CHOOSING A QUALITY CONTROL SYSTEM

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PREFACE

PRODUCT and service organizations alike agree that a quality control system of some type is desirable, if not absolutely necessary. There are over 24 quality control systems recommended for the control and improvement of quality and process; there are over 30 techniques and buzzwords suggested for implementing them; and to assist in learning about these systems and techniques, there are well over 200 courses, seminars, programs, and conferences available. This book discusses the pros and cons of these many alternatives and suggests how an effective system can be assembled or reconstructed by selecting and combining some basic engineering methods, some nonstatistical methods based on team efforts, and seven statistical tools, with assistance from the power of the computer. This logical system can be expanded and modified as required—later.

Having had an opportunity to observe the different requirements of different company cultures, the author found that there is no one best way to construct or modify a quality system plan that "fits all sizes." This obvious failing has not been made apparent in many highly structured courses to seminar leaders with "ivory tower" backgrounds. And there are CEOs who recognize the need for process control but have neither the background, interest, nor time to devote to it. This book presents the needs, the goals, the cautions, and suggested procedures in simplified terms, which should clarify the four areas to be considered in modifying or constructing an effective system for a company, with some of the precautions (people problems, training, and rewards) highlighted.

The food industry is emphasized, but the suggestions offered should be applicable to hardware manufacturers, process industries, and service organizations. Actual case histories are presented to illustrate how basic nonstatistical quality and process techniques have been used with varying degrees of success. The importance of these components of control and improvement aspects of the system are stressed. Pitfalls of blind trust in computer-assisted procedures are also illustrated.

The single theme is guidance in selecting and assembling the component parts for an effective quality and process system. The major thrust is at upper management, who would benefit the most by having assistance in selecting the right options from a veritable ocean of offerings. Process engineers, store managers, and production personnel would gain a whole new perspective on the basic operations of an effective quality/process control and improvement system. This book should provide guidance in their work in these areas. It should also provide established quality control managers and supervisors with a valuable reference for training quality technicians. It would be of perhaps even greater value to the novice in quality control, since it separates the essentials from the "buzzword of the day."

CONTENTS

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CHAPTER 1

Introduction

CHANCES are the Stone Age ancestor found that, if his hunting and defense weapon consisted of a club-shaped rock fastened to a length of tree branch, he could survive the attacks of small animals by clubbing them on the head. We can also guess that he eventually discovered that, if the edge of the club were chipped off to form a point, it would penetrate the hide of much larger animals, thus significantly increasing the possibility of prolonging his life in the event of an attack. If he were unlucky enough to break this club head with the sharp point, or if he were to lose it, we can be reasonably sure that, when he decided to make a replacement, he would attempt to chip one edge of a rock exactly like the one that worked so well before. This principle of survival is probably one of the earliest examples of quality control: "in order to survive, make it like the last one."

Through the centuries, there were guilds, trades, and craftsmen attempting to teach quality control by the same method: make it like the last one. It was not until Walter A. Shewhart of the Bell Telephone Laboratories sketched a control chart in a 1924 memorandum that the use of statistics was shown to provide a method of quantifying quality. This breakthrough assisted the worker in measuring how similar his product was to the last one he made, using specific numbers for comparison. It clarified why it was possible to make it somewhat like the last one, but not exactly. It applied useful numbers to variability. It led to the concepts of meaningful standards and specifications as well as the many other principles of quality control in use today.

CHOICES AND OBSTACLES

Over the years, "making it like the last one" has continued to be an accepted base for a quality control program. To this base has been added "make it better, cheaper, and quicker than the last one" "better than our competitor's" and "provide better, cheaper, and quicker services to our customers."

The techniques for accomplishing these added quality requirements are far more complicated than the basic statistical quality control procedures (see Figure 1.1). They vary widely, are occasionally very complicated, sometimes highly theoretical (and impractical), costly to implement, and not equally applicable to all goals, services, products, or companies. They should be used with caution. Some of these techniques are very effective—some are not. Subsequent chapters will discuss this further.

Dozens of excellent quality control techniques have been offered as "The best solution for your quality control," but very few can be successfully applied universally. Worse still, blindly combining two or more diverse systems may result in uncertainty, or even disaster. There are hundreds of books explaining the advantages of one or more systems of quality control. There are hundreds of computer programs containing combinations of approximately 90 quality control-related routines. There are quality control methods that are nonstatistical in nature. This overwhelming abundance of choices can be reduced to seven or eight essentials, but not until a number of obstacles can be resolved.

