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Introduction to Operations Management

Chapter Objectives

- Introduce and define operations management (OM) in terms of its contribution to an organization and the activities it involves.
- Describe how operations management contributes to the overall betterment of society.
- Present operations management as a function that addresses issues in both manufacturing and services.
- Show how operations management is gaining more recognition both internally and externally to an organization.
- Demonstrate how the operations management function interacts with the other functional areas within an organization.
- Present a brief history of operations management internationally and in Canada and its evolution to its current role in an organization.

Operations Help You Get Seated on Your Flight More Smoothly

You have probably experienced waiting in line at the gate to board an airplane. You may also recall that the gate attendant, after first boarding passengers with special needs, probably boarded passengers depending on their seat numbers. Those passengers seated at the back of the plane are boarded first so they will not get in the way of others. Have you ever wondered whether there is a better way?

There definitely is a better way, according to Clive Beddoe, CEO of Calgary-based WestJet Airlines Ltd. After trying different methods, he was convinced that the best way to board passengers is to do so randomly. The reason, according to Mr. Beddoe, is that even when boarding is done by rows it doesn't account for passengers with complications such as a big overcoat or big bag blocking others. Interestingly, WestJet hit upon this method when a boarding gate attendant as a joke decided to board passengers by the colour of their socks. This created a random order which WestJet discovered to be the most effective.

Air Canada, however still feels that the best way to ensure smooth boarding is to give priority to passengers at the back of the plane. United Airlines boards passengers seated at window seats first, then those

Source: www.bigfoto.com.

seated in the middle, and finally passengers seated at the aisle. United feels that this method reduces boarding times on average by four to five minutes and save US$1 million annually. America West uses what it calls a "reverse pyramid" whereby passengers with window seats in the middle and rear of the plane are boarded first and those with aisle seats in the front are boarded last.

Every business, whether in manufacturing or services, uses processes or operations to take inputs and create outputs that satisfy customers. In the case of an airline, the boarding process is just one of the many processes it uses. Some processes, such as boarding, are used frequently; others, such as route scheduling and fleet planning, are used less frequently. Managing all these operations effectively can be the difference between success and failure for a business. Herein lies the importance of operations management. As the boarding example above shows, there often are different ways of doing things. One way may be more appropriate to one situation; another way may be better in a different situation. Operations management allows the decision maker to analyze processes and improve them by selecting appropriate strategies and methods.

Like other functions, operations management also involves evaluating trade-offs. For example, at Vancouver International Airport, WestJet is able to load passengers through front and back doors at the same time. This requires an additional jetway to the plane. Managers have to evaluate whether this additional investment is justified by improved efficiencies and increased customer satisfaction from quicker aircraft turnarounds.

Sources:

Brent Jang, "Best boarding rules are no rules, Beddoe says," *The Globe and Mail*, November 4, 2005, B1.

Nicholas Zamiska, "Plane geometry: Scientists help speed boarding of aircraft; America West saves minutes with 'reverse pyramid'; Link to Relativity Theory," *The Wall Street Journal*, November 2, 2005, A21.

Managerial Issues

Today's operations managers, those responsible for producing and delivering the goods and services that we use every day, face a wide variety of challenges in the twenty-first century. The highly competitive business environment that currently exists, caused in large part by the globalization of the world's economies in conjunction with the growth in e-commerce, has shifted the balance of power from the producers to the consumers. As a result, consumers are now demanding increased value for their money. To put it simply, they want more for less.

From an operations management perspective this means providing continuously higher-quality products with shorter delivery times and better customer service while simultaneously reducing labour and material costs and increasing the utilization of existing facilities—all of which translates into higher productivity.

To accomplish all of this, operations managers are turning to a wide variety of technologies. These include the use of robotics on assembly lines and automation, which can take the form of ATMs and vending machine purchases with cell phones. In the forefront is the increasing use of information technology, driven by an improved telecommunications infrastructure, which also is providing faster service at lower costs. Examples here include the Internet and customer support centres, which now can be located in any corner of the world.

Firms that ignore the important role of operations management within an organization pay a price: failure, as evidenced by the many dot-com bankruptcies that have occurred in recent years. Many of these firms were virtual in every sense. All they had were Web sites with no operational infrastructure to support them. (This can be compared to putting up wallpaper without having a wall behind it!) Stories abound of Christmas shoppers who could not get deliveries on time (and couldn't even speak to someone about the problem) and virtual banks that were incapable of providing customers with something as simple as deposit slips. In every case, these customers took their business elsewhere as a result of their bad experience, never to return.

What Is Operations Management?

An Organizational Perspective

operations management
Management of the conversion process that transforms inputs such as raw material and labour into outputs in the form of finished goods and services.

Operations are what must be done internally in order to deliver value to the customer, whether in goods or services.[1] Thus, from an organizational perspective, **operations management** may be defined as the management of direct resources that are required to produce and deliver value via the organization's goods and services. Every function in the organization—whether marketing, finance and accounting, production, purchasing, or human resources—adds value to the customer. Keep in mind as you read through this textbook that operations management concepts can be used productively in every function of the organization.

Operations management, just as every functional area within an organization, can be defined from several perspectives: one with respect to its overall role and contribution within an organization; another focusing more on the day-to-day activities that fall within its area of responsibility.

Within the operations function, management decisions can be divided into three broad areas:

- Strategic (long-range) decisions
- Tactical (medium-range) decisions
- Operational planning and control (short-range) decisions

These three areas can be viewed as a top-down (hierarchical) approach to operations management, with the decisions made at the lower level(s) depending on those made at the higher level(s).

[1]Robert S. Kaplan and David P. Norton. *Strategy Maps* (Boston: Harvard Business School Press, 2004).

Operations Management in Practice

LETTERS FROM TWO MBA STUDENTS AT THE UNIVERSITY OF CALGARY

... the ever-increasing cost of delivering health care along with government funding constraints has resulted in challenges in managing the tension between those administering care to patients i.e., doctors and nurses, and the managers running hospitals as organizations.

Among the many facets of health care delivery that requires [*sic*] a critical re-evaluation, the processes used to deliver care certainly come to mind. Why do some patients wait for up to 3–4 hours before seeing a doctor with whom they had an appointment? Why do some patients get laboratory or imaging results a week after the test is performed, when the results often are available the same day? Why do hospitals work full throttle from Monday to Friday, 8 a.m. to 5 p.m., and continue at half speed (if that) after 5 p.m. or on the weekend?

