

CHAPTER 24 Production and Control

CHAPTER SUMMARY

Production control ensures that an organization produces goods and services as planned. Production is the transformation of organizational resources into products, while productivity is the ratio of outputs to inputs. Five traditional strategies can be used to increase productivity: (1) train the work force, (2) use automation and robotics, (3) make products easier to assemble, (4) upgrade equipment, and (5) hire more qualified employees. While increasing productivity, managers should not ignore quality. Management has come to realize that quality is not an afterthought, but rather it is a continuous process that when done properly, reduces rework, production delays, and poor use of time and materials. Quality assurance starts with quality standards and ends when a quality product is delivered to the customer. A “no rejects” philosophy helps management control quality on the front end instead of at the end when it’s too late. Quality circles—small groups of workers who meet to solve a particular quality problem—are being used more and more as a way of involving the employee and gaining commitment. Automation can be defined as electromechanical devices replacing human effort.

In addition to understanding production and productivity, managers need to be aware of strategies, the plan of action, systems, organizational components (linked together to help complete a process), and the flow of interrelated events toward a goal. Operations management deals with such management activities as the selecting, designing, operating, controlling and updating of production systems. Operations management transforms resources into finished products through a number of key strategies: (1) capacity strategy, (2) location strategy, (3) product strategy, (4) process strategy, (5) layout strategy, and (6) human resource strategy. After the operational plan has been developed, the specific tasks needed to accomplish the goals are considered. Operations control includes such activities as: (1) just-in-time inventory control, (2) maintenance control, (3) cost control, (4) ~~materials budgetary~~ control, (5) ~~advanced-ratio analysis~~ ~~manufacturing support~~, and (6) ~~master scheduling, inventory control, aggregate planning, etc.~~ ~~materials control.~~ -

In addition to the production management tools listed, there are other selected operational control tools to be considered: (1) management by exception, (2) management by objectives, (3) break-even analysis, (4) decision tree analysis, (5) ~~work measurement~~ ~~process control~~, (6) ~~payoff table~~, (7) value analysis, and (8) computer-aided design and manufacturing. Management by exception ensures that managers handle only exceptional issues.

Management by objectives uses employee-participation to improve productivity. Break-even analysis generates information about various levels of profit or loss associated with various levels of production. Managers can use either graphic or algebraic break-even models or a combination. Materials requirement planning plots the flow of materials. Just-in-time (JIT) inventory control is one form of materials requirement planning.

Two other control tools which do not deal directly with the production process are budgets and ratio analysis. A budget is a planning and a control tool. In using budgets, managers should emphasize significant expenses, justify expenses each year, and change budgets periodically. Ratio analysis is a control tool that summarizes the financial position of an organization by calculating

ratios based on various financial measures. There are four types of ratios: (1) liquidity, (2) leverage, (3) activity, (4) profitability.

LEARNING OBJECTIVES

1. Definitions of *production*, *productivity*, and *quality*
2. An understanding of the importance of operations and production strategies, systems, and processes
3. Insights into the role of operations management concepts in the workplace
4. An understanding of how operations control procedures can be used to control production
5. Insights concerning operations control tools and how they evolve into a continual improvement approach to production management and control

Chapter's Target Skill:

Production Skill: the ability to transform organizational resources into products.

CHALLENGE CASE

DELTA ATTEMPTS TO BOOST PRODUCTIVITY

The Challenge Case describes the changes that Delta is implementing to improve productivity. Specifically, it explains how Delta is making changes in airports in an effort to reduce the time it takes passengers to board their flights. This chapter is designed to help managers in companies such as Delta increase productivity. This chapter emphasizes the fundamentals of production control—ensuring that an organization produces goods and services as planned. The primary discussion topics in the chapter are (1) production, (2) operations management, (3) operations control, and (4) selected operations control tools.

“ See all related teaching notes for Challenge Case in the Management Skill Activities”

EXPLORING YOUR MANAGEMENT SKILL: PART 1

CHAPTER OUTLINE

- I. INTRODUCTORY CHALLENGE CASE: DELTA FOCUSES ON CHECK-IN TO BUILD ATTEMPTS BOOST PRODUCTIVITY
 - A. To remain competitive, Delta must focus on improving customer check-in time through self-service kiosks.
- II. PRODUCTION

A. Defining Production

1. Production is the transformation of organizational resources into products.

B. Productivity

1. Productivity is the relationship between the amount of goods or services produced and the organizational resources needed to produce them.

2. Productivity = Outputs/Inputs

3. Some traditional strategies for increasing productivity include improving [the following](#):

- a. Work force effectiveness through training
- b. The production process through automation
- c. Product design to make products easier to assemble
- d. Production facility by purchasing more modern equipment
- e. The quality of workers being hired to fill open positions

4. Information Technology: [Sallie Mae Uses the Internet to Improve Productivity](#)

~~a. The lending institution uses a Web site to provide users with direct access. [Intel and Cisco are changing the way they design offices in an attempt to improve worker productivity.](#)~~

5. Quality and Productivity

- a. Quality is the extent to which a product reliably does what it is intended to do.

- b. Focus on Continual Improvement

1. Management theorists are finding that improving product quality actually improves the productivity of the system manufacturing the product.

- ~~c. [Ethics Spotlight](#)~~

- ~~1. [Bridgestone/Firestone admitted that design and manufacturing problems had contributed to tire failures resulting in 148 traffic deaths. It must now be decided where corporate social responsibilities lie and how they should be met.](#)~~

- ~~d. Focus on Quality and Integrated Operations~~

1. Deming believes that a serious focus on improving product quality throughout all phases of a production process initiates a set of chain reactions that benefits not only the company, but society. (Figure [22.10.2](#))

6. Quality Assurance

- a. Quality Assurance involves a broad group of activities that are aimed at achieving the organizational quality objectives.

- b. An organization's interpretation of quality is expressed in its strategies.

- c. Statistical Quality Control is the process used to determine the total number of products that need to be inspected in order for the organization to meet its quality standards.

- d. Quality assurance works best when management adopts a "no rejects" philosophy. Employees should be trained with a "do not make the same mistake once" [philosophy](#) [mind set](#).

7. Quality Circles

- a. Quality Circles are small groups of workers who meet to discuss a particular project in terms of quality assurance.