The first step in choosing a quality control system is to recognize the obstacles that exist in *your* industry, in *your* product, in *your* management, in *your* employees, in *your* methods, *your* suppliers, and *your* customers. Assembling the quality system that is most likely to succeed is possible only after these obstacles have been identified.

In the following chapter, the assorted definitions related to "quality" and "quality control" are discussed in some detail. The intent is certainly not to add to the confusion, but to show the wide selection of "quality principles" that are available. It has been suggested that a company should consider embracing one of the quality philosophies in the same manner that individuals choose to adhere to one religion or another: tradition, pressures of the environment, beliefs, and needs. This is not as radical a proposition as it first appears to be; most company decisions are based on similar philosophical selections. Of the many marketing options available, for example, each company will select the one that has worked in the past (tradition), is most likely to be successful in specific markets (pressures of the environment), is readily accepted by the company sales personnel (beliefs), or is demanded by the customer (needs). Each company will likewise choose a human

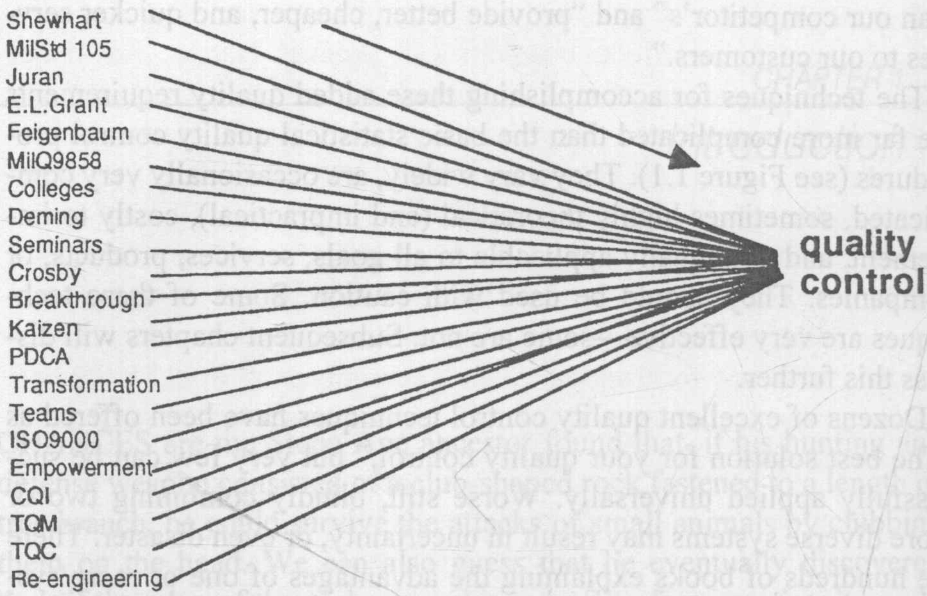

FIGURE 1.1 All these roads lead to quality control. Which ones do you take?

resources system, a financing philosophy, or a maintenance plan that works best for its needs.

When it comes to quality control, there is no universal "one best way." A *zero-defects* system might work well for a manufacturer until he discovers that it has locked him into a quality level that is not competitive. On the other hand, a *continuous quality improvement* system might backfire by offering a constantly changing product to customers who expect their reorders to be identical. In some industries, customers might be annoyed by a supplier's constant attempts at "*quality partnering.*" Adopting a *total quality management* system, where everybody is responsible for quality, might reveal that, in fact, nobody is in charge of quality. In short, a system that works well for one company may not work at all in another.

So what should your company do to select the best quality control system for its unique requirements? For a starter, let us suggest that the phrase "*select the best system*" be replaced by "*assemble the best system.*" This is not a trivial play on words; it is a serious concept that emphasizes the need to develop a system, step by step, that satisfies the specific needs of your organization. The company president may be disappointed that his desire to install a new effective quality control system in two months cannot be achieved if it has to be assembled a piece at a time. The inexperienced quality manager might have his enthusiasm shaken if he returns from a seminar labeled something like

"Total Quality Improvement" or "Reengineered Quality Program" only to find that significant portions of what he has just learned are not applicable to the structure or the philosophy of his company. The machine operator or the fruit juice press employee or the salesperson who completes an in-house training program on a quality-related subject, such as total quality control improvement teams, may come away from the course with the conviction that only a small part of the instruction is applicable in his organization. He may later wonder if any of the quality courses attended are really useful.