It would be too easy (and erroneous by the way) to blame the doctors and nurses for these inexplicable shortcomings. The challenge in how health care is delivered is a more fundamental one, doctors and nurses just work the best they can in the systems they are provided with. Operations management provides the tools to start analyzing and subsequently optimizing the fundamental structures upon which health care delivery is build. Concepts such as process selection, total quality management, statistical quality control, capacity planning, facility layout, and scheduling, just to name a few, have the potential to modernize health care delivery in a manner that will allow health care providers to provide true medical excellence, as expected by the public.

Max J. Coppes, MD, PhD

I thought my management accounting background would be all I needed when I became a business analyst, but within weeks I found myself re-reading my old operations management textbook.

In order to understand how the business operated, I was forced to learn about the information system the business used. I was initially shocked at how much operations management stuff was in the software, and that it actually was being extensively used.

Working now as a business consultant, an understanding of operations management has proven invaluable in working with various product and service organizations. It seems that regardless of the type or size of business, some form of operations management is always a part of it.

Please share this with your current students—effort put into an operations management course will pay off regardless of what role they will eventually play in an organization. At the very least, it will prevent them from having to re-read their textbook like I did.

Brent Snider, BComm, CMA

The strategic issues usually are very broad in nature, addressing such questions as:

- How will we make the product?
- Where should we locate the facility or facilities?
- How much capacity do we need?
- When should we add more capacity?

Consequently, by necessity, the time frame for strategic decisions typically is very long, usually several years or more, depending on the specific industry.

Operations management decisions at the strategic level impact the long-range effectiveness of the company in terms of how well it can address the needs of its customers. Thus, for the firm to succeed, these decisions must be closely aligned with the corporate strategy. Decisions made at the strategic level then define the fixed conditions or constraints under which the firm must operate in both the intermediate and short term. For example, a decision made at the strategic level to increase capacity by building a new plant becomes a capacity constraint with respect to tactical and operational decisions.

At the next level in the decision-making process, tactical planning primarily addresses the issue of how to efficiently schedule material and labour over a specific time horizon and within the constraints of the strategic decisions that were previously made. Thus, some of the OM issues at this level are:

- How many workers do we need?
- When do we need them?

Exhibit 1.1
Hierarchy of Operations Decisions and Operations Management Topics

Type of Planning	**Typical Issues** (and related chapters in this textbook)
Strategic	Facility location and capacity (Chapter 7), process selection (Chapter 3), supply chain structure (Chapter 12)
Tactical	Aggregate planning (Chapter 14), quality and process improvement (Chapters 5, 6, and 13), material requirements (Chapter 16), layout (Chapter 8)
Operational	Daily scheduling of employees and machines (Chapter 11), inventory control (Chapter 15), quality control (Chapter 6)

- Should we work overtime or put on a second shift?
- When should we have material delivered?
- Should we have a finished goods inventory?

These tactical decisions, in turn, define the operating constraints under which the operational planning and control decisions are made.

Management decisions with respect to operational planning and control are very narrow and short term, by comparison. For example, issues at this level include:

- Which jobs do we work on today or this week?
- To whom do we assign which tasks?
- Which jobs have priority?

Exhibit 1.1 relates some of the topics covered in the textbook relating to the hierarchy of operations decisions. Not all topics are exclusive to one category. For example, Chapter 15 discusses inventory management. Although the decision to have a finished goods inventory is a tactical one, the decision to place an order to replenish finished good stock when the stock is low is a operational one.

Exhibit 14.1 in Chapter 14 gives an overview of the different operations planning activities.

An Operational Perspective

transformation process
Actual conversion of inputs into outputs.

The day-to-day activities within the operations management function focus on adding value to the organization through a **transformation process** (as illustrated in Exhibit 1.2), sometimes referred to as the *technical core,* especially in manufacturing organizations. Some examples of the different types of transformations are:

- Physical, as in manufacturing
- Locational, as in transportation
- Exchange, as in retailing

Exhibit 1.2
The Transformation Process within OM

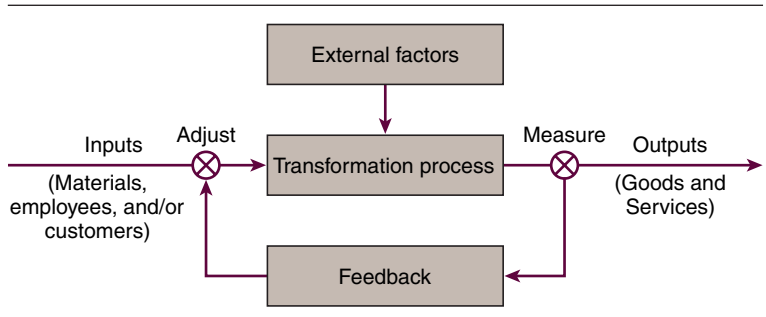


Exhibit 1.3

Input–Transformation–Output Relationships for Typical Systems

System	Inputs	Primary Transformation Function(s)	Typical Desired Output
Hospital	Patients, medical supplies, MDs, nurses, equipment	Health care (physiological)	Healthy individuals
Restaurant	Hungry customers, food, chef, waitstaff, environment	Well-prepared food, well served; agreeable environment (physical and exchange)	Satisfied customers
Automobile factory	Sheet steel, engine parts, tools, equipment, workers	Fabrication and assembly of cars (physical)	High-quality cars
College or university	High school graduates, books, teachers, classrooms	Imparting knowledge and skills (informational)	Educated individuals
Department store	Shoppers, stock of goods, displays, salesclerks	Attract shoppers, promote products, fill orders (exchange)	Sales to satisfied customers
Distribution centre	Stockkeeping units (SKU), storage bins, stockpickers	Storage and redistribution	Fast delivery, availability of SKUs

- Storage, as in warehousing
- Physiological, as in health care
- Informational, as in telecommunications

The inputs are customers and/or materials which undergo the transformation. Also part of the transformation process are a variety of components supplied by the organization, such as labour, equipment, and facilities, which convert the inputs into outputs. Every transformation process is affected by external factors, which are outside the control of management. External factors include random, unexpected events such as natural disasters, economic cycles, changes in government policies and laws, as well as changes in consumer preferences and tastes. These external factors can also include anticipated changes, such as seasonality, over which management has little or no control.

Another important role of the operations management function is the measurement and control of the transformation process. This consists of monitoring the outputs in various ways, including quality and quantity, and then using this information as feedback to make the necessary adjustments that will improve the process.

