SECTION 16
TRAINING FOR QUALITY[1]

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INTRODUCTION

Traditionally, companies have provided training focused on the technical knowledge, skills, and abilities to complete specific tasks as they relate to job responsibilities. In the past decade, however, there has been a shift in this traditional pattern of training just for technical reasons as the need emerged to focus also on the holistic development of the professional. Professional development and the term "professional" have been a reflection of the overall change in educational distribution throughout the workforce. There has been a larger population of better-educated individuals entering the workforce with a greater need for ongoing education and development. There has also been great debate raging over the value of our national education system in preparing workforce candidates for the new work environment. These factors have placed a greater responsibility, and burden, on organizations to respond. Some have responded well, and many others are still struggling with the acknowledgment and the "how to" of this phenomenon. To complicate these matters further, there has been a virtual explosion in information technology advancements, which continue to change at a blinding pace. All of these combined have made a strong case for shifting our approach to training in general, and to Quality training in particular.

[1]In the Fourth Edition, material for the section on training for quality was supplied by Frank M. Gryna.

Methods of the Past. Most organizations have an established manager of training or training department. This department is generally tasked with the training of all people in all things, everything from technical training on the use of customer service techniques to leadership training for the executives. Traditionally the training person or department would be consulted on the most effective way to meet a training need. This would involve assigning either an expert or group of experts from within one or more functional departments to craft a means to meet the training need. These means may be

- On-the-job training
- Classroom training
- Self-instruction through video cassettes, programmed instruction, home study, etc.
- Visits to other companies
- Membership in professional associations
- Computer-based learning

Most large organizations (Fortune 500 size) have a fairly sophisticated training infrastructure in place and are capable of handling the wide variety of requests they receive. They may either develop a training intervention to meet that need or contract with an external professional to provide that expertise in collaboration with the internal expert responsible for that discipline. However, training departments have taken a "hands-off" approach to quality-related subject matter. As a result, most organizations that chose to implement an organized Total Quality Management (TQM) system established a separate quality training organization. This was a component of the "Quality department" and the responsibility of the quality manager. The quality training organization was responsible for developing the curriculum and materials and implementing and evaluating the quality training independent of other corporate training efforts.

Major Issues. Organizations in the 1990s have begun to realize the concept of "Big Q"; that is, quality is related to every department and process within the organization. This is a breakthrough in itself! As a result of this, the requirement for quality-focused training and education has extended throughout the organization, increasing the scope of activities and level of knowledge of the quality professionals. This increased knowledge among the quality professionals began to foster a barrier to collaboration; there was a distinct separation, even competition, between quality training and other training within organizations.

There has been a major downsizing (re-engineering) effort in the business community during this decade. It has driven many organizations into departmental consolidation and a general rethinking of how they do business. The quality and training departments were not exempted from this. The trend has been a merging of the quality, training, and human resources departments into a more consolidated "professional development" team, threatening each with a loss of identity.

Downsizing and consolidation has forced more work on fewer people, thereby making time an even more precious commodity than it was before. As a result, parts of the organization are in competition for whatever discretionary time is left from service- and production-oriented activities.

MANAGEMENT OF THE QUALITY TRAINING FUNCTION

In view of the major issues training for quality is facing, there has to be an organized and integrated approach to management of quality training in this environment. Some key components of this are

- A delineation of responsibilities for who contributes and in what ways
- A strong and unswerving focus on the customer—internal and external
- A plan established with clear strategies and tactics for quality training
- A budget to fund the plan

Responsibilities. Training for quality, and the TQM system the training supports, can succeed only if there is accountability and responsibility for its implementation and effectiveness. This accountability and responsibility lies with the same group that it does in any other key competitive or developmental strategy—with the leadership team. It is their responsibility to agree on the strategy and assure that it will support the other operational, cultural, and financial corporate strategies. They also have a responsibility to review and evaluate the results of the training strategy. They are not responsible for the planning, design, and execution of the quality strategy; this responsibility generally lies with a component of the human resources function, with technical support provided by key quality professionals.

The responsible parties are

- *Executive leadership:* The executive team (ET) bears the responsibility for creating a quality culture in the organization. A quality culture is a product of behaviors, skills, tools, and methods as they are applied to the work. These changes don't come about without showing people "how" to implement and sustain this culture. Therefore the ET must become educated in quality and stimulate their professional development team to offer options for training for quality. On the basis of these options, the ET will then develop and approve a strategy and strategic goals for the quality training effort. This effort may be organizationwide and long-term (3 to 5 years), or very narrowly focused on a particular segment of the organization or product/service line, and planned for a relatively short duration.
- *Human resources:* The human resources (HR) function (or a subfunction) bears the responsibility for implementing the quality training strategy. The implementation activities include the selection of subject matter, training design and delivery, and establishing an evaluation process. This is integrated into other corporate training activities and follows the same implementation process. The subject matter may be internally sourced, or may be outsourced to external quality training providers. The major difference between how this is approached now compared to the past is that there is a strong trend to seamlessly integrate the quality training into the professional development curriculum and to include a high degree of customization to reflect the organization's culture. This is especially true for organizations that have a mature Total Quality Management system in place.
- *The quality professionals:* The quality professionals (or Quality department) bear the responsibility to collaborate with the HR professionals to share their technical expertise on quality, much the same as key sales professional would share their expertise in developing the curriculum for sales training. This is also a departure from the past, when organizations had elaborate (and sometimes very large) Quality departments that identified, developed, and delivered the quality training, separate from the training department. This created barriers in the implementation of TQM as an integral part of all activities (Big Q) and contributed to the "quality versus real work" dilemma of the late 1980s and early 1990s.

Focusing on the Customer. An underlying principle of quality is to have an unswerving focus on the customer. Training for quality demands the same. A clear understanding of who the customers are, what their needs are, and what the features should be of a training strategy and the subsequent training subject matter that responds to those needs are critical components in training for quality. A contemporary and integrated training system for quality requires an organization to design the system using a process that incorporates all of the basics of quality planning.

A clear understanding of the customer means that all of those who will participate or benefit from the quality training must be considered in the design and delivery. Often organizations discover, too late, that the subject matter and delivery mechanisms of the quality training have been developed on the basis of how course designers *perceive* who the customers are and what their needs may be. Responsive organizations carefully approach this identification of customers and their objectives, and communicate how the quality training can help achieve those objectives. Many times, for lack of a clearly defined corporate training strategy, organizations waste huge amounts of time and money developing quality training or training associates on tools and techniques that they will never use. It was commonplace in the past for organizations to measure their success in quality in terms of the number of individuals they trained and the number of subjects they were trained in.

Developing a Training Plan for Quality. Developing the strategic training plan for quality is critical to the success of any TQM implementation. A strategic training plan addresses these key areas: quality awareness, executive education, management training, technical training, resources, budgeting, and staffing.

