Chapter 02
Ensuring High Quality and Productivity

I. Chapter Overview

Although it may be difficult to define what good quality really is, poor quality will be recognized by the customer, and will result in higher costs of doing business. Some of the results of poor quality are dissatisfied and, ultimately, lost customers; higher costs of producing products and services through rejection, rework, and replacement; and a loss of reputation. Customer loyalty can result in business for a lifetime at a relatively low cost. It is much more costly to attract a new customer than retain an old one. A reputation for poor quality may be the most costly because it can result in the inability to recruit and retain superior employees, lost business opportunities, and higher costs to finance any business improvements.

Because of the negative consequences of poor quality, organizations try to prevent and correct such problems through various approaches to quality control. There are two types of quality control—product quality control and process quality control. Product quality control focuses on ways to improve the product itself. A restaurant survey that asks whether the food and service were acceptable is an example of product quality control. Process quality control emphasizes on how to do things in a way that leads to better quality. The planning of preparation, cooking, and serving methods to ensure excellent quality of products at a restaurant is an example of process quality control. Usually a combination of both methods can be found in an organization.

Techniques for assuring high quality include the use of statistics (statistical quality control and statistical process control) and employee involvement teams. Looking for defects in parts, finished goods, or other outcomes selected through a sampling technique is known as statistical quality control. The most accurate way to apply statistical quality control is to use a random sample. Statistical process control is a quality-control technique that uses statistics to monitor production quality on an ongoing basis and makes corrections whenever the results show the process is out of control. The operator periodically measures some aspect of what he or she is producing and then plots the results on a control chart. Employee involvement teams are teams of employees who plan ways to improve quality in their areas of organization. Such teams include quality circles, problem-solving teams, process improvement teams, or self-managed work groups.

Achieving and maintaining high quality requires both a philosophy of the value of quality and use of a variety of tools and techniques. Zero-defects approach, Six Sigma, and Total Quality Management (TQM) are examples of quality improvement methods. The zero-defects is a quality-control technique based on the view that everyone in the organization should work toward the goal of delivering such high quality that all aspects of the organization's goods and services are free of problems. In implementing a zero-defects approach, managers and employees at all levels seek to build quality into

every aspect of their work. Six Sigma is a process-oriented quality-control method designed to reduce errors to 3.4 defects per 1 million operations. TQM is an organization-wide focus on satisfying customers by continuously improving every business process for delivering goods or services. The objective of TQM is to meet or exceed customer expectations.

There are several resources to help organizations assess their quality systems and to guide improvement. The Malcolm Baldrige National Quality Award and the ISO 9000 series provide criteria for organizational conditions consistent with high quality levels.

Supervisors play a vital role in the production and delivery of quality products and services today. They direct and facilitate the work of those who directly serve the customer. They must understand the principles of quality control, the consequences of poor quality, and the methods to continuously improve process, product, and service quality. Supervisors must follow the guidelines for quality control and communicate quality expectations to employees and model behavior that is consistent with high quality.

Supervisors and other managers should be aware of the constraints that limit their impact so that they can either plan ways to overcome them or set realistic goals within them.

Process and product improvement is never ending in today's business climate. Supervisors will be expected to lead and facilitate quality improvement methods in teams in order to reap the benefits of group problem solving.

Productivity is the amount of results (output) an organization gets for a given amount of inputs. To increase productivity, a supervisor needs to increase outputs, reduce inputs, or both.

A highly productive organization is in an ideal position to thrive and grow. Employees fear productivity improvements. Supervisors must respond to these fears. A supervisor who does not understand the types of changes to be made and the reasons for them should discuss the matter with his or her manager as soon as possible. After obtaining a clear view of the organization's plans and goals, a supervisor should present this information to the employees.

II. Teaching the Concepts by Learning Objectives

Learning Objective 2.1: Describe consequences suffered by organizations as a result of poor-quality work.

1. Key Term:

   Productivity: The amount of results (outputs) an organization gets for a given amount of inputs

2. Teaching Notes:

Table 2.1 describes eight possible measures for the quality of goods or services.

Figure 2.1 shows the productivity formula: Productivity = Outputs/Inputs

Productivity can refer to the amount of acceptable work employees do for each dollar they earn or the number of acceptable products manufactured with a given amount of resources.

Many of the supervisor's activities, including planning, leading, and controlling, are directed toward improving quality and productivity.

Like employees at all levels, supervisors must care about quality because poor quality limits the organization's access to resources and raises its costs.

When the quality of an organization's goods or services is poor, the whole organization suffers. As word spreads about problems with the product, customers look for alternatives. The organization develops a negative image, which drives away customers and clients. The organization loses business and therefore revenues, and it also has more difficulty attracting other important resources. An organization with a poor reputation has a harder time recruiting superior employees and borrowing money at favorable terms.

Poor-quality work can also lead to high costs. Some managers might think it is expensive to ensure that things are done right the first time. But the reality is that businesses spend billions of dollars each year on inspections, errors, rework, repairs, customer refunds, and other costs to find and correct mistakes. Attracting new customers costs several times more per customer than keeping existing customers satisfied, so marketing costs are higher too. Thus, poor quality often results in much wasted time and materials, in addition to requiring that unacceptable items be fixed or discarded.

3. Teaching examples to describe consequences suffered by organizations as a result of poor-quality work:

   (Both Tangible and Intangible Costs)

   Examples of the Costs of Poor Quality

   a. 4,000 parts are made on a single line each day. If the cost of each part scrapped is $1.50, and 2 percent of the parts made are scrapped, how much is the cost of poor quality for this part per day? (80 parts ~ $1.50 = $120.00 per day.). For this one part, the cost of poor quality per year is [264 days (22 days per month) x $120.00 = $31,680]. Reducing the quality problem by half will save the company $15,840 per year.

      Since most companies make more than one product per day, calculate the possible savings for multiple products, lines, and work shifts.

b. Offending a customer may result in the loss of, not just one sale, but a lifetime of sales.

c. Consider what the lost revenue is of a lifetime of car sales, groceries, or clothing? What is the lost revenue or commission as a result of a canceled insurance policy? Also consider the cost of attracting new customers to replace old customers. These costs are unknown but potentially very large.

4. Exercise to describe consequences suffered by organizations as a result of poor-quality work:

The cost of obtaining a new customer is far greater than the cost of keeping an old customer. For example, to renew an old insurance customer's policy often takes only a mailed invoice, and the customer automatically renews the policy by sending a check. It is probably impossible for a company to calculate the cost of lost customers. Students can get some idea of the costs of poor quality by estimating the amount of money they spend at a place of business per month, then calculating how much their business is worth for 10 years.

a. Ask all students to estimate how much they spend at a specific local business, like a fast-food restaurant, in one month. (Example: $20 per month)

b. Have them multiply that amount by 120, the number of months in ten years. ($20 x 120 = $2,400)

c. Add the amount for each student and estimate the amount of money a business would lose if a number of customers equal to the class refused to buy anything from that business. ($2,400 x 30 students = $72,000)

d. Now consider the loss of a lifetime of new cars to a dealership.

e. A small amount of money quickly adds up to big losses when several customers stop buying from a business.

Learning Objective 2.2: Compare product quality control and process control.

1. Key Terms:

Quality Control: An organization's efforts to prevent or correct defects in its goods or services or to improve them in some way

Some organizations use the term *quality control* to refer only to error detection, whereas *quality assurance* refers to both the prevention and the detection of quality problems. However, this chapter uses *quality control* in the broader sense.

Product Quality Control: Quality control that focuses on ways to improve the product itself

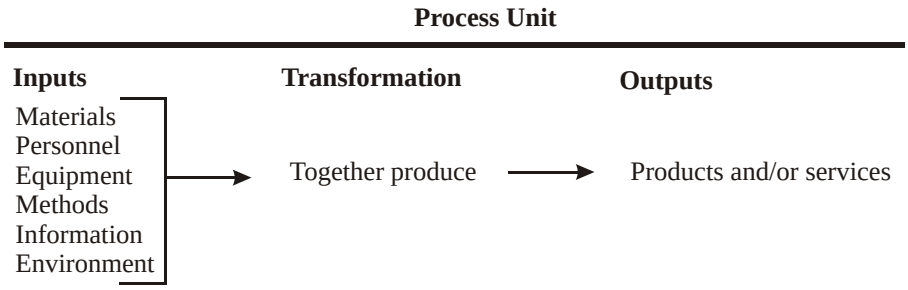
Process Control: Quality control that emphasizes how to do things in a way that leads to better quality

2. Teaching Notes:

A broad approach to process control involves creating an organizational climate that encourages quality. From the day they are hired, employees at all levels should understand that quality is important and that they have a role in delivering high quality.

3. Teaching examples to compare product quality control and process control:

The difference between product and process control can be illustrated by examining a basic process unit. The easiest way to explain the process unit is to think about manufacturing a simple product such as making cookies. To produce cookies, one needs materials (sugar, butter, etc.), personnel (the person mixing up the dough, etc.), equipment (mixer, oven, etc.), methods (order of adding ingredients, temperature for baking, length of time, etc.), information (recipe), and a certain environment (the condition of the room in which one is working including humidity, temperature, dust, noise, stress, etc.). It is the combination of all of these things that will produce the cookies.



Product Control Focuses on the Outputs

Simply put, product control evaluates the product or service, which is determined to be good or bad, and is accepted or rejected. In processes in which there is no adequate control or capability, there is variation in the output, which will produce both good and bad outcomes.

Homemade cookies vary. Sometimes they are more crunchy than others. Sometimes they are too brown. When the cookies are evaluated after they come out of oven, all of the costs of making cookies have been incurred. If the cookies are not good enough, the control is feedback control or product control. Contrast this with process control.

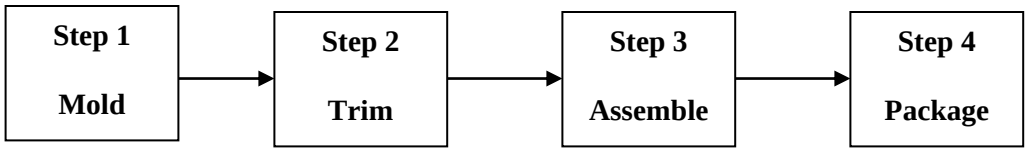
Process Control is Concerned with the Inputs

Inputs vary. Materials are not always the same. Personnel vary in skill and knowledge. Methods vary according to the personnel and equipment used. Time constraints may contribute to variation, with steps being skipped to save time. Information can be incomplete and/or inaccurate. The environment can be too warm or cold, noisy, stressful, etc. Process control seeks to minimize variation on the input side to minimize variation or poor quality on the output side.

Process control for making cookies would focus on reducing variation or inconsistencies in the inputs. This may include accurately measuring materials; training the personnel; assuring equipment is capable and performs consistently; following a consistent method; using instruments to ensure temperature, time of mixing, and baking; carefully following the instructions; and controlling or minimizing the impact of the environment.

