

# CHAPTER 1

## INTRODUCTION TO OPERATIONS MANAGEMENT

### **Teaching Notes**

The initial meeting with the class (the first chapter) is primarily to overview the course (text), and to introduce the instructor and his/her interest in Operations Management. The course outline (syllabus), the objectives of the course and topics, chapters, and pages of text covered in the course, as well as problems/cases to be done in class, videos to watch, Excel worksheets to use, etc. are announced to the class.

Many students may know little about OM and the types of jobs available. This point can be addressed in order to generate enthusiasm for the course. The Learning Objectives at the beginning of the chapter indicate the highlights of the chapter.

### **Answers to Discussion and Review Questions**

1. The term operations management relates to the management of processes and systems that create goods and/or provide services. A system is a set of interrelated parts that must work together. A process is a series of linked actions, changes, or functions bringing about a result.
2. Production/operations planner/scheduler/controller, demand planner (forecaster), quality specialist, logistics coordinator, purchasing agent/buyer, supply manager, materials planner, inventory clerk/manager, production/operations manager, supervisor.
3.
  - a. Because a large % of a company's expenses occur in the operations, e.g., purchasing materials and workforce salaries, more efficient operations can result in large increases in profits.
  - b. A large number of management jobs are in OM.
  - c. Activities in all other areas of any organization are all interrelated with OM activities.
4. The three major functions of organizations are operations, finance, and marketing (to a lesser extent for some non-profit orgs). Operations is concerned with the creation of goods and services identified by marketing, finance is concerned with provision of funds necessary for operation and investment of extra funds, and marketing is concerned with promoting and/or selling goods or services.
5. The operations function consists of all activities that are directly related to producing goods or providing services. It is the core of most organizations. It adds value during the transformation process (the difference between the cost of inputs and price of outputs). An operations manager manages the transformation function. He/she is responsible for planning and use of resources (labour, machines, and materials). Not all jobs which are primarily OM are called as such. For example, a store/restaurant manager is in effect an operations manager. See Figure 1-6 for examples of typical activities performed by operations managers.
6. Design decisions are usually strategic and long term (1–5 years or so ahead), whereas operational decisions (planning, scheduling, execution, and control) are shorter term. In particular, planning

decisions are tactical and medium term (1–12 months or so ahead), and scheduling, execution and control decisions are short term (1–12 weeks or so ahead). *System design* involves decisions that relate to product and service design, capacity, acquisition of equipment, arrangement of departments, and location of facilities. *Operational activities* involve quality and inventory control, and production planning and scheduling.

7. Important differences between producing goods and performing services are:
  - (1) Customer contact, use of inventories, and demand variability
  - (2) Uniformity of input
  - (3) Labour content of jobs
  - (4) Uniformity of output
  - (5) Measurement of productivity
  - (6) Quality Assurance
8. Teaching; personal services such as hair cut, lawn mowing, maid service, and car wash. The customer or something belonging to the customer is transformed.
9. From Figure 1-6:
  - dealing with labour difficulties, solving personnel problems, solving management problems
  - making OM decisions, including general management decisions (planning, organizing, controlling, and directing)
  - innovating, personal initiatives, improving productivity
5.
  - a. Industrial Revolution began in the 1770s in England, and spread to the rest of Europe and North America in the late eighteenth century and the early nineteenth century. A number of inventions such as the steam engine, the spinning Jenny, and the power loom helped to bring about this change. There also were ample supplies of coal and iron ore to provide the necessary materials for generating the power to operate and build the machines which were much stronger and more durable than the simple wooden ones they replaced.
  - b. Frederick W. Taylor, who is often referred to as the father of scientific management, spearheaded the scientific management movement. The science of management was based on observation, measurement, analysis, improvement of work methods, and economic incentives. Management is responsible for planning, carefully selecting and training workers, finding the best way to perform each job, and achieving cooperation between management and workers.
  - c. An interchangeable part is a part made to such precision that all units of the part would fit any particular product it is made for. It meant that individual parts would not have to be custom-made (they were standardized).
  - d. Division of labour is breaking up a production process into a series of tasks, each performed by a different worker. It enabled a worker to learn the job and become proficient at it more quickly, and avoid the delays of shifting from one activity to another.

