

## CHAPTER 1 – INTRODUCTION TO OPERATIONS AND SUPPLY CHAIN MANAGEMENT

### ANSWERS TO QUESTIONS, PROBLEMS, AND CASE PROBLEMS

#### Answers to Questions

- 1-1. The operations function involves organizing work, selecting processes, arranging layouts, locating facilities, designing jobs, measuring performance, controlling quality, scheduling work, managing inventory, and planning production. Operations interacts with marketing in product development, forecasting, production planning, and customer service. Operations and finance interact in capital budgeting, cost analysis, production and inventory planning, and expansion and technology plans. Operations and human resources work together recruiting, training and evaluating workers, designing jobs and working with unions. IT and operations work together daily on e-commerce, enterprise resource planning and supply chain management systems.
- 1-2.
  - a. Operations at a bank involves transferring funds, processing funds, providing cheques, cashing cheques, preparing monthly statements, reconciling statements, approving loans, loaning money, keeping track of loan payments, approving credit cards, and more.
  - b. Operations at a retail store involves purchasing goods, stocking goods, selling goods, keeping track of inventory, scheduling workers, laying out the store, locating the store, forecasting demand, and more.
  - c. Operations at a hospital involves preparing the rooms, scheduling doctors, nurses and other workers, processing paperwork, ordering supplies, caring for patients, maintaining the facility, laying out the facility, ensuring quality and more.
  - d. Operations at a cable TV company involves taking orders, installing equipment, maintaining equipment, keeping the shows on the air, scheduling work, processing statements and payments, and more.
- 1-3. Inventions during the *industrial revolution* brought workers together under one roof in a factory setting where division of labour and interchangeable parts encouraged the formation of separate worker and management jobs. Ideas from the *scientific management* era made work more efficient. *Human relations* theorists emphasized the importance of the human element in operations management. *The management science era* saw many advances in quantitative techniques and their application. The *quality revolution* focused management on meeting customer expectations and emphasized quality over quantity. The *Internet* brought numerous opportunities to do work faster and better. It also opened doors to new markets worldwide. Today's successful companies compete worldwide for both market access and production resources.
- 1-4. *Competitiveness* is the degree to which a nation can produce goods and services that meet the test of international markets. A country's competitiveness is measured by its GNP, import/export ratio, and increases in productivity. Industry competitiveness can be measured by the number of major players in the industry, average market share, and

average profit margin. Measures of a firm's competitiveness include market share, earnings per share, revenue growth, and profit margins. The Internet has opened new avenues of trade so that more firms compete for a larger, global market. The ease with which consumers can compare products and prices online has also increased competitiveness.

1-5. Student answers will vary. The information can be accessed directly from the Internet or through the hyperlinks provided in Chapter 1 of the text's homepage located at [www.wiley.com/go/russellcanada](http://www.wiley.com/go/russellcanada)

1-6. Student answers will vary.

1-7. Students can begin this assignment by accessing Fortune's homepage and referring to the Fortune 500 or **Global 500** by industry. The leaders in each industry are listed and there is usually some discussion of industry concerns. Individual data on companies can be found at Hoover's website ([www.hoovers.com](http://www.hoovers.com)).

1-8. Student answers will vary.

1-9. Student answers will vary.

1-10. Student answers will vary. The information can be accessed directly from the Internet or through the hyperlinks provided in Chapter 1 of the text's homepage located at [www.wiley.com/go/russellcanada](http://www.wiley.com/go/russellcanada)

1-11. The WTO is an international organization that works to establish and enforce rules of trade between nations. WTO agreements are ratified by the governing bodies of the nations involved. WTO's dispute settlement process interprets agreements and rules on violations, thereby avoiding political or military conflict. The group promotes free trade and more recently, has helped developing nations enter the trade arena on more equitable grounds. Currently, there are 147 member nations. Membership is achieved by meeting certain environmental, human rights, and trade criteria, agreeing to abide by the rules of the organization, and being approved by two-thirds of the existing membership. See [www.wto.org](http://www.wto.org)

1-12. Student answers will vary. Access [www.worldbusinessculture.com](http://www.worldbusinessculture.com)

1-13. Student answers will vary. Access [www.transparency.org](http://www.transparency.org)

1-14. Student answers will vary. Access <http://laws-lois.justice.gc.ca/eng/acts/C-45.2/> for basic information.