Quality Awareness. This addresses the foundation and principles of quality: the definition of quality; the quality processes of improvement, planning, and control (the Juran Trilogy); customer focus; measurement and data collection; reward and recognition; teamwork; and introduction to quality tools. The objective of quality awareness is to convey a basic understanding of

- Why quality is important
- What quality means in our environment
- How quality affects our daily work
- Where we can begin to apply quality concepts and techniques

Organizations have approached training for quality awareness in a variety of ways: (1) They have looked upon this awareness training as all that is necessary for a quality system implementation. (Just tell them and they will do it.) (2) They have implemented various types of technical quality training (statistical quality control, quality improvement process, benchmarking, etc.), ignoring the necessity to establish a foundation for understanding why this is important, a basic requirement for success in adult learning (Knowles 1980). (3) They have focused the quality awareness training on intermittent levels within the organization and ignored others, thereby creating an imbalance in basic knowledge within the organization.

Quality awareness training is critical to the success of any TQM implementation. The training should start at the top of the organization as the introductory component of the executive education. Our experience has shown us that, while many executives have become educated in the language and methods of quality, the diversity in their individual backgrounds has prevented them from finding the common threads to tie all of their collective knowledge together. Developing comprehensive quality awareness subject matter is an effective method to galvanize the thinking of the executive team toward quality and set the stage for initiating the quality training process for the rest of the organization.

Organizations that have won the Malcolm Baldrige National Quality Award (MBNQA), or have seriously competed for it, have developed clear and organized quality awareness training for all employees. Typically, the training is delivered to everyone in the organization, then to all new employees as part of their orientation. This material presents in very basic terms the organization's quality philosophy and how employees are expected to support it.

The United States Customs Service has instituted a quality effort it calls "People, Processes and Partnership." Vice President Al Gore has called the Customs Service the "vanguard" in the reinvention of the United States government to become more customer-focused and businesslike. The awareness training material in "People, Processes and Partnership" is focused on first-line supervisory personnel (above nonexempt and below first-line managers). Of particular interest is Day 3 of the training (Table 16.1), when the entire day is devoted to a description and discussion of the current union contract. Many companies have treated this subject as a separate issue, failing to understand the value of integrating it with quality training. One of the key strategies of the U.S. Customs Service in their reinvention efforts is to develop a strong working relationship with the union.

Executive Education. If quality awareness is the beginning of the training journey for the executive team then where does the journey end? It doesn't! Quality training is a systematic process that is continuously evolved and integrated into the organization's professional development process. Previously, executive education was treated in the same way as other quality training. Executives were asked to gather as a group, and a trainer or lecturer would impart knowledge to them. Given the changes the business environment has undergone these days, the approach has been modified to include a number of other options, both in delivery and content. The subject matter includes the primary subject matter of a TQM system:

TABLE 16.1 People, Processes and Partnership Detailed Agenda for Quality Awareness Training

Time	Description
Day 1	
8:00–9:00	Introduction: Welcome, participant introduction, course layout, logistics
9:00–10:00	Why change: Why customs is changing, what's changing
10:00–10:15	Break
10:15–11:00	Why change: Supervisor responsibilities
11:00–11:30	Change management: Discussion
11:30–12:30	Lunch
12:30–1:45	Change management: Exercise—Barriers to change, brainstorm
1:45–2:00	Break
2:00–2:30	Leadership skills: Coaching
2:30–3:15	Leadership skills: Effective teams, exercise—Toxic waste dump
3:15–3:45	Leadership skills: Effective meetings
3:45–4:15	Leadership skills: Making decisions, negotiating differences
4:15–4:30	Pluses and deltas
Day 2	
8:00–8:10	Review
8:10–9:10	Customer focus: Discussion
9:10–10:10	Business approaches: BPM Trilogy, process planning discussion
10:10–10:25	Break
10:25–11:15	Business approaches: Exercise—Build a paper airplane
11:15–11:30	Business approaches: Strategic problem solving
11:30–12:30	Lunch
12:30–1:10	Business approaches: Writing a mission statement
1:10–1:45	Measurement: Discussion
1:45–2:00	Break
2:00–2:25	Measurement: Variation
2:25–3:30	Measurement: Process control spread sheets, discussion
3:30–4:15	Empowerment: Video and debrief
4:15–4:30	Pluses and deltas
Day 3	
8:00–8:10	Review
8:10–9:45	Part/IBN/contract: Partnership, discussion
9:45–10:00	Break
10:00–11:15	Part/IBN/contract: Partnership, exercise—challenges
11:15–12:00	Part/IBN/contract: Interest-based negotiations, discussion
12:00–1:00	Lunch
1:00–1:30	Part/IBN/contract: Exercise—Part 2: Facts and myths
1:30–2:00	Part/IBN/contract: National agreement with NTEU
2:00–2:10	Break
2:10–3:20	Business analysis tools: Tools 1–4
3:20–3:30	Break
3:30–4:15	Business analysis tools: Tools (5), Pareto diagram discussion
4:15–4:30	Pluses and deltas
Day 4	
8:00–8:10	Review
8:10–9:30	Business analysis tools: Tools (6–10)
9:30–9:45	Break
9:45–10:45	Comparisons: Comparisons discussion, exercise: Scenarios
10:45–11:45	Why change: Linkages again, discussion
11:45–12:00	Pluses and deltas

Source: United States Customs Service.

- Awareness
- Quality leadership
- Roles and responsibilities
- Reward and recognition
- Team processes
- Strategic quality planning
- Customer satisfaction and loyalty
- Benchmarking
- Customer supplier relationships
- Business process quality
- Self-directed work teams

The delivery process has been enhanced. A critical goal for executive quality training is that the executives always be at the leading edge of the organizational learning curve. Executives do not necessarily need to know all of the technical how-to's of a particular subject. However, it is critical for them to be able to articulate what the training is and why it is important. Some of the contemporary delivery techniques that are particularly well suited for executives are

Modular training: Breaking down the training subject matter into bite-sized pieces of no more than 2 hours in length allows a module to be inserted into a scheduled meeting. This minimizes the impact on executive time, provides a break of pattern of a traditional meeting agenda, and makes the subject matter easier to present and digest. It also exposes the executives to a steady flow of quality information.

Just-in-time training: Any training is best delivered as it is required. This allows the recipient to immediately put the knowledge to use (80 percent of what is learned and immediately applied outside of the training environment is retained). For executives, just-in-time training means receiving training in time to support the organization's quality effort, at the leading edge of the implementation time line. The executives' responsibility is to know and understand what quality training is being given and why it is important for the organization to learn and use this subject matter. Their role is promoting the application of the knowledge by others within the organization as well as demonstrating their own application of it. Executives play this role in various ways: by participating in the executive reviews, by taking part in the rollout of the quality training (e.g., presenting an introductory portion of a training course), and by applying the subject matter in their everyday work.

Mentoring: A practical and effective approach to quality training for executives is to use a quality expert, on a regularly scheduled basis, as a personal mentor or coach. This allows the executive to receive professional one-on-one guidance. This will expose the executive to the quality subject matter while applying it to matters of executive concern. Through questions and challenges of concepts and techniques, the executive can develop a personal understanding and sense of confidence. This technique overcomes the challenges of executive time and just-in-time exposure that are posed by group training sessions.