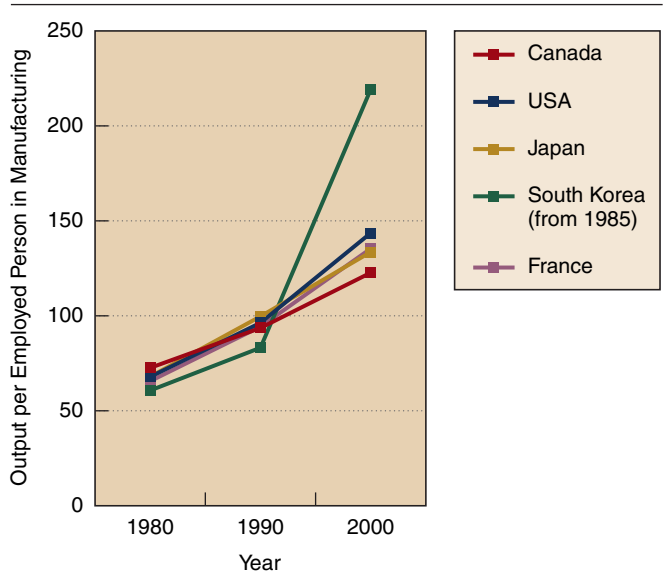
The various transformations that take place are not mutually exclusive. For example, a department store can (*a*) allow shoppers to compare prices and quality (informational), (*b*) hold items in inventory until needed (storage), and (*c*) sell goods (exchange). Exhibit 1.3 presents sample input–transformation–output relationships for a wide variety of processes. Note that only the direct components are listed; a more complete system description would also include managerial and support functions.

Operations Management's Contributions to Society

Operations management plays an important, although not always obvious, role in the societies in which we live. It is responsible for the food we eat and even the table on which we eat it; it provides us with the clothing we wear and with transportation, whether in the form of an automobile, train, or airplane, as well as being responsible for making these vehicles themselves. In other words, operations management affects nearly all aspects of our day-to-day activities.

Exhibit 1.4

International Manufacturing Productivity (1980–2000)



Source: News (Bureau of Labor Statistics, United States Department of Labor, February 26, 2003).

Higher Standard of Living

A major factor in raising the standard of living in a society is the ability to increase its productivity. (Productivity, which can be broadly defined as how efficiently inputs are converted into outputs, is discussed in greater detail in Chapter 5.) Higher productivity is the result of increased efficiency in operations, which in turn translates into lower-cost goods and services. Thus, higher productivity provides consumers with more discretionary income, which contributes to their higher standard of living. As seen in Exhibit 1.4, Canada was a leader in manufacturing output per employee, a measure of productivity, in 1980. However, in the past two decades we have slipped relative to our competitors, so that by 2000 we lagged behind the others. This has implications for our competitiveness relative to other countries and can lead to loss of jobs and a decline in our standard of living.

Better Quality Goods and Services

One of the many consumer benefits of increased competition is the higher-quality products that are available today. Quality standards are continuously increasing. Many companies today, as we will learn in Chapter 6, have established six-sigma quality standards (pioneered by Motorola in the late 1980s), which means no more than 3.4 defects per million opportunities. Such high-quality standards were once considered not only prohibitively expensive, but also virtually impossible to achieve even if cost wasn't a consideration. Today we know that such high-quality standards not only are possible, but they also result in lower costs, because firms no longer have large amounts of waste and rework to deal with.

One example of increasing quality is the focus on safety in automobiles. Honda Motor Co. voluntarily displays crash-test scores on the window stickers of its 2006 models. The company sees its product safety ratings as giving it an edge in the competitive auto industry.

Not only is operations management important in producing better quality goods and services, it also plays a vital role in ensuring that products and services (such as the Apple IPod or Dell computers) are designed and delivered, and if necessary customized, to customer specifications, in a timely manner.

Excellent quality is not limited to goods. Many Canadian for-profit companies, such as Telus in telecommunications and Amex Canada in financial services, as well as not-for-profit organizations such as government departments and educational institutions, have won national awards for the quality of their services (these are discussed further in Chapter 6).

Concern for the Environment

Many companies today are taking up the challenge to produce environmentally friendly products with environmentally friendly processes, all of which falls under the purview of operations management.

Even Canadian companies in industries that have traditionally been considered unfriendly to the environment have committed themselves to being environmentally friendly. Edmonton-based EPCOR is the first utility in Canada to have all its generating plants meet the internationally recognized standard for Environmental Management Systems—ISO 14001 (ISO standards are discussed further in Chapter 6)—and is currently in the process of certifying its distribution and transmission operations as well.[2] Forestry companies across the country, such as Vancouver's Canfor[3] and Montreal's Domtar,[4] are already ISO certified or are moving in that direction, with regards to forest lands and mills. Many companies are also taking steps toward energy efficiency and water conservation. Canada reiterated its commitment as a country to reducing greenhouse gases when it ratified the Kyoto Protocol in 2002.

Ford's new River Rouge manufacturing plant in Detroit provides another good example. No longer will raw waste be dumped into the waterways or the air be polluted with smoke from its operations. Vegetation will be used to clean up contaminated land, and the River Rouge will be restored so that fish will have access to the upper part of the river.[5] Given the location of this plant near Windsor, Ontario, the cleanup will have a beneficial effect for southwestern Ontario also.

Improved Working Conditions

Managers recognize the benefits of providing workers with better working conditions. This includes not only the work environment, but also the design of the jobs themselves. Workers are now encouraged to participate in improving operations by making suggestions. After all, who would know better how to do a particular operation than the person who does it every day? Managers have also learned that there is a very clear relationship between satisfied workers and satisfied customers, especially in service operations.

Organizations also are recognizing the importance of corporate responsibility in their supply chains, especially with regard to suppliers in developing countries. This ensures that employees in supplier companies have acceptable working conditions and human rights.

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[2]Epcor, www.epcor.com.
[3]Canfor Corporation, www.canfor.com.
[4]Domtar Inc., www.domtar.com.
[5]John Holusha, "Ford Thinks Green for Historic River Rouge Plant," *The New York Times*, November 26, 2000, p. 11.7.

The Emergence of Operations Management

Operations management has been gaining increased recognition in recent years for several reasons, including (*a*) the application of OM concepts in service operations, (*b*) an expanded definition of quality, (*c*) the introduction of OM concepts to other functional areas such as marketing and human resources, and (*d*) the realization that the OM function can add value to the end product.

Application of OM to Service Operations

Initially, the application of operations management concepts was narrowly focused, concentrating almost entirely on manufacturing. However, as shown in Exhibit 1.5, as countries become more developed, services represent a larger percentage of their respective Gross Domestic Products (GDPs). Henri De Castries, CEO of French insurance giant AXA, illustrated how important operations management has become in services when he said, "We have to increase productivity in our factories. The first to understand that financial services are an industrial business will be the winners."[6] (Also see OM in Practice box on service providers, p. 11).