11.
  - a. The service sector accounts for more than 75 percent of jobs in Canada and this continues to increase.
  - b. Manufacturing is important because it produces the goods that we use, and many service jobs are dependent on manufacturing because they support manufacturing.
12. A model is an abstraction of reality, a simplified representation of something. Models ignore the unimportant details so that attention can be concentrated on the most important aspects of a situation, thus increasing the opportunity to understand a problem and its solution.
13. Mainly from Table 1-6: Frederick W. Taylor, Frank Gilbreth, Henry Gantt, Henry Ford, F.W. Harris, W. Shewhart, W. Edwards Deming, Joseph Orlicky, and Taiichi Ohno.
14.
  - a. Pros (for owning a car): convenience, flexibility  
Cons (for owning a car): costs (initial, insurance, maintenance & repairs, gas), parking
  - b. Pros (for buying now): availability  
Cons (for buying now): technology change, reduced cost in future
  - c. Pros (for new car): reliability, warrantee  
Cons (for new car): more expensive, higher insurance, higher depreciation
  - d. Pros (for speaking up in class): develop favourable image with instructor, feel more confident, know the answer  
Cons (for speaking up in class): risk of being wrong, appearance of showing off
15. 

Craft production: involves skilled workers producing high variety of customized goods at low quantity, utilizing general-purpose equipment. The main advantage is the flexibility to produce a wide variety of goods providing many choices for customers. The main disadvantage is its inability to produce at low cost. Examples: custom tailor, machine shop, print shop, and landscaping.

Mass production: involves low skilled workers producing a few standardized goods at high quantity, utilizing specialized equipment. The main advantage is low cost, efficient production. The main disadvantage is that it does not allow easy changes in quantity of output, the product, or the process. Examples: automobiles, computers, mail sorting, appliances, paper, soft drink-bottling.

Lean production (or just-in-time): involves semi-skilled workers producing a moderate variety of goods at moderate quantity, using semi-specialized equipment. It requires high quality, and employee involvement and teamwork. It combines the advantages of both mass production (high quantity, low cost) and craft production (variety, flexibility). Examples: component manufacturers to assembly lines, e.g., Flex-n-Gate, Toyota's bumper maker.
16. Compared to workers in traditional systems, much more is expected of workers in lean production systems. They must be able to function in teams, playing active roles in operating and improving the system. Responsibilities also are much greater, which can lead to pressure and anxiety not present in traditional systems. Moreover, a flatter organizational structure means career paths are not as steep in lean production organizations. Workers tend to become generalists rather than specialists, another contrast to more traditional organizations. Unions often oppose conversion from a traditional system to a lean system because they view the added responsibility and multiple tasks as an expansion of job

requirements without comparable increases in pay. In addition, workers sometimes complain that the company is the primary beneficiary of employee-generated improvements.

17. Use of e.g., computers, cell phones, and microwaves has had positive effects on people's lives. However, there are some downsides. As a result of automation, many of us are less active, thus have gained weight and are less healthy. Another downside is the elimination of certain types of jobs that have been automated.
18. Long-term trends in OM include increasing use of Internet & e-commerce, other technologies, globalization, and supply chain management. However, recently there has been a slowdown in the world economy affecting these trends. No one knows how long the slowdown will last. For some predictions, see <http://www.conferenceboard.ca>. Personally, it is likely that use of Internet for purchasing has increased, more machines and computers are being used in one's daily life, more international purchases, especially from the U.S., is being made, and more use of package delivery services, such as Purolator, FedEx, and UPS, is being made.
19. The reasons for doing unethical things vary from person to person and from one situation to another. Some of the possible reasons are listed below:
  - a. The decision-maker cannot recognize his/her action as unethical because of lack of understanding or lack of sensitivity towards a given issue.
  - b. Even though the decision-maker recognizes his or her action as unethical, he or she justifies it based on self-rationalization. For example, the decision-maker may think that his or her decision is not going to hurt anybody.
  - c. The decision-maker knows that his or her action is unethical. However, ethics in general is not important to him or her.
  - d. The decision-maker does not think he or she will be caught.
  - e. The self-interest of the decision-maker outweighs the ethical considerations.
20. Value added is defined as the difference between the cost of inputs before the transformation process and the value or the price of output after the transformation process. In a manufacturing process as the inputs are transformed to outputs, value is added to products in a number of different ways. For example, value can be added by changing the product structurally (physical change) or transporting it (it may have more value somewhere else).
21. A supply chain is a sequence of activities and organizations involved in producing and delivering a good or service. As more and more manufacturing has been shifted overseas, especially to China, supply chains have become longer, adding to cost and lead time of products. Also, increasing global competition has boosted the amount of outsourcing. These have resulted in increased importance of coordination and collaboration of members of each supply chain.

### **Answers to Taking Stock Questions**

1. Trade-offs is the comparison of the consequences of a decision. It is important to consider *all* the consequences of a decision in order to make a measured decision which will have the best net result. Forgetting one advantage or disadvantage may result in a wrong decision.

2. An organization, by definition, is a group of individuals who work together to achieve a goal, make goods, or provide services. If functional areas do not collaborate, the organization is like an out-of-tune engine or unsynchronized orchestra, clearly not as effective and efficient as it could be.
3. Technology affects OM in terms of computer usage (Internet, office and manufacturing software), machines (automation), and new materials.
4. Because they will be deprived of education. It is well-known that level of education is a major determinant of life-long income.

### **Answers to Critical Thinking Exercises**

1. Manufacturers have the luxury of making the products earlier than the time the customer needs them. Therefore, quality and timing problems can be fixed. Also, production can be evenly distributed over the work days (e.g., 8-hour a day shifts as opposed to operating in the evenings or nights for services). Service providers have to present their staff and their facility in an attractive way because the customer will be able to see them. Services should be prepared for a wider variety of inputs (customers) and outputs. For example, an airline should be prepared to deal with problem passengers. Services generally have more staff, hence more time spent on recruiting, training, evaluating, and motivating. Defining a service and measuring it is generally more difficult. Hence, improving productivity and quality is generally more difficult.
2. This is referring to the jobs that involve creativity and therefore are not well-defined. Consider, for example, teaching. Even though there is no unique process for teaching a topic, there are some common steps that should be followed. Students should have the right background, the topic should be divided in easy-to-learn segments, and students should be tested frequently. This is a process and can be managed. Similarly, the scientific method can be applied to jobs like research and painting.

### **Answers to the Experiential Learning Exercises**

1. Quality in a fast restaurant refers to quality of food and quality of service. Quality of food pertains to the quality of raw material and cooking process. But these can only be determined when food is tasted. Quality of service refers to both the servers and the environment of the restaurant. Are the employees wearing clean uniforms? Are they polite? Is the restaurant clean? Also, a broad definition of quality includes whatever customers expect, which includes a short wait time. Is it reasonable?
2. Other than food, packaging material, condiments, napkins, and cleaning products should be stocked.
3. Employee scheduling is very important in a service, because the customers expect a short wait and ready-to-eat food is not usually made before customer orders.
4. Capacity (size) of a restaurant should match its peak demand (the busiest time and day). If the restaurant is too small, it will lose a lot of customers and revenue, whereas if it is too large, then its lease cost will be too high. In either case, its profit will be less than what it could have been. In extreme cases, the restaurant will lose money and fail.

## **Answers to the Internet Exercises**

1. Purchasing Management Association of Canada's members are organizational buyers or purchasing agents/managers. They provide a certification program, an annual conference, job listing, news and events announcements, research reports, and purchasing Internet links.

Supply Chain & Logistics Association Canada's members are transportation coordinators and others interested in logistics. They provide an annual conference and some regional meetings, research reports, job listing, a journal and newsletter, and awards for innovation in logistics.

Canadian Supply Chain Sector Council is a Federal government initiative to find solutions to human resource challenges in supply chains. They provide job descriptions and occupational standards, job fairs and conferences, accreditation of programs and courses, and labour market information to all the stakeholders.

American Production and Inventory Control Society's members are primarily professionals in Operations Management. Note that APICS has regional branches in Canada. APICS provides certification programs, an annual conference, an online bookstore, job listing, news and events announcements, research reports, APICS magazine, and Industry Internet links.

American Society for Quality's members are primarily professionals in quality management and engineering. Note that ASQ has regional branches in Canada. ASQ provides certification programs, an online bookstore, job listing, news and events announcements, and several magazines and journals.

Canadian Operational Research Society's members are professional and academics in Operations Research / Management Science. They have an annual conference and a journal.

Production and Operations Management Society's members are primarily academics in OM. They have an annual conference and other meetings, a journal, news and events announcements, academic job listing, and Internet links to OM resources.

Project Management Institute's members are primarily professionals. PMI provides a certification program, an online bookstore, job listing, news and events announcements, and few magazines and a journal.

Decision Sciences Institute's members are primarily academics in decision sciences. They have an annual conference, job placement, and a journal.

Members of Global Association of Productivity and Efficiency Professionals (previously Institute of Industrial Engineers) are primarily professionals. It provides several certification programs, job listing, news and events announcements, several conferences, and several magazines and journals.

2. a. Inputs are coal, iron ore, and scrap metal. There are two different processes to make steel slabs. One requires converting the coal into coke, melting the iron ore in a blast furnace using the coke, and making liquid iron into liquid steel in a basic oxygen furnace using some scrap steel. The other process is using the electric arc furnace to melt scrap steel. Both processes then test the liquid steel in their ladle metallurgy facility, and then use continuous casting to make steel slabs which are stored. When needed, slabs are reheated and rolled thinner in the roughing mill, and then rolled into rolled sheets in the finishing mill. These hot rolled sheets are stored. Later most are further processed in the cold roll mill into galvanized and tin-coated sheets. Also, some tubes are made. A process flow diagram for Dofasco is given in

Chapter 6's Internet Exercises. The outputs are steel slabs, hot-rolled steel, cold-rolled steel and tubes.

- b. The quality is determined in the metallurgy facilities.
- c. The inventories include iron ore, coal, scrap steel, slabs, hot rolled, and cold rolled steel.

### **Answers to Lynn Mini-case**

- 1.
  - a. Demand for her services (number and size of yards).
  - b. Mower parts, fuel, lubricants, fertilizer, chemicals, tools, etc.; replenishment decisions.
  - c. She must schedule jobs (lawns) and her staff; Weather, illness, rush orders, emergencies, breakdowns.
  - d. Very important. Repeat business would be greatly affected and new business depends on word of mouth and reputation.
  - e. Oil change, blade sharpening, motor tune-up, blade and filter clean-up, etc.
- 2.
  - a. Pros (for working for herself): being one's own boss (control).  
Cons (for working for herself): uncertainty of income, more time consuming, harder,
  - b. Pros (for expanding business): possibility of more profit  
Cons (for expanding business): more investment, more work load, more employee problems
  - c. Pros (for launching a web site): more customers (it is a form of advertising)  
Cons (for launching a web site): initial & on-going costs, time for updating the information
- 3. Yes, because Lynn promised the student a bonus of \$25 for a good idea and this idea appears to be good.
- 4. Using eco-friendly pesticides, weed-killers, and fertilizers; finding a use for the cut grass (e.g., animal feed); buying more efficient, less polluting lawn mowers.

### **Operations Tour: Sobeys**

- 1. Inputs: groceries, staff, building, fixtures (shelves, stands, displays, etc.), tills  
Transformation process: making the groceries available to customers (purchasing, transportation, receiving, and stocking shelves, etc.)  
Output: satisfied, loyal customers  
Feedback/control: inventory control, quality control, customer service
- 2.
  - a. Forecasting: to plan the store size, workforce level, and purchase quantities & inventory levels

- b. Product design & selection: to determine the merchandise mix to carry for the particular market
- c. Capacity planning: to determine the store's right size (floor size)
- d. Layout design: to determine a good floor plan (strategically directing customers through the store)
- e. Location: to determine the right location in the city (most important for a service)
- f. Quality: a system to assure and control quality in groceries (e.g., keeping meat, dairy, etc at the right temperature), and in customer service
- g. Inventory: to avoid stock-outs and excess inventory levels
- f. Staff scheduling: to provide convenient store hours, minimal customer waiting *and* minimal employee idle time