The same basic procedure applies to process control in the manufacture of products by plastic injection molding, stamping, machining, die casting, turning wood or metal on a lathe, grilling a hamburger, and all other manufactured products. The same concept can be applied to delivering a service. For example, the transmission of information to satisfy a customer's inquiry varies.

Usually the production of a product or service is not just one process unit but a series of units or steps. The output of each step becomes the material or information input of the next step. Quality improvement teams are often directed to find out how the complete process operates and where quality problems are detected. The inputs, such as materials, are examined to determine whether they will assure a good product each time.



Each step is an *input/transformation/output* unit. Process control is also concerned with looking at the entire string of steps, rather than separating one unit from other units.

4. Exercise to compare product quality control and process control:

   See the exercise for Learning Objective 2.3. The exercise includes an application of product quality control and process control.

Learning Objective 2.3: Summarize techniques for quality control.

1. Key Terms:

   Statistical Quality Control: Looking for defects in parts or finished products selected through a sampling technique

Statistical Process Control (SPC): A quality-control technique using statistics to monitor production quality on an ongoing basis and making corrections whenever the results show the process is out of control

Zero-Defects Approach: A quality-control technique based on the view that everyone in the organization should work toward the goal of delivering such high quality that all aspects of the organization's goals and services are free of problems

Employee Involvement Teams: Teams of employees who plan ways to improve quality in their areas of organization

Many companies set up employee involvement teams such as quality circles, problem-solving teams, process improvement teams, or self-managed work groups. The typical employee involvement team consists of up to 10 employees and their supervisor, who serves as the team leader.

Six Sigma: A process-oriented quality-control method designed to improve the product or service output to 99.9997 percent perfect

Six Sigma is a process-oriented quality-control method designed to reduce errors to 3.4 defects per 1 million *operations*, which can be defined as any unit of work, such as an hour of labor, completion of a circuit board, a sales transaction, or a keystroke.

Total Quality Management (TQM): An organization-wide focus on satisfying customers by continuously improving every business process for delivering goods or services

2. Teaching Notes:

Managers, researchers, and consultants have identified several methods for ensuring and improving quality. Today most organizations apply some or all of these methods, including statistical quality control, the zero-defects approach, employee involvement teams, Six Sigma, lean process improvement, and total quality management. Table 2.2 summarizes these techniques.

In choosing a method, supervisors must remember that a technique alone does not guarantee high quality. Rather, quality-control processes work when the people who use them are well motivated, understand how to use them, and exercise creativity in solving problems.

The most accurate way to apply statistical quality control is to use a random sample. This means selecting outcomes (such as parts or customer contacts) in a way that each has an equal chance of being selected.

Rather than wait until a process is complete to take a random sample, the operators of a process

can use statistics to monitor production quality on an ongoing basis. This quality-control technique is known as statistical process control (SPC). The operator periodically measures some aspect of what he or she is producing and then plots the results on a control chart.

An organization that uses the zero-defects approach provides products of excellent quality not only because the people who produce them are seeking ways to avoid defects but also because the purchasing department is ensuring a timely supply of well-crafted parts or supplies, the accounting department is seeing that bills get paid on time, the human resources department is helping find and train highly qualified personnel, and so on.

In implementing a zero-defects approach, managers and employees at all levels seek to build quality into every aspect of their work. Employees work with supervisors and other managers to set goals for quality and identify areas where improvement is needed. Management is responsible for communicating the importance of quality to the whole organization and rewarding high-quality performance.

The employee involvement teams meet periodically. At these meetings, participants examine areas where quality needs improvement, and they develop solutions.

Depending on the organization's policies, one or more managers usually must approve the recommendations of the employee involvement team. Once a recommendation is approved, the appropriate people in the organization must implement it. The team should follow up on the implementation to ensure that the problem actually was solved.

Figure 2.4 depicts a typical procedure for an employee involvement team.

Figure 2.5 illustrates the characteristics of successful employee involvement teams.

Along with the basic goal of reducing variation from the standard to almost nothing, Six Sigma programs typically include a rigorous analytical process for anticipating and solving problems to reduce defects, improve the yield of acceptable products, increase customer satisfaction, and deliver best-in-class organizational performance. These improvements, in turn, boost profits.

Six Sigma is highly structured and emphasizes costs and profits. An organization forms process improvement teams and trains employees to become Black Belts, who act as liaisons with upper management.

The objective of TQM is to meet or exceed customer expectations. Thus, it is not a final outcome but an ongoing commitment by everyone in the organization.

Today most companies accept the basic idea of TQM—that everyone in the organization should focus on quality. Three experts who played important roles in spreading this idea are Philip B. Crosby, W. Edwards Deming, and Joseph M. Juran.

To achieve product quality, Crosby maintains, the organization must be "injected" with certain ingredients like integrity, systems that measure quality, communications about progress and achievements, operations that educate suppliers and employees in delivering quality, and policies supporting the organization's commitment to quality.

Deming emphasizes that to achieve product quality, the organization must continually improve not only the product's design but also the process of producing it.

Juran emphasizes the view that management should seek to maintain and improve quality through efforts on two levels:

- The organization as a whole
- Individual departments in the organization.

A basic strategy for implementing TQM is to use groups, such as employee involvement teams, to identify and solve problems. Another is to review criteria for improving quality and then seek to meet those criteria.

Because TQM strategies call for the involvement of employees at all levels, the organization needs to educate employees about why quality improvement is needed and how the TQM process will work. Supervisors can help a TQM effort succeed by behaving as if quality is important. Among TQM users, this commonly is called "walking the talk."

Total quality management requires that employees at all levels focus on meeting or exceeding the expectations of their customers. This principle assumes that everyone has a customer to serve.

3. (a) Teaching examples to identify techniques for quality control:

The terms *statistical quality control* and *statistical process control* are important techniques that are required by many manufacturing companies today. Many companies that produce products that are purchased by other manufacturing companies are required by contract to implement these techniques. Examples are the automotive, electronics, paper, and furniture industries.

In the late 1970s, NBC produced a television program entitled, "If Japan Can, Why Can't We?" The program was about the transformation of Japan from a country destroyed by World War II to the industrial power of today. W. Edwards Deming was featured as the American responsible for the success of Japanese manufacturing efforts. Dr. Deming is a statistician, who systematically studied processes and improved them by collecting and analyzing data. As a result of seeing the television program, several major companies hired Deming to work with them to improve their businesses. Notable in this early group of followers are Ford Motor Company and General Motors Corporation. Today, Chrysler, Ford, and General Motors require all their suppliers to use statistical process control.

The concept of statistical process control is used in everyday life. A speedometer in a car is a simple example of statistical process control. The driver watches the "measurement" of speed and adjusts the mechanism, or car, to assure it stays within the specified speed limits.

If the driver deliberately drives faster than the specified limits, it is a misuse of SPC. Sometimes organizations take measurements but, like the driver, they decide to ignore the measurements. Also, like the driver, companies increase the risk of incurring higher costs and lost customers by ignoring data in making decisions.

(b) Teaching examples to explain how employee involvement teams work and what makes them successful:

A die casting company decided to implement employee teams to help improve product quality, productivity, and the quality of employees' work life. Several teams were formed. They worked on a variety of problem areas in the company. One team worked on a plating problem, while another team worked on reducing accidents. Production teams worked on reducing the number of defective parts and improving data collection methods so that the size of the problems could be determined.

An example of the steps to be taken in teamwork and the potential for saving the company thousands of dollars is the accident-reduction team. The team began with a review of the accident reports to determine the types of injuries that occurred, the time when accidents occurred, losses to the company and employees (such as lost work time), and the accuracy of data-collection methods.

It soon became apparent that the accident records were incomplete. Entries of specific occurrences did not mention the method of treatment, such as a visit to a doctor or hospital. There was also a lack of follow-up data. Based on this part of the investigation, a new accident reporting form and method for filling it out was recommended to management.

The team initially thought burns would be the most prevalent type of injury because of the hot metal molding methods used in the company. Actually, cuts were the most prevalent injury. The cuts ranged from minor cuts on fingers to cuts requiring several stitches at the local hospital.

The team observed methods used in the factory and talked to the employees about their injuries. The investigation determined that many employees were not using proper safety equipment. In some cases, the type of safety equipment that would be most effective in preventing injury was not available. The team called in a sales representative from a safety supply company to discuss the company's needs and to determine the cost of better equipment.

One of the improvements recommended by the safety supply company was the use of a different type of glove that would eliminate most cuts. An added bonus was that the cost of the new gloves was less than the amount spent on the old gloves. The reason for the lower cost was that

materials that had cut employees' hands had also cut the gloves, rendering them useless. The new gloves resisted cuts to both hands and glove; therefore, the company could purchase fewer gloves.

The supervisor's role in this team effort was to support the team. The supervisor was not a member of the team, nor did he have a say in what the team decided. His job was to help the team obtain records, relieve them from their regular jobs, provide them with work space, and a telephone, and help the team in any way requested. The recommendations were shown to the supervisor, but they were sent directly to upper management by the team.

This team setup illustrates a difficulty supervisors may have with employee improvement teams. The teams sometimes take up work that previously belonged to the supervisor. In the example, the team reviewed the records and made recommendations to change the record keeping methods. The team talked to the safety equipment salesperson and recommended new equipment. This job had belonged to the supervisor in the past. Supervisors need to understand the value of employee involvement teams and make sure they know how they fit into a company's goals when employee teams are implemented. They are expected to support and facilitate teams. For many supervisors this may seem to be a risky proposition.

(c) Teaching examples to describe principles for successfully using total quality management:

Deming's 14 Points for Management[1]

1. **Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business and provide jobs.**

2. **Adopt the new philosophy.** We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

3. **Cease dependence on inspection to achieve quality.** Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

4. **End the practice of awarding business on the basis of price tag.** Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

5. **Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.**

6. **Institute training on the job.**

7. **Institute leadership.…** The aim of supervision should be to help people and machines and

gadgets to do a better job. Supervision of management is in need of an overhaul, as well as supervision of production workers.

8. **Drive out fear, so that everyone may work effectively for the company….**

9. **Break down barriers between departments.** People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

10. **Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity.** Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.
    - Eliminate work standards (quotas) on the factory floor. Substitute leadership.
    - Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

11. **Remove barriers that rob the hourly worker of his right to pride of workmanship.** The responsibility of supervisors must be changed from sheer numbers to quality.

12. **Remove barriers that rob people in management and in engineering of their right to pride and workmanship.**

13. **Institute a vigorous program of education and self-improvement.**

14. **Put everybody in the company to work to accomplish the transformation.** The transformation is everybody's job.

[1]W. Edwards Deming Institute, "Theories & Teachings," http://deming.org/theman/theories/fourteenpoints, accessed March 5, 2014..