1-15. Students will find a variety of answers for this question. In general, it is easy to find mission or vision statements, but more difficult to find evidence of the mission or vision being applied.

- 1-16. Strategy formulation consists of four basic steps: (1) *defining a primary task*—what is the purpose of the firm? What the firm is in the business of doing? (2) *assessing core competencies*—what does a firm do better than anyone else? (3) determining *order winners and order qualifiers*—what wins orders in the marketplace? What qualifies a product or service to be considered for purchase? (4) *positioning the firm*—what one or two important things should the firm choose to concentrate on? How should the firm compete in the marketplace?

Student answers will vary. Most start-ups try too much too soon. It's difficult to stick with what you do best.

- 1-17. *Core competencies* are the essential capabilities that create a firm's sustainable competitive advantage. They have usually been built up over time and cannot be easily imitated. For example, First National Bank, one of our local banks, is known as a risk taker. Its core competence is its ability to size up the potential of investment opportunities. Through its familiarity with local businesses and its experience in loan making, the bank has developed the ability to predict which loans are worth taking extra risks.

Bonomo's, a successful retail store, is known for having just the right item in stock for special occasions. The store stocks a variety of stylish women's clothing, but not too much of each style. They specialize in knowing individual customers and even keep track of evening wear purchases so that no one else at a particular party will be wearing the same dress.

Toyota emphasizes superior quality at a price below its competitors with its Lexus line of automobiles. To establish a special reputation for quality over the lifetime of the car, the company set up separate sales and service facilities. When it is time for servicing, Lexus owners can have their vehicle picked up and delivered to their home or place of business. The car returns the same day, washed and vacuumed, often with a gift certificate inside for a night on the town complements of the dealer.

- 1-18. While the answers to this question vary considerably, most students feel competent in the technical areas of their major, but uncomfortable with their communication skills (both oral and written) and their ability to make decisions. This opens the way for more project-oriented assignments from the instructor. The question also helps students prepare for the inevitable interview question—what are your strengths and weaknesses?

- 1-19. *Order qualifiers* are characteristics of a product or service that qualify it to be considered for purchase by a customer. An *order winner* is the characteristic of a product or service that wins orders in the marketplace—the final factor in the purchasing decision.

- 1-20. a. Most companies approach quality in a defensive or reactive mode; quality is confined to minimizing defect rates or conforming to design specifications. To *compete on quality*, companies must view quality as an opportunity to please the customer, not just as a way to avoid problems or to reduce rework costs. The manufacturer of Rolex watches competes on quality.
- b. Companies that *compete on cost* relentlessly pursue the elimination of all waste. The entire cost structure is examined for reduction potential, not just direct labour costs. High volume production and automation may or may not provide the most cost-

effective alternative. Wal-Mart competes on cost.

- c. *Flexibility* includes the ability to produce a wide variety of products, to introduce new products and to modify existing products quickly, and, in general, to respond to customer needs. National Bicycle Industrial Company competes on flexibility.
- d. *Competing on speed* requires a new type of organization characterized by fast moves, fast adaptations, and tight linkages. Citicorp competes on speed.
- e. *Competing on dependability* requires a stable environment, adequate resources, high standards for performance, and tight control. Maytag competes on dependability.
- f. *Competing on service* requires closeness to the customer, availability of resources, attention to detail, and flexible operations. Ritz-Carlton competes on service.

1-21. Operations can play two important roles in corporate strategy: (1) it can provide *support* for the strategy of a firm (help with order qualifiers), and (2) it can serve as a firm's *distinctive competence* (win orders).

1-22. Strategic decisions in operations and supply chain management involve products and services, processes and technology, capacity and facilities, human resources, quality, sourcing, and operating systems.

1-23. *Policy deployment* tries to focus everyone in an organization on common goals and priorities by translating corporate strategy into measurable objectives down through the various functions and levels of the organization. As a result, everyone in the organization should understand the strategic plan, be able to derive several goals from the plan, and determine how each goal ties into their own daily activities.

1-24. The balanced scorecard examines a firm's performance in four critical areas – its finances, customers, processes, and capacity for learning and growing. Although operational excellence is important in all four areas, the tools in operations are most closely associated with process.

1-25. Student answers will vary.

1-26. Student answers will vary. The balanced scorecard worksheet in Table 1.3 is helpful. *Finances* might refer to future income, *customers* to potential employers who are interested in both grades and experience, *processes* to how students will raise their grades and gain experience, and *learning and growing* to developing skills in several areas.