- b. Most quality circles are similar in the way they operate. (See Figure [22.23](#))

~~8. Quality Spotlight~~

~~a. Recent events at Adidas show that without proper controls aimed at enhancing profit, a company might not be around long enough to enhance product quality.~~

C. Automation

1. An area of study dealing with electromechanical equipment including both the development and use of robots.

~~2. Five levels of automation are presented in Table 18.1.~~

~~3. The robot does heavy work to meet specific needs.~~

D. Strategies, Systems, and Processes

1. A strategy is a plan of action.

2. A system is a linking of organizational components that facilitates carrying out a process.

3. A process is a flow of interrelated events toward a goal, purpose, or end.

III. OPERATIONS MANAGEMENT

A. Defining Operations Management

1. Operations management is the process of managing production in organizations.

2. It entails selecting, designing, operating, controlling, and updating production systems.

B. Operations Management Considerations

1. Operations management conveys three key notions:

a. Operations management involves managers.

b. Operations management takes place within the context of objectives and policies that drive the organization's strategic plans.

c. Criteria relevant for judging the actions taken as a result of operations management are standards for effectiveness and efficiency.

1. Effectiveness is the degree to which managers attain organizational objectives: "doing the right things."

2. Efficiency is the degree to which organizational resources contribute to productivity: "doing things right."

~~2.~~ Operational strategies; capacity, location, product, process, layout and human

resources are designed to assure that resources are obtained and used effectively and efficiently.

~~3.~~ 1. Capacity Strategy

a. A capacity strategy is a plan of action aimed at providing the organization with the right facilities to produce the needed output at the right time.

b. Insufficient capacity results in loss of profits.

c. Excess capacity results in higher production costs.

d. A five-step process can help managers make sound strategic capacity decisions:

1. Measure current capacity

2. Estimate future capacity needs

3. Compare future and available capacity needs to determine whether capacity should be increased or decreased

4. Identify ways to accommodate long-range capacity needs:

5. Select the best alternative:

4.2. Location Strategy

- a. Location Strategy is a plan of action that provides the organization with competitive locations for its headquarters, manufacturing, services, and distribution activities.
- b. A successful location strategy should consider the following:
 - 1. Nearness to market and distribution centers
 - 2. Nearness to vendors and resources
 - 3. Requirements of federal, state and local governments
 - 4. Character of direct competition
 - 5. Quality and quantity of labor pools
 - 5. The degree of interaction with the rest of the corporation
 - 6. Quality and quantity of labor pools
 - 7. The environmental attractiveness of the area
 - 8. The requirements of taxes and financing
 - 9. The kinds of existing and potential transportation. The quality of utilities and services
 - 10. The quality of utilities and services

The kinds of existing and potential transportation:

5.3. Product Strategy

- a. Product Strategy is a way of deciding which goods and services an organization will produce and market.
- b. Product, marketing, and research and development strategies fit together to build the operations strategy.

6.4. Process Strategy

- a. Process Strategy determines the means and methods that the organization will use to transform resources into goods and services.
- b. Continuous Process—a production-oriented, high-volume low-variety process; examples include beer production, petroleum, and chemical production.
- c. Repetitive Process—a product-oriented production process that uses modules for producing items in large lots; examples include mass production or assembly lines used in auto manufacturing and appliance production.
- d. Job Shop Process—a high-variety, low-volume process-system used in manufacturing items; examples include: furniture, space-ships or weapons systems.

7.5. Layout Strategy (see Figure 22.4.)

- a. Layout Strategy is concerned with the location and flow of the organizational resources around, into, and within production and services.
- b. A process layout is a layout pattern based primarily on grouping similar types of equipment appropriate for organizations involved in a large number of different tasks. This pattern typically includes low volumes, multipurpose equipment, and broad employee skills.
- c. A product layout is a layout pattern based on the progressive steps by which a product is made appropriate for servicing a limited number of different products, high volumes, highly specialized equipment, and narrow employee skills.
- c. A process layout is a layout pattern based primarily on grouping similar types of equipment appropriate for organizations involved in a large number of

different tasks. This pattern typically includes low volumes, multipurpose equipment, and broad employee skills.

d. A fixed-position layout is a layout pattern that has workers, tools, and materials rotating around a stationary product because of the weight or bulk of the product being manufactured.

e. A group technology layout is a cell of a product layout within a larger process layout. (Figure 20.5 illustrates each of the three layout patterns.)

6. Human Resources Strategy

a. Human Resources Strategy is a plan to use the organization's human resources while maintaining or improving the quality of work life.

b. Manpower planning is the primary focus of the human resources strategy.

c. Job design is concerned with who will do a specific job.

d. Work methods analysis is used to improve productivity.

e. Work measurement methods are used to establish labor standards.

IV. OPERATIONS CONTROL

A. Operations Control is the specific tasks used to accomplish an organization's functional objectives.

B. Operations control includes the following activities: just-in-time inventory control, maintenance control, cost control, budgetary control, ratio analysis and materials control, ~~advanced manufacturing support, aggregate planning and master scheduling, inventory control, and resource requirements planning.~~

1. Just-in-Time Inventory Control

a. Just-in-time (JIT) inventory control is a control technique that reduces inventories to a minimum by arranging for components to be delivered to the production facility just in time to be used.

b. JIT is based on the philosophy that products should be made when customers need them and in the quantities customers need them in order to minimize inventory levels kept on hand.

c. Successful JIT programs have common characteristics:

1. Closeness of suppliers

2. High-quality materials purchased from suppliers

3. Well-organized receiving and handling of materials purchased from suppliers

4. Strong management commitment

2. Maintenance Control

a. The goal of maintenance activities is to keep the organization's equipment at predetermined work levels.

b. Fixing equipment before it malfunctions is known as pure-preventative maintenance.

c. Fixing equipment after it malfunctions is known as pure-breakdown policy fix.

3. Cost Control

a. Cost control is a major component of any organizations strategy. Any control process involves four stages: establishing standard cost values, measuring actual

cost values, comparing actual to standard cost values, and implementing needed changes.

4. Budgetary Control

a. A budget is a control tool outlining how funds will be obtained and spent in a given period.