Dr. W. Edwards Deming is a critic of the management practices used in many companies. He is a consultant to many of the largest companies in the United States and to governmental and other agencies. Deming blames management for 85 percent (or more, depending on the source) of all quality problems. Management controls the systems within which other employees work, and employees have little control over the real causes of quality problems. He advocates using statistical methods with reliable data to make decisions to improve the system.

He provides a list of 14 points for success in today's competitive environment. Two points are especially important for supervisors. Point 7 is, "Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers."[1]

The point focuses on behaviors of the supervisor. He sees the supervisor's role as one of providing the tools, materials, training, instructions and other resources necessary to do a good job. Point 8, "Drive out fear, so that everyone may work effectively for the company", refers to the ability of management to provide a work environment where people are able to pursue success without fear. The supervisor works most closely with the employees and can have the most impact on employees' trust or lack of fear.

4. (a) Exercise to identify techniques for quality control:

The following is an activity for illustrating SPC. Students participate by supplying the data. Data are recorded on a flip chart or black (white) board. The activity will take about 30 to 45 minutes.

Recall the discussion of process. The output of a process will exhibit a variation. Measurements can be taken to describe the output, and if the process remains essentially the same over time, the distribution of measurements will be approximately the same.

The following activity illustrates how a common manufacturing process, making chocolate chip cookies, will produce a product that varies in certain quality characteristics. The variation can be measured (in this case counted) and plotted on a graph. The graph will be a picture of how the process operates. There should be at least 30 measurements. Calculations will determine the average measurement and the dispersion (also known as the *range)* of the measurements. These two calculations will be sufficient to describe the process. Changes in the average, or width of the distribution, will indicate that something has changed on the input side.

Steps to Investigate Variation in Cookie Manufacturing

a. Purchase several bags of commercial chocolate chip cookies. The cookies should be the regular 2-to 3-inch cookies with regular chocolate chips (not the mini sized or "chunks" of chocolate). Distribute the cookies to the students, allowing 3 to 6 cookies per student and at least two bags (totaling 50 or more cookies).

b. Discuss with students what characteristic will be useful in controlling process quality and costs. Obviously, for a chocolate chip cookie, the number of chocolate chips in each cookie is important to the customer. Chocolate chips are also expensive, so the manufacturer needs to monitor them to control costs.

c. Determine the standard of acceptable quality. Define specifically what characteristic is to be measured, how it will be measured, and what the acceptance criteria are.

   Ask students whether they want to "destroy" the cookies and pick the chips out of the crumbs or leave the cookies whole and count chips that are visible only on the outside of the cookie. (Leaving the cookies intact results in an indicator of the number of chips.) Discuss the need to agree on what a chip is and is not so that all participants are indeed

counting the same thing.

d. Measure the item. *Be sure to comply with the quality standard.* Keep track of each cookie separately.

The instructor will probably have one or more participants who will tell them they used their own criteria to measure the characteristic or that the directions were not clear enough. These comments are useful to discuss the need for clear instruction, written instructions and visual samples, and to assure that all employees are following instructions.

e. Create a distribution of the actual measurements.

Get an indication of the range of number of chips contained in the cookies. Ask whether anyone had cookies that had no chips, 1 chip, 2 chips, etc. Number the line with enough whole numbers to go beyond the number of chips counted in the cookies.

Ask the students to report the number of chips in each cookie. Place an "X' above the number on the scale. Space succeeding numbers so that rows of "Xs" are aligned horizontally. See the example.

Example of Charting

```
      X     X
   X  X  X        X
---+--+--+--+--+---
   5  6  7  8  9
```

f. Calculate a measurement of the center and the width of the distributions, and describe the shape of the distribution.

To save time, estimate the average of the number of chips. The width of the distribution is the range from the lowest number to the highest number of chips (Range = High - Low). The shape should be approximately normal, or bell shaped. If the distribution has "holes" in it or is not a very good bell shape, explain to students that if they continued to measure more cookies made with the same process, the shape of the distribution would improve. After all, they only have a sample, not all possible outputs of the process.

g. (1) If the center of the distribution changes or the average increases or decreases, what has happened to the process?

If the center, or average, goes higher, then more chips have been added to the cookies. If the center or average goes down, then there are fewer chips in the cookies. Explain the consequences for too few chips in cookies—customer dissatisfaction—and too many chips—loss of profit and increased customer expectations.

(2) Can the average number of chips and the price be raised? Why, or why not?

(3) If the width of the distribution changes, what has happened to process?

The process has changed. If the distribution is wider, it means the chips were not distributed through the dough as thoroughly as before. Perhaps the method of making cookies was speeded up. If the distribution is narrower, perhaps the dough was mixed longer than the method required. Increased mixing increases costs and reduces the number of cookies made, or productivity.

h. If the distribution changes either in the average or the width, the supervisor should investigate the process to determine what has changed. Does the observation match the data?

Go out into the factory to ask questions and see what is happening.

(b) Exercise to explain how employee involvement teams work and what makes them successful:

The following exercise allows students to participate in a team to solve a problem. Divide the class into several quality teams of 4 to 7 participants. Each group is to evaluate the parking situation for the company in the example and make recommendations to management. Allow the students to read the case study individually and make notes of how they would solve the problems. This will ensure that a variety of solutions are discussed by the group. Make a copy of Figure 2.1, "Parking Problems," and Figure 2.2, "Parking Problem Work Sheet," for each student. (Both figures are located at the end of the IM Chapter).

Suggested Rules for the Groups

a. Each person is responsible for the group's success and is encouraged to make comments pertinent to the problem and its solution.

b. Several solutions should be considered.

c. The final recommendation should be the result of consensus decision making. Consensus means that the group should strive for a solution that all members can live with, but one or more individuals will not be 100 percent satisfied. If an individual is not satisfied with the group's decision, he or she should suggest a compromise. Compromise means that each side gives in a little.

After the teams make their recommendations, use the following questions for a class discussion:

d. What process did the groups use to come up with their recommendations?

For example, how did they get started? Did they ask for initial input of ideas from each group member? Did they agree on the final recommendations? What process did they use to reach the agreement (or why was there a lack of agreement)?

e. What are the advantages of working with a team?

More ideas. In the final recommendation, all members accepted the solution. Better communications result from talking out a situation.

f. What are the disadvantages of working with a team?

It is slower. Compromise is sometimes necessary.

g. Do the teams think that the parking rule violators who work on the afternoon shift should have been included in the team? Do you think it would make a difference in their behavior and attitude toward the decisions had they been included in the process?

If the violators are included, the team will understand the issues from another point of view. The violators may be more cooperative with the decision if they are part of the process. If the violators are included, however, the group may become distracted from the main issue.

(c) Exercise to describe principles for successfully using total quality management:

See the Exercise at the end of Learning Objective 2.7. Identify ways organizations measure their success in continuous improvement. The exercise will also include principles for successfully using total quality management.

Learning Objective 2.4: Identify ways organizations measure their success in continuous quality improvement.

1. Key Terms:

Baldrige Performance Excellence Program: An annual award administered by the U.S. Department of Commerce and given to the company that shows the highest quality performance in seven categories

ISO 9000: A series of standards adopted by the International Organization for Standardization to spell out acceptable criteria for quality systems

Benchmarking: Identifying the top performer of a process, then learning and carrying out the

top performer's practices

Value: The worth a customer places on a total package of goods and services relative to its cost

2. Teaching Notes:

The Baldridge Performance Excellence Program is an annual award administered by the U.S. Commerce Department's National Institute of Standards and Technology (NIST) and given to the organization that shows the highest quality performance as measured by seven categories:

- Leadership
- Strategic planning
- Customer and market focus
- Measurement, analysis, and knowledge management
- Human resource focus
- Process management
- Results

All competitors for the award receive feedback that recommends areas for further improvement. Many organizations, whether or not they apply for the award, use the Baldrige evaluation categories to assess their own performance.

To be certified as ISO 9000, an organization is visited by independent audit teams; if the auditors determine that the key elements of the standards are in place, they issue a certification of compliance.

Quality improvement directed toward value begins when the organization's employees communicate with customers to determine their needs and wants. Customers may be evaluating a lot more than whether a product adheres to specifications; value may include timely delivery, helpful customer service, low need for maintenance, and information that helps them fully benefit from using the company's services.

Success in quality control requires that the supervisor uses a general approach that leads everyone involved to support the effort to improve quality. To develop such an approach, the supervisor can follow the guidelines illustrated in Figure 2.6.

It is almost always cheaper to prevent problems from occurring than it is to solve them after they happen; designing and building quality into a product is more efficient than trying to improve the product later. Therefore, quality-control programs should not be limited to the detection of defects. Quality control also should include a prevention program to keep defects from occurring. One way to prevent problems is to pay special attention to the production of new goods and services. In a manufacturing setting, the supervisor should see that the first piece of a new product is tested with special care, rather than wait for problems to occur down the line.

If employees and others are to support the quality-control effort, they must know exactly what is expected of them. This calls for quality standards. In many cases, the supervisor is responsible for setting quality standards as well as for communicating and enforcing them. The standards must be written, measurable, clear, specific, and challenging but achievable. Furthermore, those standards should reflect what is important to the client.

In communicating standards, a supervisor should make sure employees know why quality is important. Employees should receive specific information about the costs of poor quality and the benefits of excellent quality.

To enforce the standards, a supervisor must participate in inspecting the quality of goods and services that employees produce. This process may entail examining a random sample of parts, accompanying a salesperson on sales calls, or visiting the workplace where employees interact with customers. The timing of these inspections should be unpredictable enough that employees cannot adjust their performance because the supervisor will be checking up on them that day. When an inspection uncovers a quality problem, the supervisor should inform the responsible employees immediately. Then they should begin solving the problem.

3. Teaching examples to identify ways organizations measure their success in continuous quality improvement:

   Companies use the Baldrige Performance Excellence Program criteria to assess their progress in meeting customer needs. Customer-driven quality means that the acceptable level of quality is determined by the customer, not the provider.

   The Customer Focus and Satisfaction category examines the company's relationship with customers and its knowledge of customer requirements and of the key quality factors that drive marketplace competitiveness. Also examined are the company's methods to determine customer satisfaction, current trends and levels of customer satisfaction and retention, and the results relative to competitors.

   Following are some of the types of characteristics a company with world-class quality in customer satisfaction would exhibit:

   - Several methods are used to determine customers' needs and expectations.
   - Specific surveys are conducted to determine customers' satisfaction with the company's products or services.
   - The company performs better than the competition in terms of accuracy and financial measurements.
   - Formal processes exist to improve customer satisfaction.
   - Employees who are in direct contact with customers are empowered to solve customers' problems promptly.
   - Customer satisfaction standards are well-defined and objectively measurable.

- Satisfaction data are correlated with increases in financial gains.
- The company is recognized for outstanding quality by other organizations.

1993 Award Criteria, *Malcolm Baldrige National Quality Award,* United States Department of Commerce, Technology Administration, National Institute of Standards and Technology, Gaithersburg, MD, 1993.