At the outset, this might appear to be a rather dismal picture, but it need not be. If the overall goals of a quality control program are clearly understood, a program can be assembled that meets all the requirements unusual or specific to a company. Useful training programs for line personnel can then be selected logically. Corporate programs presented to management can be better understood and accepted.

As a guide to assembling a successful quality program, consider these five basic components and how they can be built into your company:

1. Education and training (quality control principles and techniques)
2. Continuous implementation techniques
3. Engineering (coupled with intuition and experience)
4. Nonstatistical techniques (teams, diagramming, and brainstorming)
5. Statistics (and use of the computer)

The next few chapters will explore each of these components in detail, showing goals, obstacles, and successful examples. Those many popular structured quality control programs offered that do not include all five of these fundamentals may not be doomed to total failure but neither are they likely to come close to total success.

There are countless examples of the wide range of interpretations of quality-related principles found in industry. A mid-1990s *Wall Street Journal* article entitled "Price of Progress," by Al Ehrbar, referred to a few of the then-current buzzwords in the quality area: reengineering, downsizing, total quality management, and statistical process control. With a touch of humor, he dismissed reengineering as a technique that gives firms new efficiency and workers the pink slip. The article describes how a team of *Wall Street Journal* writers spent a year visiting many different types of companies of all sizes in many industries to find out about "downsizing" and quality efforts (among other things). In talking to all of these companies, they asked how important "quality" was. The answer was to forget about quality; forget about TQM—that's a thing of the past. If top management is approached with "we're here to improve quality," it will fall on deaf ears; they are not interested in that. On the other hand, if they are told that "we're here to improve cycle times" or "we're here to show you how you can do more with less," they will be anxious to discuss the ideas.

According to some of the company management personnel interviewed, those who were making major improvements in profits and productivity were those who had divided the organization into work teams and had used "time compression management," "high performance workplace," and other undefined phrases. Some felt that translating the technical knowledge of Statistical Process Control (SPC) into a management tool, not a technical tool, and being "proactive in relations with management" could produce favorable results in quality, productivity, and cost savings. These generalities were suggested with some conviction, *but management was either unwilling or unable to explain the details.* In a few companies, however, management was eager to discuss some of the successes.

One company, faced with a series of failures in modifying their product line, set up a study team, plotted a flow chart, dismantled the entire quality control department, turned them into "coaches," and empowered the workers to do "what they knew best" without interference by management. The results were phenomenal: increase in productivity and major cost reductions.

Another company was asked how they were using the statistical approach to quality control in their office. They replied that the greatest advance using statistics was when they Pareto-charted phone calls in the accounts payable department (in response to increasing supplier complaints directly to upper management regarding late payments). The delay was found to be due to the system requiring the accounts payable department to match 13 data sets of order information with a related invoice before cutting the check. The system was changed: when a shipment was received from a supplier, the receiving dock checked the material with the purchase order, and, if it agreed, the accounts payable department was immediately notified. They, in turn, cut the check within 24 hours. If the order received was incomplete, it was shipped back to the supplier without question. (They only had to do this once or twice before the supplier got the message.) Net result: 15% fewer people in accounts payable, no invoices to process, and payment to vendors now made within 24 to 48 hours.

The *Juran News*, published by the Juran Institute, in the fall of 1994 expressed a similar opinion on the variety of definitions applied to "reengineering." They felt that the word seemed logical and that the implied meaning was appealing but that business literature was vague about its concepts and benefits. The three different approaches might be summarized as

1. Define how work proceeds through key business processes.
2. Start anew with a different look at the way business is conducted by your company.
3. Set up entirely new information systems.

The Juran Institute offers courses in this subject and combines all of the above approaches but defines them more precisely:

1. Business process reengineering
2. Business reengineering
3. Information technology reengineering

It would be a waste of time to agonize over the growing list of quality acronyms, looking for the only one that would work for a given company. It would make more sense to select those portions of systems that are likely to function well with the existing management, work force, product, and customers (see Figure 1.2).

Even after deciding on the systems or portions of systems to be used, the many options for techniques to utilize in structuring the quality system present another series of obstacles.

The late Dr. W. Edwards Deming, considered by most quality control professionals to be a leading authority in the field, recognized several major obstacles to higher productivity and market position. In his book, *Out of the Crisis* (1982), he explains how most of these obstacles are created by industry's ignorance of statistical quality control .