1. Potential Pitfalls of Budgets

- a. Placing too much emphasis on relatively insignificant organizational expenses
- b. Increasing budgeting expenses year after year without adequate information
- c. Ignoring the fact that budgets must be changed periodically

2. Human Relations Considerations in Using Budgets

- a. Budgets can result in major human relations problems.
- b. To minimize human relations problems, training programs for personnel in finance, accounting, and production focus on emphasizing both the advantages and disadvantages of applying pressure on people through budgets and the possible results of using budgets to imply organizational member success or failure.

5. Ratio Analysis

a. Ratio analysis is a control tool generating information that summarizes the financial position of an organization through the calculation of ratios based on various financial measures.

1. Ratios available to managers include: profitability ratio, liquidity ratio activity ratio and leverage ratio.

~~a. Liquidity ratios are the ratios that indicate an organization's ability to meet upcoming financial obligations.~~

~~b. Current ratio indicates the firm's ability to meet short-run financial obligations. (Current ratio = Current assets/Current liabilities)~~

~~c. Quick ratio indicates the firm's ability to meet its financial obligations with no reliance on inventory. (Quick ratio = Current assets - Inventory/Current liabilities)~~

2. Leverage Ratios

~~a. Leverage ratios indicate the relationships between organizational funds supplied by the owners of an organization and organizational funds supplied by creditor.~~

~~b. Debt ratio indicates the percentage of all organizational assets provided by creditors. (Debt ratio = Total debts/Total assets)~~

~~c. Times interest earned ratio indicates an organization's ability to pay interest expenses directly from gross income. (Times interest = Gross Income earned/Interest charges)~~

3. Activity Ratios

~~a. Activity ratios indicate how well an organization is selling its products in relation to its available resources.~~

~~b. Inventory turnover indicates whether the firm is maintaining an appropriate inventory level in relation to its sales volume. (Inventory turnover = Sales/Inventory)~~

~~c. Fixed assets turnover indicates the appropriateness of the amount of funds invested in plant and equipment relative to the level of sales. (Fixed assets turnover = Sales/Fixed assets)~~

————— d. Total assets turnover indicates the level of funds an organization has tied up in all assets relative to its rate of sales. (Total asset turnover = Sales/Total assets)

————— 4. Profitability Ratios

————— a. Profitability ratios are ratios that indicate the ability of an organization to generate profits.

————— b. Profit to sales ratio indicates whether the organization is making an adequate net profit relative to its total sales. (Profit to sales ratio = Net profit/Sales)

————— c. Profit to total assets ratio indicates whether the organization is realizing enough net profit in relation to the total dollars invested in assets. (Profit to total assets ratio = Net profit/Total assets)

b. 5. Using Ratios to Control Organizations

1a. Ratio analysis can be used in three ways to control an organization:

a1. Managers should evaluate all ratios simultaneously.

b2. Managers should compare computed values for ratios in a specific organization with the values of industry averages for those same ratios.

c3. Managers' use of ratios to control an organization should also involve trend analysis.

————— 6. Materials Control

————— a. Materials control supports the flow of materials from vendors through an operations system to customers.

b. Materials control can be grouped into six broad categories:

1. Purchasing

2. Receiving

3. Inventory

4. Floor~~d~~ controlling

5. Trafficking

6. Shipping and distribution

CLASS DISCUSSION HIGHLIGHT: Does Quality Control Matter?

This chapter highlights how a company's operations management is important, but do these management techniques ultimately help managers to improve the performance of their firms? To answer this question, Professors Tan, Kannan, and Narasimhans examined the influence of quality control and just-in-time strategies influenced firm performance.

The researchers designed a survey to better understand how operations management techniques influence firm performance, and they received over 500 responses from operations management professionals. Do you think that the authors found support for relationships between quality control and just-in-time strategies and firm performance? Why or why not? If managers share your beliefs, what are the implications for organizations and their budgets?

[7. HOW THE PROS DO IT: Inventory Control at J.C. Penny](#)

[a. J.C. Penny has developed an effective new system for controlling men's dress shirt inventory.](#)

V. SELECTED OPERATIONS CONTROL TOOLS

- A. A control tool is a specific procedure or technique that presents pertinent organizational information in a way that helps managers develop and implement appropriate control strategy.
- B. Using Control Tools to Control Organizations
 - 1. Continuous improvement is the development and use of better methods.
- C. Inspection
 - 1. Traditionally, many inspectors were hired to insure good quality.
 - 2. Today, Deming recommends either 100 percent inspection in those cases where defect-free work is impossible or no inspection where the level of defects is acceptably small.
- D. Management by Exception
 - 1. Management by exception is a control tool that allows only significant deviations between planned and actual performance to be brought to the manager's attention.
 - 2. If appropriately administered, it ensures the best use of the manager's time.
- [E. Management by Objectives](#)
 - [1. Discussed in Chapter 7, where manager assigns a objectives and action plans to workers and then rewards those workers based on of how close they get to reaching their goals](#)
- [E. Break-even Analysis](#)
 - 1. Break-even analysis is the process of generating information summarizing various profit or loss levels associated with various levels of production.
 - 2. Basic Ingredients of Breakeven Analysis
 - a. Fixed costs—expenses incurred by an organization, regardless of the number of products produced.

- b. Variable costs—expenses that fluctuate with the number of products produced.
 - c. Total costs—the sum of fixed and variable costs.
 - d. Total Revenue—all sales dollars accumulated from selling products or services.
 - e. Profits—the amount of total revenue that exceeds the total costs of production.
 - f. Loss—the amount of the total costs of producing a product that exceeds the total revenue gained from selling the product.
 - g. Break-even point—that situation wherein the total revenue of an organization equals its total costs. The firm is generating only enough revenue to cover its costs.
3. Types of Breakeven Analysis
- a. Algebraic Break-even Analysis
 - 1. $BE = FC/P - VC$, where:
 - a. BE = that level of production where the firm breaks even
 - b. FC = total fixed production costs
 - c. P = price of each individual unit
 - d. VC = variable costs associated with each product manufactured and sold
 - b. Graphic Breakeven Analysis ([See Figure 22.5.18-6](#))
 - 1. Entails constructing a graph showing all critical elements within a breakeven analysis.
 - c. Advantages of Using the Algebraic and Graphic Break-even Methods
 - 1. Choice of method depends usually on the situation managers face.
 - 2. Algebraic analysis provides a quick determination.
 - 3. Graphic method provides a more complete picture of the cumulative relationships.
4. Control and Break-even Analysis
- a. Break-even analysis is a useful control tool because it helps managers understand relationships between fixed costs, variable costs, total costs, and profit and loss within an organization.
 - b. The exact break-even strategy a manager should develop and implement primarily is dictated by the manager's unique organizational situation.
- F. Other Broad Operations Control Tools
- 1. Decision tFree aAnalysis is a statistical decision-making technique used to determine the relative expected value of each alternative course of action.
 - 2. Process control is a technique that assists in monitoring production processes.
 - 3. Value aAnalysis is an analysis that examines all parts, materials, and functions in order to reduce costs by ordering cheaper components.
 - 4. Computer-Aided Design (CAD) is used to perform engineering analysis on a part.
 - 5. Computer-Aided Manufacturing (CAM) is linked with CAD through a computer to control production processes.