The growth in services over time (see Exhibit 1.6) combined with the increased recognition that services could learn much from manufacturing and vice versa, expanded the application of operations management to also address related issues in services.

Theodore Levitt of Harvard Business School, in his article, "Production-Line Approach to Service,"[7] was one of the first to recognize that many of the concepts that previously had been developed for manufacturing could actually be applied to service operations. He observed that operations concepts can be seen readily at McDonald's fast-food outlets (where hamburgers are cooked in batches of 12 at a time) or at the Shouldice Hospital (see case at the end of Chapter 7) where patients are batched into groups of thirty to increase efficiency.

Exhibit 1.5

Services as a Percentage of Gross Domestic Product (GDP) for Different Countries

Country	Services as a Percentage of GDP
Industrialized Countries:	
United States	80%
United Kingdom	73%
France	70%
Canada	66%
Japan	63%
Lesser Developed Countries:	
Brazil	50%
Thailand	49%
Peru	45%
India	45%
Ghana	30%

Source: The World Factbook 2000, Central Intelligence Agency, Washington, DC.

[6]Charles Fleming and Thomas Kamm, "AXA's CEO Set to Push Synergies," *The Wall Street Journal,* May 3, 2000, p. A21.

[7]Theodore Levitt, "Production-Line Approach to Service," *Harvard Business Review* 50, no. 5 (September–October 1972), pp. 41–52.

Operations Management in Practice

SERVICE PROVIDERS INCREASE OPERATIONS EFFECTIVENESS AND PROFITABILITY BY ADOPTING PRINCIPLES FROM MANUFACTURING

According to McKinsey, one of the leading global consulting companies, many executives in service companies are looking to adopt methods and tools used by manufacturers to increase the effectiveness of operations. One of these companies is AXA, the well-known French insurance giant. The insurance industry that traditionally relied on investments for profitability is realizing in these days of lower market returns that effective operations management is key in maintaining profitability.

Some of the manufacturing-originated tools that AXA uses include six sigma in quality and productivity improvement, benchmarking to compare processes against others within the company, and cost modelling. Cost modelling includes improving costing by identifying fixed and variable costs with the goal of reducing some of them. Just as in manufacturing, the goal is for employees to understand what a process is, how to analyze it, and improve it. As in manufacturing, this includes reducing the time required to develop a new insurance or financial product and launch it before AXA's competitors in order to gain an advantage. So far AXA has seen encouraging results from the implementation of these tools.

Service managers are also realizing that the concept of a bottleneck, a key consideration in managing manufacturing operations, is equally applicable to services. For example, Dr. Plaxton, chief of critical care medicine at Grand River Hospital in Kitchener, Ontario, calls the ER wait time "the most visible barometer of any hospital's inner machinery." But he also understands that this wait time depends on the slowest (bottleneck) part of the process relied upon by ER doctors to decide whom to admit and treat, transfer, or send home.

Sources:

Eric Monnoyer and Stefan Spang, "Manufacturing lessons for service industries: An interview with AXA's Claude Brunet," *The McKinsey Quarterly*, May 2005, www.mckinseyquarterly.com.

Blatchford, Christine, "Doctor's note reveals system's sad reality," *The Globe and Mail*, March 30, 2005, A12.

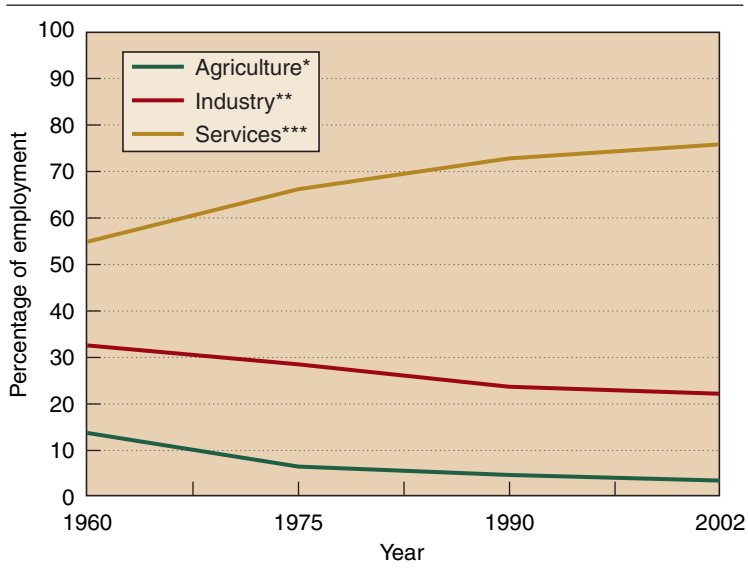


Exhibit 1.6

Growth in Services in Canada

*Includes farming, fishing, and hunting.
**Includes manufacturing, mining, and construction.
***Includes transportation, communication, public utilities, trade, finance, public administration, private household services, and miscellaneous services.

Source: Comparative Civilian Labor Force, Statistics—Ten Countries 1959–2002, Bureau of Labor Statistics U.S. Department of Labor, April 14, 2003, http://stats.bls.gov/fls/home.htm.

Exhibit 1.7

Differences between Goods and Services

Goods	Services
Tangible	Intangible
Can be inventoried	Cannot be inventoried
No interaction between customer and process	Direct interaction between customer and process

Exhibit 1.7 lists some of the major differences between goods and services. Goods are tangible, something "you can drop on your foot," whereas services, being acts rather than objects, are considered to be intangible. Another difference between goods and services is that goods can be inventoried, whereas services cannot. For example, you can buy a good, such as a book, or even food, and use it sometime in the future. This is not possible with services, because they are acts associated with a specific point in time. The revenue from a hotel room that remains vacant for a given night, or an airline seat that is not sold on a scheduled flight, or a rental car that is not leased on a given day is lost forever. (Wouldn't it be great if the airlines could save in inventory all the empty seats they have during the year to use at peak holiday periods?) The third distinguishing characteristic between goods and services is that the customer does not have to be present when the good is actually produced, but must be present for the performance of a service. For example, you do not have to go to an automobile assembly plant to buy a car, but it would be difficult to have your hair cut without actually being at the barbershop or beauty salon, or to undergo a series of tests in a hospital without being physically present.