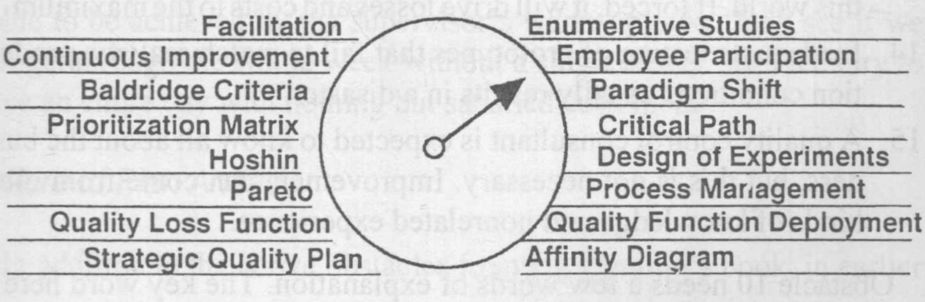

FIGURE 1.2 Quality techniques—spin the dial to select.

principles or their expectations of the impossible. Following is a very brief summary of this Deming obstacle list:

1. Uninformed management believes that a few days with a quality consultant will produce a complete operating quality system.
2. It is mistakenly supposed that automation, gadgets, and new machinery will transform industry.
3. Some think that blindly copying successful quality control programs from another company will solve their problems.
4. Others think that their company's problems are unique and that principles of statistical quality control will not work for them.
5. Some managers fail to verify the competency of statistical quality control instructors, thus exposing their employees to inadequate quality training.
6. Under some conditions, the use of acceptance sampling tables may guarantee that some customers will receive a defective product.
7. Management that fails to understand control charts and statistical thinking tends to let the quality control department unilaterally handle all quality problems.
8. It has long been thought (incorrectly) that quality troubles rest with the work force, overlooking the need for process improvements.
9. Poorly conceived quality-related programs that subsequently fail produce initial dissatisfaction, followed by frustration and despair.
10. Installation of a complete quality control program is doomed to failure. Such a program must be developed slowly over the years to be effective.
11. An inadequately designed computer system will provide little more than a collection of useless raw data.
12. The supposition that it is necessary only to meet specifications is an open invitation to competitors to steal customers.
13. The concept of zero defects does not correspond to the realities of this world. If forced, it will drive losses and costs to the maximum.
14. Inadequate testing of prototypes that fail to match realistic production conditions usually results in a disaster.
15. A quality control consultant is expected to know all about the business, but this is not necessary. Improvement can come from other kinds of knowledge and nonrelated experience.

Obstacle 10 needs a few words of explanation. The key word here is "complete." Deming certainly does not mean to imply that a complete quality control program is undesirable, for that is the ultimate goal. On the other hand, an attempt to design a complete quality control system from top to bottom, to install it throughout the entire company in a single move, and to expect it to perform successfully is unrealistic. In the first place, most quality control problems are interrelated. If you spend more time on each customer's needs, there may be service delays; if you reduce defect production, storage and shipping may be unable to handle the increased volume; if the net content control is improved significantly, subsequent content measurements, evaluations, charting, and reporting may become redundant; if chemical process control is tightened, entire rework and repair systems might become unnecessary; if computerized production feedback and control is installed, existing control systems might become obsolete, and new untried techniques might be required.

All of these cause-and-effect systems might be predicted, but an attempt to install them without actually seeing the effects over time can easily upset otherwise smoothly operating processes. Perhaps this is what Deming means when he suggests that simultaneous installation of a complete system is doomed to failure. From a practical standpoint, little is to be lost by installing quality control systems one phase at a time. Each step may show improvements and generate enthusiasm—contrasted with the possibility of despair from a complex system that creates new problems.

Obstacle 13 (zero defects) is subject to debate. As a philosophical goal, zero defects is perhaps an admirable principle. As a practical matter, Deming points out that it does not belong to this world. As a motivational tool, it can be partially (and perhaps somewhat dishonestly) achieved by defining "defect" in broad and forgiving terms. For example, if a defective irrigation system drip emitter is defined as one that fails to drip at 15 pounds pressure, sooner or later the laws of statistics will mercilessly combine to produce a defective emitter. If the definition of a defect omits the "at 15 pounds pressure" requirement, it is entirely possible that a "defect" will never be produced. Yet, there still is some value to be achieved by the supervisor's warm-up talk: "let's see if we can get through the whole week without a single defect" or: "let's try to have an entire day with nothing but satisfied customers."

Failure to Plan Ahead

In addition to the above obstacles found in Deming's book, in earlier