[CHALLENGE CASE AND CHALLENGE CASE SUMMARY](#)
[DELTA ATTEMPTS TO BOOST PRODUCTIVITY](#)

The Challenge Case describes the changes that Delta is implementing to improve productivity. Specifically, it explains how Delta is making changes in airports in an effort to reduce the time it takes passengers to board their flights.

Delta Air Lines provides air transportation for travelers and cargo throughout the world. Despite these many markets, the company has struggled in recent years to maintain profitability. To help remedy Delta's troubles, which entails increasing customer satisfaction, the board of directors recently named Richard Anderson as the CEO. Delta recently invested approximately \$200 million to speed up the check-in process to include using self-service kiosks that help passengers check in more quickly. They are also installing special telephones in airports so that when passengers need to make changes to their itineraries, they can call one of these telephones which also reduces the numbers of employees needed to man airport counters. These measures will improved Delta's productivity and it desperately needs these productivity increases if it wants to survive.

Increasing productivity at Delta is mainly a matter of integrating resources such as people, equipment, and materials to provide better customer service. Decision tree analysis, process control, value analysis, computer-aided design, and computer-aided manufacturing were presented in the text as broader operations tools that are highly useful to managers exercising the control function. Of all these tools, value analysis would have the most application to Delta's service-oriented operation. Delta's management could use this cost control and cost reduction technique to examine the cost and worth of every component of customer service.

MANAGEMENT SKILL EXERCISES

INDIVIDUAL EXERCISES

1. The Introductory Case outlines several steps Delta is taking to increase productivity. Define what a "No Rejects" philosophy would mean for each of these processes. Be as detailed as you can.

Students should bear in mind that quality assurance works best when management adopts a "no rejects" philosophy. Employees should be trained with a "do not make the same mistake once" philosophy. That philosophy can be applied to assuring that the self-service kiosks are working properly every time a customer used them and assuring that the service agents who specialize in making itinerary changes follow the most effective procedures under the "Delta Direct" program.

2. After students review 'Inventory Control at J. C. Penny they will assume to be in charge of the company's relationship with TAL and are beginning to feel some discomfort with the amount of independence that TAL has in making decisions about managing Penny shirt inventory. They will write three rules, consistent with the principle of management by exception, that would somewhat limit TAL's independence. They will explain how each rule limits TAL independence.

Answers will vary based on students' knowledge of the retail business and

“management by exception” approaches. Management by exception is a control tool that allows only significant deviations between planned and actual performance to be brought to the manager’s attention. The students’ opinions on what are significant deviations will vary.

GROUP EXERCISES

1. After the groups review ‘Sallie Mae Uses the Internet as an Operations Management Strategy’, the groups will explain their answers the following questions. Are managerial activities at Sallie Mae aimed at using the Internet as a facet of operations management? Can effectiveness and efficiency at Sallie Mae be enhanced through this new Internet focus?

Answers to this exercise will vary based on the groups’ understanding of the use of the Internet to improve customer service. They should answer that improving productivity is a facet of operations management. If the students show how the new Internet self-service applications create an easier way for Sallie Mae to offer services to its customers while increasing customer representative productivity then both effectiveness and efficiency are improved.

2. After groups review ‘Bridgestone/Firestone and Ford: Product Quality Triggers Social Responsibility Debate’, the groups will assume to be the Vice President for Quality Assurance at Bridgestone/Firestone, Inc., and have been asked to initiate a new program within the company that would assure the production and sale of high quality tires in the future. They will list the components of the new program and explain how each would function. They will estimate how long it will take to start seeing the results of the new program and why it would take that time.

The programs components and the timeframes will vary based on the groups’ understanding of the tire business. The new program must focus on continual improvement and integrating quality into the tire production operation. The utilization of employees’ input through using quality circles and statistical quality control should be mentioned. Compare and contrast the groups’ responses.

ANSWERS TO STUDY QUESTIONS

1. What is *production control*?

Production control is the process by which managers control production levels, maintain production schedules and workforce levels, and meet quality standards.

2. Define *production*.

Production is the transformation of organizational resources into products.

3. What is *productivity*?

Productivity is the relationship between the total amount of goods or services being produced (output) and the organizational resources needed to produce them (input). The following equation: $\text{Productivity} = \text{Output}/\text{Inputs}$ defines the concept of productivity. The greater the ratio of outputs to inputs, the higher productivity is for any given firm. Inputs are all organizational resources needed to produce the outputs (goods or services).

4. Discuss strategies for increasing productivity.

Some of the more traditional strategies for increasing productivity are as follows:

1. Improving the effectiveness of the organizational workforce through training.
2. Improving the production process through automation.
3. Improving product design to make products easier to assemble.
4. Improving the production facility by purchasing more modern equipment.
5. Improving the quality of workers hired to fill open positions.

5. What is *quality*?

Quality is the extent to which a product reliably does what it is intended to do.

6. Discuss the relationship between 'quality' and 'productivity'.

Management theorists have found that improving product quality during all phases of a production process actually improves the productivity of the system that manufactures the product.

7. Discuss Deming's flow diagram for improving product quality.

Deming's flow diagram is built on the principle that the process is integrated into one operation. The flow diagram follows a series of questions. How to build that integration is probably the biggest question asked. How do you build vendor input into your system; how do you get the employee involved at improving the process; and finally, how do you get the customer involved so as to create a product that the customer will want and desire and not a product that only contributes significantly to the bottom line?