Lecture by peers: Most executives feel more comfortable "hearing it from someone in a situation similar to mine." Peer lecture adds a sense of reality to the quality subject matter. This is best accomplished by having other executives, either internal or external, present their experiences and challenges. Hearing how others at similar levels of responsibility and in similar environments have learned, applied, and improved on quality management applications is an effective learning method for executives.

Self-study: Another personalized learning technique that is effective with executives, is to provide them with the materials, tools a plan to engage in a systematic quality education process. This is crafted jointly by the executive and an internal or external quality expert. There are scheduled

review points where the quality expert will consult with the executive to assure conformance to the education plan and exploitation of opportunities to apply the knowledge. Self-study is usually applied in conjunction with the mentoring approach.

Conferences: Attending quality conferences and public seminars gives the executive the flexibility to pick and choose specific subject matter and applications which are the most appropriate. This method is most effectively executed when the executive is matching the learning experiences to the company-wide quality management implementation plan or a specific quality application, such as business process quality, strategic quality planning, self-directed work teams, etc.

Budget Rent-A-Car Company provides an example of a quality training curriculum for executives (Table 16.2). The executive team is called the Quality Committee. The committee designed a comprehensive package of quality subject matter to support a 3-year TQM implementation.

TABLE 16.2 Budget Rent-a-Car Quality Committee

Unit	Description
	Introduction
Section 1	Workshop objectives
Section 2	Why TQM at Budget Overview Objectives Opportunities and advantages Case examples of quality and definition Summary
Section 3	How to think about quality Overview Objectives Who are the customers? How to think about total quality The results What is total quality management? Measuring quality Process measurement Summary
Section 5	Budget's TQM implementation plan Overview Objectives The roadmap Budget's infrastructure Roles and responsibilities The quality-driven organization Upper managers' roles Integrating versus separating quality responsibility More overhead and paperwork? Team operations Project mission statements: publication The project team Contrasting thought processes Working together as a team Communications skills Summary

TABLE 16.2 Budget Rent-a-Car Quality Committee *(Continued)*

Unit	Description
Section 6	Quality improvement Overview Objectives Examples of quality improvement Revolutionary improvement Budget's structured quality improvement process Evaluate alternatives Quality tool: Remedy selection matrix Summary
Section 7	Quality planning Overview Objectives Quality planning versus quality improvement Examples of quality planning The process and tools But we do not have time Summary
Section 8	Quality control Overview Objectives The quality control process Summary
Section 9	Quality for work unit teams Overview Objectives Summary
Section 10	Selecting the correct quality process to help guide your project Overview Objectives Selecting the correct quality process Guidelines for identifying the type of project Relationships among the three quality processes Summary
Section 11	Role for suppliers Overview Objectives Return to the triple role model Summary
Section 12	Strategic quality planning Overview Objectives What is strategic quality planning? The Quality Committee's Role in Strategic Quality Planning Summary
Section 13	Quality Committee meetings Importance of planning the meeting Agenda: Initial quality committee meeting Quality tool: Opportunity selection matrix Agenda: Second quality committee meeting Planning for reviews

Source: Budget Rent-a-Car Company.

Management Training. Management-level employees are usually the first candidates for quality training. This group includes the organization levels from first-line manager (just below the executive level) to supervisor. Individuals from these levels usually make up the first group of employees to "break the ice" in learning and using quality management concepts and techniques. They make up the membership of pilot quality improvement teams, business process quality management teams, quality planning teams, etc. Whereas the executives are trained in broad strategy and concepts, in preparation for their leadership roles, these individuals receive an abbreviated version of the executive subject matter, and more detailed information on the tools, techniques, and methods. They must understand the how-to's of a TQM system implementation.

Management training focuses on both the technical and human side of quality. Management's quality knowledge must go beyond the strategic quality plan to include quality improvement tools. Additionally, they must be trained to be sensitive to the organizational culture. Most TQM implementation failures are attributable to a lack of attention to this group of individuals. The lack of attention may take the form of failure to provide quality training or to consider their input in redefining the quality culture. Quality training subject matter for this group will fall in both the strategic and tactical categories. Some of the subjects, grouped by category, are shown in Table 16.3. Table 16.4 is a day plan of quality improvement training for managers offered by Juran Institute.

Technical Training. This type of quality training consists of a wide variety of tools and techniques that enhance the employees' ability to collect and analyze data and present the resulting information for decision making. Because concern for quality has permeated virtually every industry and organization, these tools and techniques vary greatly in type and application. There are, however, a core group of them that are applicable in most industries. A prime example of this is a sample curriculum (Table 16.5) from Florida Power and Light Co. for "Application Expert," a series of training workshops to develop internal experts in statistical quality control (SQC). (FP&L was the recipient of the Deming Prize in 1989, the first non-Japanese company to accomplish this.)

Resources. Every quality training program needs resources. There must be a purposeful effort to identify the staffing and materials funding necessary to achieve quality training goals. Organizations have begun to understand the value of an organized and focused quality training program. They also realize that there has to be a resource commitment made that is visible and actionable by those responsible for carrying out the training. There have been many instances

TABLE 16.3 Management Training Subjects

Strategic	Tactical
Developing strategic measures and goals	Quality processes
Deploying the strategic quality plan	• Improvement
Understanding business processes	• Planning
Quality systems	• Control
Quality culture	Quality tools
• Quality values	Facilitation skills
• Empowered employees	Communication skills
• Customer focus	Data collection and analysis
• Collaboration	Inspection and measurement
• Commitment	Assessments
• Creativity	Cost of quality
Reward and recognition	Statistical methods
Review and audit	Quality team roles and responsibilities
	Benchmarking
	Self-directed work teams

TABLE 16.4 Quality Improvement for Managers

Time	Description
Day 1	
8:00–8:30	**Introduction**
8:30–10:00	**Module 1: What is Quality?**—Overview, objectives, what is quality? Who are the customers?, external customers, triple role, total quality
10:00–10:15	**Break**
10:15–12:00	**Module 2: What is TQM?**—Overview, objectives, why have total quality management?, delighted customers, empowered employees, higher revenue, lower cost and the cost of poor quality, cost of poor quality categories, the results, what is total quality management?
12:00–1:00	**Lunch**
1:00–2:45	**Module 3: The Juran Trilogy**—Overview, objectives, a financial analogy, quality planning, quality control, quality improvement
2:45–3:00	**Break**
3:00–4:30	**Module 4: Organizing for Quality Improvement, Quality Councils and Project Teams**—Overview, objectives, quality council, cross-functional teams, roles and responsibilities
4:30–5:00	**Questions and Answers/Wrap-up**
5:00	**Adjourn**
Day 2	
8:30–9:00	**Review Day One**
9:00–10:30	**Module 5: The Diagnostic Journey**—Overview, objectives, analysis of symptoms, Pareto diagram, flow diagrams, formulate theories of causes
10:30–10:45	**Break**
10:45–12:00	**Module 5: Cont'd.**—Brainstorming: generating creative ideas, the cause-effect diagram, test theories, stratification, histograms, scatter diagram
12:00–1:00	**Lunch**
1:00–2:30	**Module 6: The Remedial Journey**—Overview, objectives, the remedial journey, consider alternatives, design controls, provide a means to measure the process, establish the control standards, determine how actual performance compares to the standard, holding the gains
2:30–2:45	**Break**
2:45–4:00	**Module 7: Your Role in TQM**—Overview, objectives, change in results, reward and recognition
4:00–5:00	**Questions and Answers/Wrap-up**
5:00	A**djourn**

