling the enterprise's objectives
- *Ethicist*. Embraces the principles, standards, morals, and norms of the society in which the enterprise operates
- *Environmentalist*. Operates the business with high regard for sustaining and improving the physical environment in which the enterprise exists, with responsible use of land, air, and water, and safeguarding of wildlife
- *Mentor*. Provides a personal role model and guidance for the development of future managers
- *Motivator*. Creates and sustains a work environment that stimulates motivation in others
- *Coach*. Sets an example and guides others in achieving excellence
- *Trainer*. Imparts knowledge and teaches skills to others
- *Communicator*. Keeps others informed
- *Integrator*. Brings previously disassociated people and processes together
- *Harmonizer*. Balances and harmonizes major functions of the enterprise
- *Controller*. Oversees the financial affairs of an enterprise
- *Evaluator*. Tracks, measures, analyzes, and evaluates the performance, outputs, and outcomes produced by the enterprise, and the contribution toward achieving the strategic goals of the enterprise and addressing the needs of society

Sometimes a person may be titled a manager even though she or he is an individual contributor (makes a personal professional contribution to benefit the enterprise) and is not responsible for managing people.

Management functions may be grouped as follows (see Chapter 8, Section 2 for more):

- *Planning*
  - Mapping the work unit's processes and interfaces with other work unit's processes
  - Defining the work unit's performance objectives and linkage with the organization's mission, strategic goals, and objectives
  - Identifying the actions and activities needed to achieve the unit's objectives
- *Organizing*
  - Acquiring or assembling the resources needed to meet the unit's objectives
  - Establishing the structural framework (systems and procedures) for managing the unit's processes and resources
- *Staffing*
  - Selecting, hiring, assimilating, and training personnel needed to achieve the unit's objectives
  - Developing the unit's individual and collective competence level to meet or exceed the planned objectives
  - Retaining the unit's competent personnel by creating a motivational environment
- *Directing*
  - Directing the actions and activities of the unit's personnel in achieving the planned objectives
  - Providing the support needed by the unit's performers in realizing the product or service produced by the unit
- *Controlling*
  - Monitoring unit performance and comparing actual results to plans
  - Taking appropriate corrective actions as needed
  - Identifying areas for continual improvement

Competencies needed by managers cover a wide range.[17] (See Chapter 8 for a discussion of management skills and abilities.) Typical managerial competencies may include:

- *Technical competence*, for example:
  - Value streams
  - Techniques and tools

  - Enterprise resource planning
  - Process and quality auditing
  - Process benchmarking (see Chapter 12, Section 3)
  - Information technology (see Chapter 8, Section 3)
  - Knowledge management (see Chapter 8, Section 7)
- *Business competence*, for example:
  - Strategic planning (see Chapters 5, 6, and 7)
  - Customer relationship management (see Chapter 17)
  - Finance (see Chapter 8, Section 5)
  - Metrics (see Chapter 15)
  - Risk analysis and management (see Chapter 8, Section 6)
  - Project management (see Chapter 10)
  - Performance management
  - Organization structures (see Chapter 1)
  - Marketing (see Chapter 8, Section 3)
  - Processes (see Chapter 14)
  - Legal requirements
  - Ethics issues (see Chapter 4)
  - Stockholders/ownership issues
  - Supply chain management (see Chapter 18)
- *People competence*, for example:
  - Personality types (see Chapter 8, Section 2)
  - Managing styles (see Chapter 8, Section 2)
  - Diversity issues
  - Behavior management
  - Interacting
  - Communicating (see Chapter 9)
- *Human resource competence*, for example:
  - Hiring
  - Training
  - Affirmative action
  - Benefits

  - Recognition and rewards
  - Compensation
  - Safety and well-being
  - Professional development
- *Environmental competence*, for example:
  - Factors affecting the world
  - Politics and power issues
  - Earth sciences
  - Competition

Drucker identifies four tasks of management:[18]

- *The task of economic performance.* Business enterprises exist for the purpose of economic performance—profitability. Other societal needs can not be fulfilled without a surplus of economic resources.
- *The task to make work productive and the worker achieving.* Performance is accomplished through work. Achieving implies consideration of the human resource as human beings and not as things.
- *The task of managing the social impacts and the social responsibilities of the enterprise.* No institution can exist outside of community and society.
- *The task of managing within the dimension of time.* Management always has to consider both the present and the future, both the short run and the long run.

See Chapter 8 for a discussion of management principles, skills, and abilities.

Persons holding management positions lower in the organizational structure usually are responsible for designated short-term outputs, for example, parts produced, engines serviced, reports generated, and so on. Managerial personnel at the high end of the organizational hierarchy are more likely to be responsible for longer-term strategic outcomes affecting the profitability, growth, and overall success of the enterprise.

3. CHANGE MANAGEMENT

Use various change management strategies to overcome organizational roadblocks and achieve desired change levels, and review outcomes for effectiveness. Define and describe factors that contribute to an organization's culture. (Evaluate)

Body of Knowledge I.B.3

Techniques for Facilitating or Managing Organizational Change

External change is inevitable; internal change is probable. Organizations that continually improve their processes will have a greater probability of success than those who only react to problems. As an organization evolves, there are not only incremental changes, but also increasingly major shifts in strategy, technology, and work organization. Change can occur as a result of outside forces or inside forces.

Fear of change is also a real and valid concern. People are afraid of change because of its potential impact on them. Corporate downsizing and outsourcing cause major disruptions of people's work and personal lives, and continual improvement efforts are sometimes blamed for job losses.

Change management is a process for ensuring that the people affected by change understand the nature of the change and the reasons for it, with the expectation that the new methods of operating will be internalized without creating undue resistance, conflict, and fear. To reduce fear, it's important that the vision of the future be well communicated and that jobs be protected when feasible. Ongoing and open communication during any change process is paramount. Although these precautions will not totally remove fear, they can remove some of the uncertainty of not knowing the direction in which the organization is headed.

Change Agents

Change agents are individuals who play a specific role in the planning and implementation of the change management process.[19] They may be members of the organization or may be outsiders. Collaboration of an internal change agent with an external change agent who has extensive experience in the type of change to be implemented can be a useful strategy.

An internal change agent is a person within the organization designated, usually by management, to facilitate a particular change effort. Internal change agents possess an understanding of the organization's culture, infrastructure, and the business, and also have a vested interest in seeing change efforts succeed. However, they can be hindered by political pressures that can influence objective feedback when problems arise. They might also lack perspective of the big picture or have a vested interest in preserving certain traditions that keep them from seeing specific opportunities for improvement. The role of the internal change agent may be filled by a staff or line person depending on the type and magnitude of the change being implemented.

An external change agent is a person from outside the organization who has been retained to advise and help facilitate the change process. An external change agent often has a greater degree of freedom and should be better able to objectively assess activities and provide honest feedback to senior management without fear of repercussion. Also, organizational members are less likely to have previous experiences with the change agent that might impact effectiveness, and the agent does not have a vested interest in preserving long-held organizational traditions. The danger, of course, is that organizations can become so dependent on an external change agent that the change process is adversely affected when the agent leaves. Another disadvantage of external change agents can be their lack of familiarity with the specific corporate culture.

External change agents must work diligently to build a relationship with the client organization. This includes becoming familiar with company norms, shared beliefs, and behaviors, as well as understanding both formal and informal leadership structures. In most organizations, the change agent needs to become acquainted with persons who serve as informal leaders and to whom others turn for new ideas. Building a relationship between informal leaders can be beneficial because other members of the organization will check with them for affirmation that it is beneficial or safe to support the change process.

Deming emphasized the role of change agents in his view of organizational transformation by stating, "A system can not understand itself. The transormation requires a view from outside."[20]

Guidelines for Implementing Change

The following steps are key to implementing change:

1. Create an awareness of the need for change.
2. Organize a project with sufficient authority to guide the process.
3. Define the vision and strategies for achieving it.
4. Communicate the vision and demonstrate personal commitment to it.
5. Remove obstacles that prevent others from acting on the vision.
6. Go for early and visible successes.
7. Build on success by rewarding supporters and involving more people.
8. Institutionalize the new methods by aligning other systems with them.[21]

The following are common errors made in managing change:

- Not sufficiently emphasizing the urgency and allowing people to be complacent.
- Those guiding the process do not have sufficient power.
- Lacking a clear and compelling vision or not communicating it strongly and/or frequently enough.
- Failing to manage the forces that resist change.
- Not ensuring some early successes that encourage others.
- Celebrating victory prematurely.
- Not changing other organizational systems and cultural elements that are required for long-term continuation of the change.[22]

In Peter Senge's *The Fifth Discipline*, he refers to the parable of the boiling frog to emphasize how threats to corporate and personal survival are perceived when transformational change is taking place: A frog suddenly placed in boiling water—the turbulence of organizational change—will scramble out. Placing a frog in water that is room temperature will not upset the frog. In fact, the frog might even be calmed. Now the water can be gradually heated until it is boiling. As the heat increases, the frog will become groggier until it can no longer climb out. When the water is boiling, the transformation is now complete. The frog's internal apparatus senses the change as a threat to survival and instinctively seeks to avoid the situation. For effective organizational change, use a slow and gradual process change, while paying attention to the subtle reactions from employees.

At the same time, a significant lesson that psychologists will emphasize is that the change process, from an individual perspective, is a progressive one that usually occurs over a considerable length of time. For major changes in culture, this is also true at the organizational level. Trying to shortcut the process may create an illusion of speed, but will not produce the desired results.

Techniques and Roles of Change Agents

Change agents may assume several roles and use a variety of techniques, such as:

- Coaching top management to:
  - Create an environment in which change can take place with minimum resistance.
  - Develop and support an improvement plan.
  - Provide the resources to implement the plan.
- Supporting and advising management colleagues on how to:
  - Deal with technical issues.
  - Cope with intellectual and emotional resistance.
  - Measure, monitor, and report progress.
  - Handle behavioral issues.
  - Provide performance feedback, including reinforcement of top management for the decision it made and reinforcing the work of those implementing the change.
  - Use the change agent as a facilitator when needed.
- Managing a specific project or segment of a large project to:
  - Fill in where no other suitable resource person is available.
  - Serve as a role model for other project management efforts.
- Guiding the development of a network to:
  - Support the implementation of the change.
  - Deploy the principles and practices for managing change throughout the organization.
- Guiding the assessment of the results and closure of the change, including:

- Reviewing lessons learned.
- Evaluating the economic case for the change.
- Documenting the change.

Organizational Roadblocks

Organizational change is difficult, partially due to the inherent nature of how organizations are designed and operated. That is, by constructing an organization in one way (for example, defining the specific roles and processes to be used), other options are excluded by default. Although the boundaries of organizational structure, policies and procedures, and norms are actually quite permeable, the fact that they are defined, documented, and reinforced makes them appear permanent in the minds of many employees. This may be especially true in an organization with a history of success, where that success is linked mentally to the way things have been done in the past.

The division of labor in an organization, both horizontally and vertically, creates several roadblocks. Following are some examples along with methods for reducing the effect on the organization's ability to change:

- *Lack of cross-functional collaboration.* Functional or other forms of work units are created in order to help clarify the mission and focus of each particular group in the organization. An organization, however, is a system with interdependencies in many different directions. When the interdependencies (for example, internal customer–supplier relationships) are not clearly defined and fostered, each work unit may view a request for change only as it relates to their own processes, rather than the entire organization.

  A possible solution is to ensure that improvement initiatives, performance measures, and rewards are designed such that collaboration (teamwork across boundaries) will be necessary in order to achieve objectives. Develop internal customer–supplier agreements and performance measures, along with ongoing joint reviews of progress.

- *Lack of authority.* The reason for dividing up work processes and tasks is because time and/or skills constraints prevent any one person from carrying out all the necessary activities. This means that responsibility and authority are divided among many. When a change in work activity is required, however, new roles, responsibilities, and processes may not fit into the predefined boundaries.

  A possible solution is to ensure that someone (for example, a champion/sponsor) is identified who has authority over the entire area to be impacted by the change, and that they have a direct link to higher levels of the organization in the event they need additional support outside their area of authority.

- *Inward focus.* Similar to the lack of cross-functional collaboration is the problem of the boundaries between the organization and its environment. By definition, each organization consists of only certain processes and people, and outside these boundaries are suppliers, customers, regulators, and other stakeholders. The day-to-day attention of many members of the organization, however, is on internal processes, resources, and knowledge. Being willing to look externally for ideas, support, and feedback may not come naturally.

A possible solution is to have employees go outside the organizational walls, for example, visiting customer sites, locations where the final product/service is in the hands of the final user, or where other sources of information on new ideas might exist (such as trade shows, conferences, workshops).

- *Internal competition for resources or rewards.* All organizations have limited resources and opportunities, and must allocate them so as to best accomplish the mission with high efficiency. Limited funds, people, or promotions can cause employees to compete against each other—not wanting to suboptimize their area—instead of seeing their efforts as needing to be focused on maximization of the enterprise.

A possible solution is to ensure that strategic and operational plans clearly indicate the priorities and strategies of the organization, and where and how resources are to be allocated. Involve employees in creating these plans through a catchball-type process (see Chapter 7).

- *Lack of understanding.* In a typical organization there are so many different strategies, initiatives, projects, and day-to-day activities always going on that it is often difficult to keep everyone fully informed. People therefore put their focus where it seems best placed, but this may not agree with what is actually expected or desired.

A possible solution is to communicate, communicate, communicate! The biggest problem noted in many employee surveys is lack of adequate communication. When people have gaps in their understanding, they often fill them in as best they can, even though what they hear or think may be incorrect. Management must ensure that information relative to organizational direction (for example, vision, mission, values, strategy, objectives, projects, and performance) is continuously communicated, with the amount and type of communication being adapted to the message and audience (see Chapter 9 for more on communications).

- *Slow decision making.* Although an organization may have clearly communicated plans and have good cross-functional relationships, levels of the hierarchy slow down and frustrate some people who are actively working on improvement initiatives. Vertical communication is meant to ensure ongoing alignment of goals and activities, but is often slower than optimal due to the number of channels through which it may travel and differing time perspectives at each level.

A possible solution is to ensure that authority levels are clearly spelled out for typical situations and use an exception basis where a few key people have the authority to act if the decision involves crossing a particularly difficult organizational boundary. Specify decision-making channels that do not require everyone in the hierarchy to be involved in all decisions, especially those related to improvement opportunities.

Those who study human development discover a tension within many individuals who on the one hand want to improve their lives, but at the same time want a life that is stable and without chaos. Similar paradoxical issues impact an organization's ability to change. Following are some examples:

- *Lack of willingness to invest for the long term.* Managers are often measured according to the end-of-quarter financial results. Yet, a significant commitment of funds and other resources is usually required in the early part of organizational transformation, with the more strategic payoffs occurring perhaps three or more years later.
- *Wanting results fast.* Many of the cause-and-effect relationships dealt with on a day-to-day basis in organizations are quickly resolved. This gets translated into people's expectations for many other issues, although there is often a significant time lag between cause and effect. People become impatient and want to stop taking action if they aren't seeing results.
- *Be selective in what to work on first.* Take the classic low-hanging fruit approach. Make sure that initial efforts are focused on areas where success and payoff are highly probable.
- *Poor history of change.* Some organizations have a long record of unsuccessful change efforts, which causes people to become cynical and to want to avoid future attempts.
- *Learn from errors.* Study and admit past mistakes, and ensure that future efforts don't repeat them.
- *Fear of the unknown.* By definition, change means that things will be different than in the past. People are often uncertain of what their new roles will be and whether they will be able to adapt to the changes, or want to.
- *Provide support for change.* Allow employees to talk with others who have been through similar changes. Provide reassurance that necessary support will be available throughout the change.
- Ensure that there is a common vision of change; communicate the purpose and importance. Figure 2.1 depicts the change process and causes for resistance to change.

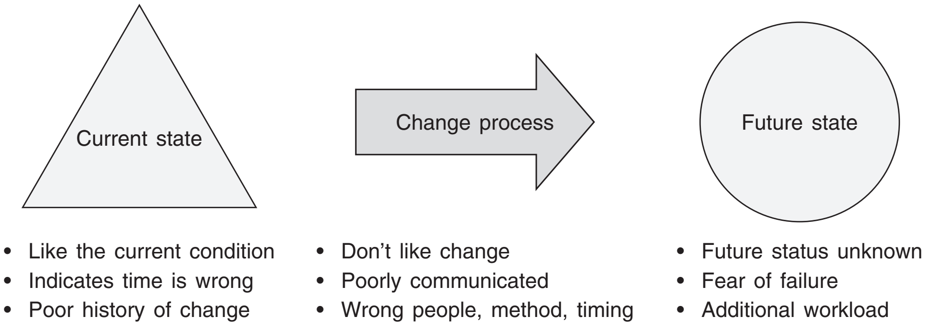

Current state
Change process
Future state
• Like the current condition
• Indicates time is wrong
• Poor history of change
• Don't like change
• Poorly communicated
• Wrong people, method, timing
• Future status unknown
• Fear of failure
• Additional workload

Figure 2.1 Causes for resistance to change.

Source: Reprinted with permission of APLOMET.

- Understand the emotional impact of change.
- Understand the systems view—that is, be aware of how changing one process or part of the organization will affect other processes or parts.
- Communicate what will and what will not change.
- Model the behaviors that are desired.
- Provide effective feedback, rewards, and consequences.
- Be consistent in responding to resistance.
- Be flexible, patient, and supportive.[23]

Constraint Management

Managing change is particularly complex due to the fact that much of what must be changed often consists of intangibles such as beliefs, behaviors, and policies. These types of constraints are more difficult to identify and manage than issues such as the capacity limitation of a piece of equipment. Conceptual models or diagrams are useful for representing situations, however, making them more visible and aiding understanding of intangible constraints that may need to be addressed. Following are some examples of how these diagrams can be used. (Chapter 14 contains additional information based on Goldratt's theory of constraints.)

Identifying Constraints with an Interrelationship Digraph. Creating the interrelationship digraph is a method for representing several elements involved in a process and their cause-and-effect relationship. The digraph involves first developing an affinity diagram, then analyzing and organizing the components into their respective relationships (see Chapter 13 for more about constructing an affinity diagram and an interrelationship digraph).

Figure 2.2 is an example of a diagram developed by an organization that was considering developing a suggestion system. Some people had reservations about whether it would be worthwhile, so the management team developed the diagram to represent its thinking about the issues involved. Team members included whether the relationships between components were positive or negative (for example, would or would not be beneficial) as some members of management had reservations about the costs, both resource and financial, of administering the program. They subsequently discovered that they could design the system to fit their particular needs rather than basing it solely on the systems they'd seen and read about. The diagram helped them understand the true cause-and-effect relationships involved and that the design they selected would be the major driver for both costs and resources. An organization unhappy with an existing suggestion system might also learn from a similar analysis.

This type of analysis allows a group to develop a common view of how something is working or should work. The model can also be used as a diagnostic tool to guide collection of data to determine which components of the system are not working as desired. Managing constraints requires understanding the issues involved in the situation, how they are interrelated, which have the most leverage, and which will or may block the desired outcome.

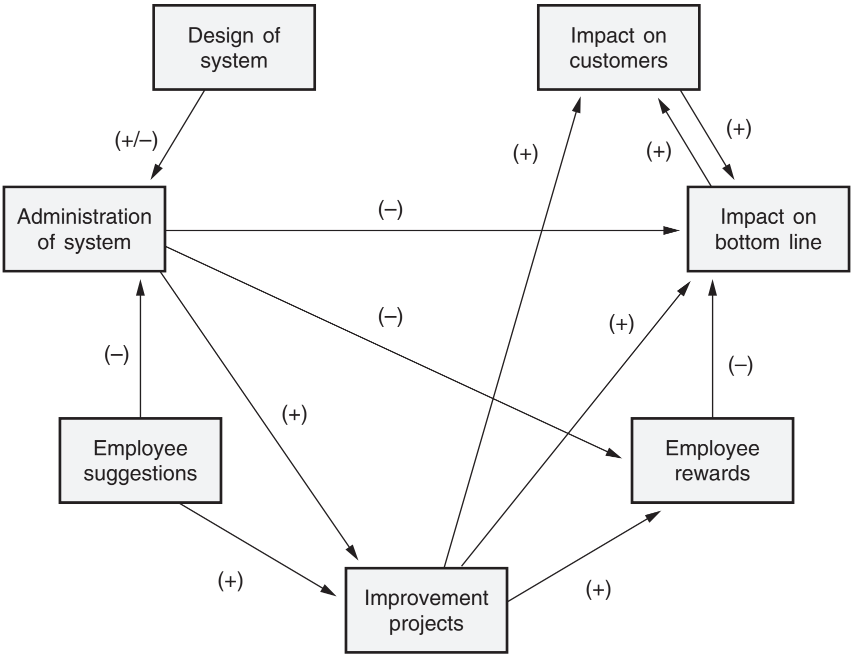

Design of system
Impact on customers
(+/–)
(+)
(+)
(+)
Administration of system
(–)
Impact on bottom line
(–)
(+)
(–)
(–)
(+)
Employee suggestions
Employee rewards
(+)
(+)
Improvement projects

Figure 2.2 Analysis of an employee suggestion system.

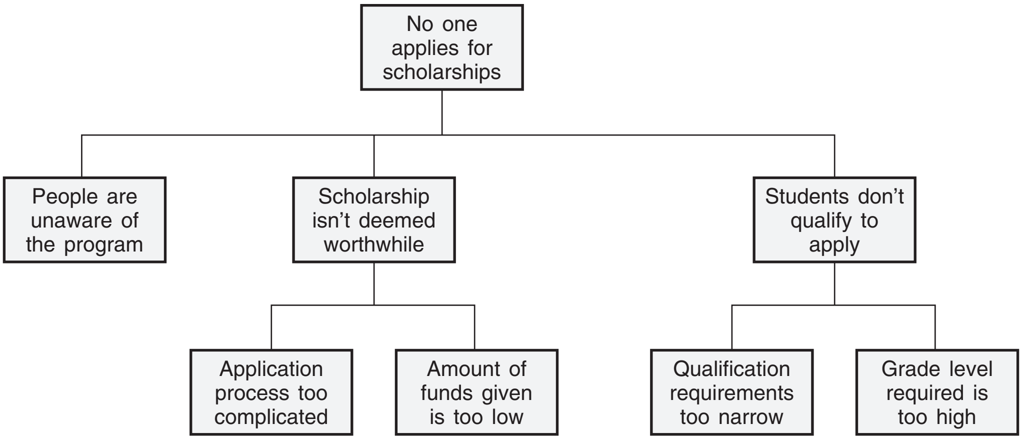

No one applies for scholarships
People are unaware of the program
Scholarship isn't deemed worthwhile
Students don't qualify to apply
Application process too complicated
Amount of funds given is too low
Qualification requirements too narrow
Grade level required is too high

Figure 2.3 Logic tree analysis.

Identifying Constraints Using a Tree Diagram. Another approach to finding constraints is to break the situation down into component parts using a logic tree diagram. Figure 2.3 demonstrates the use of the process by an organization that has offered a scholarship program for three years, but had no applicants. The organization had widely publicized the program, so elected to not look at that branch of the tree. By breaking down the other two branches, however, it found some likely sources of the problem. It may again ignore some of the branches (for example, keeping the required grade level at what is deemed necessary for true scholarship purposes) and either investigate or alter other aspects of the program in order to affect the next application period.

The logic tree diagram uses a top-down approach to analyzing the situation. As with many improvement tools, the process can also be enhanced by involving key stakeholders in developing the model and in gathering information to identify the constraint(s) for which action will be taken.

4. LEADERSHIP TECHNIQUES

> Develop and implement techniques that motivate employees and sustain their enthusiasm. Use negotiation techniques to enable parties with different or opposing outlooks to recognize common goals and work together to achieve them. Determine when and how to use influence to resolve a problem or move a project forward. (Create)
>
> **Body of Knowledge I.B.4**

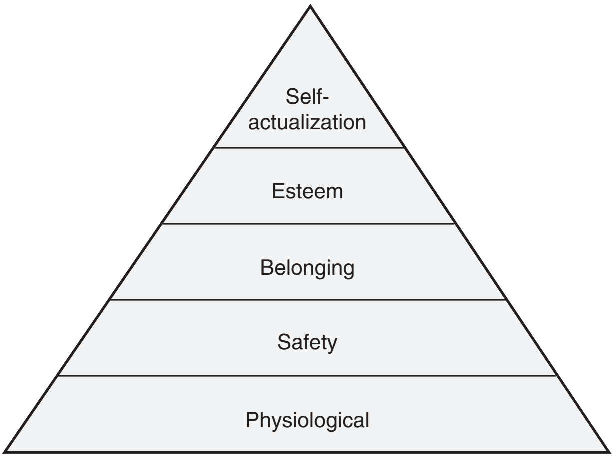
It is impossible for one person to motivate another person. Motivation is derived from within a person—a person needs to feel motivated. Therefore, motivating a person can only be done by creating an environment in which the person feels motivated. When one person (for example, a supervisor) says she is going to motivate a subordinate, she means (or should mean) she is going to do something that will cause the subordinate to become motivated. The idea that a "kick in the butt" will motivate a subordinate is incorrect; it may just move the subordinate, and usually will make the subordinate angry and/or afraid. That kind of movement is erroneously perceived as motivation.

Theories of Motivation and Influence

Two types of motivation have been identified:[24]

- *Extrinsic motivation.* The satisfaction of either material or psychological needs that is applied by others or the organization through pre-action incentive or post-action reward.
- *Intrinsic motivation.* The qualities of work itself or of relationships, events, or situations that satisfy basic psychological needs (such as achievement, power, affiliation, autonomy, responsibility, creativity, and self-actualization) in a self-rewarding process.

Abraham Maslow developed a model demonstrating a *hierarchy of needs* through which he believed people progressed.[25] Maslow's pyramid (see Figure 2.4) assumes that once humans satisfy the basic, physiologically driven needs, they will then be



Stage	Process	Needs
1st	Physiological	To eat, sleep, have shelter
2nd	Safety	To have economic and physical security
3rd	Belonging	To be accepted by family and friends
4th	Esteem	To be held in high regard; status
5th	Self-actualization	To achieve one's best

Figure 2.4 Maslow's hierarchy of needs.

motivated by higher-level needs, and this process will continue until achieving self-actualization. The workplace is obviously a key aspect in allowing an individual to satisfy physiological and safety needs, but someone who has satisfied these levels and is working to satisfy higher levels can quickly return to the bottom of the hierarchy in the event of a job loss. The workplace can also allow them to reach higher levels, assuming there are job opportunities that enable their personal desire for recognition and achievement to be satisfied. It is important to note that since Maslow's theory is based very much on values, it would not necessarily apply to people from all cultures or socioeconomic strata.

Frederick Herzberg identified two categories into which work motivation factors could be classified—*satisfiers* and *dissatisfiers*.[26] Dissatisfiers included factors such as work conditions, salary, company policies, and relationship with one's supervisor. He also called them *hygiene factors*, since although they create dissatisfaction if not adequately addressed, correcting the deficiencies would not create satisfaction. Satisfiers included items such as responsibility, achievement, advancement, and recognition.

There are also three motivational theories specifically related to recognition and rewards:

- *Equity theory.* Job motivation depends on how equitable the person believes the rewards (or punishment) to be.
- *Expectancy theory.* What people do is based on what they expect to gain from the activity (Victor Vroom).

- *Reinforcement theory.* What people do depends on what triggers a behavior initially (the antecedent) and the consequences that have in the past resulted from such behavior, or the consequences the performer believes will happen as a result of a behavior (B. F. Skinner).

What motivates one person may not motivate another. McClelland and others have posited that:

- An individual who enjoys working closely with other people is motivated by affiliation.
- Someone who works in order to accomplish personal goals is motivated by achievement.
- A person who works in order to contribute to the well-being of others is motivated by altruism.
- Someone who wants to have control over their work is motivated by power.

These motivations are not mutually exclusive, nor is any one person driven only by a single factor. In fact, in order to satisfy their many different needs, people are often involved in several different activities at work, in their local community, and in other organizations.

A paradoxical view of motivation is the division between intrinsic motivation and extrinsic motivation. Some people are driven more by their own internal needs or desires, while others are motivated primarily by external factors. This is partially a function of whether the person has an internal or external locus of control—whether you believe your future is impacted more by your own actions or by actions/decisions of others.

Caution is advised in assuming that what stimulates motivation for an individual in one situation or time frame will continue to motivate the next time. Also, what provides motivation for one person may not do so for another.

Consider this example: Work is backing up, and the manager tells her work unit personnel that the unit will have to work overtime each day for the next 10 days. Rose, a young woman who is saving money to buy a dirt bike, is delighted about the prospect of extra compensation. Ray, a single father whose baby is cared for during the day by a babysitter, is distraught because he has to be home by 6 p.m. to relieve the babysitter and realizes that any other option would cost more than he will earn on overtime. Rose is motivated, Ray is not. Six months later, the same need for overtime occurs. Rose resents the mandate (she has purchased her dirt bike and wants to ride it in the early evening before the sun sets). Ray's aunt has moved in with him and now cares for the baby. Ray needs the additional compensation to help with his expanded family. Ray is motivated, Rose is not.

Negotiation

In order for multiple parties, whether individuals or groups, to work together to achieve common goals, there must be agreement on the goals, the methods for achieving them, and what will occur when difficulties arise. Each party will typically have different values and priorities that need to be addressed, and that calls for negotiations resulting in an agreement acceptable to all parties. Management–union negotiations are perhaps the most widely discussed example, but negotiation also occurs as part of many other normal business processes, such as:

- Establishing specifications for purchased components for a new product
- Setting performance measures for a process or department
- Defining the desired outcomes for an improvement project
- Identifying personal development goals

Parties involved in such negotiations might include customers and suppliers, senior management and middle management, sponsor and team leader, or manager and employee.

A difficulty in the negotiation process is that the two parties often approach the task as though there were only two sides to the situation, when, in fact, there are multiple views that could be taken. This is exacerbated when a win–lose attitude is taken, as the process will become divisive and usually result in outcomes that are not seen as beneficial by either party. There are four orientations to negotiation: win–win, win–lose, lose–win, and lose–lose. When both parties approach negotiation with an anticipation of achieving mutual benefit, both parties tend to win. The other three orientations leave the parties striving not to lose at any cost.

Principled negotiation based on a win–win orientation includes:

- Separating the people from the problem
- Focusing on interests, not position
- Understanding what both sides want to achieve
- Inventing options for mutual gain
- Insisting on objective criteria

Timing also affects negotiations, both long-term and short-term. For negotiations that recur on a long-term periodic basis (such as labor agreements), the years between sessions allow the parties to store up their frustrations and release them just as they come together to forge a new contract. At the same time, allowing a break between negotiation sessions allows the parties to back off from what may be an emotional discussion and reflect on their primary purposes.

Negotiations should take place in an environment that is conducive to open discussion and allows all involved to see each other face to face. Rather than making presentations to each other, both parties should focus on a conversation with each other, which means that listening in order to understand the other person's viewpoint is a key requirement. A set of ground rules or a third-party mediator may be useful if the negotiations involve a highly controversial or emotional subject.

Some techniques that have been found to improve the negotiation process include:

- Focusing on common objectives before discussing areas of difference.

- Avoiding power strategies such as lying about one's priorities in order to get the other party to submit to lowered expectations.
- Doing something for the other party, even if symbolic, to create positive energy.
- Separating out discussion issues that are not interconnected so that they can be discussed based on their own merit.
- Bringing in other parties that may have additional or different information about the situation.[27]

Additional techniques include:

- Identifying, up front, a range of acceptable outcomes—and why you want what you want.
- Determining the real intentions of the other party: the goals, objectives, and priorities.
- Being prepared with supporting information.
- Not rushing the process.
- Keeping the most difficult to resolve issues for last.
- Being sensitive to face-saving needs of the other party.
- Being firm, fair, and factual.
- Always controlling your emotions.
- Evaluating each move against your objectives and assessing how it relates to all other moves.
- Being adept at formulating a win–win compromise.
- Being aware of the effect of the outcomes of the present negotiation on future negotiations.
- Actively listening and seeking clarity of expectations.
- Being flexible with your position and being able to step back and look critically at your position—there may be multiple ways the same overall objective can be achieved. This view involves going up the vertical hierarchy of one's cognitive view of the situation, rather than only going horizontally across perceived options.[28]

Figure 2.5 is a portion of a decision option hierarchy for reducing deficit spending by a city government. Negotiations between city officials and the school board often focus only on option C, while negotiations with the citizenry focus only on options A and B. By limiting the focus to the *hows*, the larger picture of the higher *why* is often ignored, which means that option D is often not even understood as a possibility.

Negotiating is a skill very much needed in the project management arena. Often, the project manager/leader has less authority than ongoing operations

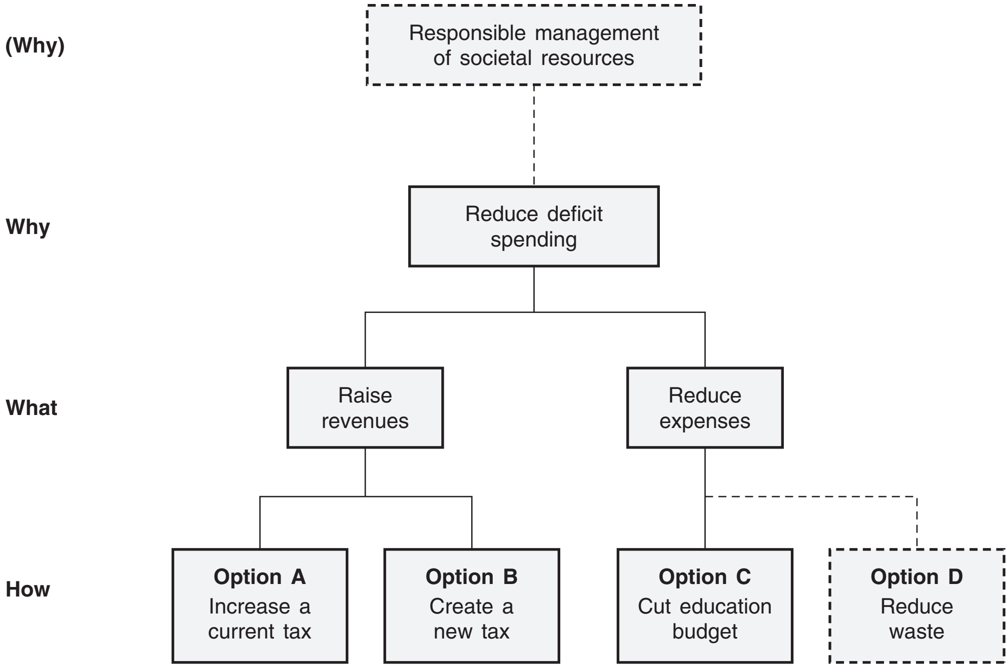

(Why)
Why
What
How
Responsible management of societal resources
Reduce deficit spending
Raise revenues
Reduce expenses
Option A
Increase a current tax
Option B
Create a new tax
Option C
Cut education budget
Option D
Reduce waste

Figure 2.5 A decision option hierarchy.

managers, and that necessitates negotiating for needed resources. This is especially problematic when the project team is not dedicated solely to the project. Then, one of the largest problems is ensuring that the project team members get the release time needed to work on the project.

Negotiating in a different culture can be a challenge, but is essential in the growing global marketplace. Communicating in a global economy is discussed in Chapter 9, Section 3.

Change management usually involves negotiation in eliminating organizational roadblocks and managing constraints. (Change management will also involve conflict resolution.)

Some common uses for negotiation are:

- Customer–supplier purchasing contracts
- Negotiation of compensation terms between a potential new hire and the organization
- Labor–management contracts
- Facilites/equipment rental contracts
- Negotiating for approval of the annual budget for a work unit

Having effectively completed negotiations usually means that the relationship between the parties will continue and that the agreement should be documented. The agreement should include the standards against which compliance of each party will be compared, a frequency or process for reviewing performance, and what is to take place if a violation should occur.

Conflict

Sources and Views of Conflict. Because organizations consist of individuals and groups with different backgrounds and responsibilities, some conflict is inevitable. A conflict might occur between two individuals (for example, between a manager and an employee, or between peers), between groups (for example, departments or teams), or between organizations (for example, customer and supplier). Although conflict will often be created by disagreements over goals or resource allocation, beneath the surface are differences in values, priorities, roles, and personal styles that cause the conflict to become emotional and/or personal.

Conflict occurs when two or more options appear to be mutually exclusive, and a viable alternative is felt to be absent. Conflict can not be resolved when the parties involved firmly believe that what each wants is incompatible with what the other wants.

Conflict may be due to personal issues or may be caused by underlying organizational issues (for example, incongruent policies or unclear boundaries). The effect is that energy that should be focused on the organization's mission instead gets transferred to activities that are unproductive. Regardless of whether the activities are unseen or visible, it is in the best interests of the organization to identify and address the conflict. Quality managers, because of their expanded role in facilitating cross-functional cooperation for strategic alignment and continual improvement, should be aware of and develop their conflict management abilities.

On the plus side, conflict can also be viewed as an energizing force. Management and resolution of differences between individuals and groups can unlock creativity. "Contrary to conventional wisdom, the most important single thing about conflict is that it is good for you. While this is not a scientific statement of fact, it reflects a basic and unprecedented shift in emphasis—a move away from the old human relations point of view where all conflict was basically seen as bad. In brief, in our new frontier environment, conflict is the order of the day."[29]

One model for understanding conflict resolution is based on the dimensions of assertiveness (extent to which a party attempts to satisfy his/her own concerns) versus cooperativeness (extent to which the party attempts to satisfy the other's concerns).[30] The resulting matrix (see Figure 2.6) has been incorporated in an assessment instrument that can be used to evaluate conflict-handling style. Interpretation of the instrument emphasizes that each conflict mode might be appropriate for a particular situation. The following list further expands on these options:

- Approach it as a problem to be solved. Utilize facts and information that can be useful for looking at and evaluating different options.
- Smooth over the conflict by emphasizing the positives and trying to avoid the negatives. This is obviously only a temporary solution if the conflict is substantial.
- Transfer the problem to a higher level of authority.
- Resolve any scarcity of resources that is creating the conflict.

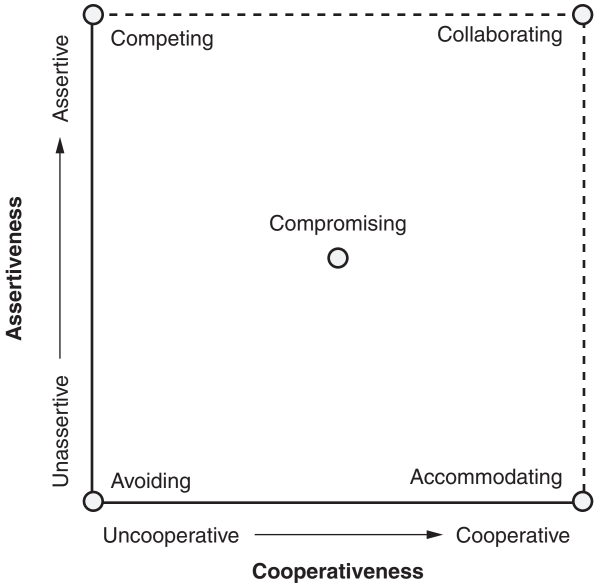


Figure 2.6 Conflict-handling modes.

- Avoid the conflict if it is not in the organization's best interests to continue to pursue it.
- See if compromise will resolve it to the satisfaction of both parties.
- Change the minds of the people involved.[31]

Since the latter option involves trying to change a person's mind, it is not a very viable one. Research indicates that people's basic personality does not change substantially over their lifetime, so changing a mind is obviously difficult. Additionally, organizations do not have the right to change a person's thought processes per se. The option is viable if interpreted differently—people may be transferred or otherwise removed from the conflict situation as a final option. In a quality organization, however, it is more likely that additional methods for resolving the situation would be attempted.

Techniques for Conflict Resolution. The best method for resolving a particular conflict depends on the situation. If there is clearly a solution that simply needs to be identified and agreed to, and the parties involved are not adamantly opposed to each other, then simple discussions utilizing brainstorming, multivoting, and consensus may be sufficient. The brainstorming process can be used to identify several possible solutions, followed by a multivoting process (see Chapter 13) that narrows the list to a smaller, more viable list. Looking at the positive and negative attributes of each option may then result in agreement of all parties on what action(s) will be taken. This discussion can be aided by looking at each of the activities that would be required by each party in the conflict, the effort it would require, and the impact it would have both on resolving the issues and on the relationship between the parties.

A more difficult situation arises when, although there may be several viable solutions, the involved parties do not appear to be prepared to work cooperatively in order to reach a joint decision. A process such as *interest-based bargaining* (also called *principled negotiation*) might then be used to attempt to satisfy as many interests as possible using the following steps:

1. Define the problem in a way that distinguishes it from the people involved.
2. Clarify the interests of the parties (as opposed to their positions on the issue).
3. Identify new and creative options beneficial to all parties.
4. Determine objective criteria to be used to evaluate fairness of the outcomes for all parties.

Conflict resolution may also involve intervention by a third party. For example, a person trained in human process interventions might help parties involved in a conflict by engaging them in dialogue. Strategies that might be used include:

- Helping the parties avoid the factors that trigger conflict
- Setting guidelines for interaction of the parties
- Helping the parties find ways to cope with the conflict
- Identifying and eliminating the underlying issues[32]

Real dialogue involves not only listening to what the other party says, but also taking care to truly comprehend his or her perspective and why it is important to him or her. It also requires that one understand the values and assumptions underlying one's own position and be willing to share them.

Core Issues in Conflict Management. Conflict management is difficult when people take a "What's in it for me?" viewpoint. A win–win approach provides the following benefits:

- A unified direction—a platform for achieving the organization's goals and objectives
- Higher employee satisfaction, especially when active listening is used and the search for alternatives is expanded
- Improved health and safety of employees due to encountering less stress in their lives

Following are components of an approach to resolving conflict to the mutual benefit of all involved parties:

- Define the conflict as a mutual problem.
- Identify goals common to all parties.
- Find creative alternatives that satisfy all parties.
- Ensure that all parties understand their own needs and communicate them clearly.

- Emphasize mutual interdependence (as opposed to independence or dependence).
- Be certain that contacts are made on a basis of equal power.
- Communicate needs, goals, positions, and proposals openly, honestly, and accurately.
- State needs, goals, and positions in the opening offer.
- Empathize with and understand others' positions, feelings, and frames of reference.
- Reduce defensiveness by avoiding threats, harassment, or inconveniencing other parties.

A conflict is not likely to be resolved successfully when either party does the following:

- Defines the conflict as a win–lose strategy.
- Pursues his or her own goals or hidden agenda.
- Forces the other party into submission.
- Increases power by emphasizing independence from the other party and the other party's dependence on them.
- Tries to arrange contacts based on power relationships.
- Uses inaccurate or misleading communications.
- Overemphasizes needs, goals, and position in the opening offer.
- Avoids empathy and understanding of others' positions, feelings, and frames of reference.
- Would rather both parties lose (lose–lose) than have the other party get his or her way.

5. EMPOWERMENT

> Apply various techniques to empower individuals and teams. Identify typical obstacles to empowerment and appropriate strategies for overcoming them. Describe and distinguish between job enrichment and job enlargement, job design and job tasks. (Apply)
>
> **Body of Knowledge I.B.5**

One of the core components of quality leadership is having everyone in the organization involved in managing and improving quality of the processes for which they are responsible. This might be done as part of day-to-day operations as a member of a natural work team or a self-directed team, or in becoming part of a group that is going to take on a special process design or improvement project. Regardless of the way it occurs, it involves giving employees greater responsibility and authority, and is commonly labeled *empowerment.*

Empowerment is based on the belief that employees have the ability to take on more responsibility and authority than has traditionally been given them, and that heightened productivity and a better quality of work life will result. Different words and phrases are used to define empowerment, but most are variations on a theme: to provide employees with the means for making influential decisions. Juran defined empowerment as "conferring the right to make decisions and take action."[33]

Empowerment means different things in different organizations, depending on culture and work design; however, empowerment is based on the concepts of job enlargement and job enrichment. *Job enlargement* means changing the scope of the job to include a greater portion of the horizontal process. An example would be a bank teller who not only handles deposits and disbursements, but now distributes traveler's checks and sells certificates of deposit. *Job enrichment* means increasing the depth of the job to include responsibilities that have been traditionally carried out at higher levels of the organization. An example would be if a bank teller also had the authority to help a client fill out a loan application and complete initial screening to determine whether or not to refer the customer to the loan officer.

As these examples show, empowerment of employees will require:

- A work environment and managing style that supports empowerment
- Training in the skills necessary in order to carry out the additional responsibilities
- Access to information on which decisions can be made
- Willingness and confidence on the part of the employee to take on greater responsibility

Empowerment also means management giving up some of the power traditionally held by it, which means management must take on new roles and responsibilities and gain new knowledge. It does not mean that management relinquishes all authority, totally delegates decision making, and allows operating without accountability. It requires a significant investment of time and effort to develop mutual trust, assess, and add to individuals' competencies, as well as develop clear agreements about roles, responsibilities, risk taking, and boundaries.

Empowerment is difficult to implement because it is often a major culture change from past ways of working. It involves behavioral changes in all members of the organization: management, operations personnel, and support staff. Therefore, it is critical that the organization lay the appropriate groundwork. To start, an organization should develop an operational definition of empowerment and communicate a strong commitment to it, starting with top management. It should develop a time-phased implementation plan and build or modify the necessary organizational systems to support empowerment.

Empowerment requires the transfer of authority with a clear agreement about expectations, responsibilities, and boundaries. This process takes place over a period of time as both managers and workers become comfortable with the concepts and implications of empowerment. Four principles that foster this transition are:

1. Give people important work to do on critical issues.
2. Give people discretion and autonomy over their tasks and resources.
3. Give visibility to others and provide recognition for their efforts.
4. Build relationships by finding them sponsors and mentors.[34]

Empowerment often also calls for restructuring the organization to reduce levels of hierarchy or to provide a more customer- and process-focused organization. Empowerment is often viewed as an inverted triangle of organizational power. In the traditional view, management is at the top while customers are on the bottom, whereas in an empowered environment, customers are at the top while management is in a support role at the bottom (see Figure 2.7).

For empowerment to be successfully implemented, the leader's role must shift from that of a traditional manager to that of an enabler. Leaders must balance their need for personal control with the ability to provide freedom for others to act on their own authority. This is a mind-set as well as a negotiated agreement between leaders and their subordinates. Leaders who empower others create an environment in which this balance can take place. They involve their subordinates in planning, delegate responsibility, clarify the scope of authority, delineate boundaries, encourage, provide a motivational environment, and reward accomplishments.

The process also needs to occur from top to bottom. Frontline managers need to understand how to implement the process and how to transition from a traditional role to that of an empowering leader. Middle management needs to work to remove barriers to empowerment and to help coach frontline managers in their

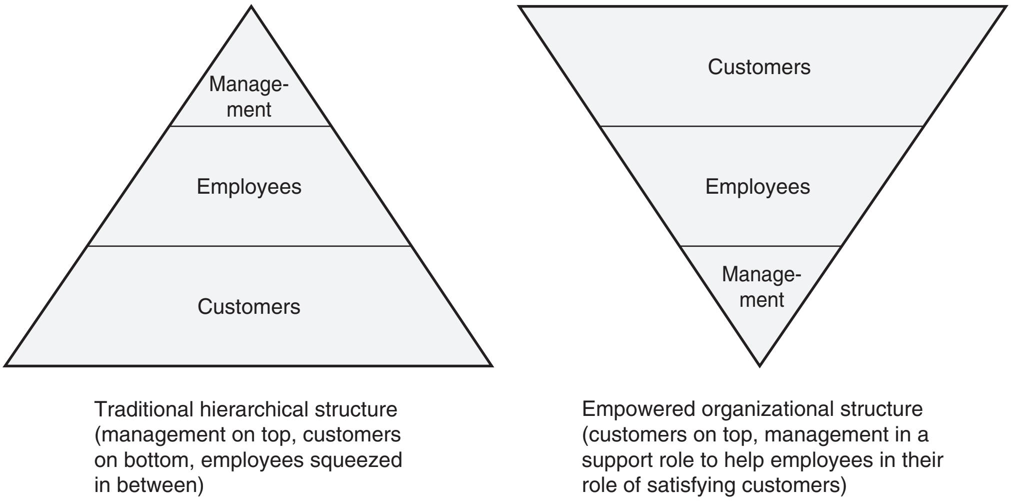

Manage-
ment
Employees
Customers
Traditional hierarchical structure (management on top, customers on bottom, employees squeezed in between)
Customers
Employees
Manage-
ment
Empowered organizational structure (customers on top, management in a support role to help employees in their role of satisfying customers)

Figure 2.7 Traditional versus empowered organization.

new roles. Changes in performance review and compensation systems are usually required to align these systems with the new responsibilities.

People who are well matched with the jobs they hold don't require force, coercion, bribery, or trickery to work hard and produce quality work. They are internally motivated.

An example of a mismatch is assigning a usually gregarious extrovert to spray-painting parts in an isolated room, wearing a protective mask all day. This would certainly be totally dissatisfying and lead to poor work. Another example would be reassigning an operator who formerly worked on a help desk solving customers' problems to a role as a telemarketer where he or she has to cold-call prospective customers. Initiating customer contact may be a totally distasteful job for the individual. Type of personality, personal beliefs and interests, fear of danger, and so on, are all factors to consider when matching people to jobs—assuming a motivated workforce is desired.

For a person to be internally motivated from the job itself, the person must:

- Receive sufficient skills training and knowledge to succeed in the job assigned
- Know what level of performance and result is expected of him or her
- Be provided with appropriate tools, equipment, and a workplace conducive to producing a quality product or service, within a safe, secure, and healthful (physical and mental) environment
- Experience responsibility for the results of the work
- Experience a challenge, but not be overwhelmed
- Have the authority to make decisions commensurate with the job responsibilities and personal competence, and within preestablished boundaries
- Experience the work as contributing value
- Know how the results from personal work contribute to the organization
- Know how work is measured and evaluated
- Have the opportunity to improve the processes used in the work
- Know that management is aware of, supports, and appreciates the work

Although work design is the most visible change in empowerment, the relationships of managers and employees is perhaps the most significant and difficult aspect of that change. Table 2.1 summarizes these changes, emphasizing the inherent difficulty in trying to change from a traditional to an empowered organization.

Common mistakes and barriers to empowerment include:

- A lack of a clear commitment. To succeed, top management must clearly communicate its support. Without this commitment, empowerment will be impossible to implement.

Table 2.1 Relationship changes in an empowered organization.

Issue for comparison	**Traditional organization**	**Empowered organization**
Employees' primary focus is on:	Management	Customers
Management's role is:	Monitoring and controlling	Facilitating and coaching
Management–employee relationship is:	Boss-to-subordinate	Peer-to-peer

- Failure to define empowerment. Failing to develop an operational definition of empowerment results in confusion and inconsistent implementation. Many managers do not understand the term and can unwittingly block its effective implementation by sending conflicting messages.
- Failure to establish the boundaries within which employees can be empowered.
- Failure to provide appropriate training to management and the performers.
- Failure to implement appropriate incentives. People who have been rewarded for behavior that serves a traditional hierarchical system will resist transitioning to a new role unless incentives to encourage change are in place.
- Lack of an implementation plan. Empowerment consumes time, resources, and up-front costs for training and organizational support systems. An implementation plan is essential to prepare this groundwork. An organization that does not think through all the implications sets up serious barriers to success.
- Inability to modify organizational culture. Many traditional organizations will hinder empowerment by virtue of their hierarchical structures, reward processes, and cultural values. Unless appropriate changes are made, empowerment will fail.
- Some people will resent a shift to empowerment. They often don't want to assume the responsibility involved. Others may feel management is trying to pass down their responsibility in order to save money or whatever.
- Not everyone will buy in at first. Some will wait and see if this is just another "here today, gone tomorrow" scheme of management. Some are terrified at the new freedom, fearful they might make a dreadful mistake and be punished for it.
- Middle and first-level management resent giving up their authority (and perhaps the curtain they've been hiding behind). Learning and

practicing new behavior is tough on those who grew up in the "old school" ways.

- If top management is not visibly and continually seen using empowerment techniques, the effort will likely not succeed.
- Changing the culture from a traditional hierarchical mode to one where empowerment is practiced takes a long time and costs money. A high level of sustained commitment is needed for years.
- The organization structure and reporting relationships will need to be changed.
- Major systems and processes will require modification or replacement, for example, strategic planning process, compensation system, employee recognition and reward process, customer service processes, expense reimbursement procedure, and so on.

Benefits from Empowerment

Aubrey and Felkins reported a survey administered in several companies to evaluate the perceived benefits of employee involvement. It indicated significant improvements in attitudes and behavior. For example, results showed an increase in individual self-respect, increased respect for employees by supervisors, increased employee understanding of management, reduced conflict, and increased employees awareness of why many problems are not solved quickly. A similar survey administered to management indicated that employee involvement seemed to increase productivity.[35]

Customer satisfaction also typically improves when personnel are given the authority to make decisions directly related to customer problems or needs. For example, a major credit card service organization reported that through its employee empowerment program, customer delight helped to propel the organization to the number two spot in the bank credit card industry and helped it win the Baldrige Award. Other Baldrige Award winners report similar results.

The very highest leader is barely known by men.

Then comes the leader they know and love.

Then the leader they fear.

Then the leader they despise.

The leader who does not trust enough will not be trusted.

When actions are performed without unnecessary speech

The people say, "We did it ourselves."

—**Lao-tzu**

This chapter has discussed a number of leadership challenges and issues. While the expression " ________________ is a born leader" may be true in some cases, for the rest of us, being a good, effective leader is a learned skill. In transforming ourselves to become a good leader we may have to change our behavior—

sometimes drastically. We may have to disregard traditional teachings and practices from our early years. We're in a rapidly evolving world that calls for innovative, adaptive, and ethical leaders. Relationships with people are critical, especially as technology tends to lead us toward dehumanizing internal and external organizational interactions.

ENDNOTES

1. Frances Hesselbein, "The Habits of Effective Organizations," in *Leader to Leader: Enduring Insights on Leadership from the Drucker Foundation's Award-Winning Journal*, ed. F. Hesselbein and P. M. Cohen (San Francisco: Jossey-Bass, 1999).
2. W. E. Deming, *Out of the Crisis* (Cambridge, MA: MIT Center for Advanced Engineering Study, 1986).
3. S. R. Covey, "Three Roles of the Leader in the New Paradigm," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
4. B. M. Bass, *Stogdill's Handbook of Leadership.* New York: The Free Press, 1990.
5. R. M. Kanter, "World-Class Leaders: The Power of Partnering," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
6. D. H. Maister, C. H. Green, and R. M. Galford, *The Trusted Advisor* (New York: The Free Press, 2000).
7. C. Farren and B. L. Kaye, "New Skills for New Leadership Roles," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
8. D. K. Smith, "The Following Part of Leading," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
9. J. M. Kouzes and B. Z. Posner, *The Leadership Challenge: How to Get Extraordinary Things Done in Organizations* (San Francisco: Jossey-Bass, 1987).
10. Ibid., 27, 135.
11. W. Bridges, "Leading the De-Jobbed Organization," and E. H. Schein, "Leadership and Organizational Culture," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
12. C. Handy, "The New Language of Organizing and Its Implications for Leaders," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
13. E. H. Schein, "Leadership and Organizational Culture," in *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*, ed. F. M. Hesselbein, M. Goldsmith, and R. Beckhard (San Francisco: Jossey-Bass, 1996).
14. W. E. Deming, *The New Economics* (Cambridge: Massachusetts Institute of Technology, 1994), 116.
15. D. Goleman, *Working with Emotional Intelligence* (New York: Bantam, 1998).
16. R. T. Pascale and A. G. Athos, *The Art of Japanese Management* (London: Penguin Books, 1986).
17. R. T. Westcott defines "competency = knowledge, experience, skills, aptitude, and attitude—KESAA Factors," and discusses examples of competence requisites in "The Metamorphosis of the Quality Professional," *Quality Progress* (October 2004): 22–32.

18. P. F. Drucker, *Management: Tasks, Responsibilities, Practices* (New York: Harper & Row, 1974).
19. D. W. Hutton, *The Change Agents' Handbook: A Survival Guide for Quality Improvement Champions* (Milwaukee: ASQC Quality Press, 1994).
20. Deming, *New Economics*.
21. J. P. Kotter, *Leading Change* (Boston: Harvard Business School Press, 1996).
22. Ibid., 16.
23. D. W. Okes, "Developing Effective Change Agent Skills," 32nd Annual Quality Clinic, Knoxville, TN, March 1991.
24. J. M. Brion, *Organizational Leadership of Human Resources: The Knowledge and the Skills, Part I, The Individual* (Greenwich, CT: JAI Press, 1989).
25. A. H. Maslow, "Self-Actualization and Beyond," in *Challenges of Humanistic Psychology*, ed. J. F. T. Bugental (New York: McGraw-Hill, 1967).
26. F. Herzberg, "One More Time: How Do You Motivate Employees?" *Harvard Business Review* (January–February 1968).
27. K. W. Thomas, "Conflict and Conflict Management," in *Handbook of Industrial and Organizational Psychology*, Vol. II, ed. M. D. Dunnette. (Chicago: Rand McNally, 1976).
28. J. F. Brett, G. B. Northcraft, and R. L. Pinkley, "Stairways to Heaven: An Interlocking Self-Regulation Model of Negotiation," *Academy of Management Review* (July 1999): 435–51.
29. J. Kelly, "Making Conflict Work for You," *Harvard Business Review* 48, no. 6 (July–August 1970).
30. K. W. Thomas and R. H. Kilman, *Thomas-Kilman Conflict Mode Instrument* (Tuxedo, NY: XICOM, 1974).
31. M. A. Bittel, ed., *Handbook for Professional Managers* (New York: McGraw-Hill, 1985).
32. T. G. Cummings and E. F. Huse, *Organizational Development and Change,* 4th ed. (St. Paul, MN: West Publishing, 1989), 171.
33. J. M. Juran, *The Last Word: Lessons of a Lifetime in Managing for Quality* (Wilton, CT: Juran Institute, 1993), 332.
34. Kouzes and Posner, *The Leadership Challenge*.
35. C. A. Aubrey and P. K. Felkins, *Teamwork: Involving People in Quality and Productivity Improvement* (Milwaukee: ASQC Quality Press, 1988).

See Appendix A for additional references for this chapter.

Chapter 3

C. Teams and Team Processes

A team is a group of people who perform interdependent tasks to work toward a common mission. Some teams have a limited life, for example, a design team developing a new product or a process improvement team organized to solve a particular problem. Other teams are ongoing, for example, a departmental team that meets regularly to review goals, objectives, activities, and performance. Understanding the many interrelationships that exist between organizational units and processes, and the impact of these relationships on quality, productivity, and cost, makes the value of teams apparent.

Many of today's team concepts were initiated in the United States during the 1970s through the use of quality circles or employee involvement initiatives. The initiatives were often seen as separate from normal work activities rather than being integrated with other organizational systems and processes. Team designs have since evolved into a broader concept that includes many types of teams formed for different purposes.

Difficulty with teams in the United States is often blamed on a cultural emphasis on individual accomplishments versus shared responsibility and success. The problems are also due to inadequate organizational support structures. For example, since reward systems often reinforce individual performance, it is logical that people would be less interested in sharing responsibilities. Formal gainsharing programs that reward individuals financially based on performance of the company, division, facility, product line, and/or project of which they are part are more likely to reinforce the need for working together toward common goals.

Just as individuals develop over their life-span, groups tend to change over time. Being aware of this normal progression and ways to overcome difficulties that arise can help the team process be a very positive experience. As Senge pointed out in *The Fifth Discipline*, if a team really jells, the resulting experience can be a highlight of one's career.

The team process also helps an organization change and begin working in different ways. If decisions are made in a multidisciplinary way, the team will consider a broader perspective and will be likely to better address problems. Other members of the organization will often more readily accept the decisions. Some work design changes mean that people from formerly separate functional areas now work together in a newly designed process. These types of changes require more significant attention to organizational change issues to help the group focus on its new mission.

Team processes offer the following benefits to the organization:

- Synergistic process design or problem solving
- Objective analysis of problems or opportunities
- Promotion of cross-functional understanding
- Improved quality and productivity
- Greater innovation
- Reduced operating costs
- Increased commitment to organizational mission
- More flexible response to change
- Increased ownership and stewardship
- Reduced turnover and absenteeism

Individuals can gain the following benefits from teams:

- Enhanced problem-solving skills
- Increased knowledge of interpersonal dynamics
- Broader knowledge of business processes
- New skills for future leadership roles
- Increased quality of work life
- Feelings of satisfaction and commitment
- Sense of being part of something greater than one could accomplish alone

Numerous reasons have been noted for why teams often fail to reach their full potential. Common reasons are:

- Failing to integrate cooperative work methods into the organizational culture
- Lack of organizational systems necessary to support the team process
- Minimal up-front planning of how the organization plans to utilize teams
- Failure to prepare managers for their changing roles
- Failure to prepare team members for their new roles
- Inappropriate recognition and compensation systems
- Inadequate training
- Impatience of top management with the time needed for maturation
- Incomplete understanding of group dynamics

1. TYPES OF TEAMS

> Identify different types of teams and their purpose, including process improvement, self-managed, temporary or ad hoc (special project), and work groups or workcells. (Understand)
>
> **Body of Knowledge I.C.1**

Team Configurations

Consider the differences between a baseball team, a jazz quartet, and a bomb squad. They differ according to the number of members, the range and complexity of skills required, the forms of leadership used, the frequency of working together, and the total time spent working together. As Louis Sullivan, a mentor of Frank Lloyd Wright, stated, "form follows function," and this also applies to teams. Although they may take different names in different industries or organizations, this section presents eight types of teams:

- Process improvement teams
- Self-managed teams
- Temporary/ad hoc teams
- Work groups
- Cellular teams
- Special project teams
- Virtual teams
- Combinations of two or more of the above types

Process Improvement Teams. A process improvement team is a project team that focuses on improving or developing a specific business process and is more likely to be trying to accomplish breakthrough-level improvement. The team comes together to achieve a specific goal, is guided by a well-defined project plan, and has a negotiated beginning and end. Such teams are typically cross-disciplinary, bringing together people from different functions and with different skills related to the process to be improved. The team may have a management sponsor who charters the team and ensures that the team has the appropriate resources and organizational support.

The leader of a process improvement team is usually selected by the project sponsor, and the team meets on a regular basis (for example, weekly) to plan activities that will be carried out outside the meeting, review information gathered since the previous meeting, and make decisions regarding implementation of process changes. An independent facilitator who has no involvement in the process to be improved may also work with the team if team members do not have sufficient skills or experience with team facilitation.

In today's fast-paced environment, many organizations also do process improvement through an accelerated team process sometimes called a *kaizen event* or *kaizen blitz.* These teams spend three to five consecutive full days focusing on a very narrow project scope and implement many of their recommended changes during that period. Gains on the order of 70 percent (for example, increase in productivity or reduction in changeover time) are not uncommon. In order to accelerate the pace of progress, the facilitator typically has more authority than with most teams.

Self-Managed Teams. Self-managed teams are groups of employees involved in directly managing the day-to-day operation of their particular process or department. They are authorized to make decisions on a wide range of issues (for example, safety, quality, maintenance, scheduling, and some personnel decisions). Their responsibilities also include processes traditionally performed by managers, such as setting objectives, allocation of assignments, and conflict resolution. These teams are also called *self-directed teams* or *high-performance work teams*. They give employees much broader responsibility and ownership of a work process.

The leader of a self-managed team is usually selected by the team members, and in many cases the role is rotated among the members over time. Also often rotated is the responsibility for providing within-team coordination of particular technical aspects of the team's processes, such as safety or scheduling.

All the elements that apply to work groups also apply to self-managed teams. Self-managed work teams, however, require more up-front planning, support structures, and nurturing. The transition will usually take a significant time period, and needs consistent support from management.

The following key lessons related to self-managed teams were identified during a study of a financial organization:

- Implement a well-thought-out structure to design and guide the implementation process, such as a steering committee, a design team, and a pilot effort.
- Provide special training to managers and supervisors to help them make the transition from their current role to the new support role.
- Develop a careful plan to manage people throughout the transition. The new team structure will cause changes that will appear threatening to many involved, as they interpret the changes as a loss.
- Set realistic expectations that consider the long and energy-consuming time required for the process to become integrated into the business.[1]

Comprehensive training is also critical in order to move from a traditional to a self-managed work environment. For example, one Fortune 500 company provides training in the following subjects:

- How to maintain a focus on the customer
- How to develop a vision and mission that are integrated with the larger organization's mission

- Understanding of roles and operating guidelines
- Skills required for working together to make decisions, plan work, resolve differences, and conduct meetings
- The concepts and strategy for empowerment
- Setting goals (objectives) and solving problems for continuous improvement[2]

Self-managed teams are more likely to be successful when they are created as part of starting up a new facility (a greenfield site) since the cultural change required if an existing facility (a brownfield site) attempts to transition from a traditional work design is so dramatic. In order to smooth the transition to self-managed teams, an existing organization may begin by first implementing cross-functional process improvement teams and/or work teams as a means for learning.

Temporary/Ad Hoc Teams. In a flexible organization, a need for a temporary team may be identified due to a specific problem or situation. Although such ad hoc teams may not use the same formal structures (for example, agenda, regular meeting frequency), the same general principles and processes are still necessary. An empowered organization often sanctions the use of such teams when deemed useful to carry out a short-term mission. For example, many organizations regularly use temporary teams to conduct internal audits of compliance of their quality management system with the ISO 9001 standard.

A problem or situation may arise that requires immediate and dedicated attention, for example:

- A flood or fire has occurred, and decisions have to be made regarding temporary relocation of the process. What emergency plans need upgrading to deal with a similar future emergency?
- A major customer is sending in an auditing team to assess the adequacy of your quality management system. What needs to be done to prepare for the audit?
- Your information management computer system has been compromised by an outside virus. What processes have been affected, and what emergency steps must be taken to recover from the infected data and programs? What safeguards need upgrading or replacement to prevent a similar future disaster?

Usually, management designates the person to form the team to address the situation. Typically, and depending on the nature of the situation, the team will be small and cross-functional, and will call on other technical expertise as needed.

Situations less critical than those listed may also be addressed by a temporary team, for example, the disposition of an unusually large return or recall of unacceptable product.

Work Groups. Work groups, sometimes called *natural teams*, are teams of employees who have responsibility for a particular process (for example, a department, a product line, or a stage of a business process) and who work together in a participative environment. The degree of authority and autonomy of the team can range from relatively limited to full self-management depending on the organizational culture. The participative approach is based on the belief that employees will be more productive if they have a higher level of responsibility for their work (see Chapter 2, Section 5). Since the team understands the work processes, the members should monitor and improve the processes on an ongoing basis. The team leader is usually the individual responsible for the work area, such as a department supervisor.

Work groups function similarly to quality circles, in which department personnel meet weekly or monthly to review performance of their process. They monitor feedback from their customers and track internal performance measures of processes and suppliers. These teams focus on continual, incremental improvements in their work processes. They are similar to process improvement teams, with the key differences being that they are neither cross-functional nor temporary. Again, a facilitator is usually available for teams if needed. Other outside personnel may be brought in as resources on a temporary basis.

More effective use of the work group team design involves applying it at all levels of an organization, with each level linked to the one above and below it (see Figure 3.1). The top management team monitors performance of processes for which it is responsible (for example, overall business performance), teams at the next level monitor and improve their processes (for example, logistics and delivery performance), and teams at the next level track and improve their performance. Since performance of a work area can be impacted by issues outside the team's control, one work group might request that another (for example, the supplier work group) improve a particular process. Alternatively, a process improvement team may be organized that involves both departments working together.

Since work groups are an ongoing organizational structure, it is critical that the organizational systems and values support the effort. Certain basic elements should be considered when an organization is attempting to initiate work groups:

- Top management support
- Clear communication
- Improvement objectives and expectations
- Team training
- Appropriate competencies
- Supportive compensation and performance appraisal systems

Other issues to consider include:

- Team's scope of responsibility and authority
- Degree of autonomy
- Information needed by team and where obtained
- Decision-making process
- Performance measures and success factors
- Recognition and rewards for performance
- Competencies that must be developed

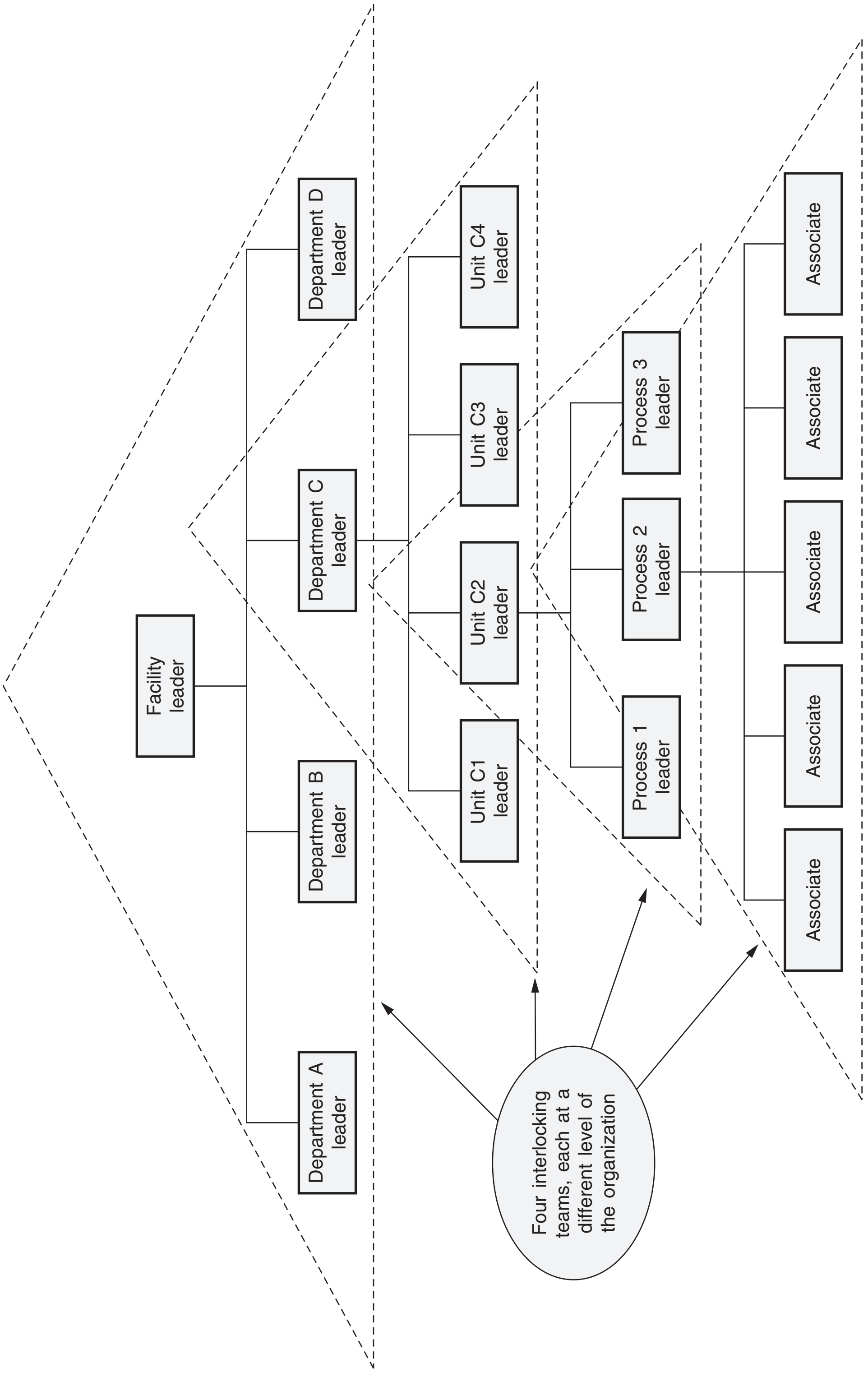

Facility leader
Department A leader
Department B leader
Department C leader
Department D leader
Unit C1 leader
Unit C2 leader
Unit C3 leader
Unit C4 leader
Process 1 leader
Process 2 leader
Process 3 leader
Associate
Associate
Associate
Associate
Associate
Associate
Four interlocking teams, each at a different level of the organization

Figure 3.1 Linking team structure.

- Selection process for leaders and facilitators
- Risk management process

An implementation plan including the necessary support systems should be defined before initiating such groups. If work groups are being introduced into an existing organization where a participative management style has not been used before, a pilot program in a department where it is likely to succeed is highly recommended.

Cellular Teams. When processes are organized into cells, the layout of workstations and/or machines used in a given part of the process typically is arranged in a U-shape (see Figure 14.8) configuration. This allows operators to proceed with a part from machine to machine, performing a series of sequential steps to produce a whole product or a major subassembly.

The team that operates the cell is usually totally cross-trained in every step in the series. Team effectiveness depends on coordination, timing, and cooperation. Team members' competencies must be as closely matched as possible to maintain a reasonable and consistent work pace and quality.

Cell team members usually assume ownership and responsibility for establishing and improving the work processes. Leadership of the cell team may be by a person designated as lead operator, or a similar title. In some cases, the role of lead operator may be rotated among the members. The lead operator is usually responsible for training new team members, reporting team output, and balancing the flow of work through the process. A cellular team is a specialized form of a self-directed work group.

Special Project Teams. Often, a need develops to form a long-duration, totally dedicated project team to implement a major new product, system, or process. Some examples are:

- Reengineering an entire process
- Relocating a major segment of the operation
- Mergers, acquisitions, or divestitures
- Replacing a major information system
- Entering a new market with a new product
- Preparing to apply for the Baldrige Award

Such special project teams may operate as a parallel organization during their existence. They may be located away from the main organization, and even be exempt from some of the policy and work-rules constraints of the main organization. The core team members are usually drafted for the duration of the project. Persons with additional expertise may be called into the team on a temporary, as-needed basis. Usually, the project is headed by an experienced project manager. Depending on the nature of the team's objectives, external specialists or consultants may be retained to augment the core competencies of the team members.

Virtual Teams. In today's global and electronic business environment, it may be expedient to have team members who do not work in the same geographic location. These virtual teams also require many of the same roles and processes, but the substitution of electronic communications (for example, e-mail, videoconferencing) for face-to-face meetings provides an additional challenge to team leadership. A key competency of team members is the ability and motivation to self-manage their time and priorities.

Virtual teams have special needs, some of which are:

- Telephones, local area networks, satellites, videoconferencing
- Computers, high-speed and wireless connections, internet technology, e-mail, web-based chat rooms/forums, and so on
- Software for communications, meeting facilitation, time management, project management, groupware, accessing online databases
- Combinations of the above may facilitate communication and performance

The benefits of virtual teams are:

- Team members may work from any location and at any time of day.
- Team members are selected for their competence, not for their geographic location.
- Expenses may be reduced or eliminated, such as travel, lodging, parking, and renting/leasing or owning a building, office equipment, and furniture.

Team Selection

Management selects the team leader. Team members may be selected by either management or the team leader. When the choice of the team members is left to the team leader, however, some methods and tools may be used. To begin, the team leader should identify the competence needed. Five factors (KESAA) comprise competence:

- *Knowledge.* Formal education, degrees, educational certifications, professional certifications, and self-study achievements
- *Experience.* Years spent applying knowledge and skills in pertinent types of organizations and industries, and in jobs/positions held
- *Skills.* Skill certifications, training received, and demonstrated proficiency in use of pertinent tools and equipment
- *Aptitude.* Natural talent, capability, capacity, innate qualities, deftness, knack, adaptability to change, natural ability to do things requiring hand-eye coordination, and fine motor skills
- *Attitude.* Manner of showing one's feelings or thoughts; one's disposition, opinion, mood, ideas, beliefs, demeanor, state of feeling, reaction, bias, inclination, emotion, temperament, mental state, frame of mind, ease in accepting and adopting new or changed plans and practices

By analyzing the tasks facing the team, the team leader can complete a *KESAA requisites analysis* for each individual role, major task, or task cluster.[3] A sample from staffing a project team is shown in Figure 3.2.

In addition, the *Myers-Briggs Personality Type Indicator* may be used to determine how each potential team member is best suited to the team tasks and team

Project Staffing—KESAA Requisites Analysis

[Define KESAA factors for each key project participant planned on the resource requirements matrix—personnel]

Task/work package name: Train project managers in using new Microsoft Project software
Task/WP number: 3.10.01.01
Job/position category/title: Application software specialist

Knowledge	• Knows proven techniques for designing and delivering software training to people with diverse knowledge, experience, and skills • Extensive knowledge of project planning and management techniques, tools, and practices • Received Microsoft certificate for completing the advanced MS Project five-day training program within last four years • Earned college degree (software major)
Experience	• Has instructed project teams in use of MS Project at a previous employer, two or more times • Used MS Project on two or more previous large-scale projects • Has demonstrated proficiency in providing software technical support for MS Project users working on large-scale projects • Has demonstrated proficiency in using thorough, rapid, and user-friendly techniques for training new software users
Skills	• Possesses excellent communication skills (reading comprehension, instructing, technical writing, and listening) • Proficient in using all Microsoft Office software • Trained in using proven instructional technology in training design, delivery, and evaluation
Aptitude	• Has capability to adapt the MS Project training to the special needs of each participant • Has worked well in a team environment that is subject to frequent changes. Fast learner.
Attitude	• Enjoys imparting his/her knowledge and skills to new software users • Measures his/her success on the improved performance of those trained by him/her • Believes that MS Project is the best selection of project management software, at this time and place • Exhibits "What can we do to make this happen?" demeanor

Additional comments:

Prepared by: Anna Lyst

Date: June 30, 2013

Figure 3.2 Project staffing–KESAA requisites analysis.

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dynamics anticipated. The *DiSC* model and instrument may also be used (see Chapter 8). Team leaders should also consider any problems obtaining cooperation from a selected person's boss relative to time constraints and conflicts, prior commitments (unfinished work on regular assignment), priorities (which work is most important?), and reporting relationships (to whom does selected person report?).

A selected individual's reluctance to join a team may be because of the potential for losing interaction with colleagues from the same discipline and the potential for losing an opportunity for further education and training in the individual's chosen field, and potential impact on pay raises and promotion.

2. STAGES OF TEAM DEVELOPMENT

Define and describe the classic stages of team development: forming, storming, norming, performing. (Apply)

Body of Knowledge I.C.2

Teams will progress through stages of growth and maturity as the members work together over time. Understanding these development stages is valuable for the effective management of the team process. The stages can vary in intensity and duration depending on the type of team, the environment in which it works, and the individuals who constitute it. A generic model for the phases of team development, described by Tuckman,[4] is shown in Figure 3.3:

- *Stage 1: Forming.* When team members first come together, they bring with them individual identities and the values and the priorities of their usual environment. Each team is a new experience, even for those who have previously been members of teams. Individuals enter this situation cautiously, feeling uncertain of what their role and performance will be in this new environment. During the forming stage, the team usually clarifies its purpose, identifies roles for each member, and defines rules of acceptable behavior (often called *norms*).
- *Stage 2: Storming.* During this phase, the reality of the team's task sinks in. Team members still think primarily as individuals, and might attempt to form decisions on the basis of their individual experiences rather than pooling information with other members. Collaboration has not yet become the norm as team members fluctuate in their attitude about the team's chances for success. The behaviors exhibited during this time may involve argument, testing the leader's authority, attempts to redefine goals, and competitive or defensive acts.
- *Stage 3: Norming.* In this phase, the individuals coalesce into a team by shifting their focus from personal concerns to that of meeting the

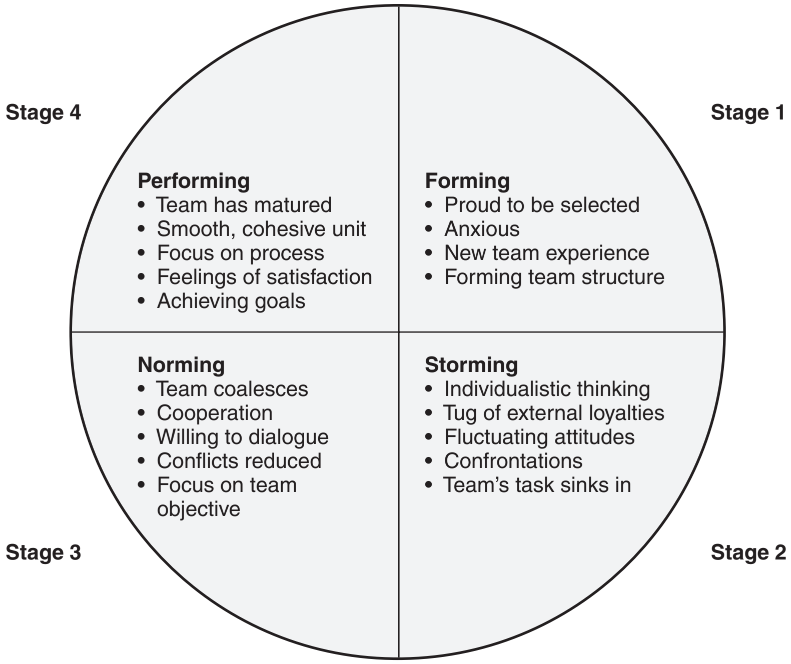
Stage 4
Stage 1
Performing
• Team has matured
• Smooth, cohesive unit
• Focus on process
• Feelings of satisfaction
• Achieving goals
Forming
• Proud to be selected
• Anxious
• New team experience
• Forming team structure
Norming
• Team coalesces
• Cooperation
• Willing to dialogue
• Conflicts reduced
• Focus on team objective
Storming
• Individualistic thinking
• Tug of external loyalties
• Fluctuating attitudes
• Confrontations
• Team’s task sinks in
Stage 3
Stage 2

Figure 3.3 Team development phases.

team-related challenges. Interpersonal conflicts and the tug of external loyalties are reduced. Team members are willing to discuss differences for the sake of the team, resulting in more cooperation and dialogue.

- *Stage 4: Performing.* At this stage, the team has matured to the point where it is working as a smooth, cohesive unit. Team members have a good understanding of each other ’s strengths and weaknesses and how they support the mission, and are now able to work through group problems. There is a better appreciation of the team’s processes and a general satisfaction with team membership. During this phase, the team is making significant progress toward achieving its goals.

Although the four stages of development indicate a logical sequence that occurs over time, the actual progress made by each team will vary. For example, a team that has progressed to stage 3 or 4 may fall back to stage 1 or 2. This may occur if they learn that previous assumptions about one another are not true, information they have been using for decision making is found to be inaccurate, or team membership changes.

Some teams might never progress beyond an earlier stage because of limited project duration or poor resolution of group dynamics issues.

Some authors have added a stage to Tuckman’s original model: *adjourning.* It is the process of closure that occurs when the team has accomplished its mission. The team should take time to review the lessons learned and what was accomplished, complete documentation, celebrate, and formally disband. Frequently, this stage is either skipped over or incompletely performed, or in some cases, project teams just continue to meet without "closing" the project and without a continuing business purpose.

Team development can be enhanced by making sure that team members have a basic understanding of how to (1) interact in positive ways, (2) deal with difficult people or situations, (3) contribute to accomplishing the team's goals, and (4) give or receive constructive feedback.

3. TEAM-BUILDING TECHNIQUES

> Apply basic team-building steps such as using ice-breaker activities to enhance team introductions and membership, developing a common vision and agreement on team objectives, identifying and assigning specific roles on the team. (Apply)
>
> **Body of Knowledge I.C.3**

Team Processes

There are two major groups of components in team processes—task-type and maintenance-type. Task-type processes keep a team focused and moving toward its goal, while maintenance processes help build and preserve the effectiveness of relationships between team members. Key task components include:

- Reviewing and documenting the team's objective(s).
- Preparing an agenda for every team meeting and staying focused on the agenda. If other issues come up that need to be addressed, the agenda can either be intentionally modified, or new issues can be placed on a list for the next meeting agenda.
- Defining or selecting, and following a technical process that fits the particular project mission (for example, a seven-step problem-solving model if the team is trying to solve a problem; see Chapter 13).
- Using decision-making techniques (for example, consensus, consultative) appropriate to the situation.
- Defining action items, responsibilities, and timing, and holding team members accountable.

Maintenance tasks are somewhat less easily defined, but can also dramatically impact team performance. An outsider might see only the tasks involved with meeting objectives as important, but for team members, the dynamics of interactions between team members can be just as critical. Theories and practices of team dynamics have come from fields as diverse as sociology, psychology, anthropology, organizational development, and political science, where group behavior has been studied in working, living, academic, and therapeutic environments.

Team maintenance tasks are meant to help alleviate the problems created by the fact that each individual on the team has his/her own perspectives and priorities. These are shaped by individual personality, current issues in the person's personal life, and the attitudes of both the formal and informal groups within the organization to which the individual belongs. This means that although the team may have a specific objective and agenda, each individual perceives things differently.

Preventing Problems with Team Process. Two common ways of preventing team dynamics problems are to use *norms* and *roles*. A list of behavioral expectations (norms) is defined by the team during the first meeting, or a predetermined set of norms used by all teams within the organization might be adopted. Following are a few examples of norms and the purpose of each:

- "Be on time for meetings." Emphasizes that meeting time needs to be used effectively, and to wait for someone to arrive is a waste of others' time.
- "At least four (of five) team members must be able to attend." Recognizes that vacation, business travel, and other events may prevent some team members from attending a particular meeting, while ensuring that meetings are not held and decisions made by only a small proportion of the members.
- "No side conversations." Ensures that members are fully present and listening to what is being said, making sure that each person's ideas are heard and considered.
- "Staying on the agenda." Although somewhat task oriented, this emphasizes that team meetings are not the place for personal gripes, and that the team has an important mission.
- "Participation by everyone." Clarifies that all are expected to play an active role, even though the particular skills and activities may differ.
- "Use the *parking lot*." For issues not on the agenda that are set aside to be dealt with at a later time.
- "No phones or other electronic devices" are to be used in a team meeting unless specifically required to accomplish the task at hand.
- "The management of team members must be apprised that the need for absolute dedication to the team objectives by team members is not to be interrupted, except for extreme personal or business emergencies."

Having team members take on particular roles helps get them involved and reduces the likelihood of their feeling that their time is being wasted. Two common roles often rotated among team members are scribe and timekeeper. A *scribe* is responsible for capturing information from the team meeting in a record of meeting minutes and distributing them appropriately following the meeting. A *timekeeper* monitors how well the team is progressing against the timeline spelled out in the agenda, and will notify the team if they are straying off the scheduled times.

Another method for getting team members more involved and working together is to have them work in even smaller groups on narrow activities. For example, if the team needs to acquire some data that are readily available, having two team members work together to get and present the data will provide an opportunity for them to develop a closer working relationship that can carry over into the overall team process.

The first team meeting can set the tone for the entire team effort, and it is therefore important that it be well planned. Following are some actions that can enhance the first meeting:

- Have the sponsor or other stakeholders attend the meeting to emphasize the importance of the project, and the support that will be provided.
- Ensure that all team members have a full understanding of the team's mission and scope.
- Allow team members to get acquainted.
- Clarify team members' roles.
- Work out decision-making issues.
- Establish meeting ground rules (norms).
- Define or select the technical process improvement methodology/model to be used.
- Define/review the project plan and schedule.
- Draft the team's objectives (may be modified in second meeting).
- Define the structure for future meetings.

Special exercises (often called *icebreakers*) can also be conducted during the first meeting to help team members feel more comfortable in the new environment. (Training material providers offer a plethora of such exercises.) Aside from structured exercises, team members can be asked to state what they hope to personally gain from the project experience. The team can come up with a name for the group. Team members can discuss previous experiences with working in teams and what they learned from them. Activities such as these allow the personalities and values of individual team members to become more visible, and bring team members closer together.

Setting the Team's Objectives. Setting objectives not only gives the team some work to do, it begins the team's development and helps to begin to clarify the task ahead. It is likely that the first draft will require modification at a subsequent meeting. As a template, consider the *S.M.A.R.T. W.A.Y.* (Table 5.1).

Decision-Making Method. Consensus decision making is the process recommended for major project issues. The approach is more time-consuming and demanding, but provides the most thorough and cohesive results. It allows the team to work out different points of view on an issue and come to a conclusion that is acceptable. Consensus means that the decision is acceptable enough that all team members will support it. To achieve consensus, all team members must be allowed to express their views and must also objectively listen to the views of others. The decision and alternatives should be discussed until consensus is reached.

4. TEAM ROLES AND RESPONSIBILITIES

> Define and describe typical roles related to team support and effectiveness such as facilitator, leader, process owner, champion, project manager, and contributor. Describe member and leader responsibilities with regard to group dynamics, including keeping the team on task, recognizing hidden agendas, handling disruptive behavior, and resolving conflict. (Analyze)
>
> **Body of Knowledge I.C.4**

Of the seven roles described in Table 3.1, the roles of timekeeper and scribe are the only ones that are optional depending on the ability of a team member to effectively fulfill a dual role of participating member and either scribe or timekeeper. While the remaining five roles are essential, they may be combined in a variety of ways. Crucial roles for the success of the team, once it is formed, are the team leader and facilitator roles. The *team leader* is responsible for the content, the work done by the team. The *facilitator* is responsible for ensuring that the process used by the team and team dynamics are the best for the stage and situation the team is in.[5]

There is a need for a trained facilitator when:

- No team member is trained for, capable of, or willing to assume this role in addition to functioning as a participating member.
- The team has been meeting for some time and is incapable of resolving conflicting issues.
- A new member has been added, thus upsetting established relationships.
- A key contributor has left the team.
- There are other factors, such as running short on resources, project cancellation, or major change in requirements, that may disturb the smooth functioning of the team.

Supplementing the team with on-call experts can often compensate for a shortfall in either the number of members or members' competencies. Such temporary members must willingly share their expertise, listen attentively, abide by team norms, and support team decisions.

The selection of a team member to serve as a timekeeper may be helpful, at least until the team has become more adept at self-monitoring time usage. When a timekeeper is needed, the role is often rotated, giving consideration to whether the selected member has a vital role to play in the deliberations at a particular meeting.

For some team missions where very formal documentation is required, a scribe or notetaker may be needed. This role can be distracting for a member whose full attention may be needed on the topics under discussion. For this reason, an assistant, not a regular member of the team, is sometimes assigned to take the minutes and publish them. Care should be taken to not select a member to serve as a scribe solely based on the person's gender or position in the organization.

All team members must adhere to expected standards of quality, fiduciary responsibility, ethics, and confidentiality (see Chapter 4). It is imperative that the most competent individuals available are selected for each role. See Table 3.1 for attributes of good role performance.

Frequently, a team must function in parallel with day-to-day assigned work and with the members not being relieved of responsibility for the regularly assigned work. This, of course, places a burden and stress on the team members. The day-to-day work and the work of the team must both be conducted effectively. Not being able to be in two places at one time calls for innovative time management, conflict resolution, and negotiation skills.

Steering Committee

Top management is ultimately responsible for organizational performance improvement. One of top management's key roles, then, is to identify and prioritize opportunities, and initiate teams to address those of greatest value to the organization. Projects might be selected on the basis of new strategic initiatives (for example, developing a new service for a new market niche), customer satisfaction data, cost-of-quality reports, or other strategic or operational performance measures or initiatives (for example, capacity, throughput, and lean projects such as waste reduction).

In order to carry out this process and to simultaneously provide opportunities for learning, a special group called the *steering committee* is often set up for guiding and tracking of team efforts. The group usually includes key leaders in the organization (for example, president, operations manager, quality manager) as well as others who represent particular interests. In an organization working under a union contract, the union representative is also likely to be a member of the steering committee. The steering committee is often a diagonal slice representing all levels of the organization.

One role of the steering committee is to initiate desired organizational improvement efforts. It is vital that each team have a clear understanding of its purpose and how that purpose is linked to and supports the organization's strategic plans. This is done through a written charter that defines the mission and objectives of each project, as well as key personnel (for example, team leader, members, facilitator) and project timing. The charter is a formal document agreed to by both the

Table 3.1 Roles, responsibilities, and performance attributes.

Role name	Responsibility	Definition	Attributes of good role performance
Champion	Advocate	The person initiating a concept or idea for change/improvement	• Is dedicated to seeing it implemented • Holds absolute belief it is the right thing to do • Has perseverance and stamina
Sponsor	Backer, risk taker	The person who supports a team's plans, activities, and outcomes.	• Believes in the concept/idea • Has sound business acumen • Is willing to take risk and responsibility for outcomes • Has authority to approve needed resources • Will be listened to by upper management
Team leader	Change agent, chair, head	A person who: • Staffs the team or provides input for staffing requirements • Strives to bring about change/improvement through the team's outcomes • Is entrusted by followers to lead them • Has the authority for, and directs the efforts of, the team • Participates as a team member • Coaches team members in developing or enhancing necessary competencies • Communicates with management about the team's progress and needs • Handles the logistics of team meetings • Takes responsibility for team records	• Is committed to the team's mission and objectives • Has experience in planning, organizing, staffing, controlling, and directing • Is capable of creating and maintaining channels that enable members to do their work • Is capable of gaining the respect of team members; serves as a role model • Is firm, fair, and factual in dealing with a team of diverse individuals • Facilitates discussion without dominating • Actively listens • Empowers team members to the extent possible within the organization's culture • Supports all team members equally • Respects each team member's individuality

Continued

Table 3.1 *Continued.*

Role name	Responsibility	Definition	Attributes of good role performance
Facilitator	Helper, trainer, adviser, coach	A person who: • Observes the team's processes and team members' interactions and suggests process changes to facilitate positive movement toward the team's goals and objectives • Intervenes if discussion develops into multiple conversations • Intervenes to skillfully prevent an individual from dominating the discussion or to engage an overlooked individual in the discussion • Assists the team leader in bringing discussions to a close • May provide training in team building, conflict management, and so forth	• Is trained in facilitating skills • Is respected by team members • Is tactful • Knows when and when not to intervene • Deals with the team's process, not content • Respects the team leader and does not override his or her responsibility • Respects confidential information shared by individuals or the team as a whole • Will not accept facilitator role if expected to report to management information that is proprietary to the team • Will abide by the ASQ Code of Ethics
Timekeeper	Gatekeeper, monitor	A person designated by the team to watch the use of allocated time and remind the team members when their time objective may be in jeopardy.	• Is capable of assisting the team leader in keeping the team meeting within the predetermined time limitations • Is sufficiently assertive to intervene in discussions when the time allocation is in jeopardy • Is capable of participating as a member while still serving as a timekeeper

Continued

Table 3.1 *Continued.*

Role name	Responsibility	Definition	Attributes of good role performance
Scribe	Recorder, note taker	A person designated by the team to record critical data from team meetings. Formal “minutes” of the meetings may be published and distributed to interested parties.	• Is capable of capturing on paper, or electronically, the main points and decisions made in a team meeting and providing a complete, accurate, and legible document (or formal minutes) for the team’s records • Is sufficiently assertive to intervene in discussions to clarify a point or decision in order to record it accurately • Is capable of participating as a member while still serving as a scribe
Team members	Participants, subject matter experts	The persons selected to work together to bring about a change/improvement, achieving this in a created environment of mutual respect, sharing of expertise, cooperation, and support.	• Are willing to commit to the purpose of the team • Are able to express ideas, opinions, and suggestions in a nonthreatening manner • Are capable of listening attentively to other team members • Are receptive to new ideas and suggestions • Are even-tempered and able to handle stress and cope with problems openly • Are competent in one or more fields of expertise needed by the team • Have favorable performance records • Are willing to function as team members and forfeit “star” status

team and by management. It legitimizes the team's effort and documents a tacit agreement from management to provide whatever support is necessary to sustain the team. The charter should also include boundaries of the scope of work, authority and responsibility and related limitations, relationship of the team to other teams or projects, the team's reporting relationships within the organization, and the expected deliverables. (See Chapter 10 for more on project management.)

If a process improvement team is chartered without a clear mission or objective, the team will either do nothing or will go in the direction it believes best. One way to test understanding is to ask, "What will you measure to determine whether the objective has been accomplished?"

The steering committee may also have the responsibility for approving the team's recommendations, and certainly has the authority to enable implementation. This helps ensure that teams' recommendations are acted on. Inaction will result in the belief of team members that management is not serious about the process, and employees will be reluctant to get involved in future efforts.

Another role of the steering committee is to ensure that managers and team members are trained in all aspects of the team concept. This should include team dynamics, project management, process design and improvement methodologies, empowerment, managing organizational change, attributes of leadership and the transformation process, and how to motivate and reward efforts.

Team Structure

How a team is structured will depend on the scope of the process on which it will work. A cross-functional team is most widely used for process improvement, as it may be necessary to cover the full range of job functions that the process involves. The dynamics of individual personalities will affect the team's development and performance, and should be taken into account when selecting team members. Every team needs a leader, appropriate team members, and, in some cases, a facilitator.

Team Leader. The team leader is responsible for coordinating meetings, which includes scheduling of meeting rooms, creating agendas, guiding the team through the agenda (including reviews of homework assignments), and reporting progress to the steering committee. The team leader may also coordinate implementation of the team's approved recommendations. The team leader should have a vested interest in the process, and may be a process owner responsible for the results of the process. The team leader must have strong organizational and interpersonal skills, and should be sensitive when dealing with diverse opinions.

Team Members. Other team members are those involved with the process to be improved and may also include internal or external customers and suppliers. Technical experts and outsiders with no vested interest in the process are sometimes added to help provide additional knowledge, objectivity, or creativity. The team members will generally have action items to accomplish outside the team meetings, and will often take on special roles during a meeting (such as scribe or timekeeper).

Team Facilitator. The team facilitator has the responsibility of helping the team to work effectively. The facilitator can play a critical role by asking questions, thereby encouraging the group members to look at the technical process on which they're working from different points of view. It is important that the team facilitator understand quality management theory. In particular, he or she should recognize the impact of individual and social psychology in groups. The facilitator may also provide or arrange for training to assist the team with the technical tools of improvement, such as process mapping, selecting data collection strategies, using relevant analysis tools, and ultimately, guiding the development of a project plan to carry out improvement recommendations.

Dealing with Team Process Problems

Team members are most productive in an environment in which others are responsive and friendly, encourage contributions, and promote a sense of worth. Peter Scholtes spelled out 10 problems that frequently occur within teams and are typical of the types of situations for which team leaders and facilitators must be prepared. Following is the list along with recommended actions:[6]

Problem 1. Floundering or difficulty in starting or ending an activity. *Solution:* Redirect team to the project plan and written objectives.

Problem 2. Team members attempt to influence the team process based on their position of authority in the organization. *Solution:* Talk to the members off-line; clarify the impact of their organizational role and the need for consensus, and ask for cooperation and patience.

Problem 3. Participants who talk too much. *Solution:* Structure meeting so that everyone is encouraged to participate (for example, have members write down their opinions, then discuss them in the meeting one person at a time).

Problem 4. Participants who rarely speak. *Solution:* Practice gatekeeping by using phrases such as, "John, what's your view on this?" or divide tasks into individual assignments and have all members report.

Problem 5. Unquestioned acceptance of opinions as facts, or participants making opinions sound like facts. *Solution:* Do not be afraid to ask whether something is an opinion or a fact. Ask for supporting data.

Problem 6. Rushing to get to a solution before the problem-solving process is worked through. *Solution:* Remind the group of the cost of jumping to conclusions.

Problem 7. Attempting to explain other members' motives. *Solution:* Ask the other person to clarify.

Problem 8. Ignoring or ridiculing another's values or statements made. *Solution:* Emphasize the need for listening and understanding. Support the discounted person.

Problem 9. Digression/tangents creating unfocused conversations. *Solution:* Remind members of the written agenda and time estimates. Continually direct the conversation back on track. Remind team of its mission, objectives, and the norms established.

Problem 10. Conflict involving personal matters. *Solution:* Request that these types of conflict be taken off-line. Reinforce ground rules.

Solutions to conflicts should be in the best interest of the team. Team members should be nonjudgmental, listening to team discussions and new ideas. Group feelings should be verbalized by periodically surfacing any undercurrents or by giving feedback.

One important skill needed in working with teams is the ability to provide constructive feedback during and/or at the end of a meeting. Feedback is an important vehicle to help the team mature. This feedback can be provided by the facilitator or by team members.

There are two types of appropriate feedback: motivational and coaching. *Motivational feedback* must be constructive, that is, specific, sincere, clear, timely, and descriptive of what actually occurred in the meeting. *Coaching*, or *corrective feedback*, specifically states the improvements that need to be made. Scholtes provides the following guidelines for providing constructive feedback (obviously, destructive or degrading feedback is not acceptable behavior):[7]

- Be specific.
- Make observations, not conclusions.
- Share ideas or information, not advice.
- Speak for yourself.
- Restrict feedback to known things.
- Avoid using labels.
- Do not exaggerate.
- Phrase the issue as a statement, not a question.

Having a team do a self-evaluation at the end of each meeting can be useful in helping the team to further develop their team skills and to take more responsibility for team progress. Team members can be asked to write down how well the team is doing on each of the norms (for example, on a scale of 1–5) and to list any additional norms they believe need to be added. A group discussion of the information can then result in revised norms and specific actions the team will take to improve in the future.

Team Facilitation Techniques

A *facilitator* is a person who helps a team manage the team dynamics and relationship processes. A facilitator does not normally get involved in the content—the technical aspects of what the team is working on. The role of the facilitator is instead to act as:

- A guide to circumvent the pitfalls of a stoppage or detour in difficult situations

- A catalyst to assist in developing a plan that provides follow-up to all management levels, thus maintaining continuity of support
- An objective evaluator and auditor of team progress, identifying any roadblocks to success and opportunities to improve performance[8]

Some specific responsibilities of the facilitator include:

- Cultivating an unbiased and impartial environment
- Ensuring that a full examination and discussion of issues takes place
- Providing an objective framework
- Reinforcing focus on mission and objectives
- Helping organize multiple and diverse viewpoints
- Regulating interruptions
- Ensuring that everyone on the team has the opportunity to participate in discussions and decision making
- Defusing destructive behaviors
- Encouraging visual or verbal tracking of ideas

In order to carry out these responsibilities, the facilitator typically does the following:

- Encourages reluctant participants to speak
- Helps to resolve conflict between team members
- Provides feedback to the leader and/or team
- Ensures that ground rules (agreed-to group norms) are followed
- Ensures that members are listening to and understanding others
- Legitimizes everyone's perceptions and feelings
- Verbalizes what is going on
- Checks for agreement
- Maintains or regains focus on the meeting agenda or topic of discussion
- Provides ideas on approaches for gathering or analyzing data
- Ensures consensus
- Periodically summarizes results

A well-trained facilitator is a valuable asset in any team situation. A combination of formal training and considerable experience will produce the best results. Facilitators should be trained in meeting process facilitation, conflict resolution, training and coaching skills, interpersonal skills in a group environment, basic behavior management skills, quality management principles and practices, and appropriate use of quality tools.

Facilitators are less necessary as the team becomes more experienced and capable. Initially, the facilitator is more of a coach and referee in the team process, and therefore requires good communications skills as well as some technical knowledge of the subject, meeting facilitation skills, and the ability to resolve conflict when it occurs. If performance of the team remains dependent on the facilitator, however, then the facilitator has not done an effective job of helping the team to develop. A highly developed team should have the knowledge and ability to deal with problems that might arise, such as a deviation from the agenda, interpersonal conflict, or ineffective decision making—in effect, to become self-facilitating.

Sponsor. Each team usually has a sponsor responsible for ensuring success. The *sponsor* is an individual who has a significant stake in the outcome of a particular team project. He or she is often the process owner. Such a person must be at a level high enough in the organization to be able to address any difficulties encountered by the team. In the early part of a continuous improvement effort, the sponsor may also be a member of the steering committee. A sponsor 's responsibilities include the following:

- Helping to initiate the team effort by authorizing the activity
- Defining the purpose and scope of the team
- Coordinating the front-end planning
- Helping to select the team leader, facilitator, and members
- Negotiating additional resources needed

During the team effort, the sponsor maintains an awareness of team progress, monitors team performance problems, acts as a liaison to the steering committee, top management, or other departments or teams, helps obtain any additional information and resources that are outside the team's authority boundaries, and acts as a coach to the team leader.

Team Leader. The *team leader* is responsible for the team's ongoing success. Responsibilities include:

- Organizing and managing team meetings
- Working with the sponsor to develop and monitor the project plan
- Keeping the team effort on track
- Providing status updates to the sponsor and steering committee
- Addressing group dynamics issues
- Serving as a liaison between the team and other parts of the organization
- Helping to resolve problems
- Handling administrative duties and keeping team records

A team leader is also responsible for contributing to the team's content, although he or she must be careful that those contributions do not receive greater status

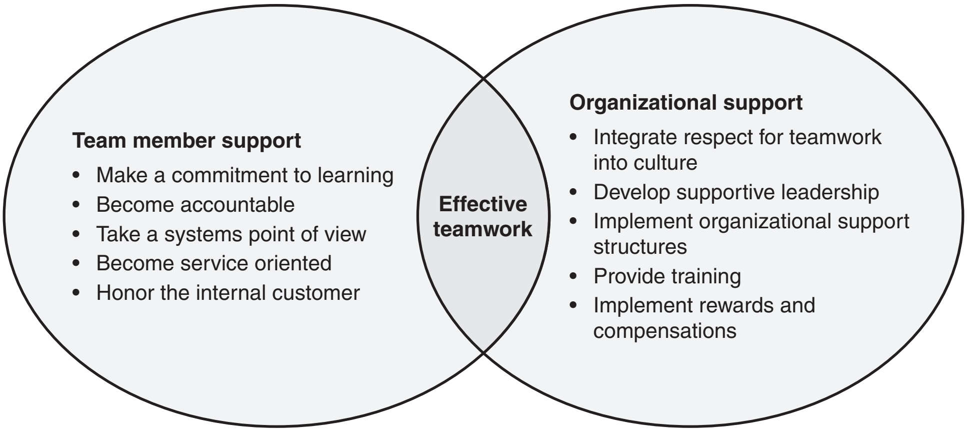
Team member support
• Make a commitment to learning
• Become accountable
• Take a systems point of view
• Become service oriented
• Honor the internal customer
Effective teamwork
Organizational support
• Integrate respect for teamwork into culture
• Develop supportive leadership
• Implement organizational support structures
• Provide training
• Implement rewards and compensations

Figure 3.4 Supporting factors for effective teamwork.

than those of other team members. When a facilitator is not involved, the leader also has the same responsibilities as a facilitator relative to team dynamics and relationships.

A team's growth is the responsibility both of individual team members and of the organization. As shown in Figure 3.4, both must create the cultural synergy that makes teams productive.

A new type of organizational leadership is necessary to provide teams with the authority they need to be successful. This requires a transformation from the old type of autocratic leadership to the new facilitating, coaching, participative approach.

5. TEAM PERFORMANCE AND EVALUATION

> Evaluate team performance in relation to established metrics to meet goals and objectives. Determine when and how to reward teams and celebrate their success. (Evaluate)
>
> **Body of Knowledge I.C.5**

Team members and top management will quickly become frustrated if teams are not making progress. The organization should be tracking progress to identify problems, such as poor meeting attendance, failure of other departments to provide the necessary support, or lack of specialized technical knowledge. Long-term projects also require more-complex project management skills and processes (see Chapter 10). Measuring and communicating the effectiveness of a team can help promote necessary changes and stimulate improvement. The feedback is important to management to indicate the degree to which a team is meeting its objectives.

Objective measures directed toward the project goal could include data such as changes in process performance (for example, increase in first-time yield, reduction of customer waiting time), resource utilization (for example, number of person-hours invested in the project, funds spent), and timing against the project plan. The team may also use internally oriented measures such as overall percentage of team member attendance at meetings and the team's evaluation of meeting effectiveness. A team should take responsibility for self-evaluation, with appropriate measures reported to the sponsor and steering committee.

One way a team can evaluate itself is to select criteria based on team effectiveness guidelines included in team training materials or based on the team's list of behavioral norms. A list of questions and a rating scale can then be used at the end of each meeting to monitor how well the team performed. The evaluation criteria can also evolve over time as the team develops. Standard instruments available from providers of training and organization development materials can also be used.

Questionnaires or interviews can be administered to outside-the-team personnel—such as internal and external customers, other teams, or management—and used to capture metrics related to perceived progress on attributes such as relationship building, effectiveness of the team's progress, and efficiency of the team's process. Maintaining a list of lessons learned can also help the team to see what additional benefits are being gained, and these lists can be shared with others to accelerate organization-wide learning.

Teams, like individuals, deserve recognition for their efforts. This recognition can also provide encouragement for future progress and success. In an organization that is just beginning to use the team process, this might be the single most important factor for sustaining momentum. The following suggestions for recognition and rewards are described by Aubrey and Felkins:[9]

- Supportive comments and helpful suggestions provided by management during team presentations
- Public recognition through professional societies or through publication of results in such journals as *Quality Progress* or industry publications, as well as company newsletters and bulletins
- Performance appraisals that reflect employees' personal growth and contribution as team members
- Material rewards such as certificates, pins, coffee mugs, and lunches
- Gainsharing, or distributing some of the cost savings or revenue enhancements to team members
- Bonuses or other monetary rewards

What is measured (and recognized/rewarded) and how it is measured and administered requires careful thought and team members' input. Applying recognition and rewards fairly implies the creation of standard performance definitions and values. Ignoring some achievements, recognizing or rewarding under-standard achievements, and giving the wrong weighting to an achievement are reasons why care and good judgment are critical, and each are causes of disappointment, disillusionment, and discontent among team members.

Nonmonetary forms of recognition are used to acknowledge a team's efforts in a majority of cases. Examples are public recognition in articles published in the organization's newsletter and/or community newspapers, verbal mention at group meetings, plaques and certificates, T-shirts, pins, and other visible, but low-cost items. Recognizing an entire team with one standard reward can be less effective than when team members choose their own rewards, within a value range. Catalog programs have evolved to service this approach. Sustained performance excellence may be rewarded by promotions and preferred assignments for team members.

Rather than focusing on rewarding performance, some organizations create a pay-for-skills plan. As employees progress through a ladder-style development program, their pay is increased at predefined increments. This is especially relevant in a self-directed team environment.

In addition to external recognition, it is important that team members and leaders provide internal recognition for team progress when important milestones have been accomplished. Recognition might also be given to individuals whose contributions are exceptional or above expectations, or to people outside the team who have provided valuable support.

Formal recognition for team-based efforts often involves ceremonies at which top management recognizes teams that have made significant contributions (for example, excellent project outcomes and/or significantly enhanced organizational learning). The recognition might also involve a symbolic award (usually not financially based). Formal efforts to reward team performance are likely to include a modification of performance evaluation criteria to include the new behaviors desired, with an increase in financial compensation or greater job opportunities being a possible outcome for good performers.[10]

Groupthink

In the team selection process, as well as when the team is functioning day-to-day, care must be taken to avoid groupthink.[11] *Groupthink* occurs when most or all of the team members coalesce in supporting an idea or a decision that hasn't been fully explored, or when some members may secretly disagree. The members are more concerned with maintaining friendly relations and avoiding conflict than in becoming engrossed in a controversial discussion. Actions to forestall groupthink may include:

- Brainstorming alternatives before selecting an approach
- Encouraging members to express their concerns
- Ensuring that ample time is given to surface, examine, and comprehend all ideas and suggestions
- Developing rules for examining each alternative
- Appointing an "objector" to challenge proposed actions

Final Thought

An effective team leader can provide an environment in which team members feel motivated. This can be achieved by applying the *six R's*:

1. *Reinforce.* Identify and positively reinforce work done well.
2. *Request information.* Discuss team members' views. Is anything preventing expected performance?
3. *Resources.* Identify needed resources, the lack of which could impede quality performance.
4. *Responsibility.* Customers make paydays possible; all employees have a responsibility to the customers, internal and external.
5. *Role.* Be a role model. Don't just tell; demonstrate how to do it. Observe learners' performance. Together, critique the approach and work out an improved method.
6. *Repeat.* Apply the above principles regularly and repetitively.[12]

ENDNOTES

1. C. C. Manz and H. P. Sims Jr., *Business without Bosses: How Self-Managed Teams Are Building High-Performance Companies* (New York: John Wiley & Sons, 1993).
2. Ibid.
3. R. T. Westcott, *Simplified Project Management for the Quality Professional* (Milwaukee: ASQ Quality Press, 2005), Chapter 5.
4. B. W. Tuckman, "Developmental Sequence in Small Groups," *Psychological Bulletin* 63, no. 6 (1965): 384 –99.
5. J. E. Bauer, G. L. Duffy, and R. T. Westcott, eds. *The Quality Improvement Handbook* (Milwaukee: ASQ Quality Press, 2002), Chapter 3.
6. P. R. Scholtes, *The Team Handbook* (Madison, WI: Joiner Associates Consulting Group, 1988): 6–37.
7. Ibid., 6–24.
8. J. L. Hradesky, *Total Quality Management Handbook* (New York: McGraw-Hill, 1995), 57.
9. C. A. Aubrey and P. K. Felkins, *Teamwork: Involving People in Quality and Productivity Improvement* (Milwaukee: ASQC Quality Press, 1988).
10. J. M. Juran and F. M. Gryna, eds., *Juran's Quality Control Handbook* (New York: McGraw-Hill, 1988), 8.6–8.7.
11. J. E. Bauer, G. L. Duffy, and R. T. Westcott, eds., *The Quality Improvement Handbook* (Milwaukee: ASQ Quality Press, 2002), Chapter 3.
12. Ibid.

See Appendix A for additional references for this chapter.

Chapter 4

D. ASQ Code of Ethics

Identify and apply behaviors and actions that comply with this code. (Apply)

Body of Knowledge I.D

It is important that people in an organization know and understand the behaviors that are considered acceptable. Therefore, another critical role of leadership is to ensure that the organization has defined those behaviors and the principles behind them as clearly as possible. Documenting and communicating the values and principles that should be used as a guide for day-to-day decision making is one way employees learn what is acceptable. Another way is through observation of the actions of persons in leadership roles and others in influential or powerful positions. Therefore, it is important that a leader's actions be congruent with the stated principles and values.

For some fields of professional practice, codes of conduct are defined by professional organizations. Following is the code of ethics for quality professionals established by the American Society for Quality (ASQ). It provides both general principles and specific actions designed to ensure that ASQ members demonstrate ethical behaviors in their relationships with the public, employers, customers and clients, and peers. The code is critical to quality decisions and behavior, and valuable when designing systems as well as in day-to-day communications.

It is important for leaders in organizations to take action on the basis of how well employees meet ethical guidelines. Employees who demonstrate ethical practices, especially during difficult situations, must be commended for their actions, whereas those who do not must be dealt with appropriately.

Use the ASQ Code of Ethics as a model to assist your organization in developing its own code as well as using it to develop your personal code of ethics. Refer often to your organization's code and your own code. Ensure that you are behaving at or above the ethical level embodied in the code.

One thing to consider, though, is that unethical behavior in one country may be an acceptable behavior in another locale.

Although the term *supplier* is not specifically mentioned, the intent of an ethical relationship between a customer and a supplier may be implied from the intent

ASQ CODE OF ETHICS

Fundamental Principles

ASQ requires its members and certification holders to conduct themselves ethically by:

I. Being honest and impartial in serving the public, their employers, customers, and clients.

II. Striving to increase the competence and prestige of the quality profession.

III. Using their knowledge and skill for the enhancement of human welfare.

Members and certification holders are required to observe the tenets set forth below:

Relations with the Public

Article 1—Hold paramount the safety, health, and welfare of the public in the performance of their professional duties.

Relations with Employers and Clients

Article 2—Perform services only in their areas of competence.

Article 3—Continue their professional development throughout their careers and provide opportunities for the professional and ethical development of others.

Article 4—Act in a professional manner in dealings with ASQ staff and each employer, customer, or client.

Article 5—Act as faithful agents or trustees and avoid conflict of interest and the appearance of conflicts of interest.

Relations with Peers

Article 6—Build their professional reputation on the merit of their services and not compete unfairly with others.

Article 7—Assure that credit for the work of others is given to those to whom it is due.

of the ASQ code. A code developed for use by a different type of organization would, no doubt, include specific principles applying to supplier ethics.

There is an increasing concern that the *social responsibilities* of an organization, its management, employees, and subcontractors be addressed in any code of ethics. Although this concern is not specifically mentioned in the ASQ Code of Ethics, it can be assumed the intent exists. The ISO 26000 standard provides guidance.[1]

This is a short chapter, but the importance of embracing and sustaining ethical behavior permeates every aspect of organizations' operations. Laws and regulations have been enacted to control certain industries and types of organizations and punish wrongdoers. Behaving ethically, however, has to derive from personal values and integrity. Controls are useful reminders, but individuals must believe in and feel the need to conduct themselves ethically.

ENDNOTE

1. American Society for Quality, ASQ/ANSI/ISO 26000:2010 *Guidance on social responsibility* (Milwaukee: ASQ Quality Press, 2010).

See Appendix A for additional references for this chapter.

Chapter 20

The Certified Manager of Quality/ Organizational Excellence Body of Knowledge

> *Total quality management addresses the quality of management as well as the management of quality.*
>
> —V. Daniel Hunt

CERTIFIED MANAGER OF QUALITY/ORGANIZATIONAL EXCELLENCE (CMQ/OE) COMPLETE BODY OF KNOWLEDGE (BoK)—2013

The topics in this new BoK include descriptive details (subtext) that will be used by the Exam Development Committee as guidelines for writing test questions. This subtext is also designed to help candidates prepare for the exam by identifying specific content within each topic that may be tested. The subtext is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam but is intended to clarify how the topics relate to a Manager's role. The descriptor in parentheses at the end of each entry refers to the maximum cognitive level at which the topic will be tested. A complete description of cognitive levels is provided at the end of this document.

I. Leadership (25 Questions)

   A. *Organizational Structures.* Define and describe organizational designs (i.e., matrix, flat, and parallel) and the effect that a hierarchical management structure can have on an organization. (Apply)

   B. *Leadership Challenges*

      1. *Roles and responsibilities of leaders.* Describe typical roles, responsibilities, and competencies of people in leadership positions and how those attributes influence an organization's direction and purpose. (Analyze)

      2. *Roles and responsibilities of managers.* Describe typical roles, responsibilities, and competencies of people in management positions and how those attributes contribute to an organization's success. (Analyze)

3. *Change management.* Use various change management strategies to overcome organizational roadblocks and achieve desired change levels, and review outcomes for effectiveness. Define and describe factors that contribute to an organization's culture. (Evaluate)
4. *Leadership techniques.* Develop and implement techniques that motivate employees and sustain their enthusiasm. Use negotiation techniques to enable parties with different or opposing outlooks to recognize common goals and work together to achieve them. Determine when and how to use influence to resolve a problem or move a project forward. (Create)
5. *Empowerment.* Apply various techniques to empower individuals and teams. Identify typical obstacles to empowerment and appropriate strategies for overcoming them. Describe and distinguish between job enrichment and job enlargement, job design and job tasks. (Apply)

C. *Teams and Team Processes*

1. *Types of teams.* Identify different types of teams and their purpose, including process improvement, self-managed, temporary or ad hoc (special project), and work groups or workcells. (Understand)
2. *Stages of team development.* Define and describe the classic stages of team development: forming, storming, norming, performing. (Apply)
3. *Team-building techniques.* Apply basic team-building steps such as using ice-breaker activities to enhance team introductions and membership, developing a common vision and agreement on team objectives, identifying and assigning specific roles on the team. (Apply)
4. *Team roles and responsibilities.* Define and describe typical roles related to team support and effectiveness such as facilitator, leader, process owner, champion, project manager, and contributor. Describe member and leader responsibilities with regard to group dynamics, including keeping the team on task, recognizing hidden agendas, handling disruptive behavior, and resolving conflict. (Analyze)
5. *Team performance and evaluation.* Evaluate team performance in relation to established metrics to meet goals and objectives. Determine when and how to reward teams and celebrate their success. (Evaluate)

D. *ASQ Code of Ethics.* Identify and apply behaviors and actions that comply with this code. (Apply)

II. Strategic Plan Development and Deployment (18 Questions)

  A. *Strategic Planning Models.* Define, describe, and use basic elements of strategic planning models, including how mission, vision, and values as guiding principles relate to the plan. (Apply)

  B. *Business Environment Analysis*

    1. *SWOT analysis.* Analyze an organization's strengths, weaknesses, opportunities, and threats, and develop and prioritize actions to take in response to that analysis. Identify and analyze risk factors that can influence strategic plans. (Analyze)

    2. *Market forces.* Define and describe various forces that drive strategic plans, including existing competition, the entry of new competitors, rivalry among competitors, the threat of substitutes, bargaining power of buyers and suppliers, current economic conditions, and how well the organization is positioned for growth and changing customer expectations. (Apply)

    3. *Stakeholder analysis.* Identify and differentiate various internal and external stakeholders, as well as their perspectives, needs, and objectives, to ensure that the organization's strategic objectives are aligned with those of the stakeholders. (Analyze)

    4. *Technology.* Describe how changes in technology can have long- and short-term influences on strategic planning. (Understand)

    5. *Internal capability analysis.* Identify and describe the effects that influence an organization's internal capabilities: human resources, facilities capacity, and operational capabilities. Analyze these factors in relation to strategy formation. (Analyze)

    6. *Legal and regulatory factors.* Define and describe how these factors can influence strategic plans. (Understand)

  C. *Strategic Plan Deployment*

    1. *Tactical plans.* Identify basic characteristics of tactics: specific, measurable, attainable, relevant, time-specific, and linked to strategic objectives. Evaluate proposed plans to determine whether they meet these criteria. (Evaluate)

    2. *Resource allocation and deployment.* Evaluate current resources to ensure they are available and deployed in support of strategic initiatives. Identify and eliminate administrative barriers to new initiatives. Ensure that all internal stakeholders understand the strategic plan and have the competencies and resources to carry out their responsibilities. (Evaluate)

    3. *Organizational performance measurement.* Develop organizational performance measures to ensure that they are aligned with strategic goals, and use those measures to assess the organization in relation to the strategic plan. (Evaluate)

4. *Quality in strategic deployment.* Support strategic plan deployment by applying continuous improvement and other quality initiatives to drive performance outcomes throughout the organization. (Create)

III. Management Elements and Methods (30 Questions)

A. *Management Skills and Abilities*

1. *Principles of management.* Define and apply basic management principles such as planning, leading, delegating, controlling, organizing, and re-sourcing, in various situations. (Apply)

2. *Management theories and styles.* Define and describe management theories such as scientific, organizational, behavioral, learning, systems thinking, and situational complexity. Define and describe management styles such as autocratic, participative, transactional, transformational, management by fact, coaching, and contingency approach. Describe how management styles are influenced by an organization's size, industry sector, culture, and competitors. (Apply)

3. *Interdependence of functional areas.* Describe the interdependence of an organization's areas (human resources, engineering, sales, marketing, finance, research and development, purchasing, information technology, logistics, production, and service) and how those dependencies and relationships influence processes and outputs. (Understand)

4. *Human resources (HR) management.* Apply HR elements in support of ongoing professional development: setting goals and objectives, conducting performance evaluations, developing recognition programs, ensuring that succession plans are in place where appropriate. Develop quality-supportive responsibilities to include in job descriptions for positions throughout the organization. (Apply)

5. *Financial management.* Read, interpret, and use various finance tools including income statements, balance sheets, and product/service cost structures. Manage budgets and use the language of cost and profitability to communicate with senior management. Use potential return on investment (ROI), estimated return on assets (ROA), net present value (NPV), internal rate of return (IRR), and portfolio analysis, to analyze project risk, feasibility, and priority. (Analyze)

6. *Risk management.* Identify the kinds of risk that can occur throughout the organization, from such diverse processes as scheduling, shipping/receiving, financials, production and operations, employee and user safety, regulatory compliance and changes. Describe and use risk control and mitigation methods: avoidance, reduction, prevention, segregation, and transfer. (Apply)

7. *Knowledge management (KM).* Use KM techniques in identifying core competencies that create a culture and system for collecting and sharing implicit and explicit knowledge among workers, customers, competitors, and suppliers. Capture lessons learned and apply them across the organization to promote best practices. Identify typical knowledge-sharing barriers and how to overcome them. (Apply)

B. *Communication Skills and Abilities*

1. *Communication techniques.* Define and apply various modes of communication used within organizations, such as verbal, non-verbal, written, and visual. Identify factors that can inhibit clear communication and describe ways of overcoming them. (Apply)

2. *Interpersonal skills.* Develop skills in empathy, tact, friendliness, and objectivity. Use open-minded and non-judgmental communication methods. Develop and use a clear writing style, active listening, and questioning and dialog techniques that support effective communication. (Apply)

3. *Communications in a global economy.* Identify key challenges of communicating across different time zones, cultures, languages, terminology, and business practices, and identify ways of overcoming them. (Understand)

4. *Communications and technology.* Identify how technology has affected communications, including improved information availability, its negative influence on interpersonal communications, and the new etiquette for e-communications. Use appropriate communication methods to deliver different kinds of messages in a variety of situations. (Apply)

C. *Project Management*

1. *Project management basics.* Use project management methodology and ensure that each project is aligned with strategic objectives. Define the different phases of a project: initiation, planning, execution, monitoring and controlling, and closure. Recognize the importance of keeping the project on-time, and within budget. (Apply)

2. *Project planning and estimation tools.* Use tools such as risk assessment, benefit–cost analysis, critical path method (CPM), Gantt chart, PERT, and work breakdown structure (WBS) to plan projects and estimate related costs. (Apply)

3. *Measure and monitor project activity.* Use tools such as cost variance analysis, milestones, and actual vs. planned budgets to monitor project activity against project plan. (Evaluate)

4. *Project documentation.* Use written procedures and project summaries to document projects. (Apply)

D. *Quality System*

1. *Quality mission and policy.* Develop and monitor the quality mission and policy and ensure its alignment with the organization's broader mission. (Create)
2. *Quality planning, deployment, and documentation.* Develop and deploy the quality plan and ensure that it is documented and accessible throughout the organization. (Create)
3. *Quality system effectiveness.* Evaluate the effectiveness of the quality system using various tools: balanced scorecard, internal audits, feedback from internal and external stakeholders, skip-level meetings, warranty data analytics, product traceability and recall reports, and management reviews. (Evaluate)

E. *Quality Models and Theories*

1. *Organizational and Performance Excellence.* Define and describe common elements and criteria of performance excellence models such as the Malcolm Baldrige National Quality Award (MBNQA), Excellence Canada, and European Excellence Award (EFQM). Describe how these programs are used as management models to improve processes at an organization level. (Understand)
2. *ISO quality management standards.* Define and describe how the ISO 9001 standards can be used to support quality management systems. (Understand)
3. *Other quality methodologies.* Describe and differentiate methods such as total quality management (TQM), continuous improvement, and benchmarking. (Apply)
4. *Quality philosophies.* Describe and apply basic methodologies and theories proposed by quality leaders such as Shewhart, Deming, Juran, Crosby, Feigenbaum, and Ishikawa. (Apply)

IV. Quality Management Tools (30 Questions)

A. *Problem-Solving Tools*

1. *The seven classic quality tools.* Select, interpret, and evaluate output from these tools: Pareto charts, cause and effect diagrams, flowcharts, control charts, check sheets, scatter diagrams, and histograms. (Evaluate)
2. *Basic management and planning tools.* Select, interpret, and evaluate output from these tools: affinity diagrams, tree diagrams, process decision program charts (PDPCs), matrix diagrams, prioritization matrices, interrelationship digraphs, activity network diagrams, and Gantt charts. (Evaluate)
3. *Process improvement tools.* Select, interpret, and apply tools such as root cause analysis, PDCA, six sigma DMAIC (define, measure,

analyze, improve, control), and failure mode and effects analysis (FMEA). (Evaluate)

4. *Innovation and creativity tools.* Use various techniques and exercises for creative decision-making and problem-solving, including brainstorming, mind mapping, lateral thinking, critical thinking, 5 whys, and design for six sigma (DFSS). (Apply)
5. *Cost of quality (COQ).* Define and distinguish between prevention, appraisal, internal, and external failure cost categories and evaluate the impact that changes in one category will have on the others. (Evaluate)

B. *Process Management*

1. *Process goals.* Describe how process goals are established, monitored, and measured and evaluate their impact on product or service quality. (Evaluate)
2. *Process analysis.* Use various tools to analyze a process and evaluate its effectiveness on the basis of procedures, work instructions, and other documents. Evaluate the process to identify and relieve bottlenecks, increase capacity, improve throughput, reduce cycle time, and eliminate waste. (Evaluate)
3. *Lean tools.* Identify and use lean tools such as cycle-time reduction, 5S, just-in-time (JIT), kanban, value stream mapping, single-minute exchange of die (SMED), poka-yoke, kaizen, and overall equipment effectiveness (OEE). (Apply)
4. *Theory of constraints (TOC).* Define key concepts of TOC; local vs. system optimization, physical vs. policy constraints, and throughput. Classify constraints in terms of finite resources and increased expectations. (Understand)

C. *Measurement: Assessment and Metrics*

1. *Basic statistical use.* Use techniques such as the goal-question-metric (GQM) model and others to identify when, what, and how to measure projects and processes. Describe how metrics and data gathering methods affect resources and vice versa. (Apply)
2. *Sampling.* Define and describe basic sampling techniques such as random and stratified. Identify when and why sampling is an appropriate technique to use. (Understand)
3. *Statistical analysis.* Calculate basic statistics: measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation, and variance). Identify basic distribution types (normal, bimodal, skewed) and evaluate run charts, statistical process control (SPC) reports, and other control charts to make data-based decisions. (Evaluate)

4. *Measurement systems analysis.* Define basic measurement terms: accuracy, precision, bias, and linearity. Understand the difference between repeatability and reproducibility in gauge R&R studies. (Understand)

5. *Trend and pattern analysis.* Interpret data graphs and charts to identify cyclical, seasonal, and environmental trends. Evaluate control chart patterns to determine process shifts. (Evaluate)

6. *Process variation.* Analyze data to distinguish between common and special cause variation. (Analyze)

7. *Process capability.* Recognize process capability (C_p and C_{pk},) and performance indices (P_p and P_{pk}). (Understand)

8. *Reliability terminology.* Recognize reliability measures such as mean time between failures (MTBF) and mean time to repair (MTTR). (Understand)

9. *Qualitative assessment.* Identify subjective measures such as verbatim comments from customers, observation records, and focus group output. Describe how they differ from objective measures, and determine when measurements should be captured in categories rather than numeric values. (Analyze)

V. Customer-Focused Organizations (17 Questions)

A. *Customer Identification and Segmentation*

1. *Internal customers.* Define and describe the impact an organization's treatment of internal customers will have on external customers. Develop methods for energizing internal customers to improve products, processes, and services and evaluate the results. (Evaluate)

2. *External customers.* Define external customers and describe their impact on products and services. Develop strategies for working with them and integrating their requirements and needs to improve products, services, and processes. (Evaluate)

3. *Customer segmentation.* Define and describe the process of customer segmentation and its impact on aligning service and delivery to meet customer needs. (Evaluate)

B. *Customer Relationship Management*

1. *Customer needs.* Use quality function deployment (QFD) to analyze customer needs in relation to products and services offered. Use the results of the analysis to prioritize new, future development in anticipation of changing customer needs. (Analyze)

2. *Customer satisfaction and loyalty.* Develop systems to capture positive and negative customer perceptions and experiences, using tools such as voice of the customer, listening posts, focus groups,

complaints and warranty data, surveys, and interviews. Use customer value analysis to calculate the financial impact of existing customers and the potential results of losing those customers. Develop corrective actions and proactive methods to improve customer satisfaction, loyalty, and retention levels. (Create)

3. *Customer service principles.* Develop and deploy strategies that support customer service principles: courtesy, politeness, smiles, cheerfulness, attention to detail, active listening, empathy, rapid response, and easy access for information and service. (Apply)

4. *Multiple and diverse customer management.* Establish and monitor priorities to avoid or resolve conflicting customer requirements and demands. Develop methods and systems for managing capacity and resources to meet the needs of multiple customers. Describe the impact that diverse customer groups can have on all aspects of product and service development and delivery. (Evaluate)

VI. Supply Chain Management (15 Questions)

A. *Supplier Selection.* Define, develop, and use criteria for selecting suppliers, including internal rating programs and external certification standards. Assess and manage the impact these programs can have on various internal processes of the organization. (Create)

B. *Supplier Communications.* Develop and implement specific communication methods with suppliers, including regularly scheduled meetings and routine and emergency reporting procedures. Develop explicit expectations and confirm that the supplier is aware of critical product and delivery requirements. (Create)

C. *Supplier Performance.* Define, develop, and monitor supplier performance in terms of quality, cost, delivery, and service levels, and establish associated metrics for defect rates, product reliability, functional performance, timeliness, responsiveness, and availability of technical support. (Create)

D. *Supplier Improvement.* Define and conduct supplier audits, evaluate corrective and preventive action plans, provide feedback, and monitor process improvements. (Create)

E. *Supplier Certification, Partnerships, and Alliances.* Define and implement supplier certification programs that include process reviews and performance evaluations. Identify strategies for developing customer–supplier partnerships and alliances. (Create)

F. *Supplier Logistics and Material Acceptance.* Describe the impact that purchased products and services can have on final product assembly or total service package, including ship-to-stock, and just-in-time (JIT). Plan and conduct incoming material inspections. (Understand)

VII. Training and Development (15 Questions)

A. *Training Plans.* Develop and implement training plans that are aligned with the organization's strategic plan and general business needs, including leadership training and alignment of personal development plans. (Create)

B. *Training Needs Analysis.* Use various tools and techniques such as surveys, performance reviews, regulatory requirements, and gap analysis to identify training needs. (Create)

C. *Training Materials/Curriculum Development and Delivery.* Use various tools, resources, and methodologies to develop training materials and curricula that address adult learning principles and the learning needs of an increasingly diverse workforce. Describe various methods of training delivery: classroom style, workbooks, simulations, computer-delivered, on-the-job, mentoring, coaching, and self-directed learning. (Apply)

D. *Training Effectiveness and Evaluation.* Assess training effectiveness and make improvements based on feedback from training sessions, end-of-course test results, on-the-job behavior or performance changes, and departmental or area performance improvements. (Create)

Topics for the Constructed-Response (Essay) Portion of the Certified Manager of Quality/Organizational Excellence Exam

Candidates will be presented with three open-ended questions from which they can select the two that they prefer to answer. Candidates will have 45 minutes in which to write responses to the two chosen situations. Prior to the start of the constructed-response portion of the exam, candidates will be given 5 minutes to review and select their situations. Candidates may split their time spent on the problems as they like. Their responses will be graded on their knowledge of quality management as it relates to the content areas listed below and in the following skills and abilities: communication, critical thinking, personnel management, general management.

CR-1. Leadership. Demonstrate knowledge of the quality manager's role in organizational leadership and as quality champion and customer advocate. Deploy change agent strategies in support of organization-wide continuous improvement efforts. Develop teams and participate on them in various roles.

CR-2. Strategy Development and Deployment. Develop and maintain organizational focus on the importance of quality and performance excellence. Create quality policies and procedures in support of the strategic plan, and integrate those policies and processes into the tactics developed to support the strategic plan.

CR-3. Management. Demonstrate management abilities in human resources, financial, risk, and knowledge management applications. Use effective communication methods in various situations to support continuous improvement efforts. Select and use appropriate tools and methodologies to plan, implement, and evaluate projects. Develop, deploy, and evaluate quality plans that can be used throughout the organization. Evaluate and recommend appropriate quality models or systems to implement in various situations.

CR-4. Customer Focus. Identify and segment customers using a variety of criteria and tools. Identify and prioritize product or service design and development on the basis of customer requirements and feedback. Solicit customer input proactively and combine with market analysis and other research to achieve organizational goals. Use customer expectations and feedback to manage continuous improvement projects.

CR-5. Supplier Management. Develop and deploy supplier management systems from selection process through partnership agreements, including mutually beneficial continuous improvement programs. Identify methods for assessing supplier performance at various levels of customer-supplier relationships.

CR-6. Training and Development. Demonstrate knowledge and ability in developing, implementing, and evaluating needs assessment, training delivery methods, and outcomes of training efforts.

Levels of Cognition (Based on Bloom's Taxonomy—Revised (2001)

In addition to content specifics, the subtext for each topic in this BoK also indicates the intended complexity level of the test questions for that topic. These levels are based on "Levels of Cognition" (from Bloom's Taxonomy—Revised, 2001) and are presented below in rank order, from least complex to most complex.

Remember (Knowledge Level). Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

Understand (Comprehension Level). Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

Apply (Application Level). Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

Analyze (Analysis Level). Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

Evaluate (Evaluation Level). Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

Create (Synthesis Level). Put parts or elements together in such a way as to reveal a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.

B. INTEGRATING THE BoK AS A SYSTEM

Up to this point the BoK has been presented as seven separate parts. In reality, the quality manager or director seldom deals with only one part at a time in performing her or his job—in planning, organizing, staffing, directing, and controlling. Typically, problem solving, decision making, and overseeing a function will call for thinking and acting using combinations of all or several of the BoK parts as a system for reaching a resolution.

In the CMQ/OE examination, the multiple-choice questions will not be presented as clusters addressing one part of the BoK at a time, but will be randomly interspersed. Even at that, it is only the constructed response (CR) questions that more realistically test the participant on the value of treating the BoK as a system. As a guideline, it is recommended that when answering a CR question, the exam taker should run a self-check against the memorized parts of the BoK, asking, Which parts of the BoK should be integrated in preparing the CR answer?

In the CMQ/OE refresher courses given by ASQ it is recommended that participants commit to memory as much of the BoK structure as possible in order to facilitate the integration mentioned above. Also, class participants are involved with a case study with the instruction (1) scan the case to get an overview of its content, (2) list the accomplishments made, and the issues and concerns not adequately addressed, (3) note on the list the parts of the BoK that could be combined to either strengthen the gains or address the weaknesses. The exercise is often done as a total group effort, either with a volunteer leader, or leaderless. The case study is used to help the participants pull it all together in discussing the decisions, actions, and events of a simulated organization over a span of time. The case study is provided in Section C.

(Note: the examination does not include a case study.)

C. APPLYING THE BoK—CASE STUDY*

Glo, Inc. (GLO) produces and distributes products based on a proprietary process for depositing reflective metallic material on plastic substrates. Their products are highway and construction site warning signs, educational institution signage, and containers for personal grooming products.

GLO employs a total of 440 workers and management. The breakdown is shown in Table 20.1.

Originally called Yonkers Signboard Co., the company was founded by the Batterson brothers in 1937. It was inherited by Alfred Batterson, son of one of the brothers, after an auto accident in 1973 killed the owners. The cosmetic container line was introduced in 1974 when Al became the CEO and reorganized the company as Glo, Inc. Al was instrumental in capturing a significant share of the cosmetic container market, partly because of the patent on their deposition process.

Al, supported by his top team, lead GLO in a series of quality initiatives from 1994 through 1998:

- Introduction of strategic planning

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Table 20.1 Employee breakdown at Glo, Inc.

Functions	Location	Employee total	Management	Nonmanagement
Administrative:	Yonkers, NY			
Officers/staff		10	4	6
Marketing		17	5	12
Engineering		7	5	2
Finance		13	4	9
Human resources		9	3	6
Purchasing		4	2	2
Sales offices:	Yonkers, NY	(included above)		
	Chicago, IL	12	2	10
	Miami, FL	5	1	4
	Denver, CO	4	1	3
	San Francisco	10	3	7
Plants:				
Outdoor signs	Troy, NY	95	7	88
Containers	Cicero, IL	116	11	105
Indoor signs	Mobile, AL	27	3	24
Containers	Downey, CA	69	6	63
Warehouses:	Yonkers, NY	7	1	6
	Cicero, IL	14	2	12
	Pomona, CA	21	2	19

- Introduction of SPC in the plants
- Introduction of a companywide enterprise resource planning computer system
- Implementation of an ISO 9001:1994–based quality management system (QMS) at all plants and warehouses, and certification of all locations
- Entry into the Empire State Quality Award (obtained site visit level)

Some of the deficiencies noted by the Empire State Quality Award site visit team included:

- There is no evidence that senior leadership solicits and reviews key performance information from all locations.
- There is inadequate evidence of how the company addresses its public responsibilities.

- There is insufficient evidence that corporate strategy (including goals and objectives) has been adequately deployed to all locations, and that there are facility action plans to support such goals and objectives.
- There is no coherent process evident for discerning the satisfaction of customers, nor is there evidence of actions taken to specifically improve customer satisfaction and retention.
- There is no evidence that GLO makes an effort to distinguish its customer base beyond just three categories: external signage, internal signage, and containers.
- It is unclear how the human resource policies and practices promulgated by headquarters are applied at the various locations.
- There is insufficient evidence that employee training and development is universally utilized at all locations.
- There is no evidence that production management participate in new product design or changes to design to ensure manufacturability.
- There is no evidence of existing or pending partnering with key suppliers.
- The only information reported is financial and operational results. There are no results shown for customer focus, market penetration, employee well-being and satisfaction, or supplier partnering.

GLO has shown relatively steady progress in recent years, throughout the ups and downs of the economy. GLO appears poised for a major upturn in growth and profitability, partially due to new military contracts for both external and internal signage, and also an upsurge in sales of women's cosmetics (lipstick especially).

In the strategic planning for years 2002–2007, the top team identified three goals: (1) improve customer satisfaction and retention, (2) introduce "lean thinking" as a means to improve product production and delivery, and reduce costs, and (3) prepare an application for the Malcolm Baldrige National Quality Award, to be submitted for the 2006 award program.

Glancing Forward Two Years

Looking at the following information through the CMQ/OE BoK lens, how would you evaluate the work GLO has done in the last two years (for example, what was done well, and what wasn't?) Be ready to present your rationale based on QM theories/principles.

1. GLO has neither added nor dropped any of its locations, or modified its employee count and mix. GLO has recently hired a director of corporate quality to head a top-level Award Task Force to guide the changes and preparation for applying for the Baldrige award. It is expected that a management person from each of the plants and each headquarters function will serve on this task force. The stated objective is to win the

Baldrige Award. (It is assumed by the rank and file that this means "at any cost.")

2. The director has hired Baldrige Award coordinators for each of the plants, reporting to the director but with a "dotted-line" relationship with the plant managers.
3. Responding to the deficiencies cited by the Empire State site visit team, teams have been established at some of the plants to address the deficiencies at the plant level. The coordinators send a status report to the quality director quarterly.
4. Human Resources devised a temporary reward system to recognize team achievements with a pay bonus. There is inconsistent information at the locations as to the criteria to be used and how the bonus is to be computed. No team has received a bonus yet. The director of quality opposed the bonus plan but was overruled by the majority of the task force. One of the teams from Cicero has applied for the bonus and been rejected by the vice president of human resources. These team members feel they have been wronged and have appealed to the director of quality to intervene on their behalf.
5. The task force wants to have Human Resources conduct an employee survey, the company's first, to provide data that can be analyzed to aid in improving employee satisfaction. Human Resources is resisting the request on several grounds: (a) with so much going on in the company, the timing is not good, (b) HR has reservations about the practicality of surveying employees, expressing fear that it can do more harm than good, (c) concern exists that HR does not have the expertise to design, implement, and analyze a survey, and (d) HR really doesn't have the expertise to evaluate outside resources that could help.
6. The coordinators at the two product container plants have been collaborating and have developed good support from their plant managers in setting up improvement teams to address the Baldrige criteria. They frequently share ideas, techniques, and tools via e-mail and other media, although they have never met face to face.
7. Sales and production maintain a traditional adversarial relationship, as does purchasing with suppliers.
8. There are no integrated plans and programs for employee training and development. What training is done is on-the-job training for persons having an impact on quality—skills training to qualify employees for their assigned tasks—an ISO 9001 requirement. Requests to attend outside training and educational events are seldom approved. Those employees who pursue a formal education do so on their own.
9. The director receives status reports, via e-mail, from each of the plant coordinators on a quarterly basis. These are summarized and presented at the quarterly management meeting.

10. Two of the coordinators have been pressing the director to hold a joint meeting of the coordinators with the task force members, at least quarterly, suggesting teleconferencing as a means for doing so.
11. The quality director has not yet personally visited any sites outside of New York state. It is unclear whether the director has initiated any action at sites and with other internal functions than just the plants.
12. The top team's attention has very recently been focused on the development of a new market with a new product line—rear-view mirrors for vehicles. This new focus resulted from a "brilliant idea" that the process used to develop the mirror-like finish on lipstick containers could be used for rear-view mirrors, especially for military vehicles. The resulting product could, ultimately, replace all metal and glass-type vehicle mirrors at a significant savings to vehicle manufacturers. (It is noted that the strategic planning process did not surface any future indication that a shift in product and marketplace was imminent.)
13. The goals from the strategic plan have taken somewhat of a "back seat," except that the quality director is now viewed as the "owner" of the Baldrige Award initiative.
14. GLO employees do participate as volunteers and elected officials within their communities. These efforts are not company sponsored, not recognized by the company, and are undocumented.
15. Recent financials place GLO as an attractive target for a hostile takeover by a huge conglomerate.
16. A Malaysian company has perfected a deposition process that is competitive with GLO's. GLO alleges their process was stolen.

Appendix A

References

A list that the preparers of the CMQ/OE examination may use to create questions is available for download from http://prdweb.asq.org/certification/control/manager-of-quality/references).

QUALITY MANAGEMENT—GENERAL

(These references address multiple sections and topics from the Body of Knowledge.)

Bauer, J. E., G. L. Duffy, and R. T. Westcott, eds. *The Quality Improvement Handbook*. 2nd ed. Milwaukee: ASQ Quality Press, 2006.

Beecroft, G. D., G. L. Duffy, and J. W. Moran, eds. *The Executive Guide to Improvement and Change.* Milwaukee: ASQ Quality Press, 2003.

Cartin, Thomas J., *Principles and Practices of Organizational Performance Excellence.* Milwaukee: ASQ Quality Press, 1999.

Christensen, E. H., K. M. Coombes-Betz, and M. S. Stein. *The Certified Quality Process Analyst Handbook.* Milwaukee: ASQ Quality Press, 2007.

Dorf, R. C., ed. *The Technology Management Handbook.* Boca Raton, FL: CRC Press, 1999.

Duffy, Grace L., ed. *The ASQ Quality Improvement Pocket Guide.* Milwaukee, WI: ASQ Quality Press, 2013.

Evans, J. R., and W. M. Lindsay. *The Management and Control of Quality.* 6th ed. Cincinnati: South Western, 2004.

Feigenbaum, A. V. *Total Quality Control.* 3rd rev. ed. New York: McGraw-Hill, 1991.

GOAL/QPC. *The Memory Jogger II: Tools for Continuous Improvement and Effective Planning.* 2nd ed. 2010; *The Six Sigma Memory Jogger II.* 2002; *The Process Management Memory Jogger: Building Cross-Functional Excellence.* 2008; *Value Methodology: To Reduce Cost and Improve Value Through Function Analysis.* 2008. Salem, NH.

Juran, J. M., ed. *A History of Managing for Quality: The Evolution, Trends, and Future Directions of Managing for Quality.* Milwaukee: ASQC Quality Press, 1995.

Juran, J. M., and A. B. Godfrey, eds. *Juran's Quality Handbook.* 5th ed. New York: McGraw-Hill, 1999.

Liebesman, S. *Competitive Advantage: Linked Management Systems.* Chico, CA: Paton Professional, 2011.

Pyzdek, T. and P. Keller, *The Handbook for Quality Management: A Complete Guide to Operational Excellence,* 2nd ed. New York: McGraw-Hill, 2013.

———. *The Six Sigma Handbook: A Complete Guide for Green Belts, Black Belts, and Managers at All Levels.* 3rd ed. Milwaukee: ASQ Quality Press, 2009.

ReVelle, J. B. *Quality Essentials: A Reference Guide from A to Z.* Milwaukee: ASQ Quality Press, 2004.

ReVelle, J. B., ed. *Manufacturing Handbook of Best Practices: An Innovation, Productivity, and Quality Focus.* Boca Raton, FL: St. Lucie Press, 2002.

Siebels, D. L. *The Quality Improvement Glossary.* Milwaukee: ASQ Quality Press, 2004.

Sirkin, M. *The Secret Life of Corporations: Understanding the True Nature of Business.* White Plains, NY: New Chrysalis Press, 2004.

Summers, D. C. S. *Quality.* 2nd ed. Upper Saddle River, NJ: Prentice Hall, 2000.

Tague, N. R. *The Quality Toolbox.* 2nd ed. Milwaukee: ASQ Quality Press, 2005.

Townsend, P. L., and J. E. Gebhardt. *The Excutive Guide to Understanding and Implementing Employee Engagement Programs: Expand Production Capacity, Increase Revenue, and Save Jobs.* Milwaukee: ASQ Quality Press, 2007.

West, J. E., and C. A. Cianfrani. *Unlocking the Power of Your QMS: Keys to Business Process Improvement.* Milwaukee: ASQ Quality Press, 2004.

PART I LEADERSHIP

A. Chapter 1 Organizational Structures

Ashkenas, R., D. Ulrich, T. Jich, and S. Herr. *The Boundaryless Organization: Breaking the Chains of Organizational Structure.* San Francisco: Jossey-Bass, 1995.

Harrington, H. J., and F. Voehl. *The Organizational Alignment Handbook: A Catalyst for Performance Acceleration.* Boca Raton, FL: CRC Press, 2012.

Hesselbein, F., and P. M. Cohen, eds. *Leader to Leader: Enduring Insights on Leadership from the Drucker Foundation's Award-Winning Journal.* San Francisco: Jossey-Bass, 1999.

B. Chapter 2 Leadership Challenges

Attong, M., and T. Metz. *Change or Die: The Business Process Improvement Manual.* Milwaukee: ASQ Quality Press, 2013.

Bellman, G. M. *Getting Things Done When You Are Not in Charge: How to Succeed from a Support Position.* San Francisco: Berrett-Koehler, 2001.

Benowitz, E. A. *Cliffs Quick Review Principles of Management.* Hoboken, NJ: Wiley Publishing, 2001.

Blank, W. *The 108 Skills of Natural Born Leaders.* New York: AMACOM, 2001.

Camarota, A. G. *Finding the Leader in You: A Practical Guide to Expanding Your Leadership Skills.* Milwaukee: ASQ Quality Press, 2005.

Covey, S. R. *Principle-Centered Leadership.* New York: Summit Books, 1991.

Cramer, A., and Z. Karabell. *Sustainable Excellence: The Future of Business in a Fast-Changing World.* New York: Macmillan-Rodale, 2010.

Duck, J. D. *The Change Monster: The Human Forces That Fuel or Foil Corporate Transformation and Change*. New York: Random House (Crown Business), 2001.

Ducoff, N. *No-Compromise Leadership: A Higher Standrad of Leadership Thinking and Behavior.* Sanford, FL: DC Press, 2009.

Everly, G., Strause, D., and Everly III, G. *The Secrets of Resilient Leadership*. Milwaukee: ASQ Quality Press, 2009.

Gawande, Atul, *The Checklist Manifesto: How to Get Things Right.* New York: Metropolitan Books-Henry Holt and Company, 2009.

Goleman, D. *Working with Emotional Intelligence.* New York: Bantam Books, 1998.

Gostick, A., and C. Elton. *The Carrot Principle: How the Best Managers Use Recognition to Engage Their People, Retain Talent, and Accelerate Performance.* New York: Free Press, 2007.

Hacker, S., and T. Roberts. *Transformational Leadership: Creating Organizations of Meaning.* Milwaukee: ASQ Quality Press, 2004.

Heath, C., and D. Heath, *Switch: How to Change Things When Change Is Hard.* New York: Crown Business, 2010.

Hersey, P., *The Situational Leader.* Escondido, CA: Center for Leadership Studies, 2004.

Hersey, P., K. Blanchard, and D. E. Johnson. *Management of Organizational Behavior: Leading Human Resources.* Upper Saddle River, NJ: Prentice-Hall, 2001.

Hesselbein, F., and P. M. Cohen, eds. *Leader to Leader: Enduring Insights on Leadership from the Drucker Foundation's Award-Winning Journal.* San Francisco: Jossey-Bass, 1999.

Hirzel, R. C. "Leadership Is Personal." Paper published by the ASQ Human Development and Leadership Division. Milwaukee, 2003.

Hopen, D. "Guiding Corporate Behavior: A Leadership Obligation, Not a Choice," *The Journal for Quality and Participation* 25 (Winter 2002):15–19

Hutton, D. *The Change Agent's Handbook.* Milwaukee: ASQ Quality Press, 1994.

Jossey-Bass. *Business Leadership: A Jossey-Bass Reader.* San Francisco: Jossey-Bass, 2003.

Kotter, J. P. *Leading Change.* Boston: Harvard Business School Press, 2012.

Kouzes, J., and B. Posner. *The Leadership Challenge.* 4th ed. San Francisco: Jossey-Bass, 2008.

Labovitz, G., and V. Rosansky. *Rapid Improvement*. Milwaukee: ASQ Quality Press, 2013.

Lee, J. *Rising Above All.* Milwaukee: ASQ Quality Press, 2013.

Miller, K. *The Change Agent's Guide to Radical Improvement.* Milwaukee: ASQ Quality Press, 2002.

Mundy, Lee. *A Journey to Quality Leadership*, Milwaukee: ASQ Quality Press, 2011.

Palmer, B. *Making Change Work: Practical Tools for Overcoming Human Resistance to Change.* Milwaukee: ASQ Quality Press, 2004.

Pauley, J. A., and J. Pauley, *Communication: The Key to Effective Leadership.* Milwaukee: ASQ Quality Press, 2009.

Perseus Publishing. *Best Practice: Ideas and Insights From the World's Foremost Business Thinkers*. Cambridge, MA: Perseus, 2003.

Pietenpol, D. *Leadership, Quality, and Learning.* Milwaukee: ASQ Quality Press, 2008.

Senge, P. *The Fifth Discipline*. New York: Random House, 2005.

Shearer, C. *Everyday Excellence: Creating a Better Workplace Through Attitude, Action, and Appreciation.* Milwaukee: ASQ Quality Press, 2006.

Smart, B. D. *Topgrading: How Leading Companies Win by Hiring, Coaching, and Keeping the Best People.* New York: Portfolio-Penguin Group, 2005.

Weiner, E., and A. Brown. *Future Think: How to Think Clearly in a Time of Change.* Upper Saddle River, NJ: Pearson-Prentice Hall, 2006.

Weiss, A. *"Good Enough" Isn't Enough: Nine Challenges for Companies That Choose to Be Great.* New York: AMACOM, 2000.

C. Chapter 3 Teams and Team Processes

Dreo, H., P. Kunkel, and T. Mitchell. *The Virtual Teams Guidebook for Managers.* Milwaukee: ASQ Quality Press, 2003.

McDermott, L. C., N. Brawley, and W. W. Waite. *World Class Teams: Working across Borders.* New York: John Wiley & Sons, 1998.

Scholtes, P. R., B. L. Joiner, and B. J. Streibel. *The Team Handbook.* 3rd ed. Madison, WI: Joiner Associates, 2003.

Wilson, S. "Forming Virtual Teams." *Quality Progress* (June 2003): 36–41.

D. Chapter 4 ASQ Code of Ethics

Anderson, B. *Bringing Business Ethics to Life: Achieving Corporate Social Responsibility.* Milwaukee: ASQ Quality Press, 2004.

AuBuchon, D. "Integrity in Management." *The Quality Management Forum* (Fall 2004).

Geissler, P. *Managing with Conscience for Competitive Advantage.* Milwaukee: ASQ Quality Press, 2004.

Sarbanes-Oxley Act of 2002. Public Law 107-204, July 30, 2002. (Addresses concerns, among other issues, about corporate responsibility for financial reports. A top corporate officer must review and sign financial reports signifying that "the report does not contain any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements made, in light of the circumstances under which such statements were made, not misleading.")

Stimson, W. A. "A Deming Inspired Management Code of Ethics." *Quality Progress* (February 2005): 67–75.

PART II STRATEGIC PLAN DEVELOPMENT AND DEPLOYMENT

A. Chapter 5 Strategic Planning Models

Cobb, C. G. *From Quality to Business Excellence: A Systems Approach to Management.* Milwaukee: ASQ Quality Press, 2003.

Colletti, J. *Hoshin Kanri Memory Jogger*. Salem, NH: GOAL/QPC, 2013.

Haines, S. G. *Strategic and Business Planning: The Systems Thinking Approach.* Amherst, MA: HRD Press, 1999.

National Institute of Standards and Technology. *Baldrige Performance Excellence Program: Criteria for Performance Excellence.* Gaithersburg, MD: NIST, 2012. (Individual copies of the criteria booklets may be obtained free of charge from: Baldrige Performance Excellence Program, NIST, Administration Building, Room A600, 100 Bureau Drive, Stop 1020, Gaithersburg, MD 20899-1020, telephone (301) 975-2036, fax (301) 948-3716, e-mail nqp@nist.gov or download from www.baldrige.nist.gov/Criteria.htm). Note: There are separate criteria for healthcare and for education.

B. Chapter 6 Business Environment Analysis

Babcock, C. *Management Strategies for the Cloud Revolution: How Cloud Computing Is Transforming Business and Why You Can't Afford to Be Left Behind*. New York: McGraw-Hill, 2010.

C. Chapter 7 Strategic Plan Deployment

DeFeo, J. A. "Strategic Deployment," Section 13 in *Juran's Quality Handbook*. 5th ed. J. M. Juran and A. B. Godfrey, eds. New York: McGraw-Hill, 1999.

Haines, S. G. *Strategic and Business Planning: The Systems Thinking Approach.* Amherst, MA: HRD Press, 1999.

PART III MANAGEMENT ELEMENTS AND METHODS

A. Chapter 8 Management Skills and Abilities

Principles of Management, Management Theories, and Tools

Hersey, P., K. Blanchard, and D. E. Johnson. *Management of Organizational Behavior: Leading Human Resources.* Upper Saddle River, NJ: Prentice-Hall, 2001.

Hofstede, G., G. J. Hofstede, and M. Mikov. *Cultures and Organizations.* 4th ed. New York: McGraw-Hill, 2010.

Liker, J. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.* New York: McGraw-Hill, 2004.

Schein, E. H. *The Corporate Culture Survival Guide: Sense and Nonsense About Culture Change.* San Francisco: Jossey-Bass, 1999.

Schermerhorn Jr., J. R., J. G. Hunt, and R. N. Osborn. *Organizational Behavior.* 9th ed. New York: John Wiley & Sons, 2005.

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

Senge, P. M., A. Kleiner, C. Roberts, R. B. Ross, and B. J. Smith. *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization.* New York: Doubleday, 1994.

Woodson, W., P. Tillman, and B. Tillman. *Human Factors Design Handbook.* 2nd ed. New York: McGraw-Hill, 1992.

Interdependence of Functional Areas

Cobb, C. G. *From Quality to Business Excellence: A Systems Approach to Management.* Milwaukee: ASQ Quality Press, 2003.

Sirkin, M. *The Secret Life of Corporations: Understanding the True Nature of Business.* White Plains, NY: New Chrysalis Press, 2004.

Human Resources Management

Holbeche, L. *Aligning Human Resources and Business Strategy.* New York: Butterworth Heinemann, 2001.

Mathis, R. L., and J. H. Jackson. *Human Resource Management.* 11th ed. Mason, OH: Thomson South-Western, 2000.

Financial Management

Chang, R. Y., and M. W. Morgan. *Performance Scorecards: Measuring the Right Things in the Real World.* San Francisco: Jossey-Bass, 2000.

Drickhamer, D. "House of Cards." *Industry Week* (January 2005): 49–51.

Finkler, S. A. *Finance and Accounting for Nonfinancial Managers.* 3rd ed. New York: Aspen Publishers, 2003.

Garrison, R. H., and E. W. Noreen. *Managerial Accounting.* Boston: McGraw-Hill/Irwin, 2003.

George, S. "How to Speak the Language of Senior Management." *Quality Progress* (May 2003): 30–36.

Hoisington, S. H., and E. C. Menzer. "Learn to Talk Money." *Quality Progress* (May 2004): 44–49.

Kaplan, R. S., and D. P. Norton. *The Balanced Scorecard: Translating Strategy into Action.* Boston: Harvard Business School Press, 1996.

Livingston, J. L., and T. Grossman. *The Portable MBA in Finance and Accounting.* 3rd ed. New York: John Wiley & Sons, 2001.

Ryan, J. *Making the Economic Case for Quality*. An ASQ White Paper. Milwaukee: American Society for Quality, 2004.
Tracy, J. A. *Accounting for Dummies: A Reference for the Rest of Us.* 2nd ed. New York: Hungry Minds, 2001.

Risk Management

Drickhamer, D. “House of Cards.” *Industry Week* (January 2005): 49–51.
Getto, G. “Risk Management Supporting Quality Management of Software Acquisition Projects,” in *Software Quality Professional (ASQ)* 2, no. 2 (2000): 42–53.
Goodden, R. L. *Product Liability Prevention: A Strategic Guide.* Milwaukee: ASQ Quality Press, 2000.
Hutchins, G., and D. Gould. “The Growth of Risk Management.” *Quality Progress* (September 2004): 73–75.
Kolka, J. W. “ISO 9001 and 9004: A Framework for Disaster Preparedness.” *Quality Progress* (February 2002): 57–62.
Snow, A. “Integrating Risk Management into the Design and Development Process.” *Medical Device & Diagnostic Industry* (March 2001): 99–113.
Vinas, T., and J. Jusko. “5 Threats That Could Sink Your Company.” *Industry Week* (September 2004): 53–62.
Westcott, R. T. *Stepping Up to ISO 9004:2000.* Chico, CA: Paton Press, 2005, Chapter 4.

Knowledge Management

Bajaria, H. J. “Knowledge Creation and Management: Integrated Issues.” *ASQ’s 54th Annual Quality Conference Proceedings.* Milwaukee: ASQ, 2002.
Davenport, T. H., and L. Prusak. *Working Knowledge: How Organizations Manage What They Know.* Boston: Harvard Business School Press, 1998.
Shockley III, W. “Planning for Knowledge Management.” *Quality Progress* (March 2000).
Von Krogh, G., K. Ichijo, and I. Nonaka. *Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation.* New York: Oxford University Press, 2000.
Wilson, L. T., and D. Asay. “Putting Quality in Knowledge Management.” *Quality Progress* (January 1999): 25–31.

Product Development

Cooper, R. G. *Winning at New Products: Accelerating the Process from Idea to Launch.* 3rd ed. Cambridge, MA: Perseus, 2001.
Monczka, R. M., R. B. Handfield, T. V. Scannell, G. L. Ragatz, and D. J. Frayer. *New Product Development: Strategies for Supplier Integration.* Milwaukee: ASQ Quality Press, 2000.
Reilly, N. B. *The Team Based Product Development Guidebook.* Milwaukee: ASQ Quality Press, 1999.

B. Chapter 9 Communication Skills and Abilities

Brounstein, M. *Communicating Effectively for Dummies: A Reference for the Rest of Us.* New York: John Wiley & Sons, 2001.
Harrington, H. J., and F. Voehl. “Managing Global Quality: Directing a Worldwide Organization Demands Keen Strategy and Innovative Planning.” *Quality Digest* (November 2004): 33–37.
Morrison, T., W. A. Conaway, and G. A. Borden. *Kiss, Bow, or Shake Hands: How to Do Business in Sixty Countries.* Holbrook, MA: Adams Media Corporation, 1994.

C. Chapter 10 Project Management

Baker, S., and K. Baker. *The Complete Idiot's Guide to Project Management*. Indianapolis, IN: Alpha Books, 2000.

Barkley, B. T., and J. H. Saylor. *Customer-Driven Project Management: Building Quality into Project Processes.* 2nd ed. New York: McGraw-Hill, 2001.

Chapman, C., and S. Ward. *Project Risk Management*. New York: John Wiley & Sons, 2003.

Chatfield, C. S., and T. D. Johnson. *Microsoft Project 2000 Step by Step*. Redmond, WA: Microsoft Press, 2002.

Conklin, J. D. "Smart Project Selection." *Quality Progress* (March 2003): 81–83.

Cooper, R. G. *Winning at New Products: Accelerating the Process from Idea to Launch.* 3rd ed. Cambridge, MA: Perseus, 2001.

Dobson, M. *Project Management for the Technical Professional*. Upper Darby, PA: Project Management Institute, 2001.

Fleming, Q. W., and J. M. Koppelman. *Earned Value: Project Management*. Newtown Square, PA: Project Management Institute, 2000.

Frame, J. D. *Managing Risk in Organizations: A Guide for Managers*. New York: John Wiley & Sons, 2003.

———. *The New Project Management.* 2nd ed. San Francisco: Jossey-Bass, 2002.

Graham, R. J., and R. L. Englund. *Creating an Environment for Successful Projects.* 2nd ed. Milwaukee: ASQ Quality Press, 2003.

Kerzner, H. *Project Management: A Systems Approach to Planning, Scheduling, and Controlling.* 8th ed. New York: Van Nostrand Reinhold, 2003.

LaBrosse, M. A. *Accelerated Project Management*. New York: HNB, 2002.

Lewis, J. P. *Project Planning, Scheduling & Control: A Hands-On Guide to Bringing Projects in on Time and on Budget.* 3rd ed. Chicago: Probus, 2001.

Lowenthal, J. N. *Six Sigma Project Management: A Pocket Guide*. Milwaukee: ASQ Quality Press, 2002.

Milosevic, D. Z. *Project Management Toolbox: Tools and Techniques for the Practicing Project Manager*. New York: John Wiley & Sons, 2003.

Phillips, J. J., T. W. Bothell, and G. L. Snead. *The Project Management Scorecard: Measuring the Success of Project Management Solutions*. New York: Butterworth Heinemann, 2002.

PMI Standards Committee. *A Guide to the Project Management Body of Knowledge*. Upper Darby, PA: Project Management Institute, 2000.

Pyzdek, T. "Selecting Winning Projects." *Quality Digest* (August 2000): 26.

Rad, P. F., and G. Levin. *Achieving Project Management Success Using Virtual Teams*. Boca Raton, FL: J. Ross, 2003.

Stevenson, N. *Microsoft Project for Dummies*. Foster City, CA: IDG, 2000.

Uyttewaal, E. *Dynamic Scheduling with Microsoft Project 2002*. Boca Raton, FL: J. Ross, 2003.

———. *The Portable MBA in Project Management*. New York: John Wiley & Sons, 2003.

Westcott, R. T. *Simplified Project Management for the Quality Professional.* Milwaukee: ASQ Quality Press, 2004.

Wysocki, R. K., and J. P. Lewis. *The World Class Project Manager: A Professional Development Guide*. Cambridge, MA: Perseus, 2001.

D. Chapter 11 Quality System

Arter, D. R. *Quality Audits for Improved Performance.* 3rd ed. Milwaukee: ASQ Quality Press, 2003.

Arter, D. R., C. A. Cianfrani, and J. E. West. *How to Audit the Process-Based QMS.* Milwaukee: ASQ Quality Press, 2003.

Palmes, P. C. *Process Driven Comprehensive Auditing.* Milwaukee: ASQ Quality Press, 2005.

———. *The Internal Auditing Pocket Guide.* Milwaukee: ASQ Quality Press, 2003.

———. *Continual Improvement Assessment Guide: Promoting and Sustaining Business Results.* Milwaukee: ASQ Quality Press, 2004.

West, J., and C. A. Cianfrani. *Unlocking the Power of Your QMS: Keys to Business Performance Improvement.* Milwaukee: ASQ Quality Press, 2005.

E. Chapter 12 Quality Models and Theories

Bernhart, M. S., and F. J. Maher. *ISO 26000 in Practice.* Milwaukee: ASQ Quality Press, 2011.

Blazey, M. L. *Insights to Performance Excellence 2013–2014: Understanding the Integrated Management System and the Baldrige Criteria: An Inside Look at the 2005 Baldrige Award Criteria.* Milwaukee: ASQ Quality Press, 2013.

Brown, M. G. *Baldrige Award Winning Quality: How to Interpret the Baldrige Criteria for Performance Excellence.* 14th ed. New York: Productivity Press, 2005.

Byrnes, M. A., and J. C. Baxter. *There Is Another Way! Launch a Baldrige-Based Quality Classroom.* Milwaukee: ASQ Quality Press, 2005.

Cianfrani, C. A., and J. E. West. *ISO 9001:2008 Explained Expanded: Optimizing Your QMS for Success.* Milwaukee: ASQ Quality Press, 2013.

Collins Jr., J. W., and D. S. Steiger. *The Memory Jogger 9001:2008: Implementing a Process Approach Compliant to ISO 9001:2008 Quality Management Systems*. Salem, NH: GOAL/QPC, 2011.

Crosby, P. B. *Quality Is Free*. New York: Mentor Books, 1979.

Deming, W. E. *The New Economics.* 2nd ed. Cambridge, MA: MIT Center for Advanced Educational Studies, 1994.

———. *Out of the Crisis.* Cambridge, MA: MIT Center for Advanced Engineering Study, 1986.

Imai, M. *Kaizen: The Key to Japan's Competitive Success.* New York: Random House Business Division, 1986.

Ishikawa, L. *Guide to Quality Control.* Tokyo: Asian Productivity Organization, 1982.

Leonard, D., and M. McGuire. *Executive Guide to Understanding and Implementing the Baldrige Criteria: Improve Revenue and Create Organizational Excellence.* Milwaukee: ASQ Quality Press, 2007.

Myhrberg, E. V. *A Practical Field Guide for ISO 9001:2008.* Milwaukee: ASQ Quality Press, 2009.

Russell, J.P. *Continual Improvement Assessment Guide.* Milwaukee: ASQ Quality Press, 2004.

———. *The Internal Auditing Pocket Guide.* Milwaukee: ASQ Quality Press, 2003.

West, J. E., and C. A. Cianfrani. *Unlocking the Power of Your QMS: Keys to Business Performance Improvement.* Milwaukee: ASQ Quality Press, 2005.

Westcott, R. T. *Stepping Up to ISO 9004:2000: A Practical Guide for Creating a World-Class Organization.* Chico, CA: Paton Press, 2003.

PART IV QUALITY MANAGEMENT TOOLS

A. Chapter 13 Problem-Solving Tools

Seven Classic Quality Tools and Basic Management and Planning Tools

Andersen, B., T. Fagerhaug, B. Henriksen, and L. F. Onsøyen. *Mapping Work Processes.* Milwaukee: ASQ Quality Press, 2008

Brassard, M., and D. Ritter. *The Memory Jogger 2.* 2nd ed. Salem, NH: GOAL/QPC, 2010.

Process Improvement Tools

ABS Consulting—L. N. Vanden Heuvel, D. K. Lorenzo, R. L. Montgomery, W.E. Hanson, and J. R. Rooney. *Root Cause Analysis Handbook.* 3rd ed. Milwaukee: ASQ Quality Press, 2008.

Andersen, B., and T. Fagerhaug. *Root Cause Analysis: Simplified Tools and Techniques.* 2nd ed. Milwaukee: ASQ Quality Press, 2006.

Barry, R., and A. C. Smith. *The Manager's Guide to Six Sigma in Healthcare: Practical Tips and Tools for Improvement.* Milwaukee: ASQ Quality Press, 2005.

Brassard, M., L. Finn, D. Ginn, and D. Ritter. *The Six Sigma Memory Jogger II: A Pocket Guide of Tools for Six Sigma Improvement Teams.* Salem, NH: GOAL/QPC, 2002.

GOAL/QPC. *The Problem Solving Memory Jogger: Seven Steps to Improved Processes.* Lawrence, MA: GOAL/QPC, 2000.

Munro, R. A. *Six Sigma for the Shop Floor.* Milwaukee: ASQ Quality Press, 2002.

Okes, D., *Root Cause Analysis: The Core of Problem Solving and Corrective Action.* Milwaukee: ASQ Quality Press, 2009.

Pande, P. S., and L. Holpp. *What Is Six Sigma?* New York: McGraw-Hill, 2001.

Pande, P. S., R. R. Cavanagh, and R. P. Neuman. *The Six Sigma Way: How GE, Motorola, and Other Top Companies Are Honing Their Performance.* New York: McGraw-Hill, 2000.

Plenert, G. *Strategic Continuous Process Improvement: Which Quality Tools to Use, and When to Use Them.* New York: McGraw-Hill, 2012.

Pries, K. H. *Six Sigma for the Next Millennium.* 2nd ed. Milwaukee: ASQ Quality Press, 2009.

Six Sigma Academy. *The Black Belt Memory Jogger: A Pocket Guide for Six Sigma Success.* Salem, NH: GOAL/QPC, 2002.

Stamatis, D. H. *Failure Mode Effect Analysis: FMEA from Theory to Execution.* 2nd ed. Milwaukee: ASQ Quality Press, 2003.

Tague, N. R. *The Quality Toolbox.* 2nd ed. Milwaukee: ASQ Quality Press, 2005.

Watson, G. *Six Sigma for Business Leaders: A Guide to Implementation.* Salem, NH: GOAL/QPC, 2004.

Innovation and Creativity Tools

Cook, H. E. *Design for Six Sigma As Strategic Experimentation: Planning, Designing, and Building World-Class Products and Services.* Milwaukee: ASQ Quality Press, 2005.

GOAL/QPC. *The Design for Six Sigma Memory Jogger.* Salem, NH: GOAL/QPC, 2004.

Hidahl, J. W. "DFMA/DFSS." In *Manufacturing Handbook of Best Practices*, edited by J. B. ReVelle. Boca Raton, FL: St. Lucie Press, 2002.

Mader, D. P. "Design for Six Sigma: You Need More Than Standard Six Sigma Approaches to Optimize Your Product or Service Development." *Quality Progress* (July 2002): 82–86.

Tague, N. R. *The Quality Toolbox.* 2nd ed. Milwaukee: ASQ Quality Press, 2005.

Ungvari, S. F. "TRIZ." Chapter 19 in *Manufacturing Handbook of Best Practices: An Innovation, Productivity, and Quality Focus*, edited by J. B. ReVelle. Boca Raton, FL: St. Lucie Press, 2002, 399–425.

Watson, G. H. *Design for Six Sigma: Innovation for Enhanced Competitiveness.* Salem, NH: GOAL/QPC, 2005.

Cost of Quality

Beecroft, G. D. "Cost of Quality and Quality Planning Affect the Bottom Line." *The Quality Management Forum* (Winter 2001).

DeFeo, J. A. "The Tip of the Iceberg: When Accounting for Quality, Don't Forget the Often Hidden Costs of Poor Quality." *Quality Progress* (May 2001): 29–37.

Freiesleben, J. "Quality Problems and Their Real Costs." *Quality Progress* (December 2004): 49–55.

Gryna, F. M. "Section 8: Quality and Costs." In *Juran's Quality Handbook*. 5th ed. Edited by J. M. Juran and A. B. Godfrey New York: McGraw-Hill, 1999.

Wood, D. C., ed. *Principles of Quality Costs: Financial Measures for Strategic Implementation of Quality Management.* 4th ed. Milwaukee: ASQ Quality Press, 2012.

B. Chapter 14 Process Management

Process Goals and Analysis

Alukal, G., and A. Manos. *Lean Kaizen: A Simplified Approach to Process Improvement.* Milwaukee: ASQ Quality Press, 2006.

Christensen, E. H., K. M. Coombes-Betz, M. S. Stein, *The Certified Quality Process Analyst Handbook.* Milwaukee: ASQ Quality Press, 2007.

Imai, M. *Gemba Kaizen: A Commonsense Approach to a Continous Improvement Strategy.* 2nd ed. Milwaukee: ASQ Quality Press, 2012.

Lareau, W. *Office Kaizen 2: Harnessing Leadership, Organizations, People, and Tools for Office Excellence.* Milwaukee: ASQ Quality Press, 2011.

Windsor, S. *An Introduction to Green Process Management.* Milwaukee: ASQ Quality Press, 2011.

Lean Tools

Hinckley, C. M. *Make No Mistake!: An Outcome-Based Approach to Mistake-Proofing.* Portland, OR: Productivity Press, 2001.

Lareau, W. *Office Kaizen: Transforming Office Operations into a Strategic Competitive Advantage.* Milwaukee: ASQ Quality Press, 2003.

Macinnes, R. L. *The Lean Enterprise Memory Jogger: Create Value and Eliminate Waste throughout Your Company*. Salem, NH: GOAL/QPC, 2002.

MCS Media. *The New Lean Pocket Guide XL: Tools for the Elimination of Waste!* Chelsea, MI: MCS Media, 2006.

Ohno, T. *Toyota Production System: Beyond Large-Scale Production.* Portland, OR: Productivity Press, 1988.

ReVelle, J. B. *Manufacturing Handbook of Best Practices: An Innovation, Productivity, and Quality Focus*. Boca Raton, FL: St. Lucie Press, 2002.

Rooney, S. A., and J. K. Rooney. "Lean Glossary." *Quality Progress* (June 2005): 41–47.

Schonberger, R. J. "Make Work Cells Work for You." *Quality Progress* (April 2004): 58–63.

Tapping, D., T. Luyster, and T. Shuker. *Value Stream Management: Eight Steps to Planning, Mapping, and Sustaining Lean Improvements.* New York: Productivity Press, 2002.

Trischler, W. R. *Understanding and Applying Value-Added Assessment: Eliminating Business Process Waste*. Milwaukee: ASQC Quality Press, 1996.

Voelkel, J. G., and C. Chapman. "Value Stream Mapping." *Quality Progress* (May 2003): 65–69.

Theory of Constraints

Dettmer, W. W. *Breaking the Constraints to World-Class Performance.* Milwaukee: ASQ Quality Press, 1998.

———. *Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement.* Milwaukee: ASQ Quality Press, 1997.

Nave, D., “How to Compare Six Sigma, Lean, and the Theory of Constraints.” *Quality Progress* (March 2002): 73–78.

C. Chapter 15 Measurement: Assessment and Metrics

Andersen, B. *Business Process Improvement Toolbox.* Milwaukee: ASQ Quality Press, 1999.

Anderson, M. J., and S. L. Kraber. “Eight Keys to Successful DOE.” *Quality Digest* (July 1999): 39–43.

ASQ Statistics Division. *Improving Performance Through Statistical Thinking.* Milwaukee: ASQ Quality Press, 2000.

Barrentine, L. B. *Concepts for R&R Studies.* 2nd ed. Milwaukee: ASQ Quality Press, 2003.

Blank, R. *Basics of Reliability.* New York: Productivity Press, 2004.

Borror, C. M., ed. *The Certified Quality Engineer Handbook.* 3rd ed. Milwaukee: ASQ Quality Press, 2009.

Brassard, M., L. Finn, D. Ginn, and D. Ritter. *Six Sigma Memory Jogger II: A Pocket Guide for Six Sigma Improvement Teams.* Salem, NH: GOAL/QPC, 2002.

Brassard, M., and D. Ritter. *The Creativity Tools Memory Jogger.* Salem, NH: GOAL/QPC, 1998.

Carey, R. G., and R. C. Lloyd. *Measuring Quality Improvement in Healthcare: A Guide to Statistical Process Control Applications.* Milwaukee: ASQ Quality Press, 2001.

Crossley, M. L. *The Desk Reference of Statistical Quality Methods.* Milwaukee: ASQ Quality Press, 2000.

Hahn, G. J., W. Q. Meeker, and N. Doganaksoy. “Speedier Reliability Analysis.” *Quality Progress* (June 2003): 58–64.

Hunter, J. S. “Improving an Unstable Process.” *Quality Progress* (February 2004): 68–71.

———. “Making a Decision Under Uncertain Circumstances.” *Quality Progress* (April 2003): 83–85.

Kimothi, S. K. *The Uncertainty of Measurements: Physical and Chemical Metrology Impact and Analysis.* Milwaukee: ASQ Quality Press, 2002.

Okes, D. *Performance Metrics: The Levers for Process Management.* Milwaukee: ASQ Quality Press, 2013.

Payne, G. C. “Calibration: What Is It?” *Quality Progress* (May 2005): 72–76.

Schilling, E. G. “Acceptance Sampling.” In *Juran’s Quality Handbook.* 5th ed. Edited by J. M. Juran and A.B. Godfrey. New York: McGraw-Hill, 1999, Section 46.1–46.87.

Stephens, K. S. *The Handbook of Applied Acceptance Sampling: Plans, Procedures, and Principles.* Milwaukee: ASQ Quality Press, 2001.

West, J. E., and C. A. Cianfrani. *Unlocking the Power of Your QMS: Keys to Business Performance Improvement.* Milwaukee: ASQ Quality Press, 2005.

Wheeler, D. J. *Understanding Variation: The Key to Managing Chaos.* Knoxville, TN: SPC Press, 1993.

Wood, D., ed. *Principles of Quality Costs: Financial Measures for Strategic Implementation of Quality Management.* 4th ed. Milwaukee: ASQ Quality Press, 2013.

PART V CUSTOMER-FOCUSED ORGANIZATIONS

A. Chapter 16 Customer Identification and Segmentation

Westcott, R. T. “Quality-Level Agreements for Clarity of Expectations.” *The Informed Outlook* (December 1999): 13–15.

B. Chapter 17 Customer Relationship Management

Albrecht, K., and R. Zemke. *Service America in the New Economy.* New York: McGraw-Hill, 2002.

Barlow, J., and C. Møller. *A Complaint Is a Gift: Using Customer Feedback As a Strategic Tool.* San Francisco: Berrett-Koehler, 1996.

Becker, K. "Are You Hearing Voices?" *Quality Progress* (February 2005): 28–35.

Camarota, A. G. *Finding the Leader in You.* Milwaukee: ASQ Quality Press, 2004.

Cochran, C. "Leveraging Customer Complaints into Customer Loyalty." *Quality Digest* (December 2004): 26–28.

Allen, D. R., and T. R. Rao. *Analysis of Customer Satisfaction Data.* Milwaukee: ASQ Quality Press, 2000.

Fisher, C. M., and J. T. Schutta. *Developing New Services: Incorporating the Voice of the Customer into Strategic Service Development.* Milwaukee: ASQ Quality Press, 2003.

Fornell, C. *The Satisfied Customer: Winners and Losers in the Battle for Buyer Preference.* New York: Palgrave-Macmillan, 2007.

Harris, E. K. *Customer Service: A Practical Approach.* Upper Saddle River, NJ: Prentice Hall, 2000.

Hayes, B. E. *Measuring Customer Satisfaction and Loyalty: Survey Design, Use, and Statistical Analysis Methods.* 3rd ed. Milwaukee: ASQ Quality Press, 2008.

Jeffries, R. D., and P. R. Sells. "Customer Satisfaction Measurement Instruments: In Healthcare, Does One Size Fit None?" *Quality Progress* (February 2000): 118–23.

Kessler, S. *Customer Satisfaction Toolkit for ISO 9001:2000.* Milwaukee: ASQ Quality Press, 2003.

LeBoeuf, M. *How to Win Customers and Keep Them for Life.* Rev. ed. New York: Berkeley Books, 2000.

McKenzie, R. *The Relationship-Based Enterprise: Powering Business Success Through Customer Relationship Management.* New York: McGraw-Hill, 2001.

Mody, A. "New Imperative: To Keep Customers, Deliver an Exceptional Experience." *The Quality Management Forum* (Fall): 5–7.

Naumann, E., and S. H. Hoisington. *Customer Centered Six Sigma: Linking Customers, Process Improvement, and Financial Results.* Milwaukee: ASQ Quality Press, 2001.

Newell, F. *Loyalty.com: Customer Relationship Management in the New Era of Internet Marketing.* New York: McGraw-Hill, 2000.

Nykamp, M. *The Customer Differential: The Complete Guide to Implementing Customer Relationship Management.* New York: AMACOM, 2001.

Plsek, P. E. "Creative Thinking for Surprising Quality: The Ability to Innovate Is a Must in Today's Competitive Marketplace." *Quality Progress* (May 2000): 67–73.

Rosenbluth, H. F., and D. M. Peters. *The Customer Comes Second: Put Your People First and Watch 'Em Kick Butt.* New York: HarperCollins, 2002.

Schultz, G. *The Customer Care & Contact Center Handbook.* Milwaukee: ASQ Quality Press, 2003.

Sewell, C., and P. B. Brown. *Customers for Life: How to Turn That One-Time Buyer into a Lifetime Customer.* New York: Doubleday, 2002.

Timm, P. R. *Seven Power Strategies for Building Customer Loyalty.* New York: AMACOM, 2001.

Ulwick, A. W. *What Customers Want: Using Outcome-Driven Innovation to Create Breakthrough Products and Services.* New York: McGraw-Hill, 2005.

Vavra, T. G. *Customer Satisfaction Measurement Simplified: A Step-by-Step Guide for ISO 9001:2000 Certification.* Milwaukee: ASQ Quality Press, 2002.

Warner, C. M. In *Real World Customer Service Strategies That Work.* Sevierville, TN: Insight, 2004.

Westcott, R. T. “Stepping Up to ISO 9004:2000: Focusing on the Customer.” *The Informed Outlook* (July 2001): 3–8 and (August 2001): 19–24.

———. “Tapping the Many Voices of the Customer.” *The Informed Outlook* (June 2000): 20–23.

———. “Safeguard Your Customer Base.” *The Quality Management Forum* (Summer 1998): 10–13.

———. “Unconditional Guarantee: Implications for Your Business.” *The Quality Management Forum* (Spring 1994): 3–6.

Wilburn, M. W. *Managing the Customer Experience: A Measurement-Based Approach.* Milwaukee: ASQ Quality Press, 2007.

Xie, M., K. C. Tan, T. N. Goh. *Advanced QFD Applications.* Milwaukee: ASQ Quality Press, 2003.

Zeithaml, V. A., A. Parasuraman, and L. L. Berry. *Delivering Quality Service: Balancing Customer Perceptions and Expectations.* Milwaukee: ASQ Quality Press, 2002.

PART VI SUPPLY CHAIN MANAGEMENT

Chapter 18 Supply Chain

Andrews, D. L. “How to Manage Cross-Cultural Change.” *Chief Supply Chain Officer* (May 2005): 34–39.

Ayers, J. B. *Supply Chain Project Management: A Structured Collaborative and Measurable Approach.* 2nd ed. Boca Raton, FL: CRC Press, 2010.

Balasubramanian, R., and S. Baumgardner. “Good Supplier Management Aids New Product Launch.” *Quality Progress* (June 2004): 49–57.

Barney, D. “Get Ripped!: 20 Steps to a Lean, Mean Supply Chain Machine.” *Chief Supply Chain Officer* (May 2005): 18–25.

———. “10 Rules of Supply Chain Excellence.” *Chief Supply Chain Officer* (February 2005): 22–29.

Bolstorff, P., and R. Rosenbaum. *Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model.* 2nd ed. New York: AMACOM, 2003.

Boone, T., and R. Ganeshan. *New Directions in Supply-Chain Management: Technology, Strategy, and Implementation.* New York: AMACOM, 2002.

Bossert, J. L., ed. *The Supplier Management Handbook.* 6th ed. Milwaukee: ASQ Quality Press, 2004.

CQI-19 AIAG Sub-tier Supplier Management Process Guideline, Version I, Issued August 2012.

Dittmann, P. J. *Supply Chain Transformation: Building and Executing an Integrated Supply Chain.* Milwaukee: ASQ Quality Press, 2013.

Dominick, C., and S. Lunney. *The Procurement Game Plan: Winning Strategies and Techniques for Supply Management Professionals.* Fort Lauderdale, FL: J. Ross, 2012.

Fawcett, S. E., and G. M. Magnan. *Achieving World-Class Supply Chain Alignment: Benefits, Barriers, and Bridges.* Center for Advanced Purchasing Studies, 2001. http://www.capsresearch.org.

Gilmore, D. “Integrated Supply Chains Require Effective Sales and Operations Planning.” *Chief Supply Chain Officer* (May 2005): 48–47.

Gordon, S. “Seven Steps to Measure Supplier Performance.” *Quality Progress* (August 2005): 20–25.

Handfield, R. B., and E. L. Nichols Jr. *Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems.* Upper Saddle River, NJ: Prentice Hall, 2002.

"How to Give a Quality Score to Your Supplier." Metric Stream. Accessed August 1, 2013. http://www.metricstream.com/insights/qualityScore.htm.

Navas, D. "The Global Supply Chain: 3PLs Lead the Way." *SCS* (May 2005): 10–17.

Norausky, P. H. *The Customer and Supplier Innovation Team Guidebook.* Milwaukee: ASQ Quality Press, 2000.

ReVelle, J. B., ed. *Manufacturing Handbook of Best Practices: An Innovation, Productivity, and Quality Focus.* Boca Raton, FL: St.Lucie Press, 2002, Chapters 16 and 17.

Stauffer, D. "Risk: The Weak Link in Your Supply Chain." *Harvard Business Review* (March 1, 2003): 3–5.

Supply and Demand Executive: Solutions-Based Intelligence for Supply Chain ROI . Magazine published five times per year, Northbrook, IL, omeda.com.

Supply Chain Metric.com. Accessed August 1, 2013. http://www.supplychainmetric.com/.

Terry, L. "Supply Chain Execution Expands Its Footprint: The Distinction between Supply Chain Planning and Supply Chain Execution Software Is Beginning to Blur, As Businesses Build Cross-Functional, Integrated Demand-Driven Networks." *SCS* (May 2005): 18–25.

Watkins, D. K. "Quality Management's Role in Global Sourcing." *Quality Progress* (April 2005): 24–31.

Chapter 19 Training and Development

Allen, M. W. *Michael Allen's Guide to E-Learning: Building Interactive, Fun, and Effective Learning Programs for Any Company.* Hoboken, NJ: John Wiley & Sons, 2003.

Kruse, K., and J. Keil. *Technology-Based Training: The Art and Science of Design, Development, and Delivery.* San Francisco: Jossey-Bass, 2000.

Phillips, J. J., *Handbook of Training Evaluation and Measurement Methods,* 3rd ed. Woburn, MA: Butterworth-Heinemann, 1997.

———. *Return on Investment in Training and Performance Improvement Programs.* Houston, TX: Gulf, 1997.

Rosenberg, M. J. *e-Learning: Strategies for Delivering Knowledge in the Digital Age.* New York: McGraw-Hill, 2001.

Rossett, A. *The ASTD E-Learning Handbook: Best Practices, Strategies, and Case Studies for an Emerging Field.* New York: McGraw-Hill, 2002.

———. *First Things Fast: A Handbook for Performance Analysis.* San Francisco: Pfeiffer, 1999.

———. *Training Needs Assessment.* Techniques in Training and Performance Development Series. Englewood Cliffs, NJ: Educational Technology Publications, 1987.

Rothwell, W. J., and H. C. Kazanas. *Mastering the Instructional Design Process: A Systematic Approach.* 3rd ed. San Francisco: Pfeiffer, 2003.

Stetar, B. "Training: It's Not Always the Answer." *Quality Progress* (March 2005): 44–49.

Westcott, R. T. "Mini-Scule: If You Have No Time or Money to Provide Training, Try a Mini-Scule." *Quality Progress* (June 2005): 104.

Appendix B

Glossary and Acronyms

A

A-B-C analysis—A systematic collection and analysis of the behavior observed of an individual or a work group for the purpose of determining the cause of specific behaviors.

acceptable quality limit (AQL)—The quality level that is the worst tolerable process average when a continuing series of lots is submitted for acceptance sampling.

acceptance sampling—Inspection of a sample from a lot to decide whether to accept or not accept that lot. There are two types: attributes sampling and variables sampling. In *attributes* sampling, the presence or absence of a characteristic is noted in each of the units inspected. In *variables* sampling, the numerical magnitude of a characteristic is measured and recorded for each inspected unit; this involves reference to a continuous scale of some kind.

acceptance sampling plan—Specific plan that indicates the sampling sizes and the associated acceptance or nonacceptance criteria to be used. In attributes sampling, for example, there are single, double, multiple, sequential, chain, and skip-lot sampling plans. In variables sampling, there are single, double, and sequential sampling plans. For detailed descriptions of these plans, see ANSI/ISO/ASQ A35342.

accreditation—Certification, by a duly recognized body, of the facilities, capability, objectivity, competence, and integrity of an agency, service, or operational group or individual to provide the specific service or operation needed. For example, the Registrar Accreditation Board (U.S.) accredits those organizations that register companies to the ISO 9000 series standards.

accuracy—A characteristic of measurement that addresses how close an observed value is to the true value. It answers the question, "Is it right?"

ACSI—The American Customer Satisfaction Index is an economic indicator, a cross-industry measure of the satisfaction of U.S. customers with the quality of the goods and services available to them—both those goods and services produced within the United States and those provided as imports from foreign firms that have substantial market shares or dollar sales.

action plan—The detailed plan to implement the actions needed to achieve strategic goals and objectives (similar to, but not as detailed as a *project plan*).

active listening—Listening closely to what others are saying (for example, rather than what you think of what they're saying or what you want to say back to them).

activity-based management—Managing with an accounting system (activity-based costing) that allocates costs to products based on resources employed to produce the product.

ad hoc team—See *temporary team*.

ADDIE—An instructional design model (*analysis*, *design*, *development*, *implementation*, and *evaluation*).

adult learning principles—Key principles of how adults learn that impact how education and training of adults should be designed.

affinity diagram—A management and planning tool used to organize ideas into natural groupings in a way that stimulates new, creative ideas. Also known as the *KJ method*.

agile approach—Means to change rapidly to meet changing customer and business direction. Also see *lean approach*.

AIAG—Automotive Industry Action Group.

alignment—Action taken to ensure that a process or activity allows traceability from an action level upward to support the organization's strategic goals and objectives.

alliance—An alliance can be the first step toward a partnership. See *partnership/alliance*.

alpha risk—Type 1 error; rejecting a process or lot when it is acceptable. Also see *producer's risk*.

analogies—A technique used to generate new ideas by translating concepts from one application to another.

analysis of variance (ANOVA)—A basic statistical technique for analyzing experimental data. It subdivides the total variation of a data set into meaningful component parts associated with specific sources of variation in order to test a hypothesis on the parameters of the model or to estimate variance components. There are three models: fixed, random, and mixed.

analytical thinking—Breaking down a problem or situation into discrete parts to understand how each part contributes to the whole.

AND—activity network diagram. A management and planning tool used to diagram the sequential relationships of events or processes or deliverables. The critical path method (CPM) and the program evaluation review technique (PERT) are derived from the arrow diagram.

andon board—A visual device (usually lights) displaying status alerts that can easily be seen by those who should respond.

AOQ—Average outgoing quality.

AOQL—Average outgoing quality limit.

APICS—American Production and Inventory Control Society.

appraisal cost—Costs incurred to determine the degree of conformance to quality requirements.

AQL—See *acceptable quality limit.*

AS9100—An international quality management standard for the aeronautics industry embracing the ISO 9001 standard.

ASME—American Society of Mechanical Engineers.

ASQ—American Society for Quality, a society of individual and organizational members dedicated to the ongoing development, advancement, and promotion of quality concepts, principles, and technologies.

assessment—An estimate or determination of the significance, importance, or value of something.

assignable cause—See *common cause* or *special cause.*

ASTD—American Society for Training and Development.

ASTM—American Society for Testing and Materials.

attribute data—Does/does not exist data. The control charts based on attribute data include fraction defective chart, number of affected units chart, count chart, count-per-unit chart, quality score chart, and demerit chart.

audit—A planned, independent, and documented assessment to determine whether agreed-on requirements are being met. Common types of audits are of the quality management system, processes, products, and services. When an audit is to check on conformance to a standard, specifications, contract terms, or regulations, it may be called a *compliance audit.*

audit program—The organized structure, commitment, schedules, and documented methods used to plan and perform audits.

audit scope—The depth or extent and boundaries within which the audit will be conducted.

audit team—The group of trained individuals conducting an audit under the direction of a team leader, relevant to a particular system, product, process, service, contract, project, or standard.

audit types—"Internal" or "first party" (organization being audited by itself), "external" or "second party" (an organization conducting an audit of a supplier, customer, or other company), and "external" or "third party" (audit conducted by a registrar or another party).

auditee—The individual or organization being audited.

auditor—An individual or organization carrying out an audit.

autocratic management—Autocratic managers are concerned with developing an efficient workplace and often have little concern for people (theory X assumptions about people). They typically make decisions without input from subordinates. These managers rely on their positional power.

autonomation—Use of specially equipped automated machines capable of detecting a defect in a single part, stopping the process, and signaling for assistance. See *jidoka.*

availability—The ability of a process or equipment to be in a state to perform its designated function under stated conditions at a given time. Availability can be expressed by the ratio:

$$\frac{\text{Uptime}}{\text{Downtime}}$$

average—The sum of all the pertinent data divided by the number of observations collected. Also see *mean.*

average chart—A control chart in which the subgroup average, X-bar, is used to evaluate the stability of the process level.

average outgoing quality (AOQ)—The expected average quality level of outgoing product for a given value of incoming product quality.

average outgoing quality limit (AOQL)—The maximum average outgoing quality over all possible levels of incoming quality for a given acceptance sampling plan and disposal specification.

B

balance sheet—A financial statement showing the assets, liabilities, and owner's equity of a business entity.

balanced scorecard—Translates an organization's mission and strategy into a comprehensive set of performance measures to provide a basis for strategic measurement and management, typically using four balanced views: financial, customers, internal business processes, and learning and growth.

Baldrige Performance Excellence Program (BPEP)—The Baldrige National Quality Award was established by Congress in 1987 to raise awareness of quality management and to recognize U.S. companies that have implemented successful quality management systems. A *Criteria for Performance Excellence* is published each year. Three awards may be given annually in each of five categories: manufacturing businesses, service businesses, small businesses, education institutions, and healthcare organizations. The award is named after the late Secretary of Commerce Malcolm Baldrige, a proponent of quality management. The U.S. Commerce Department's National Institute of Standards and Technology manages the award, and ASQ administers it. The major emphasis in determining success is achieving results.

batch processing—Running large batches of a single product through the process at one time, resulting in queues awaiting next steps in the process.

BATF—Bureau of Alcohol, Tobacco, and Firearms.

bathtub curve—Also called *life-history curve* or *Weibull curve*. A graphic demonstration of the relationship of failures over the life of a product versus the probable failure rate. Includes three phases: early or infant failure (break-in), a stable rate during normal use, and wear-out.

behavior management—The management methodology and practices adapted from B. F. Skinner's theories: a practice used in managing people.

behavioral theories—Motivational theories, notably those of Abraham Maslow, Frederick Herzberg, Douglas McGregor, and others.

benchmarking—An improvement process in which a company measures its performance against that of best-in-class organizations (or others that are good performers), determines how those organizations achieved their performance levels, and uses the information to improve its own performance. Areas often benchmarked include strategies, operations, processes, and procedures.

benefit–cost analysis—Collection of the dollar value of benefits derived from an initiative and the associated costs incurred and computing the ratio of benefits to cost.

beta risk—Type 2 error; the possibility that a bad product will be accepted by a consumer. See *consumer's risk*.

bias—A characteristic of measurement that refers to a systematic difference.

Big Q, little q—A term used to contrast the difference between managing for quality in all processes and products (Big Q) and managing for quality in a limited capacity (little q).

binomial distribution—Defines the probability of successes from a given number of trials.

Black Belt—Full-time leader responsible for implementing Six Sigma process improvement projects using pertinent methodologies, such as DMAIC, DOE, and others. Usually, the Black Belt trains the Green Belts, and often serves for a two-year assignment overseeing eight to ten Six Sigma projects.

blemish—An imperfection that is severe enough to be noticed, but should not cause any real impairment with respect to intended normal or reasonably foreseeable use. (See also *defect*, *imperfection*, and *nonconformity*.)

block diagram—A diagram that shows the operation, interrelationships, and interdependencies of components in a system. Boxes, or blocks (hence the name), represent the components; connecting lines between the blocks represent interfaces. There are two types of block diagrams: a *functional* block diagram, which shows a system's subsystems and lower-level products, their interrelationships, and interfaces with other systems; and a *reliability* block diagram, which is similar to the functional block diagram except that it is modified to emphasize those aspects influencing reliability.

Bloom's Taxonomy (levels of cognition)—See Appendix A.

body language—The expression of thoughts and emotions through movement or positioning of the body.

bottom line—An essential point or primary consideration. The line at the bottom of a financial statement that states the net profit or loss incurred.

boundaryless organization—An organization without the internal or external boundaries limiting traditional structures. (Also known as a *network organization*, a *modular corporation*, or a *virtual corporation*.)

BPR—Business process reengineering. See *process reengineering*.

brainstorming—A problem-solving tool that teams use to generate as many ideas as possible related to a particular subject. Team members begin by offering all their ideas; the ideas are not discussed or reviewed until after the brainstorming session.

breakthrough—A method of solving chronic problems that results from the effective execution of a strategy designed to reach the next level of quality. Such change often requires a paradigm shift within the organization.

brown fields—Abandoned, idle, or underused commercial or industrial facilities or site, often where use is complicated by real or potential environmental contamination.

BSI—British Standards Institute.

business partnering—The creation of cooperative business alliances between constituencies within an organization or between an organization and its customers or suppliers. Partnering occurs through a pooling of resources in a trusting atmosphere focused on continuous, mutual improvement. See also *customer–supplier partnership*.

business processes—Processes that focus on what the organization does as a business and how it goes about doing it; the functional processes (generating output within a single department) and cross-functional processes (generating output across several functions or departments).

C

calibration—The comparison of a measurement instrument or system of unverified accuracy to a measurement instrument or system of a known accuracy to detect any variation from the true value.

capability maturity model (CMM)—Description of key elements of an effective software process, covering planning practices, engineering, managing software development and maintenance.

capability ratio (C_p)— The specification tolerance width divided by the process capability.

capital expenditure—Money for improvements that will have a useful life of more than a year.

cascading training—Training implemented in an organization from the top down, where each level acts as trainers to those below.

case study—A prepared scenario (story) that, when studied and discussed, serves to illuminate the learning points of a course of study.

cash flow statement—A financial statement showing the flow of cash in and out of an enterprise within a given time period.

catchball—A term used to describe the interactive process of reaching consensus in developing and deploying policies and plans with hoshin planning.

cause-and-effect diagram—A tool for analyzing process variables. It is also referred to as the *Ishikawa diagram* because Kaoru Ishikawa developed it, and the *fishbone diagram* because the complete diagram resembles a fish skeleton. The diagram illustrates the main causes and sub-causes leading to an effect (symptom). The cause-and-effect diagram is one of the seven tools of quality.

CBT—Computer-based training. Training delivered via computer software.

***c*-chart**—Count control chart. See also *attribute data*.

CDC—Centers for Disease Control and Prevention.

CE mark—A mark placed on a product signifying that the product complies with the essential/safety requirements of the relevant European regulations; from the French, Conformité Européenne.

cell—A layout of workstations and/or various machines for different operations (usually in a U shape) in which multitasking operators proceed with a part from machine to machine to perform a series of sequential steps to produce a whole product or major subassembly.

cellular team—The cross-trained individuals who work within a cell.

central tendency—The propensity of data collected on a process to concentrate around a value situated somewhere midway between the lowest and highest values.

centralization—Relates to the locus of the decision-making authority within an organization.

certification—The receipt of a document from an authorized source stating that a device, process, or operator has been certified to a known standard.

certification to a standard—A process in which an accredited, independent third-party organization conducts an on-site audit of a company's operations against the requirements of the standard to which the company wants certification. Upon successful completion of the audit, the company receives a certificate indicating that it has met the standard requirements. The third party (registrar) lists the organization receiving certification (registration). For example, an ISO 9001–based quality management system (QMS) is implemented, audited, passes, and is certified as compliant with the standard. The registrar lists the organization as having received a certificate. The organization is registered.

CFR—Code of Federal Regulations.

cGMP—current good manufacturing practices.

chain reaction—A series of interacting events described by W. Edwards Deming: improve quality > decrease costs > improve productivity > increase market share with better quality and lower price > stay in business, provide jobs, and provide more jobs.

chaku–chaku—(Japanese) Means *load–load* in a cell layout where a part is taken from one machine and loaded into the next.

champion—An individual who has accountability and responsibility for many processes or who is involved in making strategic-level decisions for the organization. The champion ensures ongoing dedication of project resources and monitors strategic alignment (also referred to as a *sponsor*).

chance cause—Same as *common cause*, a random and uncontrollable cause of variation.

change agent—The person who takes the lead in transforming an organization into a quality-focused organization by providing guidance during the planning phase, facilitating implementation, and supporting those who pioneer the changes.

change management—The strategies, processes, and practices involved in creating and managing change.

changeover—Changing a machine or process from one type of product or operation to another.

characteristic—A property that helps to identify or to differentiate between entities and that can be described or measured to determine conformance or nonconformance to requirements.

charter—A documented statement officially initiating the formation of a committee, team, project, or other effort in which a clearly stated purpose and approval is conferred.

check sheet—A simple data-recording device. The check sheet is custom designed for the particular use, allowing ease in interpreting the results. The check sheet is one of the seven tools of quality. Check sheets should not be confused with data sheets and checklists. Sometimes called *tally sheet*.

checklist—A tool for organizing and ensuring that all important steps or actions in an operation have been taken. Checklists contain items that are important or relevant to an issue or situation. Checklists should not be confused with check sheets and data sheets.

chi-square—A measurement of how well a set of data fits a proposed distribution, such as a normal distribution.

chronic problem—A long-standing adverse situation that can be remedied by changing the status quo. For example, actions such as revising an unrealistic manufacturing process or addressing customer defections can change the status quo and remedy the situation.

clean room—Workplace or process location within which the air is filtered to a specified level and/or additional environmental controls are present to prevent failures due to contamination or to ensure the personal safety of the workers.

cloud computing—A model for enabling convenient, on-demand network access to a shared pool of configurable computing resources, for example, networks, servers, storage, applications, and services, that can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models. (National Institute of Standards and Technology, Information Technology Laboratory.)

CMI—Certified mechanical inspector (ASQ).

coaching—A continual improvement technique by which people receive one-to-one learning through demonstration and practice and that is characterized by immediate feedback and correction.

code of conduct—The expected behavior that has been mutually developed and agreed on by a team, and communicated to the workforce.

comment cards—Printed cards or slips of paper used to solicit and collect comments from users of a service or product.

common causes of variation—Causes that are inherent in any process all the time. A process that has only common causes of variation is said to be stable or predictable or in control. Also called *chance causes.*

companywide quality control (CWQC)—(Japanese origin) Similar to total quality management.

competence—Refers to a person's ability to learn and perform a particular activity. Competence consists of *knowledge*, *experience*, *skills*, *aptitude*, and *attitude* components (KESAA factors).

competency-based training—A training methodology that focuses on building mastery of a predetermined segment or module before moving on to the next.

competitive analysis—The gathering of intelligence relative to competitors in order to identify opportunities or potential threats to current and future strategy.

complaint handling—The process and practices involved in receiving and resolving complaints from customers.

complexity—In an organizational context, the number of different entities (job title, reporting levels, functional departments, and physical work locations) that comprise the organization.

complexity theory—The theory concerned with the interaction among the parts of a system, as well as the interaction between the system and its environment.

compliance—An affirmative indication or judgment that the supplier of a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.

computer-based training—Any instruction delivered via a computing device.

concurrent engineering—A process in which an organization designs a product or service using input and evaluations from business units and functions early in the process, anticipating problems, and balancing the needs of all parties. The emphasis is on upstream prevention versus downstream correction. Sometimes called *simultaneous engineering.*

conflict resolution—A process for resolving disagreements in a manner acceptable to all parties.

conformance—An affirmative indication or judgment that a product or service has met the requirements of a relevant specification, contract, or regulation.

consensus—Finding a proposal acceptable enough that all team members can support the decision, and no member opposes it.

constancy of purpose—Occurs when goals and objectives are properly aligned to the organizational vision and mission. (First of Deming's 14 steps.)

constraint—A constraint may range from the intangible (for example, beliefs, culture) to the tangible (for example, posted rule prohibiting smoking, buildup of work-in-process awaiting the availability of a machine or operator).

constraint management—Identifying a constraint and working to remove or diminish the constraint, while dealing with resistance to change.

construct—A formally proposed concept representing relationships between empirically verifiable events and based on observed facts.

consultative—A decision-making approach in which a person talks to others and considers their input before making a decision.

consumer's risk—For a sampling plan, refers to the probability of acceptance of a lot the quality of which has a designated numerical value representing a level that is seldom desirable. Usually, the designated value will be the lot tolerance percent defective (LTPD). Also called *beta risk* or *type 2 error.*

content analysis—A qualitative analytical technique for categorizing and analyzing the contents of documents.

continual process improvement (CPI)—The actions taken throughout an organization to increase the effectiveness and efficiency of activities and processes in order to provide added benefits to the customer and organization. It is considered a subset of total quality management and operates according to the premise that organizations can always make improvements. Continual improvement can also be equated with reducing process variation.

continuous probability distribution—A graph or formula representing the probability of a particular numeric value of continuous (variable) data, based on a particular type of process that produces the data.

continous quality improvement (CQI)—A philosophy and actions for repeatedly improving an organization's cabilitities and processes with the objective of customer satisfaction.

contract review—Systematic activities carried out by an organization before agreeing to a contract to ensure that requirements for quality are adequately defined, free from ambiguity, documented, and can be realized by the supplier.

control chart—A basic tool that consists of a chart with upper and lower control limits on which values of some statistical measure for a series of samples or subgroups are plotted. It frequently shows a central line to help detect a trend of plotted values toward either control limit. It is used to monitor and analyze variation in a process to see whether the process is in statistical control.

control limits—(1) Calculated boundaries of a process within specified confidence levels, expressed as upper control limit (UCL) and lower control limit (LCL). (2) The limits on a control chart used as criteria for signaling the need for action or for judging whether a set of data does or does not indicate a "state of statistical control."

control plan—A document, or documents, that may include the characteristics for quality of a product or service, measurements, and methods of control.

core competency—Pertains to the unique features and characteristics of an organization's overall capability.

corporate culture—See *organization culture.*

correction—When a problem occurs (1) find out how bad it is, (2) decide what to do to keep it from having a larger impact, and (3) determine what to do with what has already been impacted. Doing 1 and 2 is containment action, and 3 is remedial action. This is correcting the problem, but not the causes.

corrective action—Once a problem has been corrected, decide whether or not it was of enough significant importance (based on frequency, impact, risk, and so on) to warrant investigating the causes, and take action to eliminate the root cause(s) and symptom(s) of an existing deviation or nonconformity to prevent recurrence.

correlation—Refers to the measure of the strength of the relationship between two sets of numbers or variables. (A *scatter chart* may be used in the analysis.)

correlation coefficient—Describes the magnitude and direction of the relationship between two variables.

cost–benefit analysis—Compares the potential or actual benefits with the estimated or real cost associated with a problem solution or process improvement, as a ratio or in dollars.

cost of poor quality—The costs associated with providing poor-quality products or services.

cost of quality (COQ)—The total costs incurred relating to the quality of a product or service. There are four categories of quality costs: *internal failure costs*

(costs associated with defects found before delivery of the product or service), *external failure costs* (costs associated with defects found during or after product or service delivery), *appraisal costs* (costs incurred to determine the degree of conformance to quality requirements), and *prevention costs* (costs incurred to keep failure and appraisal costs to a minimum).

count chart—A control chart for evaluating the stability of a process in terms of the count of events of a given classification occurring in a sample.

count-per-unit chart—A control chart for evaluating the stability of a process in terms of the average count of events of a given classification per unit occurring in a sample.

C_p—A widely used process capability index. It is expressed as

$$\frac{\text{Upper spec limit} - \text{Lower spec limit}}{6\sigma}$$

C_{pk}—A widely used process capability index. It is expressed as

$$\frac{\text{(Ratio with smallest answer) Upper specification limit} - X\text{-bar}}{3\sigma}$$

or

$$\frac{X\text{-bar} - \text{Lower specification limit}}{3\sigma}$$

Crawford slip method—A method of anonymously gathering and presenting data from a group.

creativity, stages of—One model gives the following stages: generate, percolate, illuminate, and verify. May also be defined as visualization, exploration, combination, and modification.

criteria—Stated objectives, guidelines, principles, procedures, and/or standards used for measuring a project, process, product, or performance.

criterion—A standard, rule, or test on which a judgment or decision can be based.

critical incident—An event that has greater than normal significance, often used as a learning or feedback opportunity.

critical path—Refers to the sequence of tasks that takes the longest time and determines a project's completion date.

critical path method (CPM)—An activity-oriented project management tool that uses arrow-diagramming techniques to demonstrate both the time and cost required to complete a project. It provides one time estimate—normal time—and allows for computing the critical path.

critical success factors (CSF)—Factors identified by the organization as critical to the organization's success in achieving its strategic goals and objectives.

critical thinking—The careful analysis, evaluation, reasoning (both deductive and inductive), clear thinking, and systems thinking leading to effective decisions.

critical-to-quality (CTQ)—Characteristics that, from a customer's perception of quality, are critical to the achievement of quality goals, objectives, standards, and/or specifications.

cross-functional team—A group consisting of members from more than one department, work unit, or technical discipline that is organized to accomplish a project.

CSR—Customer service representative.

culture—See *organization culture.*

culture change—Major proposed or actual change in organizational operating principles, behavior, and attitude.

cumulative sum control chart (CUSUM)—A control chart on which the plotted value is the cumulative sum of deviations of successive samples from a target value. The ordinate of each plotted point represents the algebraic sum of the previous ordinate and the most recent deviations from the target.

current reality tree—A technique used in applying Goldratt's theory of constraints to identify undesirable effects (similar to root cause analysis).

customer—Recipient of a product or service provided by a supplier. See also *external customer* and *internal customer.*

customer council—A group usually composed of representatives from an organization's largest customers who meet to discuss common issues.

customer delight—The result achieved when customer requirements are exceeded in unexpected ways the customer finds valuable.

customer loyalty/retention—The result of an organization's plans, processes, practices, and efforts designed to deliver their services or products in ways that create retained and committed customers.

customer oriented organization—An organization whose mission, purpose, and actions are dedicated to serving and satisfying its customers.

customer relationship management (CRM)—Refers to an organization's knowledge of its customers' unique requirements and expectations, and using that knowledge to develop a closer and more profitable link to business processes and strategies.

customer satisfaction—The result of delivering a product or service that meets customer requirements, needs, and expectations.

customer segmentation—Refers to the process of differentiating customers based on one or more characteristics for the purpose of developing a marketing strategy to address specific segments. The intent is to better address customers' needs, and improve customer satisfaction and organizational effectiveness.

customer service—Activities dealing with customer questions; also may be the designation of the department that takes customer orders or provides post-delivery services.

customer–supplier partnership—A long-term relationship between a buyer and supplier characterized by teamwork and mutual confidence. The supplier is considered an extension of the buyer's organization. The partnership is based on several commitments. The buyer provides long-term contracts and uses fewer suppliers. The supplier implements quality assurance processes so that incoming inspection can be minimized. The supplier also helps the buyer reduce costs and improve product and process designs.

customer value—There are five factors of influence on customer value: price, product/service quality, innovation, and organization image relative to competition. When customers are satisfied with their perception of the balance of the product/service meeting their need or want, the quality is satisfactory, and the price is right for them—customer value has been achieved.

cycle time—Refers to the elapsed time that it takes to complete a process from the start of the process to completion.

cycle time reduction—To reduce the time that it takes, from start to finish, to complete a particular process.

D

data—Quantitative or qualitative facts presented in descriptive, numeric, or graphic form. Two types of numerical data are *measured*, or *variable* data, and *counted*, or *attribute* data.

data mining—The process of searching a large computer database (for example, a customer database) for previously undetected patterns and relationships, with the intent to transform the data into information for making decisions about strategy.

decision matrix—A matrix used by teams to evaluate problems or possible solutions. For example, after a matrix is drawn to evaluate possible solutions, the team lists them in the far left vertical column. Next, the team selects criteria to rate the possible solutions, writing them across the top row. Then, each possible solution is rated on a scale of 1 to 5 for each criterion and the rating recorded in the corresponding grid. Finally, the ratings of all the criteria for each possible solution are added to determine its total score. The total score is then used to help decide which solution deserves the most attention.

defect—A product's or service's nonfulfillment of an intended requirement or reasonable expectation for use, including safety considerations. They are often classified, such as:

- Class 1, *critical*, leads directly to severe injury or catastrophic economic loss.
- Class 2, *serious*, leads directly to significant injury or significant economic loss.

- Class 3, *major*, is related to major problems with respect to intended normal or reasonably foreseeable use.
- Class 4, *minor*, is related to minor problems with respect to intended normal or reasonably foreseeable use. See also *blemish*, *imperfection*, and *nonconformity*.

defective—A product that contains one or more defects relative to the quality characteristics being measured.

delighter—Feature of a delivered product or service that unexpectedly pleases a customer.

demerit chart—A control chart for evaluating a process in terms of a demerit (or quality score), such as a weighted sum of counts of various classified nonconformities.

Deming cycle—See *plan–do–check–act cycle*.

Deming Prize—Award given annually to organizations that, according to the award guidelines, have successfully applied companywide quality control based on statistical quality control and will keep up with it in the future. Although the award is named in honor of W. Edwards Deming, its criteria are not specifically related to Deming's teachings. There are three separate divisions for the award: the Deming Application Prize, the Deming Prize for Individuals, and the Deming Prize for Overseas Companies. The award process is overseen by the Deming Prize Committee of the Union of Japanese Scientists and Engineers in Tokyo.

demographics—Variables among buyers in the consumer market, which include geographic location, age, sex, marital status, family size, social class, education, nationality, occupation, and income.

dependability—The degree to which a product is operable and capable of performing its required function at any randomly chosen time during its specified operating life, provided that the product is available at the start of that period. (Nonoperation-related influences are not included.) Dependability can be expressed by the ratio

$$\frac{\text{Time available}}{\text{Time available} + \text{Time required}}$$

deployment—Used in strategic planning to describe the process of cascading *goals*, *objectives*, and *action plans* throughout an organization.

design failure mode and effects analysis (DFMEA)—See *FMEA*.

design for manufacturing (DFM)—The design of a product for ease in manufacturing. Also called *design for assembly* (DFA).

Design for Six Sigma (DFSS)—The aim is for a robust design that is consistent with applicable manufacturing processes and assures a fully capable process that will produce quality products.

design of experiments (DOE)—A branch of applied statistics dealing with planning, conducting, analyzing, and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters.

design review—Documented, comprehensive, and systematic examination of a design to evaluate its capability to fulfill the requirements for quality.

designing-in quality versus inspecting-in quality—See *prevention versus detection.*

desired quality—Refers to the additional features and benefits a customer discovers when using a product or service that lead to increased customer satisfaction. If missing, a customer may become dissatisfied.

deviation—A nonconformance or departure of a characteristic from specified product, process, or system requirements.

diagnostic journey and remedial journey—A two-phase investigation used by teams to solve chronic quality problems. In the first phase, the diagnostic journey, the team moves from the symptom of a problem to its cause. In the second phase, the remedial journey, the team moves from the cause to a remedy.

dimensions of quality—Different ways in which quality may be viewed, for example, meaning of quality, characteristics of quality, or drivers of quality.

DiSC—A profiling instrument that measures characteristic ways in which a person behaves in a particular environment. Four dimensions measured are dominance, influence, steadiness, and conscientiousness.

discrete probability distribution—The measured process variable takes on a finite or limited number of values; no other possible values exist. A discrete variable could be the number of people in a room.

disposition of nonconformity—Action taken to deal with an existing nonconformity; action may include correct (repair), rework, regrade, scrap, obtain a concession, or amend a requirement.

dissatisfiers—Those features or functions that the customer or employee has come to expect, which, if they are no longer present, would result in dissatisfaction.

distance learning—Learning where student(s) and instructor(s) are not colocated; interaction through electronic means.

distribution—Describes the amount of potential variation in outputs of a process; it is usually described in terms of its shape, average, and standard deviation.

DMAIC—A methodology used in a Six Sigma initiative: *define*, *measure*, *analyze*, *improve*, *control*.

Dodge–Romig sampling plans—Plans for acceptance sampling developed by Harold F. Dodge and Harry G. Romig. Four sets of tables were published in 1940: single-sampling lot tolerance tables, double-sampling lot tolerance tables, single-sampling average outgoing quality limit tables, and double-sampling average outgoing quality limit tables.

downsizing—The planned reduction in workforce due to economics, competition, merger, sale, restructuring, or reengineering.

drivers of quality—Crucial factors that when controlled, the product or service will be controlled. These factors might include processes, customers, products, services, employee satisfaction, total organizational focus on providing quality products/services, and so on.

E

earned value analysis (EVA)—A methodology used to measure project performance by comparing planned work with actual work accomplished to determine if performance is adhering to plan.

education—Refers to the individual learner's process to acquire new or refreshed knowledge. See also *training*.

efficiency—Ratio of output to the total input in a process, with an objective to use less resources, such as time, cost.

eighty–twenty (80–20) rule—A term referring to the Pareto principle, which suggests that most effects come from relatively few causes; that is, 80 percent of the effects come from 20 percent of the possible causes.

employee involvement—A practice within an organization whereby employees regularly participate in making decisions on how their work areas operate, including making suggestions for improvement, planning, objectives setting, and performance monitoring.

empowerment—A condition whereby employees are given the authority to make decisions and take action in their work areas, within stated bounds, without prior approval. For example, an operator can stop a production process upon detecting a problem, or a customer service representative can send out a replacement product if a customer calls with a problem.

end users—External customers who purchase products/services for their own use—*consumers.*

engineering change order (ECO)—An order to make a change in a process, product, or service after the initial release of the product or service design. See *concurrent engineering* for a process for reducing ECOs.

entropy—Tendency of a system or process to run down and collapse.

environmental analysis/scanning—Identifying and monitoring factors from both inside and outside the organization that may impact the long-term viability of the organization.

environmental management system (EMS)—A management system for addressing the environmental policies, objectives, principles, procedures, authority, responsibility, accountability, and implementation of an organization's practices for managing its impact on the environment in which it operates.

EPA—Environmental Protection Agency.

equity theory—A theory that states that job motivation depends on how equitable the individual believes the rewards or punishment to be.

error-proofing—See *poka-yoke.*

ethics—An individual or an organization's adherence to a belief or documented code of conduct that is based on moral principles and tries to balance what is fair for individuals and the organization with what is right for society.

EU—European Union.

event—The starting or ending point for a task or group of tasks. An occurrence of some attribute.

executive education—Usually refers to the education (and training) provided to top management.

expectancy theory—A motivational theory inferring that what people do is based on what they expect to gain from the activity.

expected quality—Also known as *basic quality,* the minimum benefit or value a customer expects to receive from a product or service.

experimental design—A formal plan that details the specifics for conducting an experiment, such as which responses, factors, levels, blocks, treatments, and tools are to be used.

explicit knowledge—Represented by the captured and recorded tools of the day, for example, procedures, processes, standards, and other like documents. See also *tacit knowledge.*

exponential distribution—A continuous distribution where data are more likely to occur below the average than above it. Typically used to describe the break-in portion of the bathtub curve.

external audit—Audit performed by anyone or any organization outside the organization being audited. See *second-party audit* or *third-party audit.*

external customer—A person or organization who receives a product, a service, or information, but is not part of the organization supplying it. See also *internal customer.*

external failure costs—Costs associated with defects found during or after delivery of the product or service.

F

facilitator—A trained individual who is responsible for creating favorable conditions that will enable a team to reach its purpose or achieve its goals by bringing together the necessary tools, information, and resources to get the job done. A facilitator addresses the processes a team uses to achieve its purpose.

factor analysis—A statistical technique that examines the relationships between a single dependent variable and multiple independent variables. For example, it is used to determine which questions on a questionnaire are related to a specific question such as "Would you buy this product again?"

failure mode analysis (FMA)—A procedure for determining which malfunction symptoms appear immediately before or after a failure of a critical parameter in a system. After all the possible causes are listed for each symptom, the product is designed to eliminate the problems.

failure mode and effects analysis (FMEA)—A procedure in which each potential failure mode of every sub-item of an item is analyzed to determine its effect on other sub-items and on the required function of the item. Typically, two types of FMEAs are used: DFMEA (design) and PFMEA (process).

failure mode effects and criticality analysis (FMECA)—A procedure that is performed after a failure mode and effects analysis to classify each potential failure effect according to its severity and probability of occurrence.

false customer—An individual or group within a process that performs activities that do not add value to the product or service.

fault tree analysis (FTA)—Technique for evaluating the possible causes that might lead to the failure of a product or service.

FDA— Food and Drug Administration.

feasibility study—Examination of technical and cost data to determine the economic potential and practicality of a project or application of equipment. NPV may be used in this analysis.

feedback—The interpersonal communication response to information received (written or oral); it may be based on fact or feeling and helps the party who is receiving the information judge how well he/she is being understood by the other party. More generally, feedback is information about a process or performance and is used to make decisions that are directed toward improving or adjusting the process or performance as necessary.

feedback loops—Pertains to open-loop and closed-loop feedback. Open-loop feedback focuses on how to detect or measure problems in the inputs and how to plan for contingencies. Closed-loop feedback focuses on how to measure the outputs and how to determine the control points where adjustment can be made.

filters—Relative to human-to-human communication, those perceptions (based on culture, language, demographics, experience, and so on) that affect how a message is transmitted by the sender and how a message is interpreted by the receiver.

finding—A conclusion of importance based on observation(s) and/or research, for example, an audit finding.

first-party audit—Audit of a process or product/service by auditing personnel employed by the organization in which the audit is performed. Also called *internal audit.*

fishbone diagram—See *cause-and-effect diagram*.

fitness for use—A term used to indicate that a product or service fits the customer's defined purpose for that product or service.

five S (5S)—(Japanese) Five practices for maintaining a clean and efficient workplace. Briefly the term embraces: *seiri* (sort/separate), *seiton* (arrange and identify), *seiso* (clean up), *seiketsu* (standardize), *shitsuke* (develop habit of always following first four S's).

five whys—A repetitive questioning technique to probe deeper to surface the root cause of a problem by asking *why* five times (more or fewer, as needed).

flowchart—A graphical representation of the steps in a process. Flowcharts are drawn to better understand processes. The flowchart is one of the seven basic tools of quality.

focus group—A discussion group consisting of eight to 10 participants, usually invited from a segment of the customer base to discuss an existing or planned product or service, led by a facilitator working from predetermined questions (focus groups may also be used to gather information in a context other than customers). Information from a focus group is often used as a basis for forming survey questions.

force field analysis—A technique for analyzing the forces that aid or hinder an organization in reaching an objective.

formal communication—The officially sanctioned information within an organization, which includes publications, memoranda, training materials/events, public relations information, and company meetings.

fourteen (14) points—W. Edwards Deming's 14 management practices to help organizations increase their quality and productivity. They are:

1. Create constancy of purpose for improving products and services.
2. Adopt a new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production, and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.

11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work to accomplish the transformation.

fraction defective chart (*p*-chart)—An attribute control chart used to track the proportion of defective units.

frequency distribution—Set of all the various values from individual observations, and the frequency of their occurrence in the sample population. Statistically, a display of a large volume of data so that the central tendency (average or mean) and distribution are clear.

functional organization—An organization organized by discrete functions, for example, marketing/sales, engineering, production, finance, and human resources.

funnel experiment—An experiment that demonstrates the effects of tampering. Marbles are dropped through a funnel in an attempt to hit a flat-surfaced target below. The experiment shows that adjusting a stable process to compensate for an undesirable result, or an extraordinarily good result, will produce output that is worse than if the process had been left alone.

future reality tree—A technique used in the application of Goldratt's theory of constraints to show what to change and how to identify any new unfavorable aspects to be addressed prior to the change.

G

gage blocks—Standards of precise dimensions, used in combination to form usable length combinations. The blocks are traceable to national standards in the country of use (NIST in the United States).

gage repeatability and reproducibility (GR&R)—The evaluation of a ga~~u~~ging instrument's accuracy by determining whether the measurements taken with the gage are repeatable (that is, there is close agreement among a number of consecutive measurements of the output for the same value of the input under the same operating conditions) and reproducible (that is, there is close agreement among repeated measurements of the output for the same value of input made under the same operating conditions over a period of time). *Repeatability* is the variation in results on a single gage when the same part is measured repeatedly by the same person. *Reproducibility* is the variation from person to person using the same gage.

gainsharing—A type of program that rewards individuals financially on the basis of organizational performance.

Gantt chart—A type of bar chart used in process/project planning and control to display planned work and finished work in relation to time. Also called a *milestone chart* when interim checkpoints are added. May be used in the planning stage as well as in tracking progress.

gap analysis—A range of techniques that compares a company's existing state to its desired state (as expressed by its long-term plans) to help determine what needs to be done to remove or minimize the gap between them.

gatekeeper—The role of an individual (often a facilitator) in a group meeting in helping ensure effective interpersonal interactions (for example, someone's ideas are not ignored due to the team moving on to the next topic too quickly).

geographic information system (GIS)—A computer-based method of collecting and displaying data in relation to a specific point or location on earth to which each datum is related—the computer program maps the data.

geographic organization—An organization structured by geography, territory, region, or the like.

geometric dimensioning and tolerancing (GDT)—A method used to minimize production costs by considering the functions or relationships of part features in order to define dimensions and tolerances.

goal—A statement of general intent, aim, or desire; it is the point toward which management directs its mission, efforts, and resources; goals are usually nonquantitative. A goal is measured by the objectives supporting the goal.

goal–question–metric (GQM)—A method used to define measurement of a project, process, or product on three levels (conceptual, operational, quantitative).

go/no-go—State of a unit or product. Two parameters are possible: *go* conforms to specifications, and *no-go* does not conform to specifications.

grade—A planned or recognized difference in requirements for quality.

grapevine—The informal communication channels over which information flows within an organization, usually without a known origin, and without any confirmation of its accuracy or completeness (sometimes referred to as the *rumor mill*).

Green Belt—An individual trained on the improvement methodology of Six Sigma who will lead a process or quality improvement team.

group dynamics—The interaction (behavior) of individuals within a team.

groupthink—Most or all team members coalesce in supporting an idea or decision that hasn't been fully explored, or some members secretly disagree but go along with the other members in apparent support.

H

Hawthorne effect—Concept that every change in workplace environment results (initially, at least) in increased productivity. This demonstrates the importance of human factors in motivating the workforce. (Based on studies by Elton Mayo at the Hawthorne Plant of Western Electric Company in Chicago in 1924.)

heijunka—Act of leveling the variety or volume of items produced in a process over time. Used to avoid excessive batching of product types, volume fluctuations, and excess inventory.

hierarchy structure—Describes an organization that is organized around functional departments/product lines or around customers/customer segments and is characterized by top-down management (also referred to as a *bureaucratic model* or *pyramid structure*).

histogram—A graphic summary of variation in a set of data. The pictorial nature of the histogram lets people see patterns that are difficult to see in a simple table of numbers. The histogram is one of the seven tools of quality.

hold point—A point, defined in an appropriate document, beyond which an activity must not proceed without the approval of a designated organization or authority.

horizontal structure—Describes an organization that is organized along a process flow or value-added chain, eliminating hierarchy and functional boundaries (also referred to as a *systems structure*).

hoshin kanri, hoshin planning—Japanese-based strategic planning/policy deployment process that involves consensus at all levels as plans are cascaded throughout the organization, resulting in improved actionable plans and continual monitoring and measurement.

house of quality—A diagram (named for its house-shaped appearance) that clarifies the relationships between customer needs and product features. It helps correlate market or customer requirements and analysis of competitive products with higher-level technical and product characteristics, and makes it possible to bring several factors into a single figure. Also known as *quality function deployment* (QFD).

human relations theory—A theory focusing on the importance of human factors in motivating employees.

hygiene factors—A term used by Frederick Herzberg to label dissatisfiers. See *dissatisfiers*.

I

IEEE—Institute of Electrical and Electronics Engineers.

imagineering—Creative process used to develop, in the mind's eye, a process without waste.

imperfection—A quality characteristic's departure from its intended level or state without any association to conformance to specification requirements or to the usability of a product or service. See also *blemish*, *defect*, and *nonconformity*.

implied warranty—Implicit promise, not necessarily documented, that states that a product must reasonably operate or comply with the ordinary purposes for which it is intended or used.

in-control process—A process in which the statistical measure being evaluated is in a state of statistical control; that is, the variations among the observed sampling results can be attributed to a constant system of chance/common causes. The process may also be described as *stable*. See also *out-of-control process.*

incremental improvement—Improvements implemented on a continual basis. See *kaizen.*

indicators—Predetermined measures used to determine how well an organization is meeting its customers' needs and its operational and financial performance objectives. Such indicators can be either *leading* or *lagging* indicators. *Indicators* may also refer to devices used to measure lengths or flow.

indirect customers—Customers who do not receive process output directly, but are affected if the process output is incorrect or late.

individual development—A process that may include education and training, but also includes many additional interventions and experiences to enable an individual to grow and mature intellectually and emotionally, as well as professionally.

informal communication—The unofficial communication that takes place in an organization as people talk freely and easily; examples include impromptu meetings and personal conversations (verbal or e-mail).

information—Data transformed into an ordered format that makes it usable and allows one to draw conclusions.

information system—Technology-based systems used to support operations, aid day-to-day decision making, and support strategic analysis. Other names often seen include *management information system*, *decision system*, *information technology* (IT), *data processing.*

input—Material, product, or service that is obtained from an upstream internal provider or an external supplier and is used by the receiver to produce an output.

inspection—Measuring, examining, testing, and gauging one or more characteristics of a product or service and comparing the results with specified requirements to determine whether conformity is achieved for each characteristic.

intellectual property—The concepts, ideas, thought, processes, and programs that are definable, measurable, and proprietary in nature (includes copyrights, patents, trademarks, computer software).

interactive multimedia—A term encompassing technology that allows the presentation of facts and images with physical interaction by the viewers; for example, taking a simulated certification exam on a computer, or receiving training embedded in transaction processing software.

interdependence—Shared dependence between two or more items.

interfaces—Interaction between individuals, departments, work units, outside organizations, and so on, that allows the meaningful exchange of information.

intermediate customers—Distributors, dealers, or brokers who make products and services available to the end user by repairing, repackaging, reselling, or creating finished goods from components or subassemblies.

internal audit—An audit conducted within an organization by members of the organization to measure its strengths or weaknesses against its own procedures and/or external standards—a first-party audit.

internal capability analysis—A detailed view of the internal workings of the organization; for example, determining how well the capabilities of the organization match to strategic needs.

internal customer—The recipient (person or department) of another person's or department's output (product, service, or information) within an organization. See also *external customer.*

internal failure costs—Costs associated with defects found before the product or service is delivered.

internal rate of return (IRR)—An organization's acceptable rate of return from investments. Also, the discount rate that causes net present value to equal zero.

International Organization for Standardization (ISO)—Based in Geneva, Switzerland, it is the worldwide controller of ISO standards.

interrelationship digraph—A management and planning tool that displays the relationship between factors in a complex situation. It identifies meaningful categories from a mass of ideas and is useful when relationships are difficult to determine.

intervention—An action taken by a leader or a facilitator to support the effective functioning of a team or work group.

inventory—A term encompassing all forms of physical accumulation of materials, supplies, work in process, and finished goods held in temporary storage or warehoused. The term is also used by Goldratt to mean "all the money the system invests in things it intends to sell" (see *theory of constraints*).

Ishikawa diagram—See *cause-and-effect diagram.*

is/is not matrix—A tool that helps to differentiate what is distinctive about a problem.

ISO—A prefix for a series of standards published by the International Organization for Standardization. *Iso* also means *equal* in Greek.

ISO 9000 series standards—A set of individual but related international standards and guidelines on quality management and quality assurance developed to help companies effectively document the quality system elements to be implemented to maintain an efficient quality system. The standards, initially published in 1987, and revised in 1994, 2000, and 2008–2009, are not specific to any particular industry, product, or service. The standards were developed by the International Organization for Standardization, a specialized international agency for standardization composed of the national standards bodies of countries worldwide.

ISO 14000 series—A set of standards and guidelines relevant to developing and sustaining an environmental management system.

J

jidoka—Japanese method of autonomous control involving the adding of intelligent features to machines to start or stop operations as control parameters are reached, and to signal operators when necessary.

job aid—Any device, document, or other media that can be provided to a worker to aid in correctly performing tasks (for example, a laminated setup instruction card hanging on a machine, photos of product at different stages of assembly, or a metric conversion table).

job description—A narrative explanation of the work, responsibilities, and basic requirements of a job.

job enlargement—Expanding the variety of tasks performed by an employee.

job enrichment—Increasing the worker's responsibilities and authority in work to be done.

job specification—A list of the important functional and quality attributes (knowledge, skills, aptitudes, and personal characteristics) needed to succeed in the job.

joint planning meeting—A meeting involving representatives of a key customer and the sales and service team for that account to determine how better to meet the customer's requirements and expectations.

Juran's trilogy—See *quality trilogy.*

JUSE—Union of Japanese Scientists and Engineers.

just-in-time (JIT) manufacturing—An optimal material requirement planning system for a manufacturing process in which there is little or no manufacturing material inventory on hand at the manufacturing site and little or no incoming inspection.

just-in-time training—Providing job training coincidental with, or immediately prior to, an employee's assignment to a new or expanded task.

K

kaikaku—A Japanese term that means a breakthrough improvement in eliminating waste.

kaizen—A Japanese term that means incremental and unending improvement by doing little things better and setting and achieving increasingly higher standards. The term was made famous by Masaaki Imai in his book *Kaizen: The Key to Japan's Competitive Success.*

kaizen blitz/event—An intense, short time frame (typically three to five consecutive days), team approach to employ the concepts and techniques of continual improvement (for example, to reduce cycle time or increase throughput).

kanban—A system inspired by Taiichi Ohno's (Toyota) visit to a U.S. supermarket. The system signals the need to replenish stock or materials or to produce more of an item (also called a *pull* approach).

Kano model—A representation of the three levels of customer satisfaction defined as dissatisfaction, neutrality, and delight. Named after Noriaki Kano.

kansei engineering—A Japanese term referring to the translation of consumers' psychological feelings about a product into perceptual design elements (sensory engineering, emotional usability).

KESAA factors—See *competence.*

KJ method—See *affinity diagram.*

knowledge management—Involves transforming data into information and the acquisition or creation of knowledge, as well as the processes and technology employed in identifying, categorizing, storing, retrieving, disseminating, and using information and knowledge for the purposes of improving decisions and plans.

KRA (key result area)—Critical customer requirements that are important for the organization's success. Also known as *key success factor* (KSF).

L

lateral thinking—A process that includes recognizing patterns, becoming unencumbered with old ideas, and creating new ones.

LCALI—A process for operating a listening post system for capturing and using formerly unavailable customer data. LCALI stands for *listen*, *capture*, *analyze*, *learn*, and *improve.*

leader—An individual recognized by others as the person to lead an effort. Normally one can not be a leader without one or more followers. The term is often used interchangeably with *manager.* A leader may or may not hold an officially designated management-type position. See *manager.*

leadership—An essential factor in a quality improvement effort. Organization leaders must establish a vision, communicate that vision to those in the organization, and provide the tools, knowledge, and motivation necessary to accomplish the vision.

lean approach/lean thinking—A focus on reducing cycle time and waste using a number of different techniques and tools, for example, value stream mapping, and identifying and eliminating monuments and non-value-added steps.

lean manufacturing—Applying the lean approach to improving manufacturing operations.

learner-controlled instruction (LCI)—When a learner works without an instructor, at an individual pace, building mastery of a task. Computer-based training is a form of LCI. Also called *self-directed learning.*

learning curve—The time it takes to achieve mastery of a task, a body of knowledge, or a skill.

learning organization—An organization that has a policy to continue to learn and improve its products, services, processes, and outcomes—"an organization that is continually expanding its capacity to create its future" (Senge).

lesson plan—A detailed plan created to guide an instructor in delivering training and/or education.

life cycle—A product life cycle is the total time frame from product concept to the end of its intended use; a project life cycle is typically divided into six stages: concept, planning, design, implementation, evaluation, and closeout.

life history curve—See *bathtub curve.*

linear regression—The mathematical application of the concept of a scatter diagram where the correlation is actually a cause-and-effect relationship.

linear responsibility matrix—A matrix providing a three-dimensional view of project tasks, responsible person, and level of relationship.

line balancing—A method of proportionately distributing workloads within the value stream to meet *takt* time.

listening post data—Customer data and information gathered from designated organizational listening posts.

little q, Big Q—The difference between managing for quality in a limited capacity (q) to managing for quality across all business processes and products (Q). Attributed to J. M. Juran.

long-term goals—Goals that an organization hopes to achieve in the future, usually in three to five years. They are commonly referred to as *strategic goals.*

lost customer analysis—Analysis to determine why a customer or segment of customers was lost or defected to a competitor.

lot—A defined quantity of product accumulated under conditions that are considered uniform for sampling purposes.

lot tolerance percent defective (LTPD)—See *consumer's risk.*

lower control limit (LCL)—Control limit for points below the central line in a control chart.

M

macro processes—Broad, far-ranging processes that often cross functional boundaries.

maintainability—The probability that a given maintenance action for an item under given usage conditions can be performed within a stated time interval when the maintenance is performed under stated conditions using stated procedures and resources. Maintainability has two categories: *serviceability,* the ease of conducting scheduled inspections and servicing, and *repairability,* the ease of restoring service after a failure.

Malcolm Baldrige National Quality Award (MBNQA)—Earned by the organization qualifying under the criteria of the Baldrige Performance Excellence Program of NIST.

management by fact—A business philosophy that decisions should be based on data.

management by policy—The organizational infrastructure that ensures that the right things are done at the right time.

management by walking around (MBWA)—A manager's planned, but usually unannounced, walk-through of the organization to gather information from employees and make observations; may be viewed in a positive light by virtue of giving employees opportunity to interact with top management; has the potential of being viewed negatively if punitive action is taken as a result of information gathered.

management levels—A typical hierarchy of management levels is top management (executive level, upper management, top team), middle management (directors, general managers, plant managers, department managers), and first-level supervision (persons directly supervising workers).

management representative—A person appointed to act on management's behalf to manage the quality/environment system. Also, this person usually handles the interface with a registration body.

management responsibility categories—Planning, organizing, staffing, directing, and controlling (POSDC).

management review—Scheduled formal review and evaluation by management of the status and adequacy of the quality/environmental management system(s) in relation to the organization's strategic objectives and policies.

management styles—The predominant personal styles used by managers; styles may be based on prevalent management theories and assumptions about people. Style categories include authoritarian, autocratic, combative, conciliatory, consensual, consultative, democratic, disruptive, ethical, facilitating, intimidating, judicial, laissez-faire, participative, promotional, secretive, shared, or shareholder management.

management training—Usually refers to training and/or education provided to any management or professional-level person from frontline supervision up to, but usually not including, executives.

manager—An individual who manages and is responsible for resources (people, facilities, equipment, material, money, time). A person officially designated with a management-type position title. A manager is granted authority from above, whereas a leader's role is derived by virtue of having followers. The terms *manager* and *leader* are often and unfortunately used interchangeably.

market-perceived quality—The customer's opinion of your products or services as compared to those of your competitors.

Master Black Belt (MBB)—Six Sigma quality expert responsible for strategic implementation within the organization. The MBB is qualified to instruct other Six Sigma Black Belts and Green Belts on the methodologies, tools, and applications in all functions and levels of the organization, and acts as a resource on process management.

material review board (MRB)—A quality control committee or team, usually employed in manufacturing or other materials-processing installations, that has the responsibility and authority to deal with items or materials that do not conform to fitness-for-use specifications. An equivalent, the *error review board*, is sometimes used in software development.

matrix chart/diagram—A management and planning tool that shows the relationships among various groups of data; it yields information about the relationships and the importance of task/method elements of the subjects. Typically, a matrix displays the relationship between two topics—with, perhaps, the impact of a third element—such as a personnel requirements matrix. There are many varieties of matrices, for example, see *quality function deployment*.

matrix structure—Describes an organization that is organized into functional and product/project departments; it brings together teams of people to work on projects and is driven by product or project scope. Basically, functional departments obtain, train, maintain, and sustain the appropriate people, who are deployed, as needed, to product/project departments or work units. A given person may be based in a functional department (say, software developers) and deployed to one or more product/project work teams (say, a new product development team and also a team working on improving the QMS).

mean—A measure of central tendency, the arithmetic average of all measurements in a data set.

mean time between failures (MTBF)—The average time interval between failures for repairable product for a defined unit of measure (for example, operating hours, cycles, or miles).

means (in hoshin planning usage)—The step of identifying the ways by which multiyear objectives will be met, leading to the development of action plans.

measurement—Refers to the reference standard or sample used for the comparison of properties.

median—The middle number or center value of a set of data when all the data are arranged in sequence.

mentor—A person who voluntarily assumes a role of trusted advisor and teacher to another person. The mentor may or may not be the mentored person's organizational superior or even in the same organization. Usually, the only reward the mentor receives is self-gratification in having helped someone else.

metric—A standard of measurement or evaluation.

metrology—Science and practice of measurements.

micro processes—Narrow processes made up of detailed steps and activities that could be accomplished by a single person.

micromanaging—Managing every little detail (for example, executive approving requisition for paper clips).

milestone—A specific time when a critical event is to occur; a symbol placed on a milestone chart to locate the point when a critical event is to occur. (An upward-pointing triangle signifies the scheduled time of an event, a downward-pointing triangle signifies completion of an event.)

milestone chart—A Gantt chart on which event starting and ending times are indicated.

mind mapping—A technique for creating a visual representation of a multitude of issues or concerns by forming a map of the interrelated ideas.

mission statement—An explanation of the core purpose or reasons for existing as an organization; it provides the focus for the organization and defines its scope of business. The mission may define customers or markets served, distinctive competence, or technologies used.

mistake-proofing—See *poka-yoke.*

mitigation—Risk response strategy that decreases risk by lowering the probability of a risk event's occurrence or reduces the effect of the event should it occur.

mode—The value that occurs most frequently in a data set.

moment of truth (MOT)—An MOT is described by Jan Carlzon, former CEO of Scandinavian Air Services in the 1980s, as, "Any episode where a customer comes into contact with any aspect of your company, no matter how distant, and by this contact, has an opportunity to form an opinion about your company."

monitoring—Systematic and periodic or continuous surveillance or testing of a product or process to determine the level of compliance with industry, engineering, or regulatory requirements. No action is implied.

monument—The point in a process that necessitates a product waiting in a queue before processing further; a barrier to continuous flow.

motivation—Two types of motivation are *extrinsic* and *intrinsic.* Motivating a person means providing a work environment in which the person feels motivated; that is, one person can not directly motivate another person.

muda—(Japanese) An activity that consumes resources but creates no value; the seven categories of muda (waste) are correction, processing, inventory, waiting, overproduction, internal transport, and wasted motion.

multi-attribute evaluation—Simpler than QFD, this process rank-orders and weights customer requirements relative to the competition. In addition, it estimates the cost of each requirement in order to prioritize improvement actions.

multivariate control chart—A control chart for evaluating the stability of a process in terms of the levels of two or more variables or characteristics.

multivoting—A decision-making tool that enables a group to sort through a long list of ideas to identify priorities.

murmurs—A technique to gather information on consumer behavior by watching customers use the product or service.

Myers-Briggs Type Indicator (MBTI)—A method and instrument for identifying a person's personality type based on Carl Jung's theory of personality preferences.

mystery shopper—A person who pretends to be a regular shopper in order to get an unrestrained view of how a company's service process works.

N

n—Sample size (the number of units in a sample).

NAICS—North American Industry Classification System; a system replacing the Standard Industrial Classification (SIC), used to classify organizations according to the products or services produced.

natural team—A work group having responsibility for a particular process.

***n*-chart**—Number defective chart for attribute data, used where each unit is inspected from a given lot.

negotiation—A process in which individuals or groups work together to achieve common goals.

next operation as customer (NOAC)—Concept that the organization comprises service/product providers and service/product receivers, or internal customers.

NIST—National Institute of Standards and Technology (U.S.).

nominal group technique—A technique similar to brainstorming, used by teams to generate ideas on a particular subject. Team members are asked to silently come up with as many ideas as possible and write them down. Each member is then asked to share one idea, which is recorded. After all the ideas are recorded, they are discussed and prioritized by the group.

nonconformity—The result of nonfulfillment of a specified requirement. See also *blemish*, *defect*, and *imperfection.*

nondestructive testing (NDT) and evaluation—Testing and evaluation methods that do not damage or destroy the product being tested.

non-value-added—Tasks or activities that can be eliminated with no deterioration in product or service functionality, performance, or quality in the eyes of the customer.

norm (behavioral)—Expectation of how a person or group will behave in a given situation based on established protocols, rules of conduct, or accepted social practices.

normal distribution—A bell-shaped distribution for continuous data where most of the data are concentrated around the average, and it is equally likely that an observation will occur above or below the average.

***np*-chart**—A control chart for attribute data showing the number of defective units in a subgroup. Requires a constant subgroup size.

NPV (net present value)—A discounted cash flow technique for finding the present value of each future year's cash flow.

O

objective—A quantitative statement of future expectations and an indication of when the expectations should be achieved; it supports goals, clarifying and measuring what people must accomplish.

objective evidence—Verifiable qualitative or quantitative observations, information, records, or statements of fact pertaining to the quality of an item or service or to the existence and implementation of a quality system element.

objective setting—See *S.M.A.R.T. W.A.Y.*

observation—An item or incidence of objective evidence found during an audit.

OC (operating characteristic) curve—For a sampling plan, the OC curve indicates the probability of accepting a lot based on the sample size to be taken and the fraction defective in the batch.

one-to-one marketing—The concept of knowing customers' unique requirements and expectations and marketing to these. See also *customer relationship management.*

on-the-job training (OJT)—Training conducted at the workstation, typically done one-on-one.

open book management—An approach to managing that exposes employees to the organization's financial information, provides instruction in business literacy, and enables employees to better understand their role and contribution and its impact on the organization.

operating characteristic curve—See *OC curve.*

operating expense—All the money the system spends turning inventory into throughput (Goldratt's theory of constraints).

optimization—Achieving planned process results that meet the needs of the customer and supplier alike and minimize their combined costs.

organization culture—The collective beliefs, values, attitudes, manners, customs, behaviors, and artifacts unique to an organization.

organization development (OD)—An organization-wide (usually) planned effort, managed from the top, to increase organization effectiveness and health through interventions in the organization's processes using behavioral science knowledge and methodologies.

original equipment manufacturer (OEM)—An organization that uses product components from one or more other outside organizations to build a product it sells under its own name and brand. For example, an organization that furnishes the completed seats that are installed in the automobile that is sold under the auto assembler's brand is an OEM. Sometimes the term is misused to refer to the outside organization that supplies only components.

OSHA—Occupational Safety and Health Administration (U.S.).

out of spec—A term used to indicate that a unit does not meet a given specification.

outcome—The measurable result of a project, a quality initiative, or an improvement. Usually, some time passes between the completion of the action and the realization of the outcome, for example, improved productivity, quality, customer satisfaction, profits, and so on.

out-of-control process—A process in which the statistical measure being evaluated is not in a state of statistical control (that is, the variations among the observed sampling results can not all be attributed to a constant system of chance causes; special or assignable causes exist.) See also *in-control process.*

output—The deliverables resulting from a process, project, quality initiative, improvement, and so on. Outputs include data, information, documents, decisions, and tangible products. Outputs are generated both from the planning and management of the activity and the delivered product, service, or program. *Output* is also the item, document, or material delivered by an internal provider (supplier) to an internal receiver (customer).

outsourcing—A strategy and an action to relieve an organization of processes and tasks in order to reduce costs, improve quality, reduce cycle time (for example, by parallel processing), reduce the need for specialized skills, and increase efficiency. Often, the primary intent is to save money through cheaper labor costs.

P

panels—Groups of customers recruited by an organization to provide ad hoc feedback on performance or product development ideas.

paradigm—The standards, rules, attitudes, culture, and so on, that influence the way an organization lives and behaves.

paradigm shift—Advent and acceptance of a totally new model that is theory- or custom-shattering and displaces and/or discredits older theories and models, for example, a major organizational culture change such as adopting the BPEP criteria as the new business model.

parallel structure—Describes an organizational model in which groups, such as quality circles or a quality council, exist in the organization in addition to and simultaneously with the line organization. Also referred to as *collateral structure.*

parameter design (Taguchi)—The use of design of experiments in identifying the major contributors to variation.

Pareto chart—A basic tool used to graphically rank causes from most significant (or frequent) to least significant (or frequent). It utilizes a vertical bar graph in which the bar height reflects the frequency or impact of causes.

Parkinson's law—States that work expands to fit the organization developed to perform it, and there is a tendency for each work unit within the organization to try to build up its importance by expanding the number of jobs and personnel it controls. Sometimes expressed as "work expands to fit the available time."

participative management—A style of managing whereby the manager tends to work from theory *Y* assumptions about people, involving the workers in decisions made. See *theory Y.*

partnership/alliance—A strategy and a formal relationship between a supplier and a customer to engender cooperation for their mutual benefit, such as reducing costs of ownership, maintenance of minimum stocks, just-in-time deliveries, joint participation in design, exchange of information on materials and technologies, new production methods, quality improvement strategies, and the exploitation of market synergy.

payback period—The number of years it will take the results of a project or capital investment to recover the investment from net cash flows.

***p*-chart—**Fraction defective chart (also called a *proportion chart* or *percent chart*).

PDSA cycle—Plan–do–study–act cycle (a variation of PDCA) See *plan–do–check–act cycle* (PDCA).

performance appraisal/evaluation—A formal method of measuring employees' progress against performance standards and providing feedback to them.

performance management system—A system that supports and contributes to the creation of high-performance work and work systems by translating behavioral principles into procedures.

performance plan—A performance management tool that describes desired performance and provides a way to assess the performance objectively.

PERT (program/project evaluation and reporting technique) chart—An enhanced AND that graphically demonstrates the relationship among project elements. Unlike the critical path method (CPM), PERT uses three time estimates rather than one.

pilot test—Small-scale implementation of a process or an operation to test its capability, design, and performance to requirements.

plan–do–check–act (PDCA) cycle—A four-step process for quality improvement. In the first step (plan), a plan to effect improvement is developed. In the second step (do), the plan is carried out, preferably on a small scale. In the third step (check), the effects of the plan are observed. As part of the last step (act), the results are studied to determine what was learned and what can be predicted. The plan–do–check–act cycle is sometimes referred to as the Shewhart cycle because Walter A. Shewhart discussed the concept in his book *Statistical Method from the Viewpoint of Quality Control*, and as the Deming cycle because W. Edwards Deming introduced the concept in Japan. The Japanese subsequently called it the Deming cycle. Sometimes referred to as *plan–do–study–act* (PDSA).

Poisson distribution—A distribution used for discrete data, applicable when there are many opportunities for occurrence of an event but a low probability (less than 0.10) on each trial.

poka-yoke—(Japanese) A term that means to mistake-proof a process by building safeguards into the system that avoid or immediately find errors. It comes from *poka*, which means *error*, and *yokeru*, which means *to avoid.*

PONC—Price of nonconformance: the cost of not doing things right the first time.

population—A group of people, objects, observations, or measurements about which one wishes to draw conclusions.

portfolio analysis—A process of comparing the value of proposed projects or acquisitions relative to the financial impacts on current projects as well as the potential for impact on resources of the proposed projects or acquisitions.

P_{pk}—Potential process capability statistic used in the validation stage of a new product launch (uses the same formula as C_{pk}, but a higher value is expected due to the smaller time span and fewer data from the sample).

ppm—Parts per million.

precision—A characteristic of measurement that addresses the consistency or repeatability of a measurement system when the identical item is measured a number of times.

pre-control—A control process, with simple rules, based on tolerances. It is effective for any process where a worker can measure a quality characteristic (dimension, color, strength) and can adjust the process to change that characteristic, and where there is either continuous output or discrete output totaling three or more pieces.

prerequisite tree—A technique used to identify obstacles in the application of Goldratt's theory of constraints.

prevention costs—Costs incurred to keep internal and external failure costs and appraisal costs to a minimum.

prevention versus detection—A term used to contrast two types of quality activities. *Prevention* refers to those activities designed to prevent nonconformances in products and services. *Detection* refers to those activities designed to detect nonconformances already in products and services. Another phrase used to describe this distinction is *designing-in quality versus inspecting-in quality.*

preventive action—Reviewing procedures, processes, and products/services to evaluate risks, and take action to eliminate the potential causes of a nonconformity, defect, or other undesirable situation in order to prevent occurrence.

primary customer—The individual or group who directly receives the output of a process.

principled negotiation—Based on a win–win orientation, includes:

- Separate the people from the problem.
- Focus on interest, not position.
- Understand what both sides want to achieve.
- Invent options for mutual gain.
- Insist on objective criteria.

priorities matrix—A tool used to choose between several options that have many useful benefits, but where not all of them are of equal value.

probability—Likelihood of occurrence.

probability distribution—A mathematical formula that relates the values of characteristics to their probability of occurrence in a population.

problem solving—A rational process for identifying, describing, analyzing, and resolving situations in which something has gone wrong without explanation.

procedure—A document that answers the questions What has to be done? Where is it to be done? When is it to be done? Who is to do it? Why do it? (Contrasted with a work instruction, which answers, How is it to be done? With what materials and tools is it to be done?) In the absence of a work instruction, the instructions may be embedded in the procedure.

process—An activity or group of activities that takes an input, adds value to it, and provides an output to an internal or external customer; a planned and repetitive sequence of steps by which a defined product or service is delivered.

process analysis—Defining and quantifying the process capability from data derived from mapping and measurement of the work performed by the process.

process capability—A statistical measure of the inherent process variability for a given characteristic. See C_p, C_{pk}, and P_{pk}.

process capability index—The value of the tolerance specified for the characteristic divided by the process capability. There are several types of process capability indexes, including the widely used C_p and C_{pk}.

process control—Methodology for keeping a process within prescribed boundaries and minimizing the inherent variation in the process.

process decision program chart (PDPC)—A management and contingency planning tool that identifies all events that can go wrong and the appropriate countermeasures for these events. It graphically represents all sequences that can lead to an undesirable effect.

process improvement—The act of changing a process to reduce variability and cycle time and make the process more effective, efficient, and productive.

process improvement team (PIT)—A natural work group or cross-functional team whose responsibility is to achieve needed improvements in existing processes. The life-span of the team is based on the completion of the team's purpose and specific objectives.

process management—The collection of practices used to implement and improve process effectiveness; it focuses on holding the gains achieved through process improvement and assuring process integrity.

process mapping—The flowcharting of a work process in detail, including key control measurements.

process organization—A form of departmentalization where each department specializes in one phase of the process.

process owner—The manager or leader who is responsible for ensuring that a total process is effective and efficient.

process quality audit—An analysis of elements of a process and appraisal of completeness, correctness of conditions, and probable effectiveness.

process reengineering—See *reengineering.*

process village—Refers to an area where machines are grouped by type of operation performed by the machines (contrast with a cell layout).

producer's risk—For a sampling plan, the probability of not accepting a lot the quality of which has a designated numerical value representing a level that is generally desirable. Usually, the designated value will be the acceptable quality level. Also called *alpha risk* and *type 1 error.*

product life cycle management (PLM)—Concern for a product's viability, reliability, use, and disposition from its design through manufacturing, delivery, customer use, and ultimate discard.

product organization—A departmentalization where each department focuses on a specific product type or family.

product orientation—A tendency to see customers' needs in terms of a product they want to buy, not in terms of the services, value, or benefits the product will produce.

product quality audit—A quantitative assessment of conformance to required product characteristics.

product warranty—The organization's stated policy that it will replace, repair, or reimburse a customer for a defective product, providing the product defect occurs under certain conditions and within a stated period of time.

product/service liability—The obligation of a company to make restitution for loss related to personal injury, property damage, or other harm caused by its product or service.

professional development plan—An individual development tool for an employee. Working together, the employee and management create a plan that coordinates the individual's career needs and aspirations with organizational demands.

profit and loss statement—A financial statement showing the income and expenses resulting in a profit or loss for an organization within a specified period of time.

profound knowledge, system of—As defined by W. Edwards Deming, states that learning can not be based on experience only; it requires comparisons of results to a prediction, plan, or an expression of theory. Predicting why something happens is essential to understand results and to continually improve. The four components of the system of profound knowledge are appreciation for a system, knowledge of variation, theory of knowledge, and understanding of psychology.

program evaluation and review technique (PERT)—An event-oriented project management planning and measurement technique that utilizes an arrow diagram to identify all major project events and demonstrates the amount of time (critical path) needed to complete a project. It provides three time estimates: optimistic, most likely, and pessimistic.

project life cycle—Six sequential phases of project management: concept, planning, design, implementation, evaluation, and closeout.

project management—The management of activities and events involved throughout a project's life cycle.

project plan—All the documents that comprise the details of why the project is to be initiated, what the project is to accomplish, when and where it is to be implemented, who will have responsibility, how the implementation will be carried out, how much it will cost, what resources are required, and how the project's progress and results will be measured.

project team—A designated group of people working together to produce a planned project's outputs and ultimate outcome.

psychographic customer characteristics—Variables among buyers in the consumer market that address lifestyle issues and include consumer interests, activities, and opinions.

pull system—See *kanban.*

Q

quality—A subjective term for which each person has his or her own definition. In technical usage, quality can have two primary meanings: (1) the characteristics of a product or service that bear on its ability to satisfy stated or implied needs, and (2) a product or service free of deficiencies.

quality assessment—The process of identifying business practices, attitudes, and activities that are enhancing or inhibiting the continual achievement of quality improvement in an organization.

quality assurance/quality control (QA/QC)—Two terms that have many interpretations because of the multiple definitions for the words *assurance* and *control.* For example, *assurance* can mean the act of giving confidence, the state of being certain, or the act of making certain; *control* can mean an evaluation to indicate needed corrective responses, the act of guiding, or the state of a process in which the variability is attributable to a constant system of chance causes. One definition of *quality assurance* is all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. One definition for *quality control* is the operational techniques and activities used to fulfill requirements for quality. Often, however, *quality assurance* and *quality control* are used interchangeably, referring to the actions performed to ensure the quality of a product, service, or process.

quality audit/assessment—A systematic, independent examination and review to determine whether quality activities and related results comply with planned arrangements, and whether these arrangements are implemented effectively and are suitable to achieve the objectives.

quality auditor—A person trained in the auditing/assessing of the appropriate application of quality principles, policies, protocols, and practices supporting the producing of high-quality products or services that meet customer needs and expectations and comply with applicable standards.

quality characteristics—The unique characteristics of products and services by which customers evaluate their perception of quality.

quality circles—Quality improvement or self-improvement study groups composed of a small number of employees—10 or fewer—and their supervisor, who meet regularly with an aim to improve a process.

quality control—See *quality assurance.*

quality cost reports—A system of collecting quality costs that uses a spreadsheet to list the elements of quality costs against a spread of the departments, areas, or projects in which the costs occur, and summarizes the data to enable trend analysis and decision making. The reports help organizations review prevention costs, appraisal costs, and internal and external failure costs.

quality costs—See *cost of quality.*

quality council—The group driving the quality improvement effort and usually having oversight responsibility for the implementation and maintenance of the quality management system; operates in parallel with the normal operation of the business. Sometimes called *quality steering committee.*

quality engineering—The analysis of a manufacturing system at all stages to maximize the quality of the process itself and the products it produces.

quality function—The entire spectrum of activities through which an organization achieves its quality goals and objectives, no matter where these activities are performed.

quality function deployment (QFD)—A multifaceted matrix in which customer requirements are translated into appropriate technical requirements for each stage of product development and production. The QFD process is often referred to as "listening to the voice of the customer." See also *house of quality.*

quality function mission—Derived from and an input into the organization's mission, the quality function mission statement includes a customer focus, a supplier focus, and an employee focus. The statement represents the basic direction the organization intends to follow regarding quality.

quality improvement—Actions taken in any or all parts of the organization to increase the effectiveness and efficiency of activities and processes in order to provide added benefits to both the organization and its customers.

quality inspection—A number of possible activities used with an intent to ascertain or verify compliance to stated standards, prescribed measurements, or acceptable practices.

quality level agreement (QLA)—Internal service/product providers assist their internal customers in clearly delineating the level of service/product required in quantitatively measurable terms. A QLA may contain specifications for accuracy, completeness, timeliness, usability, service availability, or responsiveness to needs. The QLA provides, in writing, what a service/product receiver expects from an upstream provider, furnishes data to measure whether the quality acceptance level has been met, and is the basis for trending progress toward improvement, and ultimate recognition for quality achievement.

quality loss function—A parabolic approximation of the quality loss that occurs when a quality characteristic deviates from its target value. The quality loss function is expressed in monetary units—the cost of deviating from the target increases as a quadratic function the farther the quality characteristic moves from the target. The formula used to compute the quality loss function depends on the type of quality characteristic being used. The quality loss function was first introduced in this form by Genichi Taguchi.

quality management—All activities of the overall management function that determine the quality principles, policy, mission, objectives, responsibilities, and practices that when implemented through quality planning, quality assurance, quality control, and continual quality improvement within the quality system provide quality products and services leading to customer satisfaction and organizational benefits.

quality management system (QMS)—The organizational structure, processes, procedures, and resources designed and implemented to maintain and continually improve quality management, products, and services.

quality manual—Document stating the organization's quality policy and describing the quality system of an organization.

quality metrics—Quantitative measurements that give an organization the ability to set objectives and evaluate actual performance versus plan.

quality plan—The document, or documents, stating the specific quality practices, resources, specifications, and sequence of activities relevant to a particular product, project, or contract. The types of documents differ widely depending on the industry, type and size of organization, type of product or service produced, and other factors.

quality planning—The activity of establishing quality objectives and quality requirements.

quality policy—An organization's formally stated beliefs about quality, and the acceptable behavior that will lead to the expected result.

quality principles—Rules, guidelines, or concepts that an organization believes in, collectively. The principles are formulated by senior management with input from others and are communicated and understood at every level of the organization.

quality score chart (Q chart)—A control chart for evaluating the stability of a process in terms of a quality score. The quality score is the weighted sum of the count of events of various classifications in which each classification is assigned a weight.

quality steering committee—See *quality council.*

quality trilogy—A three-point approach to managing for quality. The three points are *quality planning* (developing the products and processes required to meet customer needs), *quality control* (meeting product and process objectives), and *quality improvement* (achieving unprecedented levels of performance). Attributed to Joseph M. Juran.

questionnaires—See *surveys.*

queue processing—Processing in batches (contrast with continuous flow processing).

queue time—Wait time of product awaiting the next step in a process.

quincunx—A teaching tool that creates frequency distributions. Beads tumble over numerous horizontal rows of pins, which force the beads to the right or left. After a random journey, the beads are dropped into vertical slots. After many beads are dropped, a frequency distribution results. In the classroom, quincunxes are often used to simulate a manufacturing process. The quincunx was invented by English scientist Francis Galton in the 1890s.

R

radar chart—A visual method to show in graphic form the size of gaps between a number of both current organization performance indicators and ideal performance indicators. The resulting chart resembles a radar screen or a spider's web.

random cause—Cause of variation due to chance and not assignable to any factor. See *common cause.*

random number generator—Used to select a stated quantity of random numbers from a table of random numbers. The resulting selection is then used to pull specific items or records corresponding to the selected numbers to comprise a random sample.

random sampling—A sampling method in which every element in the population has an equal chance of being included.

range—A measure of dispersion, the highest value minus the lowest value.

range chart (*R* chart)—A control chart in which the subgroup range, R, is used to evaluate the stability of the variability within a process.

ratio analysis—The process of relating isolated business numbers, such as sales, margins, expenses, debt, and profits, to make them meaningful.

rational subgroup—A subgroup that is expected to be as free as possible from assignable causes (usually consecutive items).

recognition and reward system—Management's recognition of work done well by individuals or groups, and any monetary or nonmonetary reward that is provided to those persons recognized.

record—Document or electronic medium that furnishes objective evidence of activities performed or results achieved, for example, a filled-in form.

red bead experiment—An experiment developed by W. Edwards Deming to illustrate that it is impossible to put employees in rank order of performance for the coming year based on their performance during the past year because performance differences must be attributed to the system, not to employees. Four thousand red and white beads, 20 percent red, in a bin, and six people are needed for the experiment. The participants' goal is to produce white beads because the customer will not accept red beads. One person begins by stirring the beads and then, blindfolded, selects a sample of 50 beads. That person passes the bin to the next person, who repeats the process, and so on.

When everyone has his or her sample, the number of red beads for each is counted. The limits of variation between employees that can be attributed to the system are calculated. Everyone will fall within the calculated limits of variation that could arise from the system. The calculations will show that there is no evidence one person will be a better performer than another in the future. The experiment shows that it would be a waste of management's time to try to find out why, say, John produced four red beads and Jane produced 15; instead, management should improve the system, making it possible for everyone to produce more white beads.

reengineering—Completely redesigning or restructuring a whole organization, an organizational component, or a complete process. It's a "start all over again from the beginning" approach, sometimes called a *breakthrough.* In terms of improvement approaches, reengineering is contrasted with incremental improvement (kaizen).

Registrar Accreditation Board (RAB)—An organization that evaluates the competency and reliability of registrar organizations that audit and register client organizations to an appropriate standard, such as ISO 9001 or ISO 14001.

registration—See *certification to a standard.*

regression analysis—A statistical technique for estimating the parameters of an equation relating a particular variable to one or more variables.

reinforcement of behavior—The process of providing positive consequences when an individual is applying the correct knowledge and skills to the job. It has been described as *catching people doing things right and recognizing their behavior.* Caution: Less than desirable behavior can also be reinforced unintentionally.

reliability—In measurement systems analysis, the ability of an instrument to produce the same results over repeated administration—consistency. In reliability engineering it is the probability of a product performing its intended function under stated conditions for a given period of time. See also *mean time between failures.*

reliability engineering—Science of including those factors in the basic design that will ensure the required degree of reliability, availability, and maintainability.

remedial journey—See *diagnostic journey.*

remedy—Something that eliminates or counteracts a problem cause: a solution.

repair—Action taken on a nonconforming product so that it will fulfill the intended usage requirements, although it may not conform to the originally specified requirements. See *rework.*

repeatability and reproducibility (R & R)—A measurement validation process to determine how much variation exists in the measurement system (including the variation in product, the gage used to measure, and the individuals using the gage).

reproducibility—Variation in the average of the measurements made by different appraisers using the same measuring instrument when measuring the identical characteristics on the same part.

resistance to change—A person or group's unwillingness to change beliefs, habits, and ways of doing things.

resource requirements matrix—A tool used to relate the resources required to the project tasks requiring them (used to indicate types of individuals needed, material needed, subcontractors, and so on).

response surface—A graphical representation of the relationship between important independent variables, controlled factors, and a dependent variable.

RETAD—Rapid exchange of tooling and dies, the same concept as *SMED.*

return on assets (ROA)—A measure of the return generated by the earning power of the organization's investment in assets, such as facilities, large equipment, and so on.

return on equity (ROE)—The net profit after taxes, divided by the previous year's tangible stockholders' equity, and then multiplied by 100 to provide a percentage (also referred to as *return on net worth*).

return on investment (ROI)—An umbrella term for a variety of ratios measuring an organization's business performance and calculated by dividing some measure of return by a measure of investment and then multiplying by 100 to provide a percentage. In its most basic form, ROI indicates what remains from all money taken in after all expenses are paid.

return on net assets (RONA)—Measure of an organization's earning power from investments in assets calculated by dividing net profit after taxes by the previous year's tangible total assets, multiplied by 100 to provide a percentage.

return on training investment (ROTI)—A measure of the return generated by the benefits obtained by the organization's investment in training.

reverse engineering—Developing new design specifications by inspection and analysis of the process steps (from last to first) used to produce an existing product.

rework—Action taken on a nonconforming product so that it will fulfill the specified requirements (may also pertain to a service).

right the first time—The concept that it is beneficial and more cost-effective to take the necessary steps up front to ensure that a product or service meets its requirements than to provide a product or service that will need rework or not meet customers' needs. In other words, an organization should engage in defect prevention more than defect detection.

risk assessment/management—The process of determining what present or potential risks are possible in a situation (for example, project plan) and what actions might be taken to eliminate or mitigate them.

risk priority number (RPN)—The priority of risks assessed expressed as a number.

robustness—The condition of a product or process design that remains relatively stable with a minimum of variation even though factors that influence operations or usage, such as environment and wear, are constantly changing.

role playing—A training technique whereby selected participants, designated to assume a particular role, spontaneously interact in an assigned scenario.

root cause analysis (RCA)—A set of quality techniques that can be used to distinguish the cause of defects or problems. It is a structured approach that focuses on finding the decisive or original source of a problem or condition.

run—Consecutive points on one side of the centerline on an SPC chart.

run chart—A line graph showing data collected during a run or an uninterrupted sequence of events. A trend is indicated when the series of collected data points up or down.

S

sales leveling—A strategy of establishing a long-term relationship with customers to lead to contracts for fixed amounts and scheduled deliveries in order to smooth the flow and eliminate surges.

sample—A finite number of items of a similar type taken from a population for the purpose of examination to determine whether all members of the population would conform to quality requirements or specifications.

sample plan—Documented plan showing the scheduled number of samples to be taken from a lot for the purpose of acceptance or rejection of the lot. There are several pre-designed sampling plans available.

sample size—The number of units in a sample chosen from a population.

sampling—The process of drawing conclusions about a population based on a part of the population.

satisfier—Term used to describe the quality level received by a customer when a product or service meets requirements.

SCAMPER—A list of seven questions used by a team to stimulate creativity.

scatter diagram—A graphical technique used to analyze the relationship between two variables. Two sets of data are plotted on a graph, with the y-axis being used for the variable to be predicted and the x-axis for the variable being used to make the prediction. The graph will show possible relationships (although two variables might appear to be related, they might not be; those who know most about the variables must make that evaluation). The scatter diagram is one of the seven tools of quality.

scenario planning—A strategic planning process that generates multiple stories/scenarios about possible future conditions, allowing an organization to look at the potential impact on them, and different ways they could respond.

scientific management—Finding the one best way to perform a task so as to increase effectiveness, quality, productivity, and efficiency.

scope—The total number of products, services, processes, people, operations, that will be affected by an initiative, project, or other action.

scope creep—In a project, job, or other work situation, the gradual expansion of responsibilities and work load, often invisible in early stages until the additional time and cost appear as a variation from estimates.

scorecard—Any evaluation device that formally specifies criteria and a means for rating performance.

secondary customer—Individuals or groups from outside the process boundaries who receive process output but who are not the reason for the process's existence.

second-party audit/assessment—An action carried out by a customer on their suppliers.

segmentation—See *customer segmentation.*

SEI capability maturity model—A model used to determine current process capabilities and identify critical software issues for improvement.

selective listening—One hears what they are predisposed to hear.

self-control—Three elements comprise workers' self-control: knowing what they are supposed to do, knowing what they are actually doing and how well, and being able to control the process.

self-directed learning—See *learner-controlled instruction.*

self-inspection—The process by which employees inspect their own work according to specified rules.

self-managed team—A team that requires little supervision and manages itself and the day-to-day work it does; self-directed teams are responsible for whole work processes, with each individual performing multiple tasks.

sensor—In an inspection or monitoring system, a device that detects a condition out of the normal and provides a notification signal of the changed condition.

service level agreement (SLA)—See *quality level agreement.*

setup time—The time taken to change over a process to run a different product or service.

seven basic tools of quality—Tools that help organizations understand their processes in order to improve them. The tools are the cause-and-effect diagram, check sheet, control chart, flowchart, histogram, Pareto chart, and scatter diagram. See individual entries.

seven management tools of quality—The tools used primarily for planning and managing are the activity network diagram (AND), or arrow diagram, affinity diagram (KJ method), interrelationship digraph, matrix diagram, priorities matrix, process decision program chart (PDPC), and tree diagram.

shape—(1) Pattern or outline formed by the relative position of a large number of individual values obtained from a process. (2) Removal of material from an item using a shaper or shaver tool.

shared leadership—Management approach in which the manager believes that the many functions of management can be effectively spread among various teams or individuals.

Shewhart cycle—See *plan–do–check–act cycle.*

shift—Abrupt change in an important variable in a process. Examples include broken tools, dropped gages, parts slipping, oil stops flowing, missed ingredient in a mix.

ship-to-stock program—An arrangement with a qualified supplier whereby the supplier ships material directly to the buyer without the buyer's incoming inspection; often a result of evaluating and approving the supplier for certification.

SIC (standard industrial classification)—Replaced by *NAICS.*

sigma—Greek letter (σ) that stands for the standard deviation of a process.

silo—(as in functional silo). An organization where cross-functional collaboration and cooperation is minimal and where the functional silos tend to work toward their own objectives, sometimes to the detriment of the organization as a whole. The allusion to "silo" is the mental picture of a vertical farm structure dedicated to serving one purpose without due regard to its relation to the farm as a whole entity.

single-minute exchange of die (SMED)—A goal to be achieved in reducing the setup time required for a changeover to a new process; the methodologies employed in devising and implementing ways to reduce setup.

single-piece flow—A method whereby the product proceeds through the process one piece at a time rather than in large batches, eliminating queues and costly waste.

SIPOC analysis—A macro-level analysis of the suppliers, inputs, processes, outputs, and customers.

situational leadership—Leadership theory that maintains that leadership style should change based on the person and the situation involved, with the leader displaying varying degrees of directive and supportive behavior.

Six Sigma approach—A quality philosophy; a collection of techniques and tools for use in reducing variation; a program of improvement.

six sigma quality—Term generally used to indicate that a process is well controlled, that is, within process limits $\pm 3\sigma$ from the centerline in a control chart, and requirements/tolerance limits $\pm 6\sigma$ from the centerline. The term was originated by Motorola.

skewness—Measure of a distribution's symmetry, a skewed distribution has a longer tail on the right or left side, with its hump (probability) pushed to the opposite side.

skip-level meeting—Evaluation technique that occurs when a member of senior management meets with persons two or more organizational levels below, without the intervening management present, to allow open expression about the effectiveness of the organization.

skip-lot sampling—An acceptance sampling plan in which some set number of lots in a series is accepted without inspection. When the set number of lots is received without inspection, the next lot is inspected unless problems surface that merit all lots being inspected until the problem is eliminated and confidence is restored.

slack time—The time an activity can be delayed without delaying the entire project; it is determined by calculating the difference between the latest allowable date and the earliest expected date. Also called *float.*

S.M.A.R.T. W.A.Y.—A template for setting objectives—*specific*, *measurable*, *achievable*, *realistic*, *time*, *worth*, *assign*, *yield.*

Society of Automotive Engineers (SAE)—International society for the exchange of ideas advancing the engineering of powered transportation systems.

spaghetti chart—A before-improvement chart of existing steps in a process, with lines showing the many back and forth interrelationships (the resulting chart resembles cooked spaghetti). It is used to identify the redundancies and other wasted movements of people and material.

span of control—How many subordinates a manager can effectively and efficiently manage.

special causes—Causes of variation that arise because of special circumstances. They are not an inherent part of a process. Special causes are also referred to as *assignable causes*, as contrasted with *common causes.*

special characteristics—Any characteristics that may affect safety and/or regulatory requirements, degradation, customer satisfaction, annoyance, and/or other criteria.

specification—The engineering requirement used for judging the acceptability of a particular product/service based on product characteristics such as appearance, performance, and size. In statistical analysis, specification refers to the document that prescribes the requirements to which the product or service has to conform.

sponsor—The person who supports a team's plans, activities, and outcomes—the team's "backer." The sponsor provides for resources and helps define the mission and scope to set limits. The sponsor may be the same individual as the "champion."

stable process—Process that is in control, with only common causes of variation present.

stakeholder—People, departments, and outside organizations that have an investment or interest in the success of—or may be impacted by actions taken by—the organization.

stakeholder analysis—The identification of stakeholders and delineation of their needs.

stakeholder requirements matrix—A matrix for capturing and categorizing the needs of identified stakeholders.

standard—A statement, specification, or quantity of material against which measured outputs from a process may be judged as acceptable or unacceptable.

standard deviation—A calculated measure of variability that shows how much the data are spread around the mean.

standardized work—Documented and agreed-on work instructions and practices that embody the present best known methods and work sequence to be followed by all performers of each manufacturing or assembly step in a process.

statement of work (SOW)—A description of the actual work to be accomplished. It is derived from the work breakdown structure and, when combined with the project specifications, becomes the basis for the contractual agreement on the project. See also *scope.*

statistical confidence—The level of accuracy expected of an analysis of data. Most frequently it is expressed as either a "95% level of significance" or "5% confidence level." Also called *statistical significance.*

statistical process control (SPC)—The application of statistical techniques to control a process.

statistical quality control (SQC)—The application of statistical techniques to control quality. Often, the term *statistical process control* is used interchangeably with *statistical quality control*, although statistical quality control includes acceptance sampling as well as statistical process control.

statistical thinking—A philosophy of learning and action based on fundamental principles:

- All work occurs in a system of interconnected processes.
- Variation exists in all processes.
- Understanding and reducing variation are vital to improvement.

steering committee—A special group established to guide and track initiatives or projects.

storyboarding—A technique that visually displays thoughts and ideas and groups them into sequenced categories (scenes), making all aspects of a process visible at once. Often used to communicate to others the activities performed by a team as they improve a process.

strategic fit review—A process by which senior managers assess the future of each project or initiative proposed for a particular organization in terms of its ability to advance the mission, strategies, goals, and objectives of the organization.

strategic planning—A process for identifying and setting an organization's long-range vision, mission, goals, and objectives, and identifying the actions needed to ultimately achieve the goals.

stratified random sampling—A technique for segmenting (stratifying) a population prior to drawing a random sample from each strata, the purpose being to increase precision when members of different strata would, if not stratified, cause an unrealistic distortion.

structural variation—Variation caused by regular, systematic changes in output, such as seasonal patterns and unaccustomed "blips" in long-term trends.

suboptimization—The result occurring when an individual business function fails to focus on the overall organizational objectives for producing higher efficiency and effectiveness of the entire system, and instead focuses on the individual function's improvement.

supplier—Source of materials, services, or information input provided to a process. Internal suppliers provide materials or services to internal customers.

supplier audits—Reviews that are planned and carried out to verify the effectiveness of a supplier's quality program, drive improvement, and increase value.

supplier certification—Process of evaluating the performance of a supplier with the intent of authorizing the supplier to self-certify shipments if such authorization is granted.

supplier performance—The monitoring and measurement of supplier conformance to standards, good manufacturing practices, industry norms, and the customer's purchase contract, often with the use of specialized performance metrics and/or supplier audits.

supplier quality assurance—Confidence that a supplier's product or service will fulfill its customers' needs. This confidence is achieved by creating a relationship between the customer and supplier that ensures that the product will be fit for use with minimal corrective action and inspection. According to J. M. Juran, there are nine primary activities needed: (1) define product and program quality requirements, (2) evaluate alternative suppliers, (3) select suppliers, (4) conduct joint quality planning, (5) cooperate with the supplier during the execution of the contract, (6) obtain proof of conformance to requirements, (7) certify qualified suppliers, (8) conduct quality improvement programs as required, and (9) create and use supplier quality ratings.

supplier selection strategy and criteria—Selection of new suppliers is based on the type and uniqueness of the product or service to be purchased, and the total cost. Suppliers of commodity-type items and basic supplies may be selected from directories and catalogs. For more-sophisticated products and services, stringent evaluation criteria may be established.

supply chain—The series of processes and/or organizations that are involved in producing and delivering a product to the final user.

supply chain management (SCM)—The process of effectively integrating and managing components of the supply chain.

support systems—Starting with top management commitment and visible involvement, support systems are a cascading series of interrelated practices or actions aimed at building and sustaining support for continual quality improvement.

surveillance—Continual monitoring of a process.

surveillance audit—The regular audits conducted by registrars to confirm that a company registered to the ISO 9001 standard still complies; usually conducted on a six-month or one-year cycle.

survey—Act of examining a process or of questioning a selected sample of individuals to obtain data about a process, product, or service. A survey is generally conducted on a selected sample of a population to collect information about predetermined questions. A customer satisfaction survey is one example. Surveys may be conducted orally by a survey-taker, by paper and pencil, by computer online, and so on. Responses are tabulated and analyzed to surface significant areas for change.

SWOT analysis—An assessment of an organization's key *strengths*, *weaknesses*, *opportunities*, and *threats*. It considers factors such as the organization's industry, competitive position, functional areas, and management.

symptom—An indication of a problem or opportunity.

system—A network of interdependent actions, processes, or events that work together to accomplish a common mission and goal.

system of profound knowledge (SoPK)—See *profound knowledge.*

systems approach to management—A management theory that views the organization as a unified, purposeful combination of interrelated parts; managers must look at the organization as a whole and understand that activity in one part of the organization affects all parts of the organization (also known as *systems thinking*).

T

tacit knowledge—Unarticulated heuristics and assumptions used by any individual or organization. The knowledge that comes from experience over time.

tactical plans—Short-term plans, usually of one- to two-year duration, that describe actions the organization will take to meet its strategic business plan.

tactics—The techniques and processes that help an organization meet its objectives.

Taguchi loss function—Pertains to where product characteristics deviate from the target intended and losses increase according to a parabolic function. Merely attempting to produce a product within specifications doesn't prevent loss (loss that is inflicted on society after shipment of a product). Any points beyond the center of the process, in either direction, even though within specifications, Taguchi considers a loss.

Taguchi methods—The American Supplier Institute's trademarked term for the quality engineering methodology developed by Genichi Taguchi. In this engineering approach to quality control, Taguchi calls for off-line quality control, online quality control, and a system of experimental design to improve quality and reduce costs.

takt time—The available production time divided by the rate of customer demand. Operating to takt time sets the production pace to customer demand.

tally sheet—Another name for check sheet.

tampering—Action taken to compensate for variation within the control limits of a stable system. Tampering increases rather than decreases variation, as evidenced in the funnel experiment.

TARP—U.S. Office of Consumer Affairs/Technical Assistance Research Programs.

task—A specific, definable activity to perform an assigned function, usually within a specified time frame.

taxonomy—Classification of terms or objects.

team—A group of two or more people who are organized to work together and held accountable for the accomplishment of a task and specific performance objective.

team building/development—The process of transforming a group of people into a coordinated team and developing the team to achieve its purpose.

team dynamics—Interactions that occur among team members under different conditions.

team facilitation—Process of dealing with both the role of the facilitator on the team and the techniques and tools for facilitating the team. See *facilitator*.

team growth, stages of—Refers to the four development stages through which groups typically progress: *forming*, *storming*, *norming*, and *performing*. Knowledge of the stages helps team members accept the normal problems that occur on the path from forming a group to becoming a team. It is suggested that *adjourning* be added to the list to deal with closing down a team's work.

team leader—A person designated to be responsible for the ongoing work and success of the team, and keeping the team focused on the task assigned.

team performance evaluation, recognition and rewards—Special metrics are needed to evaluate the work of a team (to avoid focus on any individual on the team) and as a basis for the recognition and reward for team effort and achievements.

team-based organization/structure—A function or entire entity that consists primarily of multiple teams.

telecommuting—Working individually, or as part of a group, performing at least some work away from the organization's primary location, and accomplishing tasks with the aid of electronic technologies.

temporary/ad hoc team—A team, usually small, formed to address a short-term objective or emergency situation.

theory of constraints (TOC)—Eliyahu Goldratt's theory deals with techniques and tools for identifying and eliminating the constraints (bottlenecks) in a process, to achieve greater flow of money.

theory of knowledge (TOK)—A belief that management is about prediction, and people learn not only from experience, but also from theory. When people study a process and develop a theory, they can compare their predictions with their observations; profound learning results.

theory X and theory Y—A theory developed by Douglas McGregor that maintains that there are two contrasting assumptions about people, each of which is based on the manager's view of human nature. Theory X managers take a negative view and assume that most employees do not like work and try to avoid it. Theory Y managers take a positive view and believe that employees want to work, will seek and accept responsibility, and can offer creative solutions to organizational problems.

third-party audit—External audits conducted by personnel who are neither employees of the organization, nor a supplier, but are usually employees of certification bodies or of registrars.

three-sixty-degree (360°) feedback process—A people performance evaluation method that provides feedback from the perspectives of self, peers, direct reports, superiors, customers, and suppliers.

throughput—The rate at which the entire system generates money through sales of product or service (Goldratt's theory of constraints).

throughput time—The total time required (processing + queue) from concept to launch, or from order received to delivery, or raw materials received to delivery to customer.

TickIT—A certification of quality management systems that conform to the requirements of the ISO 9001 standard, specifically pertaining to software development.

tier—Level, rank, sequence.

TJC—The Joint Commission, formerly the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

TL 9000—Quality management standard series for the telecommunications industry.

tolerance—The variability of a parameter permitted and tolerated above or below a nominal value.

tolerance design (Taguchi)—Provides a rational grade limit for components of a system; determines which parts and processes need to be modified and to what degree it is necessary to increase their control capacity; a method for rationally determining tolerances.

tolerance limit—The maximum and minimum limit values a product may have and still meet engineering or customer requirements.

tool—Any implement or technique used for making a desirable change to materials, process, product, or approach that contributes to a quality product or service. (A narrow definition—a device used by hand, or a fixture in a machine, that cuts, strikes, shapes, marks/tags, positions, polishes, or heat-treats material in a process.)

tool life—Minimum amount of useful production that can be expected from a tool.

top management commitment—Participation and visible involvement of the organization's highest-level officials in their organization's quality improvement efforts.

total productive maintenance (TPM)—Methodologies for reducing and eventually eliminating equipment failure, setup and adjustment, minor stops, reduced speed, product rework, and scrap; preventive maintenance.

total quality management (TQM)—A term initially coined by the Naval Air Systems Command (U.S.) to describe its management approach to quality improvement. Total quality management (TQM) has taken on many meanings. Simply put, TQM is a management approach to long-term success through customer satisfaction. TQM is based on the participation of all members of an organization in improving processes, products, services, and the culture in which they work. TQM benefits all organization members and society. Various methods for implementing TQM are found within the teachings of such quality leaders as Philip B. Crosby, W. Edwards Deming, Armand V. Feigenbaum, Kaoru Ishikawa, J. M. Juran, and others. The Baldrige Performance Excellence Program (U.S.) and other criteria-based programs embody the principles of TQM.

traceability—The ability to track the history, application, or location of an item or activity, and like items or activities, by means of recorded identification.

training—The skills that employees need to learn in order to perform or improve the performance of their current job or tasks, and the process of providing those skills.

training evaluation—The techniques and tools used and the process of evaluating the effectiveness of training.

training needs assessment—The techniques and tools used and the process of determining an organization's training needs.

transactional leadership—A style of leading whereby the leader sees the work as being done through clear definition of tasks and responsibilities and the provision of resources as needed.

transformational leadership—A style of leading whereby the leader articulates the vision and values necessary for the organization to succeed.

transition tree—A technique used in applying Goldratt's theory of constraints.

tree diagram—A management and planning tool that shows the hierarchy of subtasks required to achieve an objective.

trend—Consecutive points plotted against a time period that show a pattern, and help to identify any unexpected occurrences. Trend plotting of sequential data points show the direction and rate of change of an organization, work unit, or process over time.

trend analysis—The charting of data over time to identify a tendency or direction.

trilogy—See *quality trilogy.*

TRIZ—(Russian) A theory of problem solving that aids in the solution of inventive problems. A set of analytical and knowledge-based tools that are typically hidden subconsciously in the minds of creative inventors.

***t*-test**—A method for testing hypotheses about the population mean; the *t*-statistic measures the deviation between the sample and population means, in terms of the number of standard errors.

type I error—An incorrect decision to reject something (such as a statistical hypothesis or a lot of products) when it is acceptable. Also known as *producer's risk* and *alpha risk.*

type II error—An incorrect decision to accept something when it is unacceptable. Also known as *consumer's risk* and *beta risk.*

U

***u*-chart**—Count per unit chart. Attribute control chart used to show the average number of defects in a sample; uses variable sample size. A *c*-chart uses a fixed sample size.

unconditional guarantee—An organizational policy of providing customers unquestioned remedy for any product or service deficiency.

unity of command—The concept that a subordinate should be responsible to only one superior. Note: A matrix-type organization negates this concept.

upper control limit (UCL)—Control limit for points above the central line in a control chart.

upper specification limit (USL)—Maximum limit for dimensions as specified for a product to be acceptable.

USDA—U.S. Department of Agriculture.

V

validation—Confirmation by examination of objective evidence that specific requirements and/or a specified intended use are met.

validity—Refers to the ability of a feedback instrument, and validation action taken, to measure what it was intended to measure. Validity may be measured three ways: (1) criterion related, (2) construct related, and (3) content related.

value added—Parts of the process that add worth from the external customers' perspective.

value chain—See *supply chain.*

value stream—The primary actions required to bring a product from concept to placing the product in the hands of the end user.

value stream mapping—The technique for mapping the value stream, typically done for the present perception and then the future perspective.

values—Statements that clarify the behaviors that the organization expects in order to move toward its vision and mission. Values reflect an organization's personality and culture.

variable control chart—Data resulting from the measurement of a parameter or a variable. Control charts based on variable data include average (*X-bar*) chart, individuals (*X*) chart, range (*R*) chart, sample standard deviation (*s*) chart, and CUSUM chart.

variable cost—Cost that varies with production quantity, such as material and direct labor.

variable sampling plan—A plan in which a sample is taken and a measurement of a specified quality characteristic is made on each unit. The measurements are summarized into a simple statistic, and the observed value is compared with an allowable value defined in the plan.

variables—Quantities that are subject to change.

variance—The difference between a planned amount (usually money or time) and the actual amount. In math, the measure of dispersion of observations based on the mean of the squared deviations from the arithmetic mean. The square of the standard deviation, given by formula.

variation—A change in data, a characteristic, or a function that is caused by one of four factors: *special causes*, *common causes*, *tampering*, or *structural variation*. See individual entries.

verification—The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing and documenting whether items, processes, services, or documents conform to specified requirements.

vertically integrate—To bring together more of the steps involved in producing a product in order to form a continuous chain owned by the same firm; typically involves taking on activities that were previously in the external portion of the supply chain.

virtual team—A boundaryless team functioning without a commonly shared physical structure or physical contact, using electronic technology to link the team members.

vision—A statement that explains what the company wants to become and what it hopes to achieve.

visual control—A technique of positioning all tools, parts, production activities, and performance indicators so that the status of a process can be understood at a glance by everyone; providing visual cues to aid the performer in correctly processing a step or series of steps, to reduce cycle time, to cut costs, to smooth flow of work, and to improve quality.

vital few, useful many—A term used by J. M. Juran to describe his use of the Pareto principle, which he first defined in 1950. (The principle was used much earlier in economics and inventory control methodologies.) The principle suggests that most effects come from relatively few causes; that is, 80 percent of the effects come from 20 percent of the possible causes. The 20 percent of the possible causes are referred to as the *vital few*; the remaining causes are referred to as the *useful many.* When Juran first defined this principle, he referred to the remaining causes as the *trivial many,* but realizing that no problems are trivial in quality assurance, he changed it to *useful many.*

voice of the customer—The perceived understanding of the customers' needs and expectations (*voice*) interpreted and passed downward throughout the organization to ensure, at all levels, that the organization is responding to the customers' voice.

W

walk the talk—Not only talking about what one believes in, but also being observed acting out those beliefs. Employees' buy-in to the TQM concept is more likely when management is seen involved in the process, every day.

walkabout—A visual, group technique used during strategic planning for resolving resource planning conflicts among organizational components.

warranty—A manufacturers' published statement that defective or deficient product or service experienced by the customer, within a prescribed time period, will be remedied by the manufacturer.

waste—Activities that consume resources but add no value; visible waste (for example, scrap, rework, downtime) and invisible waste (for example, inefficient setups, wait times of people and machines, inventory).

Weibull distribution—A distribution of continuous data that can take on many different shapes and is used to describe a variety of patterns; in relation to the bathtub curve, used to define when the "infant mortality" rate has ended and a steady state has been reached (decreasing failure rate).

WIIFM—"What's in it for me?" Ask and answer WIIFM before suggesting that a change/improvement will be acceptable to affected persons.

win–win—Outcome of a negotiation that results in both parties being better off.

wisdom—The culmination of the continuum from data to information to knowledge to wisdom.

work analysis—The analysis, classification, and study of the way work is done. Work may be categorized as value-added (necessary work), or non-value-added (rework, unnecessary work, idle). Collected data may be summarized on a Pareto chart showing how people within the studied population work. The need for and value of all work is then questioned, and opportunities for improvement identified. A time use analysis may also be included in the study.

work breakdown structure (WBS)—A project management technique by which a project is divided into tasks, subtasks, and units of work to be performed, displayed on a chart.

work group—A team type composed of people from one functional area who work together on a daily basis and whose goal is to improve the processes of their function.

work instruction—A document that answers the question "How is the work to be done?" See *procedure.*

workbook—A collection of exercises, questions, or problems to be solved during training; a participant's repository for documents used in training (for example, handouts).

world-class quality—A term used to indicate a standard of excellence; the best of the best.

X

***x*-axis**—Horizontal axis on a control chart, run chart, or other chart.

***X*-bar chart**—Average chart.

Y

***y*-axis**—Vertical axis on a control chart, run chart, or other chart.

yield—Ratio between salable goods produced and the quantity of raw materials and/or components input at the beginning of the process.

Z

zero defects—A performance standard popularized by Philip B. Crosby to address a dual attitude in the workplace: people are willing to accept imperfection in some areas, while in other areas they expect the number of defects to be zero. This dual attitude has developed because of the conditioning that people are human and humans make mistakes. The zero-defects methodology states, however, that if people commit themselves to watching details and avoiding errors, they can move closer to the goal of perfection.

zero investment improvement—Another name for a *kaizen blitz.*

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