8. What is *quality assurance*?

Quality assurance involves a broad set of activities that—starting when quality standards are set and ending when a quality product is delivered—are aimed at achieving the company's quality objectives. Quality assurance defines quality and what it is to the company in a broad sense.

9. Define *statistical quality control*.

Statistical quality control calculates the number of products to be inspected in order to meet a quality standard.

10. Discuss a 'no rejects philosophy'.

Quality assurance works best when management adopts a "no rejects" philosophy. Unfortunately, such a philosophy is not economically feasible for most mass-produced products. What is possible is training employees to approach production with a "do not make the same mistake once" mind set.

11. What is a *quality circle*?

Quality circles are small groups of workers that meet to discuss quality-related problems on a particular project and communicate their solutions to these problems to management at a formal presentation session.

12. Discuss quality circles problem-solving process.

Quality circles are usually made up of eight or fewer members who meet to discuss certain projects in terms of quality assurance. Their focus is on solving operational problems and communicating them to upper management. Sometimes group members are outside the realm of the project. Companies often use quality circles to promote an organization's commitment to quality. To be fully effective in the quality arena, a company needs to move beyond the ideas stage—quality circles—to the implementation stage—work teams.

13. What is *automation*?

Automation is defined as the replacement of human effort by electromechanical devices. Automation is gaining wide acceptance in improving productivity. Machines can replace human effort in hazardous environments, or in environments involving boring and repetitive tasks, and can achieve levels of quality unattainable by most humans. Automation should not be seen as a method for replacing the worker but as a method of moving the worker into a job that is more challenging.

14. Define *robotics*.

Robotics is the study of the development and use of robots.

15. What is *operations management*?

~~Operations management is the performance of the managerial activities related to selecting, designing, operating, controlling, and updating production systems. Activities involved in managing production include selecting, designing, updating, and controlling products, process, equipment, workforce, and operating systems.~~

~~16. Define *effectiveness*.~~

~~Effectiveness is the degree to which managers attain organizational objectives: “doing the right things.”~~

~~17. Define *efficiency*.~~

~~Efficiency is the degree to which organizational resources contribute to productivity: “doing things right.”~~

~~18. What is *capacity strategy*?~~

~~Capacity Strategy provides a company the right amount of production facilities at the right time. Insufficient capacity may result in lost sales, and excess capacity might increase production costs.~~

~~19. What steps are involved in making capacity decisions?~~

~~A five step process is recommended:~~

- ~~—— (1) Measure the capacity of currently available facilities.~~
- ~~—— (2) Estimate future capacity needs based on demand forecasts.~~
- ~~—— (3) Compare future capacity needs with available capacity.~~
- ~~—— (4) Identify ways to accommodate long-range capacity changes.~~
- ~~—— (5) Select the best alternative.~~

~~20. What is *location strategy*?~~

~~Location Strategy determining competitive location saves a company in terms of transportation and communication costs.~~

~~21. Discuss consideration in finding an appropriate location.~~

~~A variety of major factors must be considered in finding an appropriate location. These factors include: nearness to market and distribution centers; nearness to vendors and resources; requirements of federal, state, and local governments; the character of direct competition; the degree of interaction with the rest of the corporation; the quality and quantity of labor pools; the~~

environmental attractiveness of the area; taxes and financing requirements; existing and potential transportation; and the quality of utilities and services.

22. Define *product strategy*.

Product Strategy is a way of deciding which products a company will produce. This strategy affects the operational, marketing and research, and development portions of the company and can have a decided effect on overall profitability.

23. What is *process strategy*?

Process Strategy determines the way a company will use its resources to make its products. If it doesn't use its resources in the most efficient manner, productivity and profits will suffer.

24. Discuss various types of processes.

There are three types of processes. They are:

1. Continuous—product-oriented, high-volume, low-variety; used in producing chemicals, beer, and petroleum products.
2. Repetitive—produces items in large lots; used in mass production of automobiles or appliances.
3. Job shop—produces one-of-a-kind products, high-variety, low-volume; used in production of such items as weapons systems or ships.

25. Define *layout strategy*.

Layout Strategy determines the way resources flow in and around the production facilities. Should a company not use the most efficient plant layout to produce a product, productivity will be down and costs will rise.

26. What is a *layout*?

A layout is the overall arrangement of equipment, work areas, service areas, and storage areas within a facility that produces goods or provides services.

27. Define *product, process, and fixed position layouts*.

The three different types of layouts are:

- (a) Product. This layout is specialized to handle one type of product using specialized machinery and a specialized work flow. Examples would be automobiles, washing machines, refrigerators, microcomputers, and breweries.

- (b) *Process*. This layout groups similar machines together and routes the work to the machine, which allows some flexibility in what products are produced. Examples would be hospitals, auto repair shops, machine shops, garment factories, department stores, and custom furniture makers.
- (c) *Fixed Position*. In this layout, the machinery is brought to the work station to stationary product. Examples include ships, jumbo jets, large bridges, and skyscrapers.

28. Define *human resource strategy*.

A human resource strategy attempts to match the skill level of the employee with the operational tasks of an organization.

29. What is the relationship between *manpower planning* and *job design*, and human resource strategy?

Usually a company's largest financial investment is in the human resource area. Job design, work methods, and manpower planning are all strategies that help transform your largest investment into a profitable and productive asset.

30. What is *work methods analysis*?

Work methods analysis is an operational tool used to improve productivity and ensure the safety of workers.

31. Define *motion study techniques*.

Motion study techniques are operational tools that are used to improve productivity.

32. What are *work measurement methods*?

Work measurement methods are operational tools that are used to establish labor standards.

33. What is *operations control*?

Operations control is an operational plan that specifies the operational activities of an organization.

34. What is *JIT* and when does it work best?

Just-in-time management philosophy requires that products should be manufactured when the customer needs them and only in the quantities that the customer needs. This philosophy minimizes the level of raw materials and finished goods kept on hand at a company facility. *JIT* works best in companies that manufacture relatively standardized products for which there is consistent demand.