where an aggressive training plan for quality has been developed and not implemented. The reasons stated are invariably lack of funds, time, or people to carry out the plan. Why haven't these resource requirements been considered? The common approach has been to develop these plans, then look into departmental budgets to fund the implementation. These funds are usually committed to other endeavors and are either refused or begrudgingly committed. Training for quality has to be budgeted, staffed and planned like any other business activity. If these resources are to be part of departmental budgets, the departments have to be part of the planning process (as customers) and see the benefits. World-class quality organizations, e.g., Malcolm Baldrige National Quality Award winners, budget a minimum of 40 hours per year for quality-related training. Many of them have a very small staff of trainers, depending instead on departmental volunteers to carry out the bulk of the training efforts. These volunteers are qualified by the quality-training professionals and bring an air of "credibility" to the training experience. The funding for quality training is planned for and budgeted by the Training department or individual departments. The Training department generally budgets for all developmental costs. The Quality department provides a technical consulting role to the training department in the development of materials and qualification of instructors.

TABLE 16.5 Technical Training

Application Expert—Session I	
Unit 1	Basic concepts of Total Quality Control
Unit 2	Basic data analysis
Unit 3	Histograms and frequency distributions
Unit 4	Overview of probability distributions
Unit 5	Discrete probability distributions
Unit 6	The normal distribution
Unit 7	Estimation of the mean
Unit 8	Introduction to hypothesis testing
Unit 9	Test of the mean with a known population variance
Unit 10	Test of the mean with an unknown population variance
Unit 11	Test of a single population variance
Unit 12	Estimation of the population variance
Unit 13	Test of two population variances
Unit 14	Tests of two population means
Application Expert—Session II	
Unit 1	Test of one proportion
Unit 2	Test of two proportions
Unit 3	Contingency tables
Unit 4	Review/update
Unit 5	Sampling
Unit 6	One-way analysis of variance (ANOVA)
Unit 7	Two-way ANOVA
Unit 8	Estimation of parameters
Unit 9	Project examples
Unit 10	Introduction to control charts
Unit 11	*X*-bar and *R* charts
Unit 12	*X* and *R* charts
Unit 13	*X* and *R* charts (individual observations)
Unit 14	Process evaluation
Unit 15	*np* chart
Unit 16	*p* chart
Unit 17	*c* and *u* charts
Application Expert—Session III	
Unit 1	Design of experiments
Unit 2	Correlation (I)
Unit 3	Correlation (II)
Unit 4	Regression (I)
Unit 5	Regression (II)
Unit 6	Regression (III)
Unit 7	Regression (IV)
Unit 8	Reliability overview
Unit 9	Reliability *A* type
Unit 10	Reliability—EMEA
Unit 11	Reliability—Weibull
Unit 12	Reliability—*B* type

Source: Florida Power and Light Co.

Budgeting. Training for quality, as any other key activity, requires a dedicated financial commitment. These finances can be centralized or decentralized. However, they need to be committed specifically to the strategy and tactics that support training for quality. Many organizations have chosen a decentralized approach, in which each individual business unit designates a segment of its overall training budget to training for quality. The quality projects that are planned for the year are analyzed for training requirements and prioritized. The budget for quality training is then matrixed against these requirements and the executives make specific decisions whether to increase, realign, or decrease their quality training resources. Identifying and budgeting for what is to be achieved, rather than letting the amount of money available drive how much training will be done, gives the executives a different perspective on training for quality and budgeting. It allows them to make return-on-investment decisions that can dramatically change the organization's view of the value of training for quality.

Staffing. The personnel requirements necessary to support training for quality have changed significantly over the past decade. Formerly, there was dedicated staffing for all aspects of training for quality, from development of materials to delivery. These functions were among the key roles of the "quality department." As the need for quality training increased, these departments tended to grow, sometimes exceeding 20 to 30 people. As organizations began to re-engineer themselves, these departments became targets to consolidate and streamline with the corporate training function. Currently there are many basic types of staffing options that organizations utilize. There is, however, one constant trend: quality departments and the training function for quality are leaner and multifunctional. Various staffing structures are described below.

Centralized: This is the traditional structure, in which there is a dedicated group of individuals that research, develop, instruct, and evaluate the quality-training curriculum. Many organizations have found that this structure tends to segregate the quality-training strategy from the general education strategies, creating a learning barrier. Participants view the quality training as something distinctly different from other professional development activities.

Hub and spoke: This is a more common arrangement for quality training. It consists of a training coordinator or manager at the headquarters unit with a "dotted line" relationship to training professionals in other divisions or business units. These individuals are usually part of the quality department infrastructure that is deployed throughout the organization. A good example of the hub-and-spoke structure is employed by the Golden Hope Plantations, S/B, in Kuala Lumpur, Malaysia. This organization has successfully applied the hub-and-spoke model to headquarters and each of its four major business units. These training professionals report directly to the division general manager and have a "dotted line" relationship to the director of Quality and Environment. The director has a strong collaborative relationship with the director of Human Resources, who has the overall training responsibility. This is a very efficient and effective professional development approach.

Decentralized: In this model, each department, division, or business unit has its own approach to training for quality. There is a common strategy. However each unit is charged with developing its own tactics and deploying them within their areas of responsibilities. This is not an effective approach to quality training and takes a much higher level of coordination.

Shared: This is similar to the hub-and-spoke model, with slight enhancements. The trainers draft volunteers from the organization to support the training plan. These volunteers are selected from those who have received quality training in the past and may be supporting the quality system implementation as facilitator, team leader, or team member.

External quality consultants: In the 1990s, there has been an exponential increase in the availability of external quality consultants. For many organizations this has provided an effective supplement to their training efforts and already lean quality departments. External quality

consultants provide an immediate, qualified resource that can support the organization's planning, development, delivery, and evaluation of training for quality.

CURRICULUM DESIGN

Curriculum design is the mainstay of a successful quality training system. The process by which the subject matter is selected and shaped into a curriculum is of critical concern. Key elements of this process are

- Analysis of customer needs
- Instructional design
- Content development
- Pilot testing

In quality training, the designers of the training curriculum and subject matter must understand clearly the needs of the trainees. First among these needs are their business needs. In the past, training for quality was limited to a basic curriculum of tools and techniques, and it was left up to the customers (those benefiting from the training) to determine how to best apply the training to their business environment. Contemporary quality curriculum design focuses on those areas where quality can support the business objectives, through either some skill application or philosophical understanding.

Once the business needs are identified, the designers develop learning objectives (outcomes) and tie them to method of instruction (instructional design). Instructional design consists of developing specific "learning events" or "educational tactics" that can assist an individual in translating written word into knowledge. These learning events may take the form of problem-solving exercises, role playing, case study analysis, group activities, and other interactive learning techniques. The key objective is to minimize the traditional passive approaches to learning (lecture and reading) in favor of a more interactive, "hands-on" approach. An effective quality-training curriculum will string these learning events together, paying particular attention to the timing, content, sequence, and technique, to successfully bridge from one to another while continuing to focus on achieving the learning objectives.

Content development is also based on the learning objectives, which, in turn, is influenced by three factors: the performance needs, job requirements, and audience.

The *performance needs* represent the difference between the level of skills, knowledge, and abilities required to meet the business needs and the current level the target audience possesses.

The *job requirements* identify the specific learning that is missing and specify how the skill, knowledge, or ability will be used in the execution of the job. The knowledge level of the audience will determine the level of complexity appropriate to assure an effective learning experience. With all of these things considered, designers may then set to work at developing quality subject matter that will meet the learning objectives and create an effective and enjoyable learning experience.

Once the content has been developed, the quality training should be pilot-tested with a group of objective participants. This group can consist of trainers or a randomly selected group of the target participants. The key to a successful pilot is that the participants be given a specific set of instructions describing how to evaluate the content and design. The pilot testing is time-consuming. If the test is improperly planned, it will be ineffective. However, with a pilot audience that has been properly prepared, it can become a seamless step in the curriculum design process that pays off in a more effective educational product that clearly achieves the learning objectives.

Figure 16.1 is a flowchart depicting the product development process used by Juran Institute. The flowchart depicts some steps that have not been described above, specifically having to do with marketing and an annual plan. These steps are included in the Juran Institute process because its

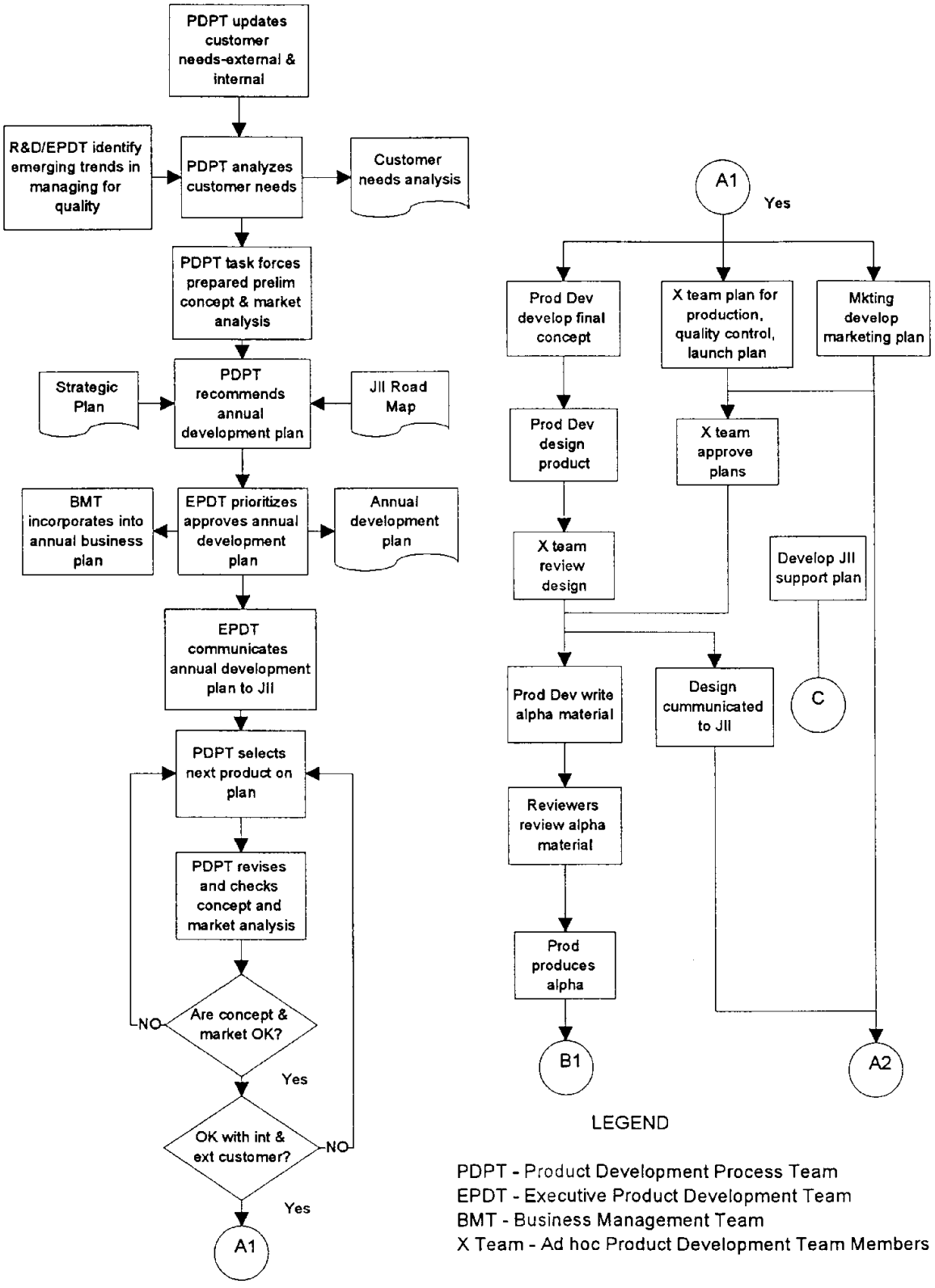

FIGURE 16.1 Product development process.

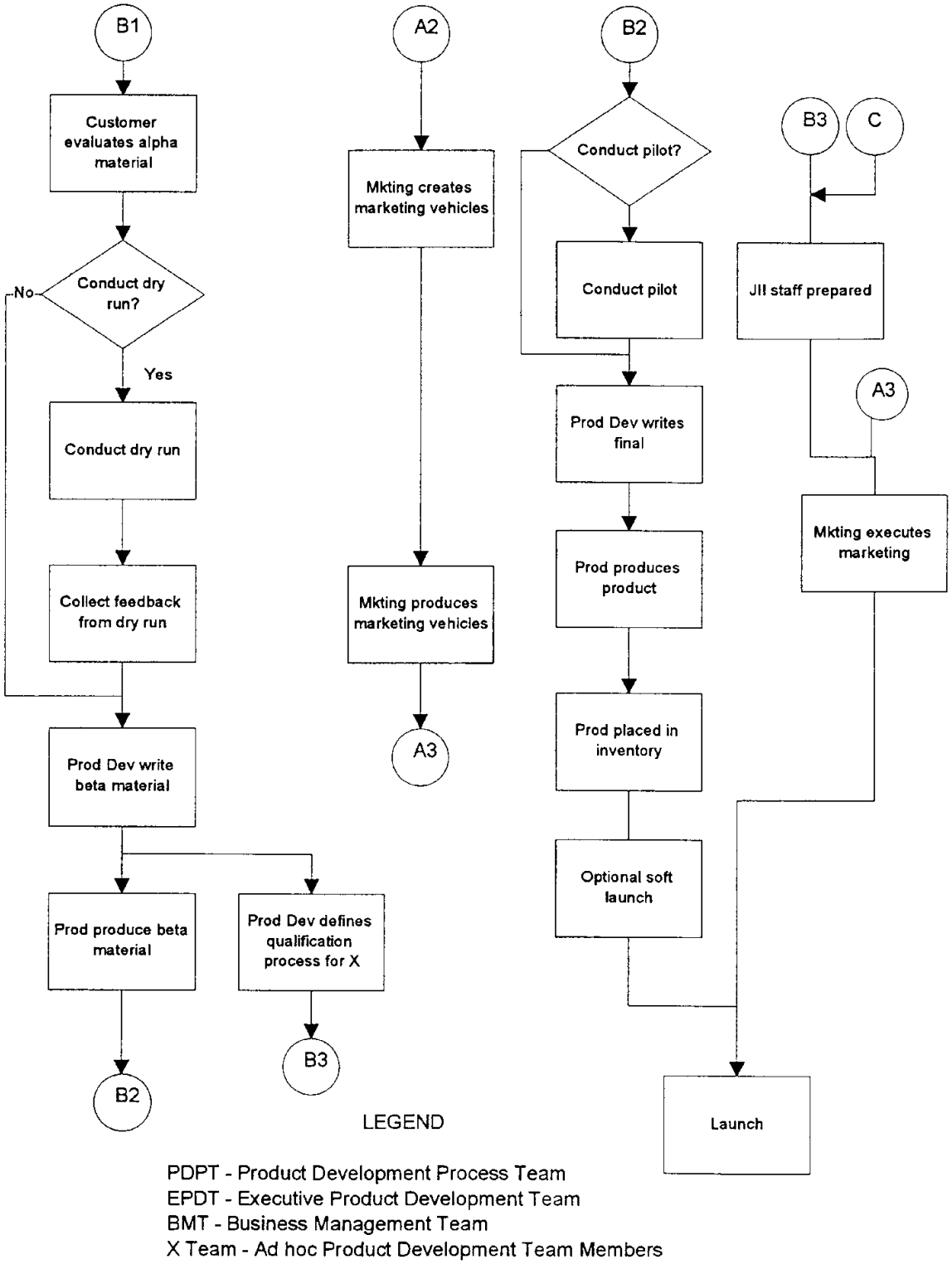

FIGURE 16.1 *(Continued)*

quality-training products (text materials, videos, software, and seminars) are for public distribution as well as for internal use. A process for developing product only for internal use would normally exclude these steps.

IMPLEMENTATION AND DELIVERY

Training for quality is usually delivered in two steps:

1. *Implementation planning and preparation:* The assessment, selection, and deployment of delivery media, mechanisms, and facilities; the establishment of physical infrastructure and information technology support; assignment of support staff and other resources.
2. *Delivery:* Transfer of the training content (subject matter) to the students, in an individual or group setting.

While instructional design is usually optimized around a set of delivery methods and media, the implementation planner still has a wide choice of alternatives in arriving at the most effective and also most cost-efficient solution.

Instructional Techniques. Before selecting delivery media, the implementation designer must decide what instructional techniques will be most appropriate for delivering the training. Training will be most effective in transferring skills and enhancing knowledge when the following conditions exist:

Program material is easily available to the student.

The training is measurable on the basis of acquired competency.

Facilitation is provided (if delivery occurs in a group setting).

Materials possess high graphic clarity.

There is interactive content.

There is a high degree of learner control over the pace and receipt of training.

The training includes performance-based testing and scoring.

The training materials are reusable and revisable.

The training is supported by practice and exercise.

Some of these conditions conflict with the choice of delivery medium, requiring the designer to make trade-offs. For instance, if learner control is an important requirement, then classroom training delivered by a live trainer may be a poor choice.

Delivery Systems, Media, and Devices. The choice of instructional techniques will determine what delivery system, medium (or media, as appropriate), and devices will be the most effective and cost-efficient for a given training event. Delivery system options include: (1) Lecture-based, (2) computer-based, and (3) video-based delivery systems, each with its related set of delivery media and support technologies.

The available media options include:

- Live lecture
- Audience-response systems (ARS)
- Workbooks and case studies
- Audiotape
- Live video (TV)

- Recorded video: tape, videodisc or CD-ROM
- Multimedia computer (capable of delivering text, audio, motion video, and graphics)

The cost aspect of delivery system and media choice is critical. The normal range of development times for the most common delivery approaches varies greatly. For each delivery approach, development time is the time required to create 1 hour of delivered training (known as student contact time). Instructor-led delivery requires, on the average, 6 to 10 development hours per contact hour; workbook-based delivery requires 40 to 50 hours, textual computer-based training requires 100 to 200 hours, and interactive multimedia videodisk training could demand as many as 200 to 500 development hours per student contact hour.

Additional factors affecting the total cost of quality training include: students' salary, travel expense, and trainer-related costs (salary and travel for internal trainers, fees and travel for externally sourced consultants and facilitators).

Summary. Instructor-led programs are appropriate when the training request requires quick response and the design calls for frequent interaction. Computer-based training is more efficient for a large audience across which to defray the costs. It requires adequate development time. Multimedia approaches are best when the training program includes multiple activities (information presentation, exercises, case studies, laboratory or practice sessions, etc.). While usually expensive, multimedia approaches help avoid bad compromises, like reading books from computer screens or using "talking heads" instead of graphic illustration.

External versus Internal Sourcing. For maximum training effectiveness, the quality of the delivery system—and in particular that of the trainers—is critical. The most appropriate and best delivery system or trainers may not always be available within an organization. For this reason the sourcing of delivery systems and trainers (including facilitators and sometimes even support personnel) is an important decision during implementation planning.

This decision usually depends on two factors: (1) the size of the training budget and (2) training policy.

In many organizations the quality training budget allows only the most basic training skills to be established internally—usually limited to training on quality control, standardization, and basic quality assurance techniques. Specialized subject matter knowledge and training skills, such as related to business process design and re-engineering, benchmarking, cost of quality analysis, strategic quality planning, and the like, are considered unaffordable by many organizations. These sorts of training subjects and skills, and related delivery systems will probably be outsourced.

On the other hand, there are even large organizations which, as a matter of policy, do not internally source any of their job- or skills-related training—including training for quality. These organizations routinely outsource all their quality-related training using hired facilitators, trainers, and consultants. One favored source for such externally acquired training is the academic community: Training in a number of quality-related topics is available from faculty members of business and engineering schools.

Training Methods. There continues to be a competition between time-tested, conventional training methods and technology-based knowledge transfer, which approaches the problem in another way. In each case, one can again focus on individualized methods and group training.

Conventional Training Methods. *On-the-job training* (OJT) is still an effective training method in use today, specifically applied to the training of quality improvement and quality planning teams. In an OJT environment, the student (learner) performs the job about which the training is provided under the supervision of an experienced trainer or mentor. This approach is particularly effective for such subjects as quality control, quality assurance, process design or redesign, benchmarking, and general problem solving (e.g., quality improvement).