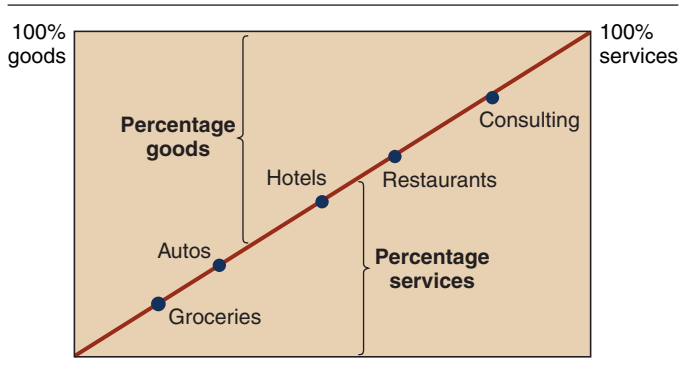
However, it is becoming more difficult to differentiate between services and manufacturing. Consequently, instead of looking at operations from two perspectives (that is, manufacturing and services), today's approach suggests that the vast majority of products consist of both a goods component and a service component, as suggested in Exhibit 1.8, and that both elements need to be addressed as a whole for a firm to be successful. (Note: Throughout this book, *product* will refer to the combination or "bundle" of goods and services being provided, whereas *goods* will refer to the tangible output, and *services* will refer to the intangible output.)

An Expanded Definition of Quality

Another key component in operations management is quality. Successful firms now acknowledge that quality is no longer limited to the operations management function, but is important in all the functional areas throughout an organization. For example, quality is

Exhibit 1.8

Most Products Are a "Bundle" of Goods and Services



important in accounting: The bill for the items purchased must be properly prepared to reflect any special terms of payment and appropriate discounts, and then sent to the customer at the correct address.

The integration of manufacturing and services also has expanded the definition of quality. Quality is no longer limited to the technical requirements of the goods being produced on the manufacturing floor. Service quality (that is, how we deal with our customers on a wide variety of issues) is equally important. How companies integrate all of these aspects of quality to properly meet the needs of their customers is a major challenge to today's managers. The customer service department of a car dealership, for example, must know how to resolve customers' complaints so they will continue to do business with the dealership in the future. For these reasons, today's managers are recognizing that improving quality in all areas of their businesses improves customer satisfaction and increases customer loyalty.

Expansion of OM Concepts into Other Functions

Successful companies are also recognizing that, in addition to quality, many of the tools and concepts now widely used within the operations function also have application to other functional areas of an organization such as marketing, finance, and accounting. For example (as we shall see in Chapter 5), process analysis is a major tool that provides insight into how inputs are converted into outputs, and can be applied to every type of process regardless of where it exists in an organization. As an illustration, the hiring of personnel in human resources is a process, as is the design of a new product in engineering or the rolling out of a new product by marketing. In accounts receivable, the preparing and mailing of an invoice to a customer is also a process.

A New Paradigm for OM

For many years following World War II, the United States was the obvious world leader in manufacturing. U.S. dominance was the result of several factors, including (*a*) available capacity built to support the war effort, (*b*) pent-up demand for consumer goods during the war, and (*c*) the virtually total destruction of most of the production capabilities of the other leading industrialized nations of the world. As Tom Peters said, "You couldn't screw up an American Fortune 500 company between 1946 and 1973 if you tried."[8] With demand significantly exceeding capacity during this period of time, emphasis was placed on output, and the operations function typically reacted to situations only when they occurred. Corporate managers during this period usually told operations managers to focus only on controlling production costs.

As we shall see in Chapter 2, in the early 1970s, Wickam Skinner at Harvard Business School introduced the notion of operations strategy. He proposed that the operations function,

Service industries, such as health care, continue to provide growing opportunities in operations management. Many of the lessons learned in manufacturing with respect to process improvement, quality, and efficiency are now being applied in the service sector (see OMP box on services, p. 11).

[8]Tom Peters and KQED Golden Gate Productions, *The Power of Excellence: The Forgotten Customer* (Jack Hilton Productions, Video Publishing House, Inc., 1987).

rather than being only reactive, could take a proactive role in developing the overall strategy for an organization. In other words, Skinner suggested that the operations function could actually add value to the products a company manufactured (that is, adding value in terms of what a customer is willing to pay for the products). In developing this concept of operations strategy, he suggested that a firm could compete on dimensions other than cost to increase profit margins. These dimensions included *quality, speed of delivery,* and *process flexibility*. Each of these dimensions, in their own way, adds value to the end product. Skinner's notion of an operations strategy resulted in a new paradigm for the operations function.

The Ever-Changing World of Operations Management

Operations management is continuously changing to meet the new and exciting challenges of today's business world. This ever-changing world is characterized by increasing global competition and advances in technology. Emphasis is also shifting within the operations function to link it more closely with both customers and suppliers.

Increased Global Competition

global economy, global village, global landscape
Terms used to describe how the world is becoming smaller and countries are becoming more dependent on each other.

The world is rapidly transforming itself into a single **global economy**, which is also referred to as a **global village** or **global landscape**. Markets once dominated by local or national companies are now vulnerable to competition from literally all corners of the world. For example, IBM's computer manufacturing business was recently bought out by Lenovo, a Chinese company. Montreal-based Bombardier Aerospace competes primarily with Embraer, a Brazilian company. According to World Steel Dynamics, a U.S.-based steel information provider, in 2001, a company from India called the Tata Iron and Steel Company was the best steel company in the world. Thus, competition for Canadian companies comes not only from North American, European, and Japanese companies, but from other, developing countries as well.

The creation of international trade through agreements such as the North American Free Trade Agreement (NAFTA), World Trade Organization (WTO), and the proposed Free Trade Agreement of the Americas (FTAA) greatly affect how business is done in Canada. As explained in the Operations Management in Practice Box in Chapter 7, the reduction of tariffs means that the world-class Canadian companies will have new global markets, will be able to invest in foreign countries more easily and prosper (see the Operations Management in Practice box in this chapter for a description of Canadian companies that have gone global). At the same time Canadian markets are no longer protected, and many companies may not be able to compete against foreign competition, which may lead to job losses. The reduction in tariffs also means that Canadian companies will be have to be innovative when developing products and services to compete against standardized, mass-produced goods from low-labour-cost countries, which would have been restricted by tariffs many years ago.

Although these agreements protect Canadian companies against unjust tariffs imposed by other countries, Canada has to ensure that these agreements do not impede its ability to protect its environment, to ensure the welfare of its citizens, to ensure the quality and safety of products and services that it allows into the country, and to prevent unfair business practices by other countries.[9]

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[9]Julie Demers, "NAFTA: Free Trade or Trade Dispute," *The New Canadian Magazine* (May/June 2003), pp. 37–41.