Robert L. Desatnick, Inside the Baldrige Award Guidelines, Category 7: Customer Focus and Satisfaction,'' *Quality Progress,* December, 1993, p. 60-74.

Teaching examples to describe guidelines for quality control:

Setting guidelines for quality control is a planning process not unlike other planning processes. Goals or objectives are set or quality characteristics are identified that will meet customer expectations, a method to monitor the process of making a product or deliver a service is determined, and the outcome is evaluated.

Examples of Quality Guidelines

a. Manufacturing example. Planning the quality guidelines of an inexpensive, plastic ballpoint pen will start with the design and engineering of the pen. Each part of the pen will have a drawing or blueprint and specifications that will include exact dimensions of each part, the materials to be used, the exact color of the materials, and the surface finish or texture. The drawings and specifications are the goals of the manufacturing process. The method of measuring is determined during the planning process.

   Each piece of the pen will be the output of different manufacturing processes. The cap of the pen will be made in a molding operation; the plastic part of the ink cartridge will be extruded. During the manufacturing processes, the dimensions on the pieces will be measured and compared with the drawing or blueprint.

   The individual pieces are assembled into the pen that one purchases at the local store. If the pieces have met the quality goals or specification during the production of the parts, they should fit together properly.

   The process of satisfying customers in this example starts with and ends with the customer. Quality guidelines will facilitate companies in meeting the customer's expectations. The customers will determine the characteristics they want in a pen, such as low cost, fits hand, writes smoothly, and lasts a long time. An engineering department will design a pen to fit these characteristics and set the quality goals. The manufacturing department will monitor the product as it is being produced. Customers will ultimately evaluate the quality by buying or not buying the pen.

b. Quality guidelines for customer intake. (Many types of businesses have a customer intake function, including hospitals and other medical facilities, legal services, construction services, etc.)

The quality guidelines will start with planning for the type of information needed to best serve a customer. An intake form can be developed to assure that the information is obtained. This information can then be passed along to the next person who will provide service, information, or a product to the customer.

The form will act as a method to assure the intake process is complete and accurate. The form itself can be viewed as a monitoring method. If designed properly, the form will also assure the next step of the process has a high probability of success.

4. (a.) Exercise to identify ways organizations measure their success in continuous quality improvement.

Total quality management includes everyone in an organization working for quality improvement on an ongoing basis. Improvements that focus on process improvement opportunities can be determined in many ways. One of the ways TQM is accomplished is through quality planning to minimize the occurrence of problems. All departments associated with a specific problem work together to make sure information and materials flow in such a way that quality product and services are assured. At the same time, the organization tries to reduce quality problems through individual and team problem solving.

Team problem solving or process improvement is a method that is often associated with the early stage TQM implementation. There are a number of ways to identify processes to improve. A customer complaint is one way to identify problems for the team. Another way is to determine how a process is performing and find ways to improve the process.

The first step in continuous improvement is to determine what is actually happening and measure the outcome. It is important to select measurements that will show how the process is operating and then collect and analyze the data. Once data are analyzed, the team can determine what improvements can be made. They should then implement the changes and collect more data. When improvements are made, measurements should also show the improvement. The exercise given below can be used for an individual student or a team. Whoever is involved should work on one process improvement to gain experience in the method.

a. Make a simple flow chart of a process including several steps. Select an easy-to-obtain measure such as, length of time. Determine how the measurement can be improved.

Sample Process

Fill in time card → Supervisor verifies time card →

Data entry into computer by person→ Checks printed →

Checks signed→ Supervisor receives checks→

Individual receives check

a. Measure the time it takes to complete the task. Take into consideration the need to correct errors or obtain more complete information on the cards. Then discuss how the time can be reduced for the overall process. When "rework" is required, more time is required. (Rework may be shown with a feedback loop.) Eliminating rework will reduce the time it takes to complete the process. Students should be sure to include any rework in the original measurements.

   The process can also be improved by combining steps or eliminating steps. For example, steps can be eliminated with electronic data entry at step one. The time used to complete the tasks can be shortened by minimizing the number of people who handle the information.

   Students can also improve the process involved in day-to-day activities such as getting ready to go somewhere. Have them chart the process to show all steps, measure the process, and find ways to improve the process.

(b.) Exercise to describe guidelines for quality control:

Quality guidelines can be set for products and services. Setting guidelines starts with planning for the goals and objectives as well as the method to evaluate the process, product, or service. For this exercise, students can work in teams, or the exercise can be assigned as homework. If the exercise is to be used in the classroom, allow about 30 minutes for groups of students to explore answers to the situations and questions.

Follow the steps below for the exercise.

a. Make a copy of Figure 2.3—Setting and Evaluating Quality Standards given at the end of the IM for each student. Working together or alone, students are to determine a plan to control the quality of each of the items or situations listed.

b. Students must determine how to monitor the standards set. For example, if the quality of the hamburger is to be controlled by the weight of the meat and the temperature to which it is cooked, the method to monitor would be weighing hamburger on a scale and checking the temperature with a thermometer.

c. Students will then determine what steps could be taken to improve the process or product.

For example, to improve the process of making the hamburger, the cooking method might be automated to detect the temperature and a bell could ring so the meat can be removed from the heat.

d. Discuss the answers with the group. Have students discuss the different answers to each of the situations and evaluate which suggestions are the best. Ask them to recommend one of the quality plans to upper management.

Learning Objective 2.5: Identify constraints on productivity.

1. Teaching Notes:

Stiff competition from around the world is forcing U.S. businesses to pay attention to productivity. To help improve productivity, supervisors must understand why it is important and what limits an organization's productivity.

When the productivity of organizations in a country is improving, people benefit. They can get goods and services at lower prices or with lower taxes than they otherwise could. Employers tend to pay higher wages and salaries to workers who are more productive. People also have access to more and better goods and services.

The amount of goods and services produced by the average U.S. worker remains higher than that for most other industrialized nations. Comparing the value of goods and services produced with an hour of labor, on average, U.S. workers produced more than their counterparts in most other developed nations, including Mexico, Japan, and Germany.

Some of the most important constraints on productivity are management limitations, employee attitudes and skills, government regulations, and union rules.

a. *Management limitations*: Operative employees will contribute to improve productivity only if they believe that management is truly committed to this objective. Too often, however, employees believe management is more interested in the next quarter's profits than in producing high-quality goods or services as efficiently as possible.

The most important way supervisors can overcome this constraint is to set a good example. Supervisors should demonstrate by their actions and words that they are interested in the department's productivity. This behavior includes seeing that the job is done right the first time, as well as using resources wisely, which, on a personal level, includes being well organized. Supervisors also must communicate instructions clearly and plan carefully so that employees are able to live up to managers' expectations. Furthermore, supervisors should listen to employees' concerns and ideas about improving productivity.

b. *Employee attitudes and skills*: Improving productivity requires changes. People have a

natural tendency to resist change because it is challenging and often frightening. Employees who fear or resent productivity improvements will not be motivated to make the changes work. Part of a supervisor's job is to identify employee attitudes and, when necessary, to help employees take a more positive view.

Employees' skills also influence how effective productivity-building efforts will be. When an organization wants each member to contribute more, each member must either work faster or do the job differently.

c. *Government regulations*: Businesses and other organizations in the United States are regulated in many areas, including payment of overtime wages, disability compensation, environmental pollution, building codes, minimum safety standards, and child labor. Following these regulations costs money, but the laws reflect the values of the majority in our society. Even when government regulations seem illogical or unreasonable, an organization can face serious penalties for ignoring or disobeying them. Thus, the proper role of supervisors and other managers is to know these regulations and seek ways to improve productivity without violating the law.

d. *Union rules*: Union contracts typically specify rules for what tasks particular employees may do, what hours they may work, or how organizations may use them. Sometimes, an organization's managers see a way to improve productivity that violates one of these rules.

When employers and unions collaborate on a solution, they can overcome such constraints, although the process usually takes time. If an organization explains how everyone will benefit from the changes, the union may agree to revise the contract, especially if the alternative is employee layoffs.

2. Teaching examples to define productivity:

A good way to understand productivity is to put it into a context. Productivity may be better understood by studying constraints to productivity and ways to improve productivity.

Teaching examples to identify constraints on productivity:

Management controls the resources and systems of the organizations. For example, they determine the types and grade of materials purchased, equipment purchased and the level of maintenance on the equipment, and the amount of training supported. Upper management also sets the policy or culture of the company whether it is written or unwritten. They may also send mixed messages to the departments. For example, upper management in a retail establishment may say excellent service is the most important goal of the company, but limit the number of hours worked by employees. As a result a supervisor may try to keep cost down by reducing the number of staff on the sales floor at any time, and risk poor service to a few customers.

The following is an example of how the constraints affected one company:

a. *Management limitations*:

A medium-size die casting and assembly company was faced with the need to improve productivity and product quality. Costs were too high. More products had to be made available for shipping without increasing the costs of production. Higher quantities of products could not be produced at the expense of lower quality.

Upper management recognized that they would lose business to more competitive companies if they could not accomplish this feat. Faced with a variety of barriers, including current low profits, upper management delegated the responsibility for improving productivity to the manufacturing function of the company. However, they retained the right to make the final decision for any changes to be made.

One of the causes of poor quality that made increased inspection necessary was the purchase of a component from another company. The quality of the component was unpredictable, requiring the die casting company to inspect every part before it could be sent to the assembly line. The reject rate at times resulted in late shipping of assemblies to customers. Obviously, this was costly and reduced the number of components that could be produced in a day. However, upper management would not change suppliers because of the higher costs charged by another supplier.

Supervisors should set a good example by demonstrating by their actions as well as their words that they are interested in the department's productivity. Jobs that are done right the first time and effective use of resources are general ways to have productive departments.

In the case of the die casting company, supervisors were frustrated and felt betrayed by upper management. They had a difficult time communicating up and down because they felt it would do no good. Employees interpreted the behavior by both upper management and supervisors as not being committed to the change necessary to improve quality and productivity.

b. *Employee attitudes and skills*:

Employee attitudes are partially the result of the perception they have of upper management and supervisors. They were not convinced that management was going to do anything different than what had always been done. However, attitudes and motivation can be the result of many things. For example, poorly maintained equipment makes it difficult for employees to reduce idle time.

Employees also need skills for doing their job and learning how to improve processes. For example, in a manufacturing company, employees may benefit by knowing how to use

simple manufacturing engineering techniques. If teams are used to improve productivity, adequate training should be provided to the teams for such things as problem solving, data collection and analysis, and interpersonal skills.

c. *Government regulations*:

Businesses and other organizations in the United States are regulated in many areas.

Additional costs for pollution control were also problematic for the die casting company. Some of the products made by the company had to be chrome-plated. This service was purchased from a plating company. Because of pollution and environmental regulations, the services of plating companies were becoming more expensive.

The company also was experiencing additional overhead costs due to a lawsuit filed by one of the female employees. She charged sexual harassment by another employee which was allowed to continue by management. This situation led to a general morale problem that affected all employees of the company, both female and male.

d. *Union rules*:

The die casting company also had a union. The labor contract specified several job classifications with the type of work that would be done by each. Two types of problems were experienced by the company. First, job redesign or enlargement was difficult because the newly designed job may cross categories. For example, a machine operator may be assisted by a helper. Process improvement resulted in extra time for the helper and it was thought the helper could do work formerly done by the inspector. However, inspecting is a separate category and has a different rate of pay. Possible solutions were to make some or all helpers, helper-inspectors.

Another problem was identified when new equipment was purchased. Because the new equipment was automated, fewer operators and no helpers were needed. The skill level of the operator position was far less than those associated with the old equipment. However, the new equipment required more skill for set-up and maintenance. What position should have the responsibility for the new skills needed—the operator, the maintenance crew, or a new classification? Previous practices usually meant promotions were given to the person with the highest seniority. Would this be feasible for a newly created set-up/maintenance of new equipment? Answering these questions is difficult, and the chance for disagreements between employees and management is high. The answers will have to be worked out and agreed to by upper management and union representatives.

Supervisors may feel they are expected to do the impossible when faced with this and other types of constraints. Although communications may feel strained at times, it is necessary to make sure the lines are open and used up, down, and laterally.

3. Exercise to define productivity:

   Exercise to describe how to identify constraints on productivity:

   The purpose of this exercise is to help students identify productivity constraints they have experienced in the past and to determine what category of barriers they have experienced. Students should understand that constraints on productivity are complex. As supervisors they will have to deal with these barriers in different ways. They will have more control to reduce some barriers than others. This exercise is a classroom discussion with the group as a whole.

   a. Ask students to think back on any job they have had in the past. Think of a job in a company or business if possible. Have students take two or three minutes to think about the level of productivity in the situation. Also have them think about constraints on productivity they experienced or witnessed.
   b. Next ask students to share their examples with the class.
   c. Ask students which constraint was demonstrated by the examples. Discuss what types of examples are easiest for supervisors to control.

Learning Objective 2.6: Describe how productivity and productivity improvements are measured.

1. Teaching Notes:

   Productivity is measured with the equation:

   Productivity = Outputs/Inputs

   In other words, productivity is the amount of output produced with the inputs used.

   Table 2.4 provides examples of inputs and outputs for several types of organizations. This productivity equation can compare the output and input for an individual, a department, an organization, or even an entire country's paid workplace.

   By applying basic arithmetic to the formula for productivity, the supervisor can see what has to change for productivity to increase. To increase productivity, a supervisor needs to increase outputs, reduce inputs, or both.

2. Teaching examples to describe how productivity and productivity improvements are measured:

   See the "Teaching examples" for Learning Objective 2.7 to identify the two basic ways in which productivity may be improved.

3. Exercise to describe how productivity and productivity improvements are measured:

   See the "Exercise" below for Learning Objective 2.7, describe cost-control strategies available to supervisors. The measurement of productivity is included in the exercise.

Learning Objective 2.7: Identify ways productivity may be improved.

1. Key Terms:

   Overhead: Expenses not directly related to producing goods and services; examples are rent, utilities, and staff

   Idle time or downtime: Time during which employees or machines are not producing goods or services

   Detour behavior: Tactics for postponing or avoiding work

   Payback period: The length of time it will take for the benefits generated by an investment (such as cost savings from machinery) to offset the cost of the investment

   Average Rate of Return (ARR): A percentage that represents the average annual earnings for each dollar of a given investment

   Turnover: The rate at which employees leave an organization

2. Teaching Notes:

   When supervisors and other managers look for ways to boost productivity, they often start by looking at their costs per unit of output. Productivity improves when the department or organization can do as much work at a lower cost or when output rises without a cost increase. Another way to improve productivity is to improve process quality so that employees work more efficiently and do not have to spend time correcting mistakes or defects. Mistakes, errors, and rework are a drag on productivity. For that reason, one of the supervisor's most important tasks is to think of and implement ways to get the job done right the first time.

   Many of the quality-control strategies introduced in this chapter, such as Six Sigma, zero defects, and employee involvement, apply to productivity improvement.

   Because of their direct contact with employees, supervisors play an important part in most of these initiatives. Supervisors can increase their own and their team's or group's productivity by understanding the goals of quality programs and their own role in achieving those goals. Through leadership and motivation, they can help employees contribute to quality goals. Finally, they can use their specific knowledge of the tasks and processes their teams perform to find unique ways

to contribute to productivity.

To lower costs, supervisors can use a number of strategies. Figure 2.10 summarizes the basic alternatives. These strategies are not mutually exclusive. Supervisors can get the greatest productivity by using as many of these strategies as will work. In deciding which strategies to use, supervisors should consider which will appeal to higher-level management, which will be acceptable to employees, and which involve areas within their control.

An important part of many of these strategies is encouraging and using employees' ideas for saving money. Operating the machines, preparing the reports, and serving clients or customers gives employees a close-up view of how things are done, enabling them to see the shortcomings of the organization's way of doing things.

a. *Use Budgets*: Before a supervisor can make intelligent decisions about how to trim costs, he or she has to know where the money is going. The most important source of such information is budget reports. By reviewing budget reports regularly, a supervisor can see which categories of expenses are largest and identify where the department is spending more than it budgeted. Then a supervisor should spend time with workers, observing how they use the department's resources, including their time. The process of gathering information about costs and working with employees to identify needed improvements is part of a supervisor's control function.

b. *Increase Output*: A logical way to increase productivity is to increase output without boosting costs. Sometimes, by applying themselves, people can work faster or harder. Of course, it is not always possible to increase output without sacrificing quality. Also, this method of improving productivity often makes employees unhappy. A supervisor who wants to boost productivity by increasing output must first ensure that the new output goals are reasonable, perhaps by including employees in the decision-making process. A supervisor must also communicate the new goals carefully, emphasizing any positive aspects of the change.

   Some companies use technology to ensure productivity. Software programs that monitor e-mail and Internet usage have many uses, including applications that identify computer use that is not work related or that violates company rules. Electronic monitoring can also provide basic productivity measures such as how long order takers spend processing each customer order.

c. *Improve Methods*: There are only limited ways for doing the same thing better or faster. Reviewing and revamping the way things are done is the basic principle of *reengineering*. Process control techniques for improving quality, like *kaizen*, also can improve productivity. A potentially powerful approach to improving methods is to give employees more control over the way they work. Similarly, designing jobs to include variety and responsibility makes the jobs more interesting, which should motivate employees to

deliver higher quality as well as work harder.

Like managers at all levels, supervisors should be constantly on the lookout for ways to improve methods. Some ideas will come from supervisors themselves. Employees often have excellent ideas for doing the work better because they see the problems and pitfalls of their jobs. Supervisors should keep communication channels open and actively ask for ideas.

d. *Reduce Overhead*: Many departments spend more than is necessary for overhead, which includes rent, utilities, staff support, company cafeteria, janitorial services, and other expenses not related directly to producing goods and services. Typically, an organization allocates a share of the total overhead to each department based on the department's overhead expenses. However, a supervisor can periodically look for sources of needless expenses, such as lights left on in unoccupied areas or messy work areas that mean extra work for the janitorial staff. By reducing these costs to the company, a supervisor ultimately reduces the amount of overhead charged to his or her department.

   Staff departments in particular can be guilty of contributing too much to the cost of overhead by generating unnecessary paperwork Supervisors and their employees who produce or handle reports and forms should evaluate this paperwork to make sure it is needed. Another way to reduce the amount of paper is to make sure that when a procedure calls for a form with several parts, all the parts are actually used.

e. *Minimize Waste*. Waste occurs in all kinds of operations. For example, a medical office may order too many supplies and wind up throwing some away or taking up unnecessary storage space.

   A costly form of waste is idle time or downtime. This term is used most often in manufacturing operations, but it applies to other situations as well. For example, in a factory, idle time occurs while a machine is shut down for repairs or workers are waiting for parts.

   Another form of wasted time results from detour behavior. Employees and their supervisors use a wide variety of detour behavior: A supervisor enjoys a cup of coffee and the newspaper before turning to the day's responsibilities or an employee stops by a colleague's desk to chat.

   Wasted time may be an even more important measure of lost productivity than wasted costs. For office employees, a major cause of wasted time is spam—messages that are unrelated to work, unwanted, and often distasteful or fraudulent. Organizations are countering the problem with filtering software that searches messages and attachments for viruses and worms, inappropriate content, and other signals that a message is likely to be spam. They also are training employees to be more wary about opening e-mail attachments

from unknown senders.

Supervisors should be on the alert for wasted time and other resources in their department. They can set a good example for effective time management and make detecting waste part of the control process. Often, employees are good sources of information on how to minimize waste. The supervisor might consider holding a contest to find the best ideas.

f. *Regulate or Level the Work Flow*: An uneven flow of work can be costly (See Figure 2.11). When work levels are low, the result is idle time. When the department faces a surge in demand for its work, employees have to work extra hours to keep up. As a result, the department may have to pay workers overtime rates during peak periods. In addition, people get tired, so they are rarely as efficient during overtime hours as they are during a normal workday. If a supervisor can arrange to have a more even work flow, the department can be staffed appropriately to get the job done during normal working hours, and fewer employees will be idle during slow periods.

   A supervisor can take several steps to regulate departmental work flow:

   (1) A supervisor should first make sure that adequate planning has been done for the work required.

   (2) A supervisor may find it helpful to work with his or her manager and peers or form teams of employees to examine and solve work-flow problems.

   (3) If the work flow must remain uneven, a supervisor may find that the best course is to use temporary employees during peak periods, an approach that can work if the temporary employees have the right skills.

g. *Install Modern Equipment.* Work may be slowed because employees are using worn or outdated equipment. If that is the case, the supervisor may find it worthwhile to obtain modern equipment. Although the value of installing modern equipment is obvious for manufacturing departments, many other workplaces can benefit from using modern equipment, including up-to-date computer technology.

   In deciding to buy new equipment or recommending its purchase, a supervisor needs to determine whether the expense will be worthwhile. One way to do this is to figure out how much money per year the new equipment will save in terms of, for example, lower repair costs, less downtime, and more goods produced. Then compute the number of years before the savings will offset the cost of buying the equipment, a time known as the payback period.

   Another way to evaluate whether an investment is worthwhile is to find its average rate of return (ARR).

Figure 2.12 shows the basic formulas for evaluating an investment.

h. *Train and Motivate Employees*: To work efficiently, employees need a good understanding of how to do their jobs. Thus a basic way to improving productivity is to train employees. Training alone does not lead to superior performance; employees also must be motivated to do good work. Motivation is a key tactic for improving productivity because employees carry out most changes and are often in the best position to think of ways to achieve their objectives more efficiently.

i. *Minimize tardiness, absenteeism, and turnover*: Lack of motivation often is the problem underlying time lost to tardiness and absenteeism. When employees dislike their jobs or find them boring, they tend to use excuses to arrive late or not at all. Lost time is costly; in most cases, the organization is paying for someone who is not actually working. In addition, other employees may be unable to work efficiently without the support of the missing person. As a result, minimizing absenteeism and tardiness is an important part of the supervisor's job.

   Absenteeism may be the first step to leaving the company. The employee misses more and more days, then finally quits. The rate at which employees leave an organization is known as turnover. High turnover is expensive, because the organization must spend a lot of money to recruit and train new employees. Therefore, an important part of controlling costs is to keep good employees by making the organization a place they want to stay. In general, when an employee is feeling unsupported by his or her organization or supervisor, that employee is more likely to look for a new employment opportunity. Therefore, as a supervisor, it is important to be aware of how supported employees feel about their relationship with them and the company as a whole. Supervisors can also minimize turnover by applying the principles of motivation.

3. Teaching examples to identify the two basic ways in which productivity may be improved:

   The die casting company attempted to achieve improved productivity through both cost reduction and increased output. As illustrated in Learning Objective 2.5, there are many constraints to improving productivity, and the improvement process is complex.

   a. *Reduced inputs*: A review of the budget and other financial reports revealed a material variance that increased the overall cost of materials. Further investigation found that the excess material usage was confined to five specific parts. In general, there was an excess of material wasted during the set-up phase of the manufacturing operation. Once this was known, a team was formed to improve the material usage in the factory, thus reducing inputs.

      A discussion was held by management about why the material variance was not addressed

earlier. It was discovered that the material usage report summarized too much of the information, making it difficult to recognize specific problem areas. This resulted in better reports for materials utilization for supervisors and other managers.

There are many opportunities to reduce costs in any organization. Simple steps taken by the die casting company was to reduce the costs of small hand tools and equipment by focusing attention on the need to reduce costs. Storage areas were moved closer to workstations, so it was easier for employees to take proper care of the tools and equipment. The costs of replacement and repair were reduced by 50 percent within two months.

b. *Improved output*: This part of the improvement process also started with a review of the data. Records and reports were reviewed to identify specific manufacturing operations—parts or assemblies that did not meet output expectations. Supervisors talked with small groups of employees to find what they knew about low productivity jobs. Several problems were uncovered.

One of the problems identified was an unreliable machine. It required repairs often. Although the repairs were completed quickly, the accumulated lost time was eight hours per week. (There were two shifts of eight hours, or 16 production hours per week. This amounted to 20 percent of the available time.) A team including two production employees, a maintenance employee, a manufacturing engineer, and an accountant was assembled to determine how best to minimize or eliminate this problem. (Also see "Teaching examples" for Learning Objective 2.5, Identify constraints on productivity. Improving output is also discussed there.)

Teaching examples to describe cost-control strategies available to supervisors:

This teaching example will provide more detail for the die casting company.

a. *Increase output*:

A supervisor should be aware of what amount of time is required to do the job properly. In manufacturing, industrial engineers can do a time study to determine a standard time. In other types of organizations or in non-production jobs in a manufacturing company, the supervisor can determine a reasonable time to accomplish a job by watching several people do the job or by actually doing the job. Be careful to determine a reasonable time rather than the time the fastest person can do the job. The fastest time may be the result of skills and knowledge gathered from years of experience. Work with slower employees. Try to determine if they need additional knowledge and skills. For example, a fairly new employee working on the service desk may have to look up more information than a more experienced employee.

Identify those jobs or processes that are not meeting the standard set. Use the rational model of decision-making described in Learning Objective 9.l of Chapter 9, Problem Solving and

Decision Making.

Supervisors should also be alert to idle time or times when employees are not working at their regular job. Idle time may provide an opportunity to do such things as catch up on paperwork, brainstorm time and cost-saving methods, and training. These activities will increase productivity in the long run.

b. *Improve methods*:

A careful examination of the step-by-step method of how a task is accomplished may uncover ways to do a job faster and better. One of the improvements made at the die casting company was rearranging the assembly area to reduce the amount of time spent moving materials. A study revealed that 50 percent of the assembly time was spent moving materials from one area to another. This was reduced to 15 percent by moving workstations into one area and putting the assembly tables and equipment closer together. Additional time reduction was realized by replacing some of the manual hand assembly tools with automatic tools.

c. *Reduce overhead*:

The company focused on reducing overhead expenses by the use of several productivity improvement teams. A study of utility utilization revealed that the installation of automatic shut-off controls that were activated after a predetermined length of time would reduce utility costs by 5 percent with a payback period of six months.

Another group investigated indirect materials costs. This resulted in changing the type of gloves worn in the assembly area to ones that cost a little more but lasted twice as long. The savings was 25 percent with no payback period.

d. *Minimize waste*:

The die casting company directed all personnel responsible for distributing written materials to others to verify that the materials were useful and used. As a result of this effort, the distribution list for most reports was reduced. The estimated saving of time and materials was $8,000 per year.

Lost information was common with extra time spent requesting and making duplicates. As a result, some information distributed was assigned a distinctive symbol to signal the receiver of its unique value. For example, a small book was put in the corner of revised standard procedures. Memos informing employees of social events had a small party hat in the corner.

It is important for students and supervisors to recognize that the waste in most organizations is substantial. Opportunities for reducing waste are often overlooked because they are so prevalent. We often think that each waste is insignificant. However, when each small waste is eliminated, cost savings are great over a longer time period. When all small savings are added together, the savings are surprisingly large.

e. *Regulate or level the work flow*:

An uneven work flow can be for a short period of time, such as low sales for a week or two. This may be predictable. Certain times of the year, for example, after holidays or during specific seasons, are slow for many organizations. These may be handled by suggesting employees take vacations during slow periods, if possible. They may also be used for extra training. Summers were busy times for the die casting company and many employees wanted vacation time during the summer. Students were hired during the summer to even out the work load.

Daily or weekly uneven work flow may be handled with work schedules. More employees can be scheduled to work busy times. Part-time employees may prefer short hours and can be used during heavy demand periods. Thursday and Friday were busy days for the shipping department. A part-time employee worked these two days to increase the size of the shipping staff.

The company would allow employees extra unpaid time off during slow days or even for longer time periods. A customer reduced its order for the month, resulting in a week of excess production employees. Several took advantage of the extra time off, bringing the work load and labor into balance.

Organizations in which employees are represented by a union may not have the above options available because of contract rules. The supervisor will have to follow company rules when increasing or decreasing the number of employees in his or her department.

f. *Install modern equipment*:

Modern equipment is a cost saver for several reasons. The ability to produce more in a shorter time is only one of the reasons to buy new equipment. Older equipment usually led to a method that grew out of mass production thinking. Equipment was often dedicated to a single or a very few functions. New equipment is often more flexible and can be used for multiple functions, resulting in an overall requirement of less equipment It is often less complicated to use, requiring less training time. For example, a typewriter’s output may be a single copy. Computers supply multiple copies that can be modified to produce multiple variations. They also act as a file, storing many documents that can be retrieved with very little effort. When calculating the cost savings of new equipment, be sure to include all cost savings. In the case of the computer, the time and cost for filing and retrieving information should be included.

Supervisors need to survey the new equipment available for use in their departments. Trade magazines and newsletter articles and advertisements will help keep them up-to-date. Trade shows and conferences are other ways to keep abreast of the field and equipment innovations.

g. *Train and motivate employees*:

When the die casting company launched its productivity improvement effort, it discovered that many employees would improve their individual output with additional job-related training. Failure to adequately understand the equipment they used resulted in idle time while a supervisor, set-up person, or maintenance person was called to solve a problem.

Employees who lacked knowledge and skills generated another problem. These employees were labeled as lazy. Often when someone was called to help them, the set-up person or maintenance person felt the operator was taking advantage of them. As a result, they took their time getting to the person requesting help. When employees had a better understanding of their job and the equipment, the morale in the department improved. Employees were much more likely to think everyone was doing his or her fair share of the work and requests for help were genuine. The time saved included unnecessary down time and unnecessary waiting for help.

h. *Minimize tardiness, absenteeism, and turnover*:

One of the problems experienced by the die casting company was the inconsistency of applying the attendance policy. All occurrences of absenteeism, whether for part or all of a day, were classified as excused or unexcused. Only unexcused time counted against the employee's record and unexcused time could lead to disciplinary action. Supervisors had the discretion to determine what was excused.

A meeting with all supervisors found a wide range of interpretations of what was excusable. Some supervisors excused almost anything that sounded like a hardship to the employee. In general, it was found that employees were taking advantage of the policy and supervisors were helping them. The policy and its intent were explained to the supervisors. A meeting was then held with the employees to interpret the policy and put them on notice that the policy would be applied consistently and as it was originally intended. Absenteeism went down.

4. Exercise to identify the two basic ways in which productivity may be improved:

See the "Exercise" below to describe cost-control strategies available to supervisors. The two basic ways of improving productivity are included in cost-control strategies.

Exercise to describe cost-control strategies available to supervisors.

The purpose of this exercise is to help students apply the concepts of improving productivity and reducing costs. Productivity improvements are difficult to conceptualize without having an organization for a context. This exercise can be assigned as homework or used as a classroom exercise. It will likely be easier for students to understand the concepts if it is used and discussed as a classroom exercise. Students can work individually or in small groups. Allow about 30 minutes for the exercise if used as a classroom exercise.

Steps for using the exercise:

a. Make a copy of Figure 2.4—"How Can Productivity be Improved" given below for each student. Select a local business familiar to most students or a fast-food chain restaurant. Have the students make suggestions for productivity improvement using Figure 2.4 as a reference list of categories.

b. If the students are going to work in small groups, have them come up with answers on their own first. Then have them share answers and come up with what they think is the best answer(s).

c. Have the small groups share their answers with the class. Ask for responses from the class. Discuss any difference of opinion expressed by the group.

d. Ask these follow-up questions:
   (1) On what side of the productivity equation would you put each answer? Ask for a sample of how students categorized their answers.

   (2) How would you determine the costs or cost savings? Since students will not likely have an in-depth understanding of costing, the answers will probably be very simple.

Potential answers for a fast-food restaurant:

1. *Increase output*: Reassign employees. At busy times additional help can be enlisted by using managers, bus employees, and any of the others employed in the restaurant. Prepackage some items, for example, place some salads in carry-out bags. (This category may overlap with improve methods.)
2. *Improve methods*: Customers could pre-punch a card to be fed into a computer with their order, reducing the need to tell a person who punches it into a computer/cash register. French fries could be cooked on a conveyor so the basket need not be watched and emptied.
3. *Reduce overhead*: Reduce the number of bags used for carry-out. Reduce the number of lights in the dining area, especially during daylight hours. Put lights on a timer.
4. *Minimize waste*: Do studies of a business to determine the right number of employees to have at one time so there is the least amount of wasted time. Keep track of discarded food as a result of poor preparation and plan to reduce the waste.
5. *Regulate or level the workflow*: Offer slightly lower prices during off-hours.
6. *Install modern equipment*: An automatic sandwich wrapper may reduce the amount of labor required to prepare food for the customer.
7. *Train and motivate employees*: Train employees for their entry-level job. Start cross-training as soon as possible to assure employees can be moved to the task that needs extra help. This will also make employees' jobs more interesting.

8. *Minimize tardiness, absenteeism, and turnover*: Provide additional benefits to employees who stay for six months, a year, and two years. To the degree possible, let employees choose their own schedule.

Figure 2.4

How Can Productivity be Improved?

Use the list below to categorize possible improvements at a local business.

1. Increase output
2. Improve methods
3. Reduce overhead
4. Minimize waste
5. Regulate or level the work flow
6. Install modern equipment
7. Train and motivate employees
8. Minimize tardiness, absenteeism, and turnover

Learning Objective 2.8: Explain why employees have fears about productivity improvement and how supervisors can address those fears.

1. Teaching Notes:

   A highly productive organization is in an ideal position to thrive and grow. Thus, employees can benefit from productivity improvements. This is true especially when efforts to boost productivity focus on improving the quality of processes rather than simply cutting payroll costs. Even so, many employees react with fear when managers start talking about improving productivity.

   Employees may have good reason to be fearful. Many have experienced or heard of cost reductions leading to less overtime pay, more difficult work, and even layoffs. Today's business news is full of stories about *outsourcing* (contracting with specialists to perform business functions) and *offshoring* (arranging for lower-cost workers in other countries to handle jobs that had been performed in the United States). When layoffs occur, the people who are left behind often have to struggle to keep up with the work that still has to be done.

Supervisors must respond to these fears. Most important, they must be prepared with information. A supervisor who does not understand the types of changes to be made and the reasons for them should discuss the matter with his or her manager as soon as possible. After obtaining a clear view of the organization's plans and goals, the supervisor should present this information to the employees. In doing so, a supervisor should emphasize what the benefits will be and avoid dwelling on the negatives.

When a supervisor gives information about productivity improvement, employees should have an opportunity to ask questions. The supervisor who cannot answer some of the questions should promise to get answers—and then do so. On its own, information will not make employees enthusiastic about a productivity program, but uninformed employees almost certainly will suffer from low morale.

2. Teaching examples to explain why employees have fears about productivity improvement, and tell how supervisors can address those fears:

   The productivity improvement effort at the die casting company was not an easy process. Employees at all levels and in all departments were asked to improve everything, yet they didn't know what the future would be like for them. If productivity improved, would they still be needed? They had ideas for improvements, but if they shared all they knew, would they still be needed? Was the situation really what management described? Was this just a story fabricated to get them to work harder? What could they change, when management runs the company and makes the decisions?

   Supervisors should first seek clarification of questions and concerns they have by talking with their boss. Then they should communicate with the employees, emphasizing the benefits from the improvements. The supervisor is then able to help employees understand what is needed and provide them with the assistance needed to identify areas of opportunity and implement improvements.

3. Exercise to explain why employees have fears about productivity improvement, and explain how supervisors can address those fears:

   The purpose of this exercise is to help students understand the role of the supervisor during a productivity improvement effort. The exercise can be a homework assignment or an in-class exercise for individuals or small groups. Allow 10 to 15 minutes for an individual in-class exercise and 20 to 30 minutes for a small group exercise.

   Steps for using the exercise:

   a. Make a copy of Figure 2.5—Productivity given below for each student. Have the students read the case study and answer the questions.

b. If the students are going to work in small groups, have them come up with answers on their own first. Then have them share answers and come up with what they think is the best answer(s).
c. Have the small groups share their answers with the class. Ask for responses from the class. Discuss any difference of opinion expressed by the group.

Potential answers to the questions:

1. Which department do you think will be most successful and why?

   The first department. The supervisor is taking charge and feels an urgency to get some improvements made. If he or she left it up to employees in the department, improvements would be slower. In addition, the employees may feel they have something to lose if improvements are made, so they may not try hard enough to come up with solutions.

   The second department. The supervisor had more information on what was expected, had the support of his or her boss, had better communications with employees, and was involved with the employees.

2. Which department do you think will be able to sustain any changes made and why?

   The first department. Since the supervisor had the responsibility and was accountable for improvements, he or she would make sure improvements were sustained.

   The second department. Since the employees were involved in the improvements or changes, they would be likely to continue with new methods.

3. Which department do you think will have the best employee morale and why?

   The first department. They knew the supervisor was the one who was responsible for the improvements. He or she would have to answer to upper management, not them.

   The second department. The employees had more information and were involved. They would feel like they had more control over the situation.

Figure 2.5

Productivity

Comparing Applications per Hour

Productivity of Employee 1	=	$\frac{\text{96 applications processed}}{\text{8 hours worked}}$	=	12 applications/hour
Productivity of Employee 2	=	$\frac{\text{160 applications processed}}{\text{8 hours worked}}$	=	20 applications

Comparing Applications per Dollar of Wages

Productivity of Employee 1	=	$\frac{\text{96 applications processed}}{\text{(\$6/hour)(8 hours worked)}}$	=	$\frac{96}{48} = 2.0$
Productivity of Employee 2	=	$\frac{\text{160 applications processed}}{\text{(\$8/hour)(8 hours worked)}}$	=	$\frac{160}{64} = 2.5$

III. Answers to Review and Discussion Questions

1. Brand X Corporation seeks to be the lowest-cost maker of lawn chairs and toboggans. To keep costs down, management tells the production department, “Keep that assembly line moving. We have an inspector on staff to catch the mistakes later.” What are the consequences Brand X Corporation is likely to experience as a result of this approach to manufacturing?

   First, the inspector is not likely to catch all of the defects, and the customer may receive a poor quality product. Loss of reputation and customer confidence is likely. Second, catching the defect after it has been produced means that costs have been incurred and the product may be scrapped. This means overall production costs may lead to higher prices and the loss of market share. Additionally, it gives employees permission to do poor quality work. This is a situation where others will say, “Management doesn’t care, so why should I?’

2. What is the difference between product quality control and process control? Give an example of each. (If possible, use examples from a job you have held.)

   Product quality control focuses on the ways to improve the product or service itself. Process quality control emphasizes how to do things in a way that leads to better quality.
   For example, a hotel that waits for customers to complain about the lack of towels to assure quality is using product quality control. When the hotel plans the method to distribute towels and follows up with a checklist to make sure the towels are in place before the room is occupied is using process quality control.

Students' answers will vary.

3. Define the zero-defects approach to quality control? Do you think zero defects is attainable? Why or why not?

   The zero-defects approach is a quality-control technique based on the view that everyone in the organization should work toward the goal of delivering such high quality that all aspects of the organization's goods and services are free of problems.
   Students' answers will vary. Some may argue that it is impossible to produce zero defects because some situations are truly unpredictable, such as human error.

4. Michelle LeVerrier supervises a group of tellers at a bank. The bank manager has asked her to lead an employee involvement team designed to improve the processes of serving individual customers at the teller windows. The four steps in the process are to (a) identify quality problems in the specific area of responsibility, (b) select one problem to focus on (c) analyze the problem, and (d) identify solutions and select one to present to management. How might Michelle use this four-step procedure to conduct her first team meeting?

   Students' answers will vary.
   Michelle could conduct her first meeting in the sequence based on the team process. First, she could ask individual team members to identify quality problems related to their jobs. For instance, perhaps many of the bank's customers speak Spanish, whereas the tellers speak only English. Then Michelle and the team could focus on two or three problems to address immediately. Then they could discuss the problem they plan to address first, analyzing it to identify its causes. Finally, they could identify possible solutions and select what they think will be the best one to implement (if she has the authority) or present to management.

5. What is total quality management (TQM)?

   TQM is an organization-wide focus on satisfying customers by continuously improving every business process for delivering goods or services. The objective of TQM is to meet or exceed customer expectations. Thus, it is not a final outcome but an ongoing commitment by everyone in the organization.

6. Imagine that you are the supervisor responsible for a pharmacy. You have received a few complaints about mistakes in customer's prescriptions. To improve the quality of service delivered by the pharmacists, you can concentrate on (a) doing a better job of catching errors in the future or (b) doing a better job of avoiding errors. Which approach would you choose? Explain.

   Students' answers will vary.
   Catching all errors is difficult to accomplish. Think about the ways one might accomplish this.

a. One could have each order double-checked by the person who filled the original order. That person has probably already done what he or she thinks will produce a quality product. If the same person rechecks the order, he or she will likely repeat a mistake made the first time.

b. One could have another person double-check the order. This means assigning an extra step and an extra person, increasing the cost of producing the product. It may also foster a decline in quality produced by the first person since any mistake made will be caught at a later time.

Both of these methods may have the effect of reducing employee morale.

Improving the process will eliminate the need to add costs to the production of the product of filled prescription. Evaluate the current process of filling prescriptions. What exactly are the prescriptions errors? Where are the mistakes made? When are they made? If, for example, the errors are in the count of pills or tablets, a change in the method for counting is needed to improve the process.

7. Frank Ouellette works at a government agency in which neither managers nor employees seem to worry about how long it takes to complete an assignment. Should Frank's co-workers be concerned about productivity? Why or why not?

Students' answers will vary. A majority of answers may be 'yes'.
With citizens pressing harder for lower taxes, government agencies must look for ways to increase productivity.

8. Anna Holt, a supervisor in a boot manufacturing plant, just received a memo from her manager informing her that productivity on her shift must increase by 10 percent during the next fiscal quarter. However, when she recently approached her manager about upgrading two of the machines, she was turned down. In addition, she knows that her employees' union will balk at an increase in the number of boots her group must produce in a given shift. What constraints on productivity does Anna face? How might she attempt to resolve them?

Students' answers will vary.
Anna faces management limitations and union rules. When management turned down her request for upgraded machinery, they probably conveyed the message that they were not really committed to the objective of greater productivity over the long run. Anna might approach her boss again on this, tying the request for new machinery to the objective of increased productivity. She should also meet with the union representative to try to explain the benefits of increased productivity and work out a solution.

9. At the claims-processing office for All-Folks Insurance, 25 employees process 2,500 claims a day. The claims-processing office for Purple Cross Insurance uses a state-of-the-art computer

system, and its 15 employees process 3,000 claims a day.

a. Which office is more productive?

If all other inputs are equal, the productivity of All-Folks Insurance is 100 per employee, while Purple Cross Insurance is 200 per employee or twice as much. However, it is unlikely that all other inputs are equal.

b. At which office would you expect that employees are paid more? Why?

Employees at Purple Cross Insurance should be paid more because their productivity is higher. However, the increased productivity may go toward paying for the computer.

c. Suppose that half the claims processed by the employees at Purple Cross contain errors and all of the claims processed at All-Folks are done correctly. Which office would you say is more productive? Why?

The productivity would be the same given the information available. Productivity should be based on good-quality outputs. However, if the claims were corrected and the output was higher than 1,500 per day, Purple Cross productivity would still be the highest.

10. Where can supervisors get information to help them determine costs?

The most important source of information on where the money is going is the budget report. By reviewing budget reports regularly, a supervisor can see which categories of expenses are largest and identify where the department is spending more than it budgeted.

11. How would you expect employees to respond to each of these efforts to cut costs?

a. A plan to increase output by scheduling fewer rest breaks

They will very likely be unhappy and may slow down their production effort. If a union contract indicates the length and frequency of breaks, the employees will likely file a grievance.

b. A plan to increase output by hiring someone to bring supplies to workers, rather than having them get their own supplies

They will likely appreciate having someone helping them out. However, going after supplies may have its own reward, such as a break in routine, an opportunity to talk with other employees, or a chance to stop by the snack area.

12. Rachel Roth supervises a shift of workers who manufacture ski clothing. Because of its seasonal

nature, the workflow tends to be uneven, and Rachel feels that this hurts productivity. What steps might Rachel take to try to regulate the workflow in her department?

Students' answers will vary, but Rachel should take two basic steps: first make sure that she is doing an adequate job of planning for the work required by her staff; then meet with her boss or peers to see if there might be ways to make the work flow more even or predictable.

13. A maintenance supervisor learned that installing a type of high-efficiency light bulb in the building can save the organization $1,000 a year. Replacing the light bulbs with the new ones would cost about $2,500.

    a. What is the payback period for this replacement?

       2 1/2 years

    b. What is the average rate of return?

       40%

    c. Do you think this is a worthwhile investment? Why or why not?

       Yes. Once installed, the savings would go on forever.
       No. The payback period is longer than the company policy allows. The price of the system may come down in the near future, thus the payback period would be even longer.

14. How does high turnover hurt productivity? What can a supervisor do to minimize turnover?

    The rate at which employees leave an organization is known as turnover. High turnover is expensive, because the organization must spend a lot of money to recruit and train new employees. Therefore, an important part of controlling costs is to keep good employees by making the organization a place they want to stay. In general, when an employee is feeling unsupported by his or her organization or supervisor, that employee is more likely to look for a new employment opportunity. Therefore, as a supervisor, it is important to be aware of how supported the employees feel about their relationship with the supervisor and the company as a whole.

15. Why do employees sometimes resist productivity improvements? How can supervisors prepare for and respond to employee attitudes?

    Employees may have good reason to be fearful of productivity improvements. Many employees have experienced or heard of cost reductions leading to less overtime pay, more difficult work, and even layoffs. When layoffs occur, the people who are left behind often have to struggle to keep up with the work that still has to be done.

Supervisors can respond to these fears by preparing themselves with information. A supervisor who does not understand the types of changes to be made and the reasons for them should discuss the matter with his or her manager as soon as possible. After obtaining a clear view of the organization's plans and goals, a supervisor should present this information to employees. In doing so, a supervisor should emphasize what the benefits will be and avoid dwelling on the negatives.

When a supervisor gives information about productivity improvement, employees should have an opportunity to ask questions. The supervisor who cannot answer some of the questions should promise to get answers—and then do so. On its own, information will not make employees enthusiastic about a productivity program, but uninformed employees almost certainly will suffer from low morale.

IV. Skill-Building

Meeting the Challenge

1. If you were a supervisor, would you have resented or welcomed the drive to be efficient in every way? Why?

   Students' answers will vary.

2. Working as a group, summarize three ways in which a Shearer's supervisor could support the company's efforts to reach "perfection" in quality and productivity.

   Students' answers will vary.

   The Shearer supervisors could support the company's efforts to reach "perfection" in quality and productivity by hiring employees who understand, appreciate, and share their commitment to continued and advancing excellence.

   The supervisors could ask the employees to practice product quality control and process control.

   The supervisors could create an organizational climate that encourages quality. From the day they are hired, employees at all levels should be made to understand that quality is important and that they have a role in delivering high quality.

   The supervisors could use statistical quality control, statistical process control, zero-defects approach, employee involvement teams, or total quality management.

   The supervisors could increase productivity by increasing output; improving methods; reducing overhead; minimizing waste; regulating or levelling the work flow; installing modern equipment; training and motivating employees; and minimizing tardiness, absenteeism, and turnover.

   Students could also consider the management functions and skills introduced in Chapter 1.

Problem Solving Case: Fast Food Is All About Service

1. What forms does quality take in a fast-food restaurant? That is what aspects of the food, service, atmosphere, and so on do you consider to be acceptable in terms of quality, and what would

exceed your expectations?

Students' answers will vary.
However, here is an example of McDonald's. The founder Ray Kroc instilled the following values which are taught even today to all the employees and the franchise owners: QVSC—Quality, Value, Service, and Cleanliness. Obviously, quality of the food, friendly service, willingness to correct the mistakes with a smile and an apology, appropriate atmosphere, being clean, well-lighted, etc. are essential ingredients of fast-food restaurant quality.

2. Productivity efforts in a fast-food restaurant often involve behind-the-scenes work in the kitchen. But in describing his experience, Drickhamer emphasizes that in a service business, production includes interaction with the customer. Identify one or two places in this case study where productivity could have been better.

   Productivity could have been bettered in the following places:
   - At the ordering station, instead of urging the customer's to try the chain's new chicken sandwich, the chain could have put up a poster.
   - Jon could have been faster in processing the payment, if:
     - He had kept a set or two of spare batteries with him.
     - His supervisor could have better trained him as to how to make his computer return to a particular customer's order when there are multiple orders.
   - Mary could have put in napkins and thus saved some time.

3. Working alone or in a group, draw a diagram of the work process described in this case study. In your diagram, show what materials each employee needed, as well as what each employee provided to the customer. Evaluate where the process could be improved, based on the information given and any experiences you have with fast-food restaurants. Finally, prepare a list of actions to improve the quality and productivity of this work process. As directed by your instructor, submit the diagram and list as a written report, or present your findings to the class.

   Students' answers will vary. Potential list of actions can include:
   - *Increase output*: Reassign employees. At busy times additional help can be enlisted by using managers, bus employees, and any other employed in the restaurant. Prepackage some items, for example, place some salads in carry-out bags. (This category may overlap with improve methods.)
   - *Improve methods*: Customers could pre-punch a card to be fed into a computer with their order, reducing the need to tell a person who punches it into a computer/cash register. French fries could be cooked on a conveyor so the basket did not have to be watched and emptied.
   - *Reduce overhead*: Reduce the number of bags used for carry-out. Reduce the number of lights in the dining area, especially during daylight hours. Put lights on a timer.
   - *Minimize waste*: Do studies of a business to determine the right number of employees to have at one time so there is the least amount of wasted time. Keep track of discarded food

as a result of poor preparation and plan to reduce the waste.

- Regulate *or level the workflow*: Offer slightly lower prices during off-hours.
- *Install modern equipment.* An automatic sandwich wrapper may reduce the amount of labor required to prepare food for the customer.
- *Train and motivate employees*: Train employees for their entry-level job. Start cross-training as soon as possible to assure employees can be moved to the task that needs extra help. This will also make employees' jobs more interesting.
- *Minimize tardiness, absenteeism, and turnover*: Provide additional benefits to employees who stay for six months, a year, and two years. To the degree possible, let employees choose their own schedule.

Assessing Yourself: Test Your Personal Productivity

This self-test will help the test-taker understand how productive he or she can be.

Class Skills Exercise: Defining and Measuring Quality of Service

This is a good exercise to get students thinking about the significance of providing quality customer service.

Building Supervision Skills: Improving Performance

1. On what basis did the judges rate the quality of houses? How many of the criteria in Table 2.1 did they use?

   Students may suggest objective dimensional criteria, such as the size of house or the number of rooms. They may also include subjective criteria, such as attractiveness or aesthetics.

2. How did your group decide on a way to make its house? How well did your group work together to produce the house?

   Ideally, they would first spend time planning. Often groups think they work as a team, but they may be working individually in the same space. Sometimes a single person will take over a task while others stand on the sidelines.

3. Given your group's experience and the information about how the judges arrived at their scores, how would you want to improve the quality of your house if you could repeat the exercise? Are your changes process improvements or product improvements?

   This is a good place to bring in the concept of benchmarking the best practices. Obviously they will improve their product, but have them discuss how the process would have to change to have process improvement.

4. Which team was most productive? Why? Did it use methods that could have helped the other groups? How could you have improved the productivity of your team?

   Students' answers will vary.

Figure 2.1

Parking Problems

Your Job

You have been selected to be part of a problem-solving team that will make recommendations to management on a variety of problems and issues. The team must (1) consider a variety of potential solutions and the potential negative response to each alternative, (2) reach consensus on recommendations, and, (3) present specific details to management.

Your team has 10 minutes to read the details of the problem and make notes. You will then have 30 minutes to discuss and come up with a recommendation on the parking situation.

The Parking Situation

The company is anticipating hiring 60 new employees, 20 on each of three shifts. At this time, the space allotted to parking will accommodate only an additional 4 cars on the day and afternoon shifts, and 10 cars on the midnight shift. The reason less space is available during the two day shifts is that from 7:30 A.M. to 6:30 P.M. 6 spaces are reserved for visitors.

Currently, there is construction going on at the company that makes expansion of the existing lot impossible. Construction will be completed approximately 12 months from now. At that time the parking lot will be expanded by an additional 30 regular parking spaces. The additional space will be sufficient for all anticipated growth at this site.

Currently, there is also a problem when the midnight shift works overtime. Workers on this shift often park in the visitor spaces; their cars may be in reserved spaces after 7:30 A.M. When visitors arrive early in the morning, all visitor spaces may be filled. Because customers are very important to the company, convenient spaces must be available for them. Sometimes people have been asked to move their cars to make adequate parking available for visitors.

In a related problem, it has been brought to the attention of management that two people who work the afternoon shift park in the visitor spaces. They park there when arriving only a minute or two before they are to start their shift and when the only available spaces are at the far end of the parking lot.

Figure 2.2

Parking Problem

Work Sheet

Start by Listing the Specific Problems to be Addressed by Your Team

1.

2.

3.

4.

5.

Potential Recommendations to Management

1.

Positive consequences:

Negative consequences:

2.

Positive consequences:

Negative consequences:

3.

Positive consequences:

Negative consequences:

4.

Positive consequences:

Negative consequences:

Final Recommendation to Management

Figure 2.3

Setting and Evaluating Quality Standards

1. What plans would you make to control the quality of making hamburgers? How would you monitor the standards set? What steps could be taken to improve the process or product?

2. What plans would you make to control the quality of moving people through the cafeteria line? (Remember, customer satisfaction is your goal.) How would you monitor the standards set? What steps could be taken to improve the process or product?

3. What plans would you make to control the quality of a delivery service? (Remember, customer satisfaction is your goal.) How would you monitor the standards set? What steps could be taken to improve the process or product?