Chapter

1 Creating Customer Value Through Operations

PROBLEMS

1. Boehring University

   a. Value of output:

$$75\frac{\text{students}}{\text{class}}\times 3\frac{\text{credit-hours}}{\text{student}}\times\left(\frac{\$200\text{ tuition}+\$100\text{ state support}}{\text{credit-hours}}\right)=\$67,500/\text{class}$$

   Value of input: labor + material + overhead

$$\frac{\$6500+\left(\frac{\$25}{\text{student}}\times 75\text{ students}\right)+\$30,000}{\text{class}}=\$38,375/\text{class}$$

   Multifactor Productivity ratio:

$$\text{Productivity}=\frac{\text{Output}}{\text{Input}}=\frac{\$67,500}{\$38,375}=1.76$$

   Compared to Solved problem 1, multifactor productivity has increased from 1.25 to 1.76.

   b. Value of output is the same as in part a: $\$67,500/\text{class}$

   Labor-hours of input:

$$20\frac{\text{hours}}{\text{week}}\times 16\frac{\text{weeks}}{\text{class}}=320\frac{\text{hours}}{\text{class}}$$

   Productivity ratio:

$$\text{Labor Productivity}=\frac{\text{Output}}{\text{Input}}=\frac{\$67,500}{320\text{ hours}}=\$210.94/\text{hour}$$

   The $192 season ticket price is not used in this calculation. It is a "red herring."

2. Compact disc players

   Value of Output: $300
   Value of Input: Labor + Materials + Overhead

$$\text{Productivity} = \frac{\text{Ouput}}{\text{Input}} = \frac{\$300}{\$30 + \$70 + \$50} = 2.000$$

10% productivity improvement $\rightarrow 2.00 \times 1.10 = 2.200$

Given productivity $= 2.20$, and the value of output $= \$300$, we solve for the cost of inputs:

$$\text{Productivity} = \frac{\text{Ouput}}{\text{Input}} = \frac{\$300}{\text{Input}} = 2.20$$

$$\text{Input} = \frac{\$300}{2.2} = \$136.36 \text{ or } \$136$$

The cost of inputs must decrease by $(\$150 - \$136) = \$14$.

a. A $14 reduction in material costs is $\$14/\$70 = 20.00\%$

b. A $14 reduction in labor costs is $\$14/\$30 = 46.67\%$

c. A $14 reduction in overhead is $14/$50 = 28.00%

3. Alyssa's Custom Cakes

a.

5 Birthday cakes x $50 per cake = $250
2 Wedding cakes x $150 per cake = $300
3 Specialty cakes x $100 per cake = $300
Total monthly revenue = $850

Multifactor productivity ratio = output/input
1.25 = $850/x
Solve for x = $850/1.25 = $680
Total costs = $680
Average cost per cake = $680/10 = $68/cake

b. Labor productivity

Birthday cake = $50/ 1.5 hours = $33.30/hour
Wedding Cake = $150/ 4 hours = $37.50/hour
Specialty Cake = $100/1 hours = $100/hour

c. Based on labor productivity, Alyssa should try to sell specialty cakes the most.

d. Yes, Alyssa should stop selling birthday cakes. Based on answer a, she loses $68 - $50 = $18 every time she sells a birthday cake.

4. Mack's Guitar Company

   a. Labor productivity = output/input
      Output = 100 guitars x 80% completion rate x price/guitar
      = 80 guitars/ month x $250/guitar = $20,000
      Input
      Labor = 10/hours per guitar x 100 guitars = 1000 hours
      Labor productivity is $20,000/1000 = $20/hour
      Multifactor productivity ratio = output/input
      Output = 100 guitars x 80% completion rate x price/guitar
      = 80 guitars/ month x $250/guitar = $20,000
      Input
      Labor = $10/hour x 10/hours per guitar x 100 guitars = $10, 000
      Material = $40/guitar x 100 guitars = $4, 000
      Overhead = $4,000
      Multifactor productivity ratio = $20, 000/$18, 000 = 1.11

   b. Option 1. Increase sales price by 10%
      Output = 100 guitars x 80% completion rate x ($250 x 1.1) = $22,000
      Input
      Labor is same as in part (a) = $10,000
      Material is same as in part (a). = $4,000
      Overhead is same as in part (a) = $4,000
      Multifactor productivity ratio = $22,000/$18,000 = 1.22

      Option 2. Improve Quality
      Output = 100 guitars x 90% completion rate x $250/guitar = $22,500
      Input
      Labor is same as in part (a) = $10,000
      Material is same as in part (a). = $4,000
      Overhead is same as in part (a) = $4,000
      Multifactor productivity ratio = $22,500/$18,000 = 1.25

      Option 3. Reduce costs by 10%
      Output = same as in part (a) = $20,000
      Input
      Reduce costs by 10% yields 90% of the input costs from part (a).
      = $18,000 x 0.90 = $16,200
      Multifactor productivity ratio = $20,000/$16,200 = 1.23

      Darren should choose Option 2 and improve quality because it yields the greatest improvement in multifactor productivity.

DISCUSSION QUESTIONS

1. Answering this question demonstrates that processes underlie all of our jobs. What might be surprising is how many students would put their job in the category of "other," suggesting that many jobs do not fall neatly into any one functional area. Perhaps many in the "other" category might best be called "operations" on further reflection. Customers, both internal and external, are part of each process, and the goal is to manage the processes to add the most value for them.

2. Some responsibilities generally supported will include responsibilities to stockholders, to customers, to the environment, to provide safe working conditions, and to pay taxes. More debatable are responsibilities to provide medical care, maternity leave, childcare, retirement, and minimum wages and responsibilities to the community other than paying taxes.

3. The problems of unions faced with international competition are still in the news. Does lifting trade barriers expose workers to competition from workers in undeveloped economies? Or does increased opportunity to compete result in more exports and more jobs? With decreased tariffs, are multinationals moving operations elsewhere to escape unions and environmental regulations? Students should recognize that effective operations management is a key to favorable outcomes.

4. Chapters.indigo.ca offers a very broad range of products and services at competitive prices, with particular emphasis on "small" easily shipped products like books and DVDs (in contrast, Amazon.com carries a broader range of electronics, clothes, etc.). Its competitive priorities would include fast delivery time, on-time delivery, customization, and low-cost operations. As a business, Chapters.indigo.ca is actually assembling a customized basket of goods that must be delivered in a short window of time in a dependable fashion. Low-cost operations are needed to remain competitive. To remain in business, Chapters.indigo.ca needs to maintain high volumes of traffic. Operations strategy must focus on stock availability and quick, economical, and dependable delivery.

5. The hospital's mission *to provide attention to patients arriving to the emergency unit in less than 15 minutes and never to turn away patients who need to be hospitalized* implies that the facility must be designed to have extra capacity in both beds and emergency room facilities. It must plan on having extra personnel in the emergency room and also plan on having additional emergency personnel on call to take care of unprecedented heavy loads. In line with the mission statement, maximum utilization of the facilities (i.e., beds and emergency room personnel) would not be one of the performance objectives for the hospital. Thus, a private hospital is more likely to be concerned about customer experience because it is run to maximize profit, i.e., revenue less cost. Dissatisfied customers are likely to recommend that other patients go elsewhere, except in dire emergencies. In contrast, a public hospital is run to minimize cost (no revenue), and so capacity utilization will be very high, with longer wait times for patients.

6. Purolator has traditionally competed on the basis of fast, dependable delivery. Before the development of many Internet applications, businesses primarily relied on Purolator to get documents and packages to other businesses overnight. Now, this has started to evolve as sophisticated systems are being installed to assist companies in moving information electronically.

As a result, dot-com companies are adding more demands for ground deliveries to specific customer doors, at low cost. To remain competitive with companies such as FedEx, Purolator must continue to develop the door-to-door delivery business, as well as better integrate with its parent, Canada Post. Doing so will require changes to this company's competitive priorities, with greater emphasis on personalized, easy to use service for consumer, in addition to business, deliveries.

7. *Customer benefit bundle* consists of a core product or service and a set of peripheral products or services.
   a. For an automobile insurance policy, the core of the customer benefit bundle includes the coverage provided. The peripherals would include the courtesy and the promptness of the agent and the service personnel in tailoring the policy and the coverage to match the customer's needs, expeditious and hassle-free processing of the claims, ease of access to the agent, convenient payment plans, information of discounts available for driver improvement courses, safety features on the automobiles, etc.
   b. For dental work to get a crown installed, the core includes a crown that fits well and is comfortable. The peripherals would include the courtesy and the pleasant demeanor of the dentist and the dentist's staff in making the process as painless as possible, the ambiance of the dentist's office, the efficiency of the staff in handling special provisions, if any, with the patient's insurance company, etc.
   c. For an airline flight, the core of the customer benefit bundle includes a convenient and quick transportation from one location to another. The peripherals would include the convenience (i.e., distances from parking lots, ground transportation, availability of carts, baggage-handling facilities) of getting around the airport and the terminal for departure and arrival, the courtesy of airline personnel, the reputation of the airline for safety and punctuality, for pleasant and enjoyable on-board service, etc.

8. Technology Management. To identify a market segment, we need to determine answers to questions such as: Which colleges and departments within colleges currently offer the subject? What do instructors desire in the way of textbook support? Is there a trend toward Technology Management courses? Are there other Technology Management texts? Some needs assessment can be accomplished by survey, but response rate may be low. A high-investment strategy would be to ask or hire instructors to review and critique a list of topics, then an outline, then a draft. The core benefit is education about the subject in the form of a textbook. Peripheral services include instructor support in the form of ancillary publications.

9. It is not a good idea for a company to try to excel in all of the competitive priorities because it is generally impossible to do so. Mediocrity is a predictable outcome.

   The choice and the minimum level of one or more of the competitive priorities are set by the order qualifiers for the particular product or service. The choice of the competitive priorities that the company should emphasize is usually governed by the company's strategy driven by its mission statement and the core competencies that the company wants to harness to seek the best competitive advantage.

10. The fast-food restaurant making hamburgers to stock is recognizable as the old-style (pre-2000) McDonald's (this is further discussed in Chapter 9, "Lean Systems"). Service-clerk duties

included taking customer orders, filling entire orders from stock, and collecting payment. Short product shelf lives required close finished-goods inventory management. When a trademark sandwich was ordered without the special sauce, customers are asked to "Please step aside." Meanwhile, materials committed to a similar sandwich in stock (but with sauce) may expire and have to be thrown away. Volume flexibility was handled by opening and closing service lanes.

An alternative operation the new "Made for You" system, deployed in Canada in 2000, which assembles hamburgers to order. When materials are held at the stage just before final assembly, they can be used to complete a wide variety of different sandwiches. Because no finished-goods stock exists, when customers say, "Hold the sauce," there is no delay or waste of materials. Service clerks specialize. One clerk takes orders and payment. Others fill portions of the order. Ideally, capacity is restricted by transactions at the cash register—the bottleneck. At busy times, capacity is increased by adding more staff to assemble orders (in addition to more customer service lanes). This new design for operations has some characteristics of assembly lines and a product focus. Therefore, the impact of new menu items on the production operations must be carefully considered.

11. Grandmother's Chicken.
    a. Kathryn Shoemaker's strategic plans include the following:
        - ❑ Product and service plans: Should the new location offer a new mix?
        - ❑ Competitive priorities: If the product mix and service mix are different at the new location, the thrust could be on low volumes and high quality.
        - ❑ Positioning strategy: Again, depending on the competitive priorities and a new location, the process could be product focused or process focused.
        - ❑ Quality management: Should the goal be reliability or top-of-the-line quality?
        - ❑ Process design: What processes will be needed to make chicken dinners in the addition?
        - ❑ New technologies: Is it time to automate? Is this why there is a problem in service times?
        - ❑ Capacity: How large should the addition or new facility be?
        - ❑ Location: Should we locate in Uniontown or expand in Middlesburg?
    b. Attitudes toward nutrition could change the demand for fried chicken. Competitors such as KFC may be planning to move to Uniontown or even Middlesburg. There may be a trend toward demands for ever-faster service, which cannot be supported by the processes specified in the "unique recipe." The economy of Uniontown might not be supportive of restaurant services. Shoemaker should also consider the availability of key resources, such as servers, whole chickens, spices, and cooking oil. Will Uniontown labor organize?
    c. The possible distinctive competencies at Grandmother's Chicken Restaurant include the "unique recipe," the homey atmosphere, and friendly, prompt service.

12. Core processes should link to a firm's core competencies. Core processes are those processes that provide the firm the best competitive advantage. Essential to the definition a firm's core processes is the concept of "interaction costs." These costs include the time and money that are expended whenever people and companies exchange services, products, or ideas. If the transaction costs are higher to retain a process within the firm's organization than to outsource the process, the process should be outsourced.

13. Wild West is similar to many of the provincial and regional telephone companies in Canada that have tried to adapt to new opportunities.

a. Strategic plans include reducing overhead, reengineering operations, and investing in new technologies to meet competition. The "do-nothing" option of remaining a local monopoly telephone company is not viable because of competition from cable systems and wireless systems that are capable of business and personal communication. If the mission is too broad, Wild West might avoid such unrelated areas as financial services and commercial real-estate. Those businesses do not match their distinctive competencies.
b. One environmental issue is whether communication, like health care, will be viewed as a "right" and therefore should be free. A significant portion of Wild West's business is governed by regulatory agencies. Customer service in their core business is essential to maintaining a favorable regulatory environment. Some business opportunities, such as manufacturing, are less likely to draw on their competitive strengths. In contrast, information services provides a value-added opportunity.
c. Wild West's distinctive competency is in connecting people (or machines) for the purpose of communication. A weakness is high overhead inherited from the era of telecommunication monopoly.

14. Although the answers may vary depending on the "niche" elements of the business, the competitive priorities would include on-time delivery, low-cost operations, and customization. The latter competitive priority comes from the capability to assemble unique "baskets" of food items for each customer. There may be a need to coordinate a given basket between two different stores. Capabilities to develop would include information systems and Web page design, efficient scheduling of delivery trucks (which must first collect the items in the basket and then deliver them to the customer's door), and an adequate fleet of trucks with drivers.

CASE: CHAD'S CREATIVE CONCEPTS*

A. Synopsis

This case describes a small furniture manufacturing company that has gained a reputation for creative designs and quality by focusing on producing custom-designed furniture. As its reputation grew it began to sell some standard furniture pieces to retail outlets. The overall growth in sales volume and the diversification into the production of standard furniture pieces have caused a number of issues to arise concerning both the internal manufacturing operations and its relationship to the other functional areas of the company.

B. Purpose

This case is designed to be used as either a "cold-call" case for class discussion or an assigned homework reading. Major points to be brought out in the discussion include:

1. The range of decisions that are made in designing and operating processes
2. The impact that these operating decisions have on the organization as a whole, such as on marketing and finance
3. The impact that decisions made in other functional areas of the organization have on the operating function
4. The need to go beyond the "functional silo" mentality and manage in an integrative manner

C. Analysis

1. What kind of operating decisions must Chad make that are of a short-term nature?
   The students should be able to discuss a number of short-term-oriented decisions that are facing Chad Thomas. These should include:
   a. How to set priorities and schedule different orders. Chad is receiving orders for both custom-made, low-volume furniture pieces and higher-volume, standard pieces. Sales have increased, but the amount of equipment and the production capacity of the company have not. Different orders with different manufacturing requirements are now competing for the same productive capacity.
   b. What orders to accept and how long of a lead time to plan for in promising a delivery date.
   c. What type of work policies should be maintained for his employees. Decisions such as the number and type of employees to employ, the number of hours to work per day, and the amount of overtime to allow are all work policy decisions that impact the available capacity level.
   d. The allocation of resources, equipment, labor, and money to each product line.
   e. The level of inventory to maintain at various stages of the production process for both the custom and standard furniture lines (i.e., raw material, WIP, finished goods). These decisions are linked to the longer-term, total inventory-investment decision.

   Examples of longer-term decisions that face Chad Thomas include:
   a. Amount of money to tie up in the total inventory investment.

* This case was prepared by Dr. Brooke Saladin, Wake Forest University, as a basis for classroom discussion.

b. The type of equipment to invest in to support efficient production. At what point should more specialized equipment be purchased to manufacture high-volume, standard furniture pieces more efficiently?
c. What should be the overall workforce level to maintain, and what should be the proper mix of skills and capabilities?
d. How should the facilities be laid out to accommodate the two different product lines? This gets the students into a whole range of capacity and equipment allocation decisions to include size, type, and configuration.

In these decisions it is important that the students see the significance of consistency of both strategic and operating decisions across functional areas.

2. How did sales and marketing impact operations when they began to sell standard pieces to retail outlets?

   Standard furniture pieces compete on a different set of competitive priorities than custom-designed pieces. Timely delivery and low costs are much more important than product flexibility. Quality may also be defined differently. The existing facilities are set up to provide flexibility with its job-shop orientation and general-purpose equipment. By introducing a standard line with what should be manufactured on a flow line with some dedicated, more specialized equipment, a conflict has developed, and scheduling problems have resulted.

3. How has the move to producing standard furniture pieces affected the financial structure of the company?

   Inventory investment and operating costs are rising because of the frequent changeovers to accommodate the two different product lines and their scheduling conflicts.

   Profit margins for the standard line are smaller, which puts pressure on manufacturing to increase productivity and reduce costs. There may also be an issue concerning the assignment of overhead costs to each product line.

   Finally, the potential need to rent warehouse space to store either WIP or finished-goods inventory cuts into the profit margin for the standard furniture line.

4. What kind of operating decisions are facing Chad Thomas' business today?

   Chad needs to address issues relating to functional areas. Make sure the student is able to identify decisions that relate to more than one functional area. Examples include the following:

Operations Function

1. Monitoring capacity and utilization of facilities
2. Formulating inventory policies—dollars, items, and unit levels
3. Setting scheduling policies and priorities
4. Maintaining product line quality

Marketing

1. Accurately forecasting orders for standard pieces
2. Defining market segments and customer needs
3. Determining what delivery schedules can be promised to customers

Finance

1. Deciding level and type of investment
2. Investigating the effect of capacity investment decisions on ROI

Distribution/Logistics

1. Managing distribution and pipeline inventory
2. Comparing cost and advantages of various transportation modes
3. Meeting delivery lead times
4. What might Chad have done differently to help avoid some of these problems?

Three possible avenues that students may focus on are:

a. Establishing a plan for a more controlled growth. Part of this plan would be the development of the appropriate infrastructure to manage a controlled growth as to what markets to enter, what product lines to develop, and how to develop the proper manufacturing capabilities.
b. Maintaining the company focus on custom-designed furniture only. This alternative presents a whole different set of issues and decisions pertaining to future growth, but it would have avoided the issues of mixed competitive priorities and scheduling conflicts.
c. Realizing the different requirements for each product line and focused the manufacturing facilities into two separate sets of production facilities designed to cater to each product line's specific needs.

D. Recommendations

This case is not designed to be a decision-making case per se but rather a vehicle to get students thinking about the types and the integrated nature of decisions that operations managers face. The students may, indeed, have suggestions as to what should be done to help out Chad Thomas. These recommendations will more than likely follow the alternatives already discussed. As recommendations are provided by students, make sure you push them to understand the implications of their recommendations with respect to the company as a whole and the other functional areas.

E. Teaching Strategy

This case can be effectively discussed in 20 to 30 minutes by following the discussion questions provided at the end. The questions are interconnected and somewhat redundant on purpose to reinforce the interrelatedness of decisions made in various functional areas of the company. The intent is to have the students understand the range of decisions that face managers in the operating function and to realize that different types of products competing in different markets place different demands on the operating function. Therefore, productive systems will take on a variety of configurations.

Exhibit TN.1 lays out a sample table to be written on the board displaying important issues in the class discussion. Each column can be used to compare and contrast the differences in the requirements imposed by custom versus standard furniture for each area.

EXHIBIT TN.1 Board Plan

Important Issues	Custom Furniture	Standard Furniture
Marketing		

Quality level and quality control	
Process equipment	
Process flow	
Production scheduling system	
Purchasing	
Type of inventory and inventory control system	
Type of engineering	
Type of labor and supervision needed	
Wage/reward system	
Layout	

EXHIBIT TN.2 A Conceptual Model Depicting the Scope of Operations Management