Consequently, as companies expand their businesses to include foreign markets, so too must the operations management function take a broader, more global perspective for companies to remain competitive. To survive and prosper in such a global marketplace, companies must excel in more than one competitive dimension, which previously was the norm. With the rise of the global economy, companies are no longer limited as to where they can make or buy their products and components. This means that supply chain management (SCM) is more complex, and critical SCM decisions have to be made more carefully. As seen in Exhibit 1.9, the Boeing 777 is assembled in the U.S. from parts sourced from all over the world. The number of countries actually involved in building the Boeing 777 may be many more than those listed in the exhibit since it does not include those that may be supplying parts to Boeing suppliers. This trend toward globalization has placed increased emphasis on the logistics of where to locate facilities and the issues associated with moving material long distances, issues which are addressed in Chapter 7 and Chapter 12 respectively.

Advances in Technology

Advances in technology in recent years also have had a significant impact on the operations management function. The increased use of information technology, automation, and robotics has also permitted us to improve the quality of the goods that are being provided.

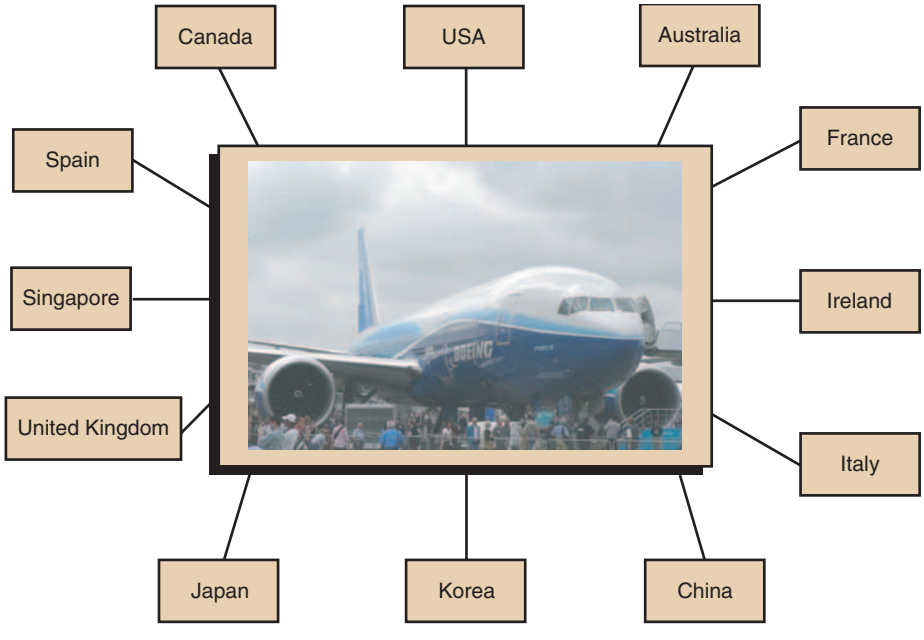


Exhibit 1.9

Boeing's Global Network to Support the Manufacture of the 777

Boeing's Global Supplier Network to Support the Manufacture of the 777.

Source: 21st Century Jet, VHS (London, UK: Channel 4 Television, 1993); www.boeing.com, Jay Heizer and Barry Render, *Operations Management* (Upper Saddle River, NJ: Prentice Hall, 1999), p. 54.

A worker assembles doors on Passat cars at a production line in Shanghai Volkswagen Automotive Company.

However, advances in technology place new requirements on the workforce and even on customers, especially in service operations. (For example, customers now must have computer skills to access companies that advertise on the Internet or the World Wide Web.) Consequently, skilled workers are replacing unskilled workers in all types of operations. As we shall see in Web Chapter 17, an organization's workforce should be considered its most valuable asset, only increasing in value as it becomes more educated.

Linking OM to Customers and Suppliers

In the past, most manufacturing organizations viewed operations strictly as an internal function that had to be buffered from the external environment by other organizational functions. Orders were generated by the marketing function; supplies and raw materials were obtained through the purchasing function; capital for equipment purchases came from the finance function; the labour force was obtained through the human resources function; and the product was delivered by the distribution function.

It was felt that buffering would prevent external influences (from both within and outside the organization) from having a disruptive influence on the efficiency of the operations function.

However, there were some inherent disadvantages when the transformation process was totally isolated. One was that information lagged between the process and the boundary functions, which inevitably led to inflexibility. Another was that for high-tech products in particular, communications between the shop floor and the customer could be extremely valuable in solving technical problems during production. As shown in the OMP box, Foxboro Company's Customer Friend Program provides a good example of how manufacturing is now directly interacting with customers.

More and more firms are recognizing the competitive advantage achieved when the transformation process is not isolated, as when customers are invited to view their

Operations Management in Practice

LOCAL CANADIAN COMPANIES GO GLOBAL

Fortis Inc. was established as the parent company of Newfoundland Power in 1987 to pursue growth through diversification. Newfoundland Power and its predecessor companies have been distributors of electricity in Newfoundland since 1885. Fortis is the principal supplier of electricity in the provinces of Prince Edward Island and Newfoundland and Labrador. At the same time it has also expanded beyond its traditional markets and is a good example of a company that has recognized global opportunities in an industry that historically was very local.

Fortis expertise is in the management of small hydroelectric facilities. It has managed to maintain this focus and at the same time go global. As a result it now holds interests in companies that supply power to Ontario and New York State from small hydroelectric facilities. It also purchased majority stakes in hydroelectric and distribution facilities in Belize in Central America and holds almost a 40 percent interest in Caribbean Utilities Company Ltd., the sole provider of electricity to the island of Grand Cayman, Cayman Islands.

Potash Corp. was created as a Crown corporation by the Province of Saskatchewan in 1975 and became a publicly traded company in 1989. Currently it is the world's largest integrated producer of nitrogen, phosphate, and potash for agricultural production. Since 1989 it has also made the transition from being a local company to one that has seven phosphate operations in Canada and one potassium nitrate plant in Chile. It has seven phosphate operations in the United States and one in Brazil, four nitrogen plants in the United States, a large complex in Trinidad, and a 26 percent interest in a potash producer in Jordan.

Finning International Inc. is a Vancouver-based international corporation that sells, rents, finances, and provides customer support services for Caterpillar equipment and engines and complementary equipment on three continents around the world. In the 1980s, to combat the domestic recession, it transformed itself from a company that only served British Columbia, Alberta, Yukon, and the Northwest Territories to an international company. Currently, there are Finning dealerships in the United Kingdom, Argentina, Bolivia, Chile, and Uruguay. It also owns Hewden Stuart, the U.K. leader in equipment rental and associated services.

Sources:

Fortis Inc., www.fortis.ca.

Potash Corp., www.potashcorp.com.

Finning International Inc., www.finning.com.