35. Discuss the advantages of *JIT*.

First, it reduces the unnecessary labor expenses generated by manufacturing products that are not sold. Second, it minimizes the tying up of monetary resources in purchases of production-related materials that do not result in timely sales. Third, it helps management hold down inventory expenses—particularly storage and handling costs.

36. What are the characteristics of *JIT*?

The characteristics of *JIT* are closeness of suppliers, high quality of materials purchased from suppliers, well-organized receiving and handling of materials purchased from suppliers, and strong management commitment.

37. Discuss *pure-preventative maintenance policy*.

Fixing equipment before it breaks is *pure-preventative maintenance*. It involves machine adjustments, lubrication, cleaning, parts replacement, painting, and needed repairs and overhauls.

38. What is *pure-breakdown policy*?

Repairing equipment after it malfunctions is known as the *pure-breakdown policy*—fix the equipment as needed.

39. Discuss cost control and its stages.

Because operations functions are cost intensive—the most cost intensive of all management activities—cost savings are realized at all operational levels when every manager takes responsibility for cost containment. The general cost control process has four stages:

1. Establishing standard or planned cost amounts
2. Measuring actual costs incurred
3. Comparing planned costs to incurred costs
4. Making changes to reduce actual costs to planned costs when necessary

40. What is a *budget*?

A budget is a single-use financial plan that covers a specified time period.

It can be used as a control tool by gathering information on actual receipts and expenditures within a specified time period. This information can then be compared to the budgeted amounts. If significant deviations exist, a control strategy can be developed and implemented to make actual performance more consistent with the planned performance.

41. Discuss possible pitfalls in using budgets.

There are three pitfalls:

- (a) placing too much emphasis on relatively insignificant organizational expenditures;
- (b) increasing budgeted expenses year after year without adequate information; and
- (c) ignoring the fact that budgets must be changed periodically.

42. What is zero-based budgeting?

Zero-based budgeting is a planning and budgeting process that requires managers to justify their entire budget request in detail rather than simply referring to budget amounts established in previous years.

43. Define a variable budget.

A variable budget (also known as a *flexible budget*) is one that outlines the levels of resources to be allocated for each organizational activity according to the level of production within the organization.

44. Discuss human relations issues in using budgets.

Budgets can build pressures that unite workers against management, cause harmful conflict between management and factory workers, and create tensions that result in worker inefficiency and worker aggression against management.

45. Define ratio analysis and how it can work to control organizations.

Ratio analysis is the process of generating information that summarizes the financial position of the organization. The ratios are calculated from financial measures that appear on the organization's balance sheet and income statement. Managers should evaluate all ratios simultaneously to develop and implement a control strategy appropriate for the organization as a whole. Managers increase the probability of formulating and implementing appropriate control strategies when they compare their financial situation to that of competitors in the same way, using the same ratios. Managers can use the ratios to incorporate trend analysis to predict future conditions and create preventive strategies.

46. Discuss *materials control*.

Materials control is the process of creating schedules that identify specific parts and materials required to produce an item, the quantities needed, when those items will be needed, and when parts, sub-assemblies, and raw materials should be ordered.

47. How does procurement relate to materials control?

Purchases of production materials are largely automated and linked to a resources requirement planning system updated through material control data.

48. How do receiving, shipping, and trafficking relate to materials control?

Material control determines the unloading, identifying, inspecting, reporting, and storing activities of inbound and outbound materials.

49. How do inventory and shop floor control relate to materials control?

Materials control reduces work-in-process, raw materials, and finished goods inventories, resulting in lower costs. In addition, it provides excellent reports on the status of any particular order flowing through the facility. The exception reports and output reports are ideal control information.

50. Define a *control tool*.

A control tool is a specific procedure that presents pertinent organizational information in such a way that managers are aided in developing and implementing appropriate control strategy.

51. Discuss inspection as a control tool.

Inspection is a limited, grossly overused, and often misused control tool to achieve quality.

52. What is *management by exception*?

Management by exception is a specific control technique that allows only significant deviations between planned and actual performance to be brought to the manager.

53. Discuss the relationship between rules and management by exception.

Setting rules must be done very carefully to ensure that all true deviations are brought to the manager's attention. Since only matters concerning significant deviations or non-routine issues

are presented, managers can spend most of their time working on significant issues. Subordinates handle the routine or minor deviations themselves. Managers can concentrate on dealing with the strengths and weaknesses of the organization.

54. Discuss management by objectives as a control tool.

The manager assigns a specialized set of objectives and action plans to workers and then rewards those workers on the basis of how close they come to reaching their goals.

55. Define *break-even analysis*.

Break-even analysis is a control tool that summarizes the various levels of profit or loss associated with various levels of production.

56. Define the major aspects of break-even analysis.

The seven major aspects of break-even analysis are:

- (1) Fixed costs—expenses incurred by the organization, regardless of the number of products produced.
- (2) Variable costs—expenses that fluctuate with the number of products produced.
- (3) Total costs—simply the sum of fixed and variable costs associated with production.
- (4) Total revenue—all sales dollars accumulated from selling manufactured products.
- (5) Profits—that amount of total revenue that exceeds the total cost of producing the products sold.
- (6) Loss—the amount of the total costs of producing a product that exceeds the total revenue gained from selling the product.
- (7) Break-even point—that situation whereby the total revenue of the organization equals its total costs.

57. What is *algebraic break-even analysis*?

Algebraic break-even analysis uses a simple formula to determine the level of production at which an organization breaks even. The formula is $BE = \frac{FC}{P - VC}$

58. What is *graphic break-even analysis*?

Graphic break-even analysis entails the construction of a graph showing all the critical elements in a break-even analysis.

59. Discuss advantages of using algebraic and graphic break-even analysis.

For a manager who desires a quick yet accurate determination of a break-even point, the algebraic method generally suffices. For a manager who wants a more complete picture of the cumulative relationships between the break-even point, fixed costs, and escalating variable costs, the graphic break-even method is more useful.

60. Explain the relationship between control and break-even analysis.

Managers can use breakeven analysis to understand the relationships among fixed costs, variable costs, total costs, and profit and loss within an organization. Once these relationships are understood, managers can modify one or more of these variables to reduce significant deviation between planned and actual profit levels. To increase profit, they could lower fixed or variable costs, increase the selling price, or produce and sell more units of the product.

61. What is a *decision tree analysis*?

Decision Tree Analysis allows a decision-maker to make decisions on uncertain events by determining the expected value of each alternative course of action.

62. What is *process control*?

Process Control is the constant monitoring of the production process in order to assure that product quality is acceptable.

63. What is *value analysis*?

Value Analysis is a method of examining all parts, materials and functions in order to reduce costs through use of cheaper components but still retain product quality.

64. Discuss *CAD*.

Computer-Aided Design (CAD) uses computer technologies to aid in the process design. CAD functions to ensure the quality of a product by guaranteeing not only the quality of parts in the product, but also the appropriateness of the product's design.

65. Define *CAM*.

Computer-Aided Manufacturing (CAM) is a system that links processes so that information can be shared easily.

INTRODUCTORY CASE:

~~DELTA FOCUSES ON CHECK-IN TO BUILD PRODUCTIVITY~~

~~Delta is attempting to speed-up getting passengers aboard the planes with less employee's customer service involvement so that it can be more productive and save per mile passenger costs.~~

~~-~~

~~The wrap-up for the case has the following questions:~~

DISCUSSION QUESTIONS

1. *Why is Delta attempting to raise productivity? From your personal experience with airlines, in what other ways do you think the company could increase productivity?*

USAir needs to lower operating costs. It sees a way to accomplish this task through the automated self-service kiosks and "Delta Direct" services. If customers have shorter waits, they will enjoy their flights more. Answers may vary: Delta could provide more training for its "Delta Direct" representatives, use robots to perform repetitive job tasks, such as baggage handling and allow workers to provide input as to what they think will work.

2. *List three concepts discussed in this chapter that could help Delta's management to increase productivity. Be sure to explain how each concept could help.*

Automation, quality assurance and training are ways to improve productivity. Delta could install automated turnstiles to handle the luggage; they could install quality circle designed to find ways to improve productivity through team efforts, and lastly, they could establish better training.

3. *Which concept listed in Question 2 do you think would have the most positive impact on increasing productivity? Explain fully.*

The idea that would probably have greatest impact is the establishment of quality circles. Quality circles focus on operational problems and not personal problems. The quality circles are made up of those who can directly solve the problems.

MANAGEMENT SKILLS ACTIVITIES

UNDERSTANDING PRODUCTION AND CONTROL CONCEPTS

ESSAY QUESTIONS

Essay Questions

1. Describe the relationship between quality and productivity.

Management theorists have found that improving product quality during all phases of a production process actually improves the productivity of the system that manufactures the product.

2. Define capacity strategy and describe the five steps involved with making capacity decisions.

Capacity Strategy provides a company the right amount of production facilities at the right time. Insufficient capacity may result in lost sales, and excess capacity might increase production costs. The five steps involved with making capacity decisions include:

- (1) Measure the capacity of currently available facilities.
- (2) Estimate future capacity needs based on demand forecasts.
- (3) Compare future capacity needs with available capacity.
- (4) Identify ways to accommodate long-range capacity changes.
- (5) Select the best alternative.

3. Describe the advantages and disadvantages associated with just-in-time inventory control.

The advantages with just-in-time inventory is that it reduces the unnecessary labor expenses generated by manufacturing products that are not sold. Second, it minimizes the tying up of monetary resources in purchases of production-related materials that do not result in timely sales. Third, it helps management hold down inventory expenses—particularly storage and handling costs. Disadvantages include manufacturers utilizing JIT find it difficult to deal with defective parts as it can slow down production costs. Relying on one large supplier may present disadvantages as well because if there is a disruption, this can slow down production.

4. Compare and contrast the following operations controls: maintenance control, cost control, budgetary control, and ratio analysis.

Maintenance control is aimed at keeping the organization's facility and equipment functioning at predetermined work levels. Cost control is broad in nature and focused on keeping organizational costs at planned levels. Because cost control relates to all organizational costs, it emphasizes activities in all organizational areas, such as research and development, operations, marketing, and finance. Budgetary controls are for ensuring that income and expenses occur as planned. Ratio analysis is the process of generating information that summarizes the financial position of the organization. The ratios are calculated from financial measures that appear on the organization's balance sheet and income statement. Managers should evaluate all ratios simultaneously to develop and implement a control strategy appropriate for the organization as a whole. Managers increase the probability of formulating and implementing appropriate control strategies when they compare their financial situation to that of competitors in the same way, using the same ratios.

5. What is operations management?

Operations management is the performance of the managerial activities related to selecting, designing, operating, controlling, and updating production systems. Activities involved in managing production include selecting, designing, updating, and controlling products, process, equipment, workforce, and operating systems.

EXPLORING YOUR MANAGEMENT SKILL: PART 2

Your Management Skills Portfolio

Improving Production and Control at Nissan

This 500 word memo should include an overview of the importance of productivity, quality, and the relationship between these two concepts. In addition, the memo should also have brief descriptions of some techniques that Nissan might use to increase quality.

Students may start by discussing productivity and quality. Management theorists have found that improving product quality during all phases of a production process actually improves the productivity of the system that manufactures the product.

Regarding techniques that Nissan might use to increase quality will vary based upon the students' perceptions however, some include: a focus on continual improvement, quality assurance,

statistical quality control, “no rejects” philosophy, quality circles.

EXPERIENTIAL EXERCISE

The owner of a small business in your community has contacted your group to help him with his organization. The owner recently encountered the term “management by exception” in a magazine article, but he is not clear regarding what it means or how organizations implement this practice. Your assignment involves searching the Internet for examples of how companies implement management by exception. Prepare a five minute presentation that defines this term and then includes examples of how organizations use management by exception.

Encourage students to searching the Internet for examples of how companies implement management by exception and give examples of how organization use management by exception.

END OF CHAPTER CASES:

ST. JOSEPH HEALTH CENTER’S QUEST FOR QUALITY

1. *Would you recommend that St. Joseph’s top managers put more emphasis on efficiency or on effectiveness? Explain.*

In a health care environment, both aspects are important. By being more efficient, more patients can be seen, which is especially critical in emergency operations. Even though efficiency is desirable, there is no acceptable loss rate and therefore the operations must be effective.

2. *How have St. Joseph’s quality-improvement initiatives affected capacity strategy and product strategy?*

Student answers may vary. However, they should point to the increase in capacity of its emergency room admissions and the lower cost resulting from controlling infection. In three years, the quality improvements in both capacity and product have turned a no profit facility into one with a new profit of \$17 million.

3. *Do you think that St. Joseph’s executives should use management by exception for controlling emergency-room activities? Explain.*

Student answers may vary. However, management by exception is a control tool that allows only significant deviations between planned and actual performance to be brought to the manager's attention. In this case, the determination of what are significant deviations in patients' health care is very subjective. A patients' health is precious and should not be tied to a number. The quality circles approach where small groups focus on operational problems, potential stopping problems from reoccurring or even materializing seems more fitting a health care environment. exactly how many tires are being produced and sold in order to reach the breakeven point. Pirelli managers could use this information to control production by either raising or lowering manufacturing costs or selling prices.

VIDEONET EXERCISE

Body Glove

Running Time –13:52

Video Highlights

As avid surfers and divers the two brothers who founded Body Glove began manufacturing wetsuits in the 1950's; after discovering neoprene kept them warmer than the rubber wetsuits of the time. The high costs of neoprene and labor in the U.S. forced the company to outsource its manufacturing to Thailand. After forty years of providing customers with the highest quality of professional grade surfing and diving apparel, Body Glove decided to focus on international branding, lending its name to a wide range of goods and services that includes neoprene cell phone covers, resort hotels and diving cruises. Today Body Glove's management team no longer worries about inventory and production costs.

Discussion Questions

1. What is the product strategy for Body Glove?

Body Glove's product strategy is to produce goods and services that closely tie them to their original market, the surfer. However, they have expanded on their initial company strategy by licensing their brand name to many other products. But in all instances, their product marketing is tied to either a product input, such as neoprene, or a product user image, the relaxed, laid back surfer. The Body Glove management team also supports the brand identity of the product by their individual surfing life styles and activities.

2. What operation control issues are of greatest concern to Body Glove? In what way does the company benefit from these control issues?

Since Body Glove no longer actually manufactures any of their products, they have limited operation control issues. In fact, Russ Lesser, President of the company, states that this biggest issue the company faces is the "lack of control." All operation control has been given to the manufacturing companies in Asia. Fortunately, Lesser reports that product quality is actually better now than before.

Because these production control issues have been taken over by the manufacturers, Body Glove has been able to reduce their own labor force, no longer has to worry about raw

materials costs or inventory costs, and can now focus all of their attention on marketing the product and developing strong licensing partner relationships. Also, the manufacturing has been outsourced to companies that focus solely on manufacturing which helps create a better product.

3. Is the management team of Body Glove using Management by Exception?

In many ways, the control method used by Lesser, Daily, and, Chief Operating Officer, Jeff Galant do use management by exception. Since most of the control of their product has been turned over to the outsourced manufacturing companies, they are clearly allowing others to handle all routine organizational and product matters. This leaves them free to deal with exceptional organizational issues like developing partnerships that help reinforce their product and brand images. They can also determine which are the best licensing opportunities for their brand name.

Internet Activity

Go to the Body Glove home page <www.bodyglove.com>. How does Body Glove's image increase the productivity and profitability of their partner companies?

The Body Glove image and brand name has greatly increased the productivity and profitability of their partner companies. For instance, the cell phone cases made of neoprene and called "cell suits" have been very successful in a short period of time and all the credit is given to the Body Glove brand name. Without the reputation of the "yellow hand", most of these products would have had extreme difficulty even making it to the store shelves. Strong brand name, identity, and reputation are priceless assets and the partners of Body Glove are profiting significantly from their use.

TEACHING NOTES FOR VIDEONET EXERCISE:

ENSURING PRODUCTIVITY AND QUALITY: PHOTON PRODUCTS

SUGGESTED ANSWERS TO DISCUSSION QUESTIONS

1. Can Photon's product increase the productivity of customers' companies? Explain

Yes, by providing high tech equipment that can test, repair, and inspect components right on the assembly line. Photon's equipment automates the quality inspection of the products and lessens the dependence on employees' quality inspection which makes the employees more productive.

2. What advice would you give Solitto for ensuring the quality of Photon products?

Continuous improvement of its own quality standards and measurements, especially by its employees producing the products, has been shown as the best approach for ensuring long-term quality.

3. Will purchasing Photon's products raise or lower customer break-even points in the short run? In the long run? Why?

Such purchases and usage would raise the break-even points in the short run due to increased cost. It would lower the break-even points in the long run through Photon's technology replacing human inspection.

INTERNET ACTIVITY

Helping Customers to Control

Go to the Photon Dynamics' homepage (www.photondynamics.com). What role does the 'support' that Photon offers play in controlling programs of customers?

Answers to these questions will vary based on the student's perceptions.

SUPPLEMENTAL INSTRUCTIONAL TOOLS

SUGGESTED ACTIVITIES

1. Much has been said about the benefits of Just-In-Time inventory control to business organizations. Do some research to determine how it has worked out for customers of those organizations. It should result in lower costs and thus also in lower price, but if it does not arrive "just in time" when you need it, a lower price for something which does not exist is not a benefit. Talk to friends, relatives, others—especially if they are a bit older—and ask if they have noted any problems in finding products in stock now as compared to years ago. After you have talked to as many as you can, determine whether a firm which does not use Just-In-Time might have an advantage.

2. Check with various business people you may know or encounter in your daily activities and ask if the "Y2K Bug" caused any to go from "Just In Time" to "Just In Case."

TEAM EXERCISES

1. Pick two teams of students. Submit a productivity improvement challenge to them (for example, improving the manufacturing costs of a product at a factory) and have the teams present

to the class its solution. Students should also indicate what concepts on production management from the text they used and how they will assure that the product is consistently manufactured with the quality standards of the organization. Compare and contrast the solutions, use of processes, and analysis of the teams.

2. Conduct a budget controlling improvement exercise by having the students role-play. Teams will determine how they want managers to impose budget controls and then students will role-play as managers and employees being in areas meeting budget restraints. The teams will then identify the how such budget controls by the managers upon the employees created or did create the necessary controls. Compare and contrast the results from the exercise and have the teams explain their observations.