## Answers to Problems

(Answers may vary due to rounding)

1-1. The Kingston store is the most productive.

| Store        | Hamilton | Kingston | London   | Waterloo |
|--------------|----------|----------|----------|----------|
| Sales volume | \$40,000 | \$12,000 | \$60,000 | \$25,000 |
| Labour hours | 250      | 60       | 500      | 200      |
| Productivity | \$160    | \$200    | \$120    | \$125    |

- 1-2. a. London is the most productive.  
 b. Based on productivity, the Kingston store should be closed. Other factors to consider include total revenue, potential for growth, and options for reducing costs.

|                | Hamilton | Kingston | London   | Waterloo |
|----------------|----------|----------|----------|----------|
| Sales volume   | \$40,000 | \$12,000 | \$60,000 | \$25,000 |
| Labour hours   | 250      | 60       | 500      | 200      |
| Labour cost/hr | \$6.75   | \$6.50   | \$6.00   | \$5.50   |
| Rent           | \$1,800  | \$2,000  | \$1,200  | \$800    |
| Productivity   | \$11     | \$5      | \$14     | \$13     |

1-3. By number, Jim was more productive last year. By weight, Jim was more productive this year.

|                | Last yr | This yr |
|----------------|---------|---------|
| Hours fishing  | 4       | 6       |
| Bass caught    | 12      | 15      |
| Average weight | 20      | 25      |
| Bass/hr        | 60      | 62.5    |

1-4. Productivity could be measured by total account dollars per hour worked, new account dollars per hour worked, or existing account dollars per hour worked. Bates is the most productive based on total output. Albert and Duong have the most new accounts, and thus the greater potential returns in the future. However, Duong cannot work many more hours a week and Bates is only working half time. Bates has the potential to sell more if he works more hours.

| Agents               | Albert            | Bates             | Cressey           | Duong             |
|----------------------|-------------------|-------------------|-------------------|-------------------|
| New accounts         | \$100,000         | \$40,000          | \$80,000          | \$200,000         |
| Existing accounts    | \$40,000          | \$40,000          | \$150,000         | \$100,000         |
| Labour hours         | 40                | 20                | 60                | 80                |
| Total \$/hr          | \$3,500.00        | <b>\$4,000.00</b> | \$3,833.33        | \$3,750.00        |
| \$ New accts/hr      | <b>\$2,500.00</b> | \$2,000.00        | \$1,333.33        | <b>\$2,500.00</b> |
| \$ Existing accts/hr | \$1,000.00        | \$2,000.00        | <b>\$2,500.00</b> | \$1,250.00        |

1-5. Japan is the most productive.

|         | Labour Hours | Units of Output | Productivity |
|---------|--------------|-----------------|--------------|
| Canada  | 79.2         | 87.1            | 1.10         |
| Germany | 89.6         | 103.6           | 1.16         |
| Japan   | 86.3         | 117.6           | <b>1.36</b>  |

1-6. Omar should probably close the plant in Guadalajara because its multifactor productivity is the lowest, its labour productivity is the second lowest, and its output is the least of the four plants.

| Units (in 000's) | Montreal | Frankfurt | Guadalajara | Beijing |
|------------------|----------|-----------|-------------|---------|
| Finished goods   | 10,000   | 12,000    | 5,000       | 8,000   |
| Work-in-process  | 1,000    | 2,200     | 3,000       | 6,000   |

| Costs (in 000's)     |         |         |         |         |
|----------------------|---------|---------|---------|---------|
| Labour costs         | \$3,500 | \$4,200 | \$2,500 | \$800   |
| Material costs       | \$3,500 | \$3,000 | \$2,000 | \$2,500 |
| Energy costs         | \$1,000 | \$1,500 | \$1,200 | \$800   |
| Transportation costs | \$250   | \$2,500 | \$2,000 | \$5,000 |
| Overhead costs       | \$1,200 | \$3,000 | \$2,500 | \$500   |

|                     |      |      |      |       |
|---------------------|------|------|------|-------|
| Labour productivity | 3.14 | 3.38 | 3.20 | 17.50 |
| Total productivity  | 1.16 | 1.00 | 0.78 | 1.46  |

1-7. Hill is the most productive in terms of rushing yards and touchdowns per carry. However, **Peressini** has highest number of rushing yards and touchdowns. Using “carries” as the input variable skews the results. Productivity is not always the best measure of performance.

| Candidates    | Hill  | Lévesque | Peressini |
|---------------|-------|----------|-----------|
| Rushing yards | 2,110 | 3,623    | 6,925     |
| # Carries     | 105   | 875      | 1,186     |
| # Touchdowns  | 15    | 20       | 70        |

|                  |       |      |      |
|------------------|-------|------|------|
| Yards/carry      | 20.10 | 4.14 | 5.84 |
| Touchdowns/carry | 0.14  | 0.02 | 0.06 |

1-8. Productivity decreases from week to week.

| Installation  | 1      | 2     | 3     |
|---------------|--------|-------|-------|
| Square Yards  | 1,225  | 1,435 | 2,500 |
| # workers     | 4      | 3     | 5     |
| # hours       | 3      | 5     | 6     |
| Square yds/hr | 102.08 | 95.67 | 83.33 |

1-9.

| <b>Centre</b>            | <b>1</b> | <b>2</b> | <b>3</b>     | <b>3c.</b>   |
|--------------------------|----------|----------|--------------|--------------|
| Pieces processed         | 1,000    | 2,000    | 3,000        | 5,000        |
| Workers/hr               | 10       | 5        | 2            | 2            |
| Hourly wage rate         | \$20.50  | \$25     | \$27         | \$27         |
| Overhead/hr              | \$10     | \$25     | \$50         | \$80         |
| Multifactor productivity | 4.65     | 13.33    | <b>28.85</b> | <b>37.31</b> |

- Work center # 3 is the most productive.
- With a 10% raise in center 1, productivity goes down to 4.25 pieces per dollar spent.
- With new equipment in center 3, productivity goes up to 37 pieces. Install the new equipment.

1-10. Material productivity is stable over the 4 weeks. Labour productivity increases in week 2 and decreases in weeks 3 and 4.

| <b>Week</b>           | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
|-----------------------|----------|----------|----------|----------|
| Units of output       | 2,000    | 4,000    | 5,000    | 7,000    |
| # workers             | 4        | 4        | 5        | 6        |
| Hours per week        | 40       | 48       | 56       | 70       |
| Labour cost per hour  | \$10     | \$10     | \$10     | \$10     |
| Material (kgs.)       | 128      | 256      | 324      | 450      |
| Material cost per lb. | \$8      | \$8      | \$8      | \$8      |

|                          |      |      |      |      |
|--------------------------|------|------|------|------|
| Labour productivity      | 0.63 | 1.04 | 0.89 | 0.83 |
| Material productivity    | 3.91 | 3.91 | 3.86 | 3.89 |
| Multifactor productivity | 0.47 | 0.68 | 0.61 | 0.58 |

1-11. Johan is the most productive.

|               | <b>Jake</b> | <b>Jasbir</b> | <b>Jennifer</b> | <b>Johan</b> |
|---------------|-------------|---------------|-----------------|--------------|
| # ads sold    | 100         | 50            | 200             | 35           |
| # hours spent | 40          | 15            | 85              | 10           |
| Output/hr     | 2.50        | 3.33          | 2.35            | <b>3.50</b>  |

1-12. Choose Cold Case.

|                                | <b>Alaskan Seal</b> | <b>Brr Frost</b> | <b>Cold Case</b> | <b>Deep Freeze</b> |
|--------------------------------|---------------------|------------------|------------------|--------------------|
| Purchase cost                  | \$3,270             | \$4,000          | \$4,452          | \$5,450            |
| Daily energy consumption (kwh) | 3.61                | 3.88             | 6.68             | 29.07              |
| Cost per kwh                   | \$0.10              | \$0.10           | \$0.10           | \$0.10             |
| Daily energy cost              | \$0.36              | \$0.39           | \$0.67           | \$2.91             |

|                                |        |        |              |        |
|--------------------------------|--------|--------|--------------|--------|
| Daily purchase cost            | \$2.99 | \$3.65 | \$4.07       | \$4.98 |
| Total cost                     | \$3.35 | \$4.04 | \$4.73       | \$7.88 |
| Volume (cu ft)                 | 25     | 35     | 49           | 79     |
| <b>Productivity (cu ft/\$)</b> | 7.47   | 8.66   | <b>10.35</b> | 10.02  |
| Cost/cu ft                     | \$0.13 | \$0.12 | \$0.10       | \$0.10 |



## **Answers to Case Problem 1.1: Visualize This**

1. It is difficult to follow the four steps of strategy formulation for this case. Students will be able to easily identify VT's core competency but will struggle with its primary task, and without a product, it's impossible to determine an order winner and order qualifiers. "Developing the next generation of visualization tools" is probably not a marketable task. Students will come up with a variety of ideas from their Internet search.
2. Student answers will vary depending on how the primary task is derived in question 1.
3. That's the crux of the problem for this case. Isaac needs to find a way to keep his business going to obtain the capital to pursue his dream. Great for class discussion.
4. (1) and (3) are more in keeping with VT's earlier projects but require more hardware and do not promise future business. (2) is the most time-consuming, least challenging, but most sustainable. (4) and (5) are the most lucrative but do not advance VT's knowledge of the field.
5. The selection of projects should reinforce the strategy determined by the student. This case is based on an actual situation. The company chose projects (1) and (3). The museum job consumed so much time and resources that the company had to turn down the bank training job. Without a "product" and no immediate repeat business, the company folded and the owner went back to academe. A student took on project (5) and became quite successful.

## **Answers to Case Problem 1.2: Whither an MBA at Brandon?**

1. The board of Regents should look at the proposal carefully and identify first what they are trying to achieve with this new program. If the program fits within their mission, and if they have the resources to pursue it, they need to assess the likelihood of their success or failure. It doesn't appear that the board has sufficient information or insight to make the decision. A lot of questions remain. The focus of the program (i.e., interdisciplinary, problem solving, etc.) doesn't seem like much of a focus at all. The desire to "try anything" to get more students is troublesome. A new program that Brandon can't support would damage their reputation. Brandon needs to gather more information before a decision can be made.
2. Brandon should go through the process of identifying its primary task. This would include the type of students it wishes to serve and their future role in society (i.e., community, regional, provincial, national, global). A clear assessment of Brandon's core competence is also needed. What special resources does the university have? What is it best known for? How does it compare to other institutions of similar size and mission?

After those issues have been settled, the university needs to find out what its customers (i.e., students) look for when deciding where to go to school. What are some basic requirements that Brandon should meet (i.e., order qualifiers)? What factor prompts the final determination of which school to attend (i.e., order winner)? If, as is hinted in the case, the ability to find employment upon graduation is important to prospective students, then the university should gather information from potential employers about their needs. It may very well be that an MBA program is needed in the area, but this needs to be determined from data. Only after the determination has been made, that the area needs another MBA program, should Brandon explore the possibility of providing it. If the university concludes that it has the skills and resources necessary to pursue the task, then it should try to position itself properly in the market and find a special niche for its particular MBA program.

## Answers to Case Problem 1.3: Weighing Options at the Weight Club

A Balanced Scorecard for the Weight Club:

| Dimension |                       | Objectives                                  | Key Performance Indicator                 | Goal  |
|-----------|-----------------------|---|---|-------|
| Finances  | Revenue               | Generate revenue for first-class facility   | % increase in revenue                     | 30%   |
|           | Growth                | Attract new customers                       | % increase in customers                   | 25%   |
| Customers | Quality               | Meet or exceed customer needs               | % customers satisfied                     | 100%  |
|           | Retention             | Build sustainable customer base             | % membership renewals                     | 75%   |
| Processes | Fitness               | Increase participation in exercise classes  | # exercise classes/week                   | 12    |
|           |                       | Increase use of personal trainers           | # client hours/week                       | 100   |
|           | Client services       | Enhance client experience                   | % participation in customer orientation   | 75%   |
|           |                       |   | # massage appointments/week               | 200   |
|           |                       | Facilitate use of services                  | Time required for check-in                | 1 min |
|           |                       |   | Hours of child care/week                  | 90%   |
|           | Equipment maintenance | Maintain equipment in top working condition | % fully operational                       | 95%   |
|           |                       |   | % on regular maintenance schedule         | 60%   |
|           | Learning & Growing    | Program development                         | % new classes                             | 25    |
|           |                       |   | # innovative suggestions                  | 30    |
|           |                       | Facility development                        | % equipment new or updated                | 100%  |
|           |                       |   | Months until facility expanded/ renovated | 6     |
|           |                       | Organizational development                  | # persons on Board of Directors           | 6     |
|           |                       |   | # full-time managers                      | 3     |