"Fortis Buys Belize Stake," *The Globe and Mail*, January 29, 2001, B13.

"Potash Corp Acquires 26% of Arab Potash," *The Globe and Mail*, October 17, 2003, B16.

operating facilities firsthand. For example, Green Giant, a unit of Minneapolis-based Pillsbury, believes that the tours of their production facilities that they provided to Japanese distributors were a major factor in their ability to penetrate that market with their Green Giant food products.[10]

In a like manner, companies are working more closely with suppliers. Firms such as Toyota, for example, have suppliers deliver product directly to the factory floor, eliminating any need for a stockroom. Wal-Mart and Proctor and Gamble (P&G) partake in a program called Vendor Managed Inventory (VMI), whereby the supplier, P&G, manages the inventory of its products stocked by Wal-Mart. Canadian home improvement firm RONA allows suppliers to access RONA's inventory system so that the supplier can decide when to replenish. RONA's competitor, Home Depot, has a similar arrangement with suppliers.

As more and more companies outsource manufacturing to focus on core competencies, the *make* versus *buy* decision is becoming more important. In addition, in a *buy* decision, when comparing suppliers, companies are also looking at the "total cost of ownership" rather than only at initial price. (These issues are discussed more in Chapter 12.)

This trend toward having the transformation process work more closely with both suppliers and customers alike is often referred to as a product's **value chain**. We can define

value chain
Steps an organization requires to produce a good or a service regardless of where they are performed.

[10]J. Ammeson, "When in Rome," *Northwest Airlines World Traveler,* March 1993.

Operations Management in Practice

THE CUSTOMER FRIEND PROGRAM AT FOXBORO'S SYSTEMS MANUFACTURING OPERATION

The Foxboro Company's systems manufacturing operation, which produces control systems for process industries such as refineries, chemical plants, and breweries, has a Customer Friend Program that directly links its customers to manufacturing. This program is offered free of charge and provides each customer with a contact person or "friend" in manufacturing who is responsible for helping the customer resolve any and all product- and service-related problems. Since its inception in 1992, more than 40 individuals from manufacturing have taken part in the Customer Friend Program involving more than 300 customer systems, both large and small.

The benefits of this program to manufacturing are to (*a*) identify more closely with the customer's needs, (*b*) feel the customer's pain when a problem does occur, (*c*) gain a better understanding of how manufacturing can improve its support to its customers, and (*d*) obtain direct feedback from "where the rubber meets the road" in terms of how manufacturing can improve its processes and products.

The program benefits the customer by (*a*) identifying more closely the customer's needs, (*b*) passing the pain directly to the source when a problem does occur, (*c*) having a dedicated individual within manufacturing who has a personal commitment to customer satisfaction, (*d*) having direct contact with manufacturing to analyze product failures, and (*e*) acting as a conduit for new and improved ideas.

Foxboro's Customer Friend Program is proactive rather than reactive. Depending on the needs and desires of the customer, the Foxboro friend will call his assigned customer every one to four weeks just to make sure everything is running smoothly. Many of these customer–friend relationships are long standing. Ray Webb, the employee involvement manager at Foxboro's Systems Manufacturing Operation, for example, has had a five-year association with Ergon Refining of Mississippi.

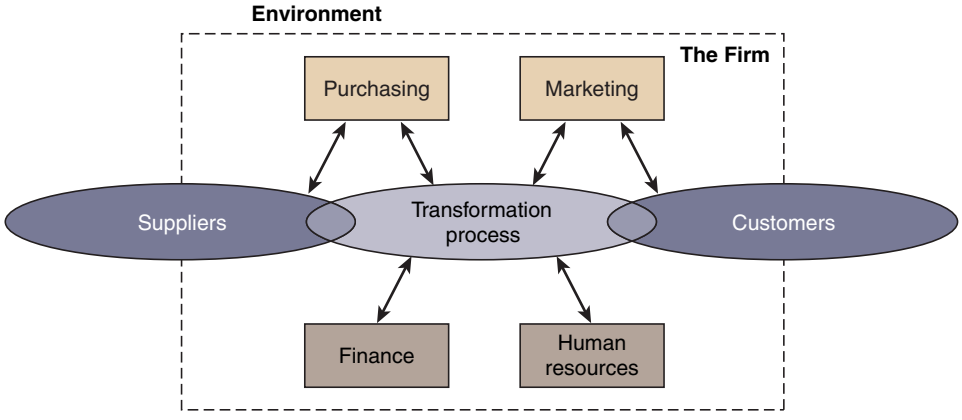
Source: Special thanks to Ray Webb, Systems Manufacturing Operation, The Foxboro Company.

a value chain as consisting of all those steps that actually add value to the product without distinguishing where they are added. This concept attempts to eliminate all nonvalue-added steps (such as inspections and inventory), and consequently results in a higher degree of dependence among the value-added functions within the chain. The relationship between the transformation process, its support functions, and the other value-added functions is shown in Exhibit 1.10.

virtual enterprise
Company whose boundaries are not clearly defined due to the integration of customers and suppliers.

This integration of both suppliers and customers into the transformation process begins to blur the boundaries between what were previously totally independent organizations. What appears to be emerging now is a concept known as the **virtual enterprise**, which is a fully integrated and interlocked network of *inter*dependent organizations. With this new approach, it is often difficult to determine where one organization leaves off and the next one begins. (See the Bose JIT II example in Chapter 12.)

Exhibit 1.10
The Value Chain and Its Support Functions



Job Opportunities in Operations Management: Relating OM to Other Business Functions

Exhibit 1.11 lists some of the line and staff jobs that usually fall within the operations function. There are more staff specializations in manufacturing than in services because of the focus on materials management and control.

Operations management is a required course in many business schools, not only because it deals with the basic question of how goods and services are created, but also because many of the concepts developed in OM have direct applications in every other functional area within an organization. As seen in Exhibit 1.12, processes exist within every function. These processes can be continuously improved by applying OM tools and techniques. In addition, as also seen in Exhibit 1.12, each of these functional areas interacts with the OM function. Therefore, to do their jobs correctly, it is important for individuals working in these areas to understand the fundamental concepts of operations management.

Exhibit 1.11

Line and Staff Jobs in Operations Management

Organizational Level	Manufacturing Industries	Service Industries
Upper	Vice president of manufacturing Regional manager of manufacturing	Vice president of operations (airline) Chief administrator (hospital)
Middle	Plant manager Program manager	Store manager (department store) Facilities manager (wholesale distributor)
Lower	Department supervisor Team leader Crew chief	Branch manager (bank) Department supervisor (insurance company) Assistant manager (hotel)
Staff	Production controller Materials manager Quality manager Purchasing agent Work methods analyst Process engineer	Systems and procedures analyst Purchasing agent Inspector Dietician (hospital) Customer service representative

Exhibit 1.12

Inputs Provided by OM to Other Functional Areas

Functional Area	Processes Performed by That Area	Input Provided by OM
Accounting	Asset valuation Financial statements	On-hand inventory Labour and material costs
Finance	Capital investment analysis Cash flow management	Capacity utilization Make-or-buy decisions
Marketing	New product introduction Customer orders	New process requirements Delivery dates
Human resources	Hiring Training	Job descriptions Worker skills requirements
MIS	Software evaluation Hardware requirements analysis	Data requirements Terminal requirements

The Historical Development of Operations Management from an International and Canadian Perspective[11]

Unlike the United States, which evolved from an agricultural base, business in Canada began as a commodity-based colony. Fish, fur, and forests were harvested, then shipped back to France or the U.K. Manufacturing as we know it today did not exist. Items were usually custom-made by skilled artisans who spent many years in apprenticeship learning every facet of how to make a good or provide a service. No two products were ever the same. For many products, trades or guilds were established to provide a common basis of knowledge for these apprenticeship programs.

This cottage industry approach to manufacturing began to change at the beginning of the 19th century. In England, in 1765, Watt invented the steam engine which provided a source of power for manufacturing. In the early 1800s, Eli Whitney introduced the concept of standardized parts, demonstrating by selecting parts at random to assemble and then fire a musket. (Prior to this, every musket was handcrafted with customized parts.) The middle of the 19th century saw the onset of the Industrial Revolution with its large manufacturing facilities powered either by steam or water. However, even with the advent of these large facilities, manufacturing to a large degree remained an art rather than a science.

In the 19th century, industrial development in Canada generally lagged behind that of its neighbour, the U.S., and its colonizer, the U.K., for a variety of reasons. Slow population growth (due to difficult living conditions) in Canada until the beginning of the 20th century resulted in relatively small markets for most products. Secondly, the existence of foreign tariffs meant that export markets were minimal. Thirdly, there was a lack of skilled people in Canada because there were no technical institutions to train them. Finally, it was not until the late nineteenth century that Canada had a cross-continental rail network. This lack of transportation prevented manufacturers from serving distant markets. Thus Canadian manufacturers had neither the skills nor the market economies of scale to invest in new technology and become competitive.

Nevertheless, limited free trade agreements with the U.S. and U.K. (although only for short periods), demand fuelled by the U.S. Civil War, general population growth in the U.S., and the easy availability of natural resources all spurred industrial growth in Canada during this period. By the turn of the twentieth century, the availability of large amounts of cheap hydroelectricity was also proving beneficial to Canada.

scientific management
Systematic approach to increasing worker productivity introduced by Fredrick W. Taylor.

Things changed in manufacturing in general with the introduction of **scientific management** at the beginning of the 20th century. Although one could claim that operations management has existed since the dawn of civilization, scientific management probably was the first historic landmark in the field because it represented for the first time a systematic approach to manufacturing. This concept was developed by Frederick W. Taylor, an imaginative engineer and insightful observer of organizational activities.

The essence of Taylor's philosophy was that scientific laws govern how much a worker can produce per day and that it is the role of management to discover and use

[11]Parts of this section are based on information from the following sources: J. Balakrishnan, J. B. Eliasson, and T. R. C. Sweet, "Factors Affecting the Evolution of Manufacturing in Canada: A Historical Perspective," forthcoming in the *Journal of Operations Management*; and Richard Pomfret, *The Economic Development of Canada* (Toronto: Methuen, 1981).

these laws in its production systems (and that it is the role of the worker to carry out management's wishes without question). Taylor's philosophy was not greeted with approval by all his contemporaries. On the contrary, some unions resented or feared scientific management—and with some justification. Too often, managers of the day were quick to embrace the mechanisms of Taylor's philosophy—time study, incentive plans, and so forth—but ignored their responsibility to organize and standardize the work to be done. In many firms, workers often were viewed as just another interchangeable asset, like plant and equipment. Notable co-workers of Taylor were Frank and Lillian Gilbreth (motion study, industrial psychology) and Henry L. Gantt (scheduling, wage payment plans).

By the early 1900s there were some notable Canadian industries, since mass manufacturing was becoming more feasible due to the increasing population and the general reduction in foreign tariffs leading to exports. The Northern Electric and Manufacturing Company Limited (now Nortel Networks), was incorporated in 1895 and made telephones, wind-up gramophones, and other telecommunications equipment. Massey Harris (later Massey Ferguson) manufactured and won international awards for farm implements. Other current companies that existed at the turn of the 20th century include Frosst (now Merck Frosst), CP Hotels (now Fairmont Hotels), Cara, CP Rail, Bell Canada, Alcan, Imperial Oil, George Weston (bakeries and owner of Loblaws), and McCain Foods. Furthermore, Canadian companies in the early part of the 20th century did not simply implement imported technology, but made their own innovations to these technologies to help growth and development.[12]

In the early 1900s a group of Ontario investors purchased a 49% interest in the Ford Motor Company of Canada and began assembling cars in Chatham, Ontario, from parts imported from Ford's factory in Detroit (the customs duty was lower on imported parts than on fully assembled vehicles). In fact, U.S. companies started establishing branch plants in Canada in the mid-19th century, first in natural products and then in manufacturing, due in part to tariffs that prevented them from exporting to Canada. Although this brought jobs to Canada, R&D usually stayed in the U.S. headquarters. At about the same time, the McLaughlin family, who owned a buggy manufacturing business, formed the McLaughlin Motor Car Company and started assembling motors cars in partnership with Buick. This company later became General Motors of Canada.[13] CCM, known today for sporting equipment, produced automobiles in the early 1900s.[14]

The year 1913 saw the introduction of one of the machine age's greatest technological innovations: the **moving assembly line** for the manufacture of Ford automobiles. (Ford is said to have gotten the idea for an assembly line from observing a Swiss watch manufacturer's use of the technology. Incidentally, all Model-T Fords were painted black. Why? Because black paint dried the fastest.) Before the assembly line was introduced in August of that year, each auto chassis was assembled by one worker in about 12 hours. Eight months later, when the line was in its final form, with each worker performing a small unit of work and the chassis being moved along the line mechanically, the average labour time per chassis was reduced to 93 minutes. This technological breakthrough, coupled with the concepts of scientific management, represents the

moving assembly line

A mass production line in which the product moves along the line while workers at sequential locations add value to the product.

[12]Peter J. Wylie, "Indigenