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# THE CERTIFIED MANAGER OF QUALITY/ ORGANIZATIONAL EXCELLENCE HANDBOOK

## Third Edition

*Russell T. Westcott, Editor*

Quality Management Division
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# Preface to the Third Edition

Management of quality continues to play a significant role in organizations as they struggle to deal with ever increasing complexities and challenges in our fast-paced world. Business success depends on their ability to use a wide range of information to define, plan, implement, and control a variety of complex, interdependent tasks using a finite set of data and decreasing resources. Organizations must develop the critical knowledge, interpersonal skills, technical tools, and management techniques needed in today's evolving workplace environment.

Organizations look to ongoing training and certification to enable their employees. The value of certification has never been higher. Many senior leaders recognize that employee certification can improve their company's bottom line and enhance business processes due to increased efficiency.

The original *Certified Quality Manager Handbook* was developed by the Quality Management Division to provide a concise resource for preparing for the certification exam. Forty-four individuals contributed content for the first edition.

Every five years the Body of Knowledge for the Certified Quality Manager Exam is updated to reflect changes in the profession. When the Body of Knowledge was updated in 2000, two division members, Duke Okes and Russ Westcott, took on the project for the second edition. Their work resulted in a reorganization of the entire text and the addition of new material and case studies.

For this third edition, the title of the certification changed to *Certified Manager of Quality/Organizational Excellence.* This title change and the revised 2006 Body of Knowledge reflect the fact that the role of the quality function is continually evolving. Many of the responsibilities for the management of quality are being deployed throughout the organization into other functions. This now requires a much more comprehensive understanding of an organization as a system within the larger system of society. The range of tools and technologies that quality professionals are required to use and/or facilitate is also increasing. The ability to read, interpret, and use financial tools, as well as use the language of cost/profitability when talking to senior management, is more important than ever for quality professionals. A significant reorganization, rewriting, and creating of new content was needed. Once again the division was successful in having one of its members, Russ Westcott, accept the task.

This handbook will be a valuable resource for professionals for several reasons:

- It provides comprehensive guidance for process improvement.
- It describes tools and techniques to drive change.

- It emphasizes sound management principles that have relevance beyond the quality field.
- It is both a primer for new leaders and a go-to manual for experienced professionals.

G. Dennis Beecroft
Chair
Quality Management Division
American Society for Quality

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To my loving wife, Jeanne Westcott, who has once again endured my grumbling and weird hours as this book has developed and finally gone to press.

To colleagues Duke Okes and Heather McCain, who have assisted me in this endeavor.

To the staff at ASQ Quality Press as well as the hard working copy and production editors who have ably corrected my grammatical goofs, and made valuable suggestions for improvement.

To the contributors to the first and second editions who laid the foundation for this edition.

Russ Westcott
Editor

# 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 the 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 setup existed in the preindustrial era where sales, design, manufacturing, finance, and quality were integrated: 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 over workers. All employees were concerned 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 *The Economic Control of Quality of Manufactured Goods* 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 to 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 demanded careful planning, analysis, communication between functions, and close cooperation among all departments.

Modern, 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 tools and powers to perform work correctly. The production cycle is becoming similar to the days when each worker was master in the shop, dealing with customers, making the product, and checking its quality. Management of the total process or subprocess calls for many skills, requiring highly educated and extremely capable 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 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 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 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 distributed over many other internal functions.

When total quality management (TQM) has been successfully implemented, the distinctions between staff and line activities can become blurred as empowered teams become responsible for both plans and action when management layers 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).* Planned and 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, 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.
- *Initiate and/or participate 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:

- Emphasis placed on quality goals and objectives
- 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
- Visible and personal involvement in quality efforts by senior leadership

The quality function is not:

- A prevention squad. When the quality department is viewed as the owner of quality, the rest of the organization abdicates its role and responsibility.
- Oriented 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 is an admission that an organization does 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 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 contrasted the difference between managing to achieve quality across the board, in all functions of the organization, and for all products and services (Big Q) with 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.

**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** Levels of organizational maturity. What is your organization's level? *(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. |  | 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. | A supplier certification program is in place. | 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. | Overall performance is about equal to industry norms. | Performance is above industry norm. | Performance is world-class. |

## THINKING LIKE A QUALITY MANAGER

The roles and responsibilities of the quality manager and approaches toward 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) is a product of inputs from many sources and reflects areas of common interest and importance. The development of actual examination questions is intended to measure the level of knowledge and skill that a person possesses relative to each area of the BoK, regardless of each person's job, company 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 the key to a successful outcome. Some recommendations for establishing a successful mind-set in using this study guide and preparing for the examination include:

- Picture or think of yourself as a corporate director of quality for a multifacility organization. In reality, businesses in which products and services are not highly regulated by government legislation and in smaller business enterprises, the quality manager is less likely to 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. A broader mind-set needs to be established 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 multifacility business, envision addressing such questions as, "What can the quality function do to help the company identify or implement new initiatives that will enable it to break into new markets?"

- Think of yourself as having to integrate the needs of the quality assurance 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 in other functional areas, such as supplier quality in purchasing and customer satisfaction in marketing/sales.

- 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 Body of Knowledge from a broad 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 ensure that the issues presented are 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 elements or subelements of the BoK and consider how they are related, such as the linkages between leadership and strategy development/deployment.

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 Appendix A. Throughout each section of this handbook, the pertinent BoK requirements associated with good quality management practices for that section are shown. These BoK requirements represent the range of content and the cognitive level to which multiple choice questions can be presented. Also, keep in mind that there is a separate BoK pertaining to constructed response questions in Appendix A.

There is some overlap of topics within the BoK. For example, reference to Six Sigma appears in three sections. 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.

Each chapter ends with a list of additional resources. 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 2006 BoK is even wider and somewhat deeper than before. On the subject of information reference material, do not forget the wealth of information available via the Internet—most of it free! That includes a sample test on the ASQ Web site, www.asq.org.

In order to provide a broad perspective of the BoK, this book has specifically been written to cover:

- Historical perspectives relating to the evolution of particular aspects of quality management, including recognized experts and their contributions
- Key concepts and terminology relevant in providing quality leadership, applying quality management principles, 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

The original Certified Quality Manager Study Guide Committee and contributing authors, as well as the editors of the second and third edition, have strived to provide readers with a more holistic perspective of the quality manager's role within the context of the subject matter specified in the BoK. Not every quality manager equally possesses expertise in each subject area, but the content of this handbook can be used to help readers properly direct their study efforts.

## TERMINOLOGY

The ISO 9000–2000 definition of *organization* includes terms such as: company, firm, enterprise, institution, charity, sole trader, association, or parts or combination thereof. Therefore, throughout the handbook these terms and others, including *business,* have been used interchangeably.

The ISO definition of *product* as "the result of a process" includes categories of hardware, software, services, and processed materials. The word *product* is therefore widely 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 were used and to substitute terms that are more apropos for their own industry or experiences where this will help clarify the material.

## DISCLAIMER

The Body of Knowledge for the Certified Manager of Quality/Organizational Excellence (see Appendix A) 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.

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 for test preparers. 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 about answer scoring cannot be answered on behalf of the BoK drafters or the question writers.

Success as a quality manager requires experience and a mature understanding of the various concepts, as well as the specific knowledge obtained from this or any other 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 and Culture |
| 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 and Culture

It's appropriate that a book on the management of quality begin with the subject of leadership. Perhaps no other factor has so much of an 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. The culture that results from the manner in which work is carried out shapes the way members of an organization relate to each other and to the outside world.

## 1. ORGANIZATIONAL STRUCTURES

Define and describe basic organizational designs: matrix, flat, parallel, etc., as well as the management hierarchy and its influence in an organization. (Understand)

**CMQ/OE BoK**

### Organizational Design

One of the major roles 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 components:

- *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 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. Some 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 among 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 they create staff functions 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 ill-structured problems, so top executives typically 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 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 divided?" 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 relatively centralized decision making. As organizational environments became more complex and dynamic, however, 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 deciding 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 one way of grouping work activities (departmentalization). Groupings may be according to the:

- Work functions being performed
- Product or service being provided

- Customer being served
- Geographic area or territory covered
- Product–customer processs 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 frequent ways to group activities is by the function being 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 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

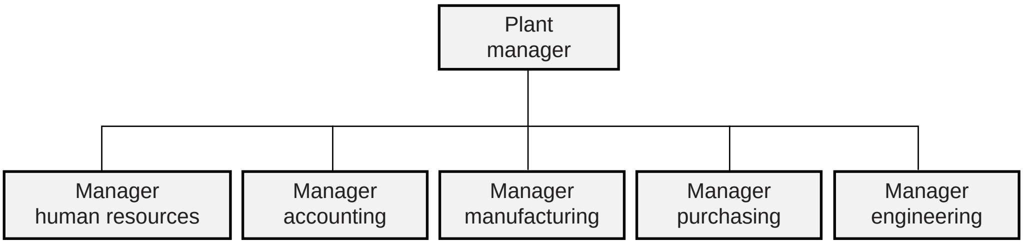
Plant manager
Manager human resources
Manager accounting
Manager manufacturing
Manager purchasing
Manager engineering

**Figure 1.1** Functional departmentalization.

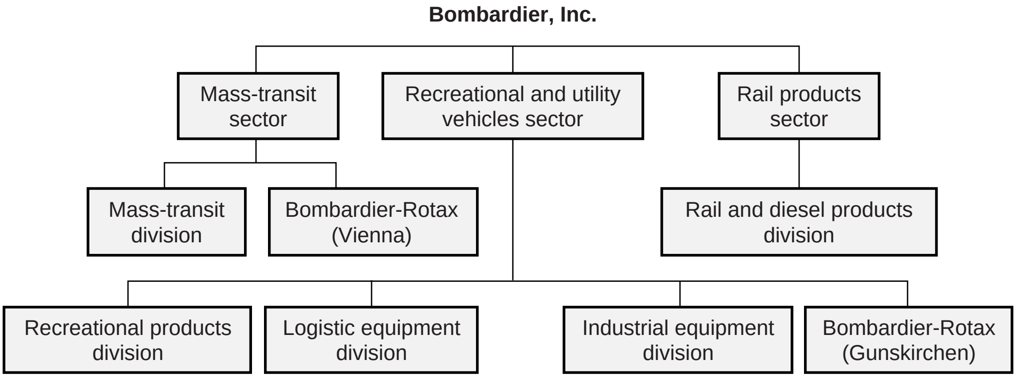
Bombardier, Inc.
Mass-transit sector
Recreational and utility vehicles sector
Rail products sector
Mass-transit division
Bombardier-Rotax (Vienna)
Rail and diesel products division
Recreational products division
Logistic equipment division
Industrial equipment division
Bombardier-Rotax (Gunskirchen)

**Figure 1.2** Product departmentalization.

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 a particular type 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 levels, secondary levels, 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.

- *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 territories within its district. Geographic organization is valuable when an organization's customers are scattered over a large area, allowing the specific needs of the territory 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

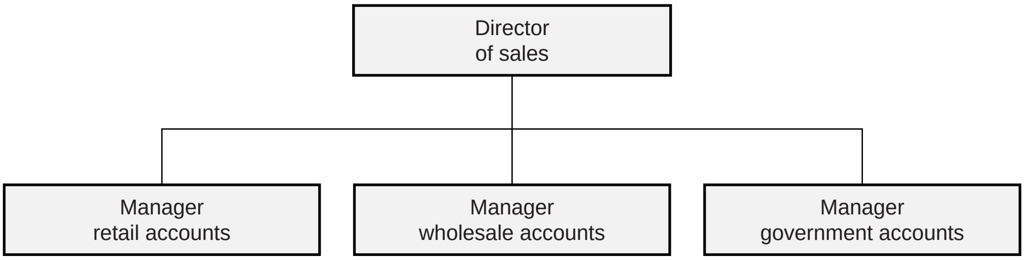
Director
of sales
Manager
retail accounts
Manager
wholesale accounts
Manager
government accounts

**Figure 1.3** Customer departmentalization.

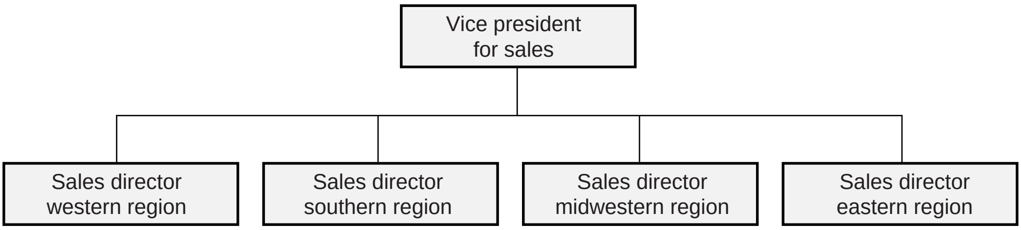
Vice president
for sales
Sales director
western region
Sales director
southern region
Sales director
midwestern region
Sales director
eastern region

**Figure 1.4** Geographic departmentalization.

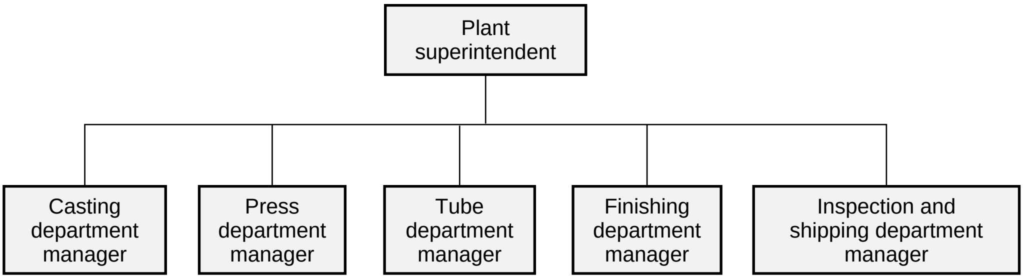
Plant superintendent
Casting department manager
Press department manager
Tube department manager
Finishing department manager
Inspection and shipping department manager

**Figure 1.5** Process departmentalization.

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 specialties 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 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 development, assignments to line or project units, and performance reviews.

- *Cells.* Parts of an organization may be structured in manufacturing or work cells. A *cell* is a self-contained unit dedicated to perform all the operations to complete a product or major portion of a product. (See Chapter 14, Section 3 and Figure 14.11, page 402.)

- *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

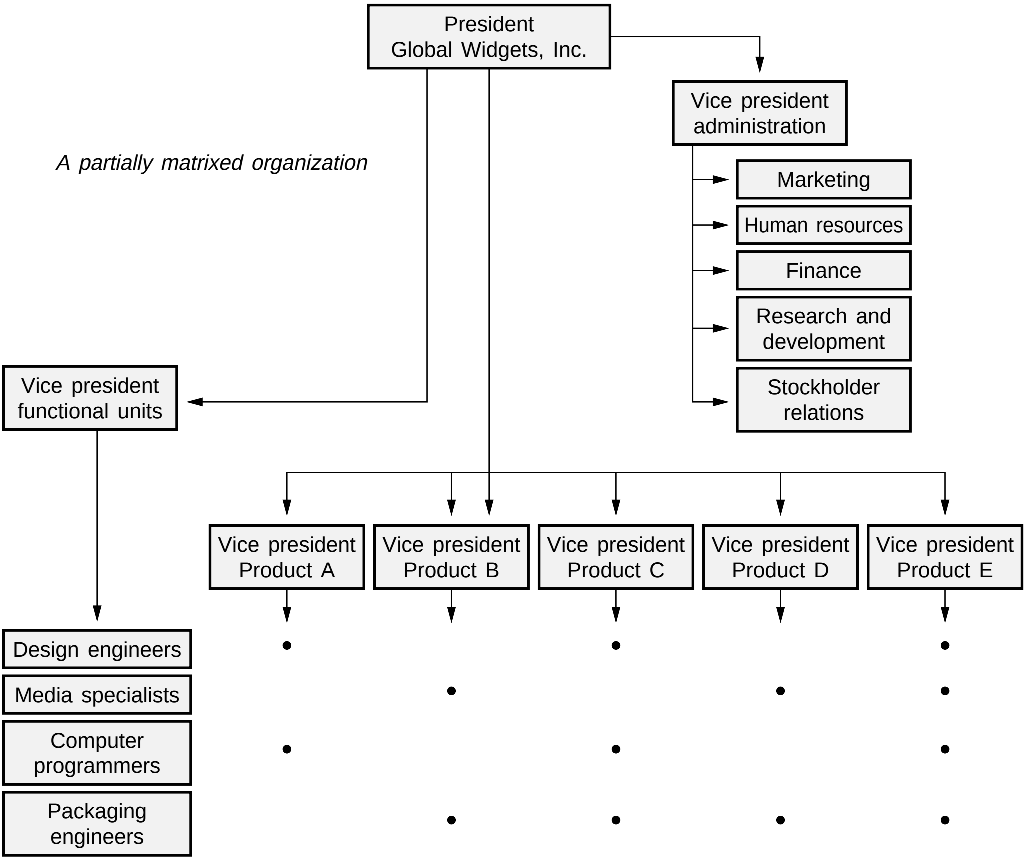
President
Global Widgets, Inc.
A partially matrixed organization
Vice president administration
Marketing
Human resources
Finance
Research and development
Stockholder relations
Vice president functional units
Vice president Product A
Vice president Product B
Vice president Product C
Vice president Product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

**Figure 1.6** Matrix organization example.

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, such as computers and telecommunications, 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 tuned to the needs for integrating resources to serve the customer, strengthening the value chain, and crossing geographic boundaries.[8] Authors of *The Virtual Corporation* focus on the powers of information, new technologies, and the 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 organizational objectives, structure should, of course, 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 needing 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 lifecycle. 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, 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 top person from the union membership 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 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, blockage of process improvement initiatives, and so on. Disagreement over the terms of the labor–management contract can result in 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 relative 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 versus Europe versus 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 through 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 and business partners.

Middle managers are responsible for carrying out the policies and procedures necessary for achieving the mission, goals, and strategic objectives. Their role 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 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 related to the workers. In this role, supervisors must communicate downward the 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 resonsibility 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.

## 2. ORGANIZATIONAL CULTURE

Define and describe characteristics of an organization that determine or underlie its culture. (Understand)

**CMQ/OE BoK**

An organization is the integration of two major systems:

- The technical system, which defines how products and services are to be realized (and includes the equipment, work processes and procedures, and human resources to carry out the processes).

- The social system, consisting of how people communicate, interrelate, and make decisions. A manifestation of the social system is called *culture,* which is evidenced by employee behaviors.

Culture is a function of the values, norms, and assumptions shared by members of the organization. It can, therefore, be shaped by communicating what standards of behavior are expected and ensuring that policies, procedures, promotions, and day-to-day decisions are appropriately aligned. Culture is manifest in ways such as:

- How power is used or shared
- The organization's orientation toward risk or safety
- Whether mistakes are punished, hidden, or used to guide future learning
- How outsiders are perceived and treated
- Vision, mission, principles, policies, protocols, procedures, and practices
- Artifacts, layout, and amenities (for example, furnishings, artwork, open versus closed work spaces, employee time-out spaces, signage, and so on)

Members new to an organization are soon acclimated to the culture through training and both formal reinforcement and peer influence.

The design of the organization has an impact on culture. If a hierarchical structure restricts cross-functional communications, then close relationships between interrelated functions will be more difficult. Similarly, in a unionized organization the relationship between organization management and union management will set the stage for how cooperatively people are able to work together toward common goals.

Culture can obviously have a significant impact on quality and is shaped by the words and actions of leadership, how work systems are designed, and what gets rewarded. If the culture is not proactive, is not focused on customers, and does not use data to guide decision making, the organization is not likely to be highly successful in the continual improvement of quality.

Visible artifacts and the metaphors used to describe an organization are often good superficial indicators of culture. For example, a company that talks of "killing the competition" and creates a graphic display showing competitors being "wiped out" would convey a focus on competitors rather than on customers.

Examining the beliefs and values espoused by members of the organization requires deeper probing than just observing artifacts. For example, in a family-owned business, the predominant values are often those of the founder(s). Those values may persist long after the death of the founding individual(s).

At an even deeper level are the shared tacit assumptions of which the organization's members may not be consciously aware. Failure to surface and consider these assumptions can result in serious blunders. For example, a failure to understand the mutual level of demonstrated trust needed for management to introduce major change in a unionized organization where an adversarial relationship persists.

Juran lists five steps for changing to a quality culture:

1. Create and maintain an awareness of quality.
2. Provide evidence of management leadership on quality.
3. Provide for self-development and empowerment.
4. Provide participation as a means of inspiring action.
5. Provide recognition and rewards.[10]

Changing an organization's culture is difficult and requires time. Fear of change must be removed, poor labor–management relations must be resolved, and the company's focus must change from the status quo.[11] Employees should be convinced of the benefits that a quality management approach will provide and should buy in to the changes. This often means that employees at all levels will need to change behaviors or perform tasks in a different manner. If strong leadership, motivation, and enthusiasm are lacking, frustration and stress will result.

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