Independent study, by definition, is any method of studying alone. Independent study in the form of self-instruction (where students take responsibility for their own learning) is frequently used to acquire the knowledge and skills needed for quality management tools.

Self-directed learning is an instructional approach in which the highly motivated student takes the initiative to master preplanned training material. Self-directed learning may be completed by the individual trainee, using self-instructional packages, or conducted with the help of trainers, facilitators, mentors, etc. The student is provided a study plan and all the materials needed to execute it. These are usually text, less frequently graphics and visual aids. Such packages are known as *learning resource packages.*

Group learning methods generally do not require special technology, equipment, or facilities. Each method, however, requires a skilled instructor to plan, prepare, present, and facilitate the learning related activities.

Instructor-led group training methods are preferable when:

- Skilled instructors are available
- Knowledge must be transferred to a large number of students
- Training (content and instructional design) must be developed and delivered within a short time
- Students lack basic learning skills (such as reading and arithmetic)
- Subject matter is difficult to comprehend
- Students can be convened in one place, on a predetermined schedule

The particular methods of group training include: lecture, discussion, presentation and demonstration, case studies, role playing, and instructional games. Again, depending on the quality-related subject, each one of these methods finds effective use in training for quality.

Technology-Based Training. Technology-based training (TBT) teaches, manages, and supports the instruction process. Most importantly, it is capable of making learning easier and more effective. TBT includes computer-supported learning resources, computer-managed instruction and computer-assisted instruction.

Computer-supported learning resources neither teach nor manage the instructional process; they represent the library or repository of resources from which a student may learn.

Computer-managed instruction (CMI) is the management of instruction by computers. In a CMI environment, learning resources do not have to be technology-based, and CMI can function independently as the manager of the instruction process. The key point is that CMI does not directly involve learning; however, it offers the power to make learning more efficient and effective.

As a management system, CMI operates in three modes: testing, study prescription, and record keeping. Of these, study prescription is the mode most directly related to the actual instructional process: the CMI system generates an instructional prescription for each unmastered learning objective. Accordingly, each student can receive individualized study prescriptions. This significantly reduces the time each student needs to study and is the basis for the instructional efficiencies associated with CMI.

Computer-assisted instruction (CAI) uses a computer in the instructional process for knowledge transfer to the student. CAI may operate in several modes of instruction, such as tutorial, exercise and practice, instructional games, modeling and simulation, and problem solving.

In training for quality, each of the modes of CAI can be effective, depending on the subject matter. Exercise and practice is used mainly in tools training; problem solving and tutorial are the key modalities for training in the basic quality management methodologies, such as quality planning, control, and improvement. Modeling and simulation are highly effective in training related to business process design, re-engineering, and analysis. Instructional games are primarily used in teaching training and facilitation skills, leadership skills, collaborative team building, and meeting-management skills.

Distance learning is an increasingly productive version of CAI: It supplies instruction to students dispersed over wide geographic areas. It enables the simultaneous study of advanced subjects by groups of individuals who could not otherwise attend a learning event in a single geographic loca-

tion at the same time. Distance learning also allows the possibility of participation in learning activities at a time of the student's choice.

Distant students can be organized either as individuals (located in a variety of places), or groups (at one or several sites).

In practice, quality-related distance learning programs are based on one of two strategies: (1) video teleconferencing (group synchronous, i.e., all students participate simultaneously) or (2) computer conferencing (individual or group, synchronous or asynchronous).

The National Technology University (NTU) is an excellent example of video teleconferencing, a model for which is the regular classroom. Video teleconferencing courses emanate from some 30 participating universities with uplinks or broadcast stations. Direct phone lines from the receiving sites to the campus classroom provide for instructor-student interaction. Electronic mail and telephone response service supplement this interaction. NTU has broadcast a number of quality-related courses which have been reported as challenging and highly applicable to the students' work environment.

Learning Laboratories. Most modern quality management processes and related tools require the introduction and use of new technologies—especially as they relate to the management of information flow and data. Many organizations, however, discover that their employees often do not have the skills to capitalize on these new technologies.

How does an organization integrate new technology into the way it manages quality? How does the organization get its employees to utilize the new technology? Who needs to be trained?

More than a classroom experience is required to answer these questions. Hands-on learning experiences must be included in the training. Learning laboratories provide the means to achieve this. They are specifically designed for education and training and not for technical research or production. The model of complete knowledge transfer by means of learning laboratories comprises:

- Classroom introduction to quality management concepts through lecture, discussion and team activities
- Training exercises and case studies
- Practice with real tools and applications in a realistic, workplacelike environment

The three types of learning laboratories most frequently used in training for quality are (1) computer-based, (2) programmable automation, and (3) manufacturing equipment laboratories.

Collaborative Training Systems. Collaborative training systems are the most advanced versions of computer teleconferencing. Over the past decade, three major developments have contributed to the growth of participative, on-line training and collaborative work sharing. These include:

1. The significant increase in the internal training needs of organizations in both the public and private sectors
2. The advent of work-process-oriented relationships based on collaborative structures such as project teams, empowered cross-functional teams, and self-directed work teams
3. The development of "groupware"—the class of systems and software that enable efficient communications and the collaborative implementation of projects within and among work teams

Employee Training. Over the past two decades, and more than ever before, internal employee training has become a key strategy and, in many cases a prerequisite for achieving business success. Many organizations in the United States, Japan, and Western Europe have launched massive training initiatives in the basics of business and technology, quality, and other strategic disciplines.

In an article in *Across the Board*, Steve Blickstein (1996) states that the education and training costs of U.S. businesses are now estimated at over $30 billion per year. The Saturn division of General Motors provides its 9200 workers an average of 90 hours of training per year. Saturn expects

all employees to spend about 5 percent of their time in training and education each year. Intel University now has a training budget equal to about 5.7 percent of payroll. Motorola University has a budget of $120 million per year and 14 branches in the United States, with more branches in Europe, Asia, and Latin America. IBM has a standing policy requiring every employee to receive a minimum of 40 hours of training every year.

Many companies have developed their own in-house world-class education programs—with related professional training organizations and support systems—for their employees. Some claim that they now provide over 80 percent of the training of their employees in-house, whereas a few years ago much more training was done by schools, consultants, and other outside providers.

Collaborative Work Practices. The application of collaborative computing technology to a variety of work shared by a number of individual or group participants results in collaborative work practices. These practices represent an increasingly useful, effective, and highly time- and cost-efficient way of carrying out shared work by participants who are geographically dispersed, or whose schedules conflict. Collaborative work practices allow specially trained experts (trainers, facilitators, team leaders, or process owners) to teach, and work on advanced solutions together with other professional participants, when a reasonable size group could not be assembled in a their own physical vicinity.

Collaborative work practices are based on the *team* as the basic work unit. The team may perform work in two modes: (1) *learning* as a team, and (2) *processing* as a team—executing tasks or activities learned, resulting in a specific *work product.* In either mode, participants can be organized, and geographically located either as individuals (located in many places) or as teams (the larger team may comprise several smaller subteams or squads, each located at a different place).

Participants—both team-member and individual—may work in one of two timing relationships: synchronous (all simultaneously) or asynchronous (at different times, usually of their own choosing). Each of these relationships offers specific advantages to the participants and to the organization implementing collaborative work practices. In practice, collaborative solutions are implemented by using a mix of these geographic and timing strategies.

"Groupware" and Collaborative Computing. Groupware is the generic term for software designed to be used by groups on a shared basis. Collaborative computing is the system of communications network and appropriate collection of applications. While these systems enable asynchronous and geographically separated efforts, collaborative computing supports more traditional teams as well. The system should train team members on a given subject (e.g., process improvement, programming, project management), provide tools to support the subsequent team efforts, and allow archiving and retrieval for current and future projects.

Training and Performance Support. Organizations face considerable challenges with their current training efforts:

- How to replicate success across the organization?
- How to measure the effectiveness of training?
- How to keep training, and work materials up-to-date, and relevant?
- How to reduce the costs of training, and teamwork?
- How to ensure the correct application of new skills and tools?
- How to provide "just-in-time" training?

The collaborative system should facilitate training, both in a classroom environment and at the desktop. Designing materials for both environments reduces development costs and provides continuity throughout the project cycle.

Measurement. The success of training, and collaborative projects is not obvious from casual observation; it has to be measured in terms of specific, widely accepted and understood metrics. These metrics include:

- Learning metrics (such as comprehension, retention, on-the-job application)
- Cycle time
- Work-product quality
- Individual and team productivity
- Cost

These metrics are developed from the identified critical system requirements prior to building a collaborative computing system, and, to the degree possible, the system should track, analyze, and report on these metrics automatically. These empirical data can be combined with focus groups or other techniques to assure the system is optimized.

EVALUATION

Why Evaluate? Evaluation is critical to effective training for quality. Evaluation is not just an afterthought but a necessary and systematic part of an effective training process for quality. Good training begins with an accurate assessment of training needs, and then proceeds through needs analysis, instructional design, and content development of training events, ending with more effective on-the-job and organizational performance of those trained.

Here we present practical guidance to assist training professionals to (1) select and design the evaluation approach, (2) evaluate the indicators of success, and (3) manage the evaluation process.

Systematic Approach to Training Evaluation. The classic framework of training evaluation is based on the simple four-part evaluation process for training, proposed by Donald Kirkpatrick in 1976. It assesses:

1. Trainees' reactions
2. Trainees' learning
3. Whether and how trainees are using what they learned
4. Whether and how the use of learning has enhanced job performance

Over the years this basic model has been modified by a number of authors and training professionals, primarily in the area of establishing intensive front-end evaluation. This modification allows a more objective measurement of the *incremental* learning accomplished during the training session. Another aspect of training evaluation is related to *retention*—which can only be assessed sometime after the training event, say 6 to 12 months or more.

In the case of training for quality, the function of evaluation is broader than simply checking to see whether a particular training event has achieved learning results. The purpose of quality-related training is to enhance the value of the products and services of the organization, through the systematic improvement of the skills and knowledge of trainees who contribute to those products and services. Ultimately, the purpose of training for quality is to enhance customer satisfaction and loyalty.

Therefore, in designing an evaluation approach for quality-related training, the evaluation must fit the strategic context of improving product and service quality. The implications for evaluation design are

Objectives of training for quality should be derived from the organizations's quality strategy—established through strategic quality planning.

Training for quality should be conducted only after the organization receiving training has deployed its quality measurement system.

Training for quality should be delivered on a prioritized basis such that those employees with direct effect on customer satisfaction receive training first. Trainees should be ready for the training and

have the prerequisite knowledge and preparation. Examples during training should include references to product and service quality; training sessions should also allow students to practice quality management skills, including appropriate tools. Students should leave training committed to the application of their newly acquired knowledge. Once back on their jobs, students need accurate and timely feedback on their impact on organizational performance, especially regarding customer satisfaction.

In designing evaluation of training for quality, the key question is how much and what sort of evaluation should be carried out. Evaluation design is a continuing process, since evaluations also must be continuously improved and adapted to changing needs. Evaluation will always work best when it has been part of the overall training strategy and training design. As with any reasonably complex process, managing the evaluation process should include the use of project management concepts, tools, and techniques, as well as professional quality management expertise as appropriate.

In summary, evaluation must be employed throughout the training process, not just during and after the training event itself. A good evaluation of training for quality will help assess:

1. Are the goals of training for quality linked to major business goals, and is the quality related training strategy driven by critical business needs?
2. Do training plans deliver the required amount of learning at the right time and in the most effective and efficient ways?
3. Are training outcomes (e.g., learning, retention, and application on the job to enhance organizational performance and customer satisfaction) being achieved?

As training for quality alone cannot meet business needs, the proper role for training evaluation is to help build strong partnerships between training professionals and their customers.

Why Training Fails. Training for quality can fail for a variety of rather conventional inadequacies: in facilities, in training materials, in leaders, and in budgets. Such inadequacies are usually obvious enough to generate alarm signals to those directing the training program. The more subtle reasons for failure are also the more serious, since they may generate only subtle alarm signals, or no signals at all. Such subtle reasons (Juran 1989) include:

- Lack of prior participation by line managers
- Too narrow a base
- Failure to change behavior

Management has a role to play in heading off failures of training programs. That role consists of laying down the necessary policies and guidelines, which include the need for a strategic plan for training for quality and the requirement that trainees should apply their new learning to their jobs.

THE FUTURE OF TRAINING FOR QUALITY

In any organization, the prime role of training is to develop work-related skills, knowledge, and expertise. Training for quality occupies a special position in the spectrum of training activities, as it supplies quality-management expertise that can have a major impact on the organization's relationship with its customers.

Quality management practices straddle the entire spectrum of organizational performance. In an industrial and manufacturing environment, training for quality traditionally addresses levels of performance related to operations and troubleshooting—primarily through training in quality control.

After World War II, and in particular as a result of the research and practical work of such experts as Deming, Feigenbaum, Ishikawa, and Juran, quality management began to shift its focus to quality improvement and planning for quality—with an attendant shift in the focus of training for quality.

Another, more recent, development has been the extension of training for quality to include training in teamwork, team building, meeting management, and team facilitation—as necessary methods and techniques supporting the implementation of quality management through the empowerment of teams and individual employees.

The coming century will see a further expansion of the training for quality into the *technological domain,* where problem-solving methodologies will be complemented and enhanced by artificial intelligence and collaborative computing techniques. Another expected development is the application of systems theory to quality-related training, as a shift in *systems thinking* takes place from a closed system view (e.g., technological and chemical processes, and related quality issues) to an open system view (e.g., organizational and business processes, with quality, information, and human-resource issues). Finally, the increasing relevance of *economic and financial* theory to quality management will require an extension of the training for quality to include economic and financial subjects (e.g., cost-of-quality analysis, activity-based management, and the like).

RESOURCES

Examples of Training for Quality. Examples of currently available, highly effective approaches and sources for quality-related training include:

American Society for Quality Control

American Society for Training and Development

Corporate universities (Motorola, Arthur Andersen, etc.)

IBM Quality Institute

Juran Institute

National Technological University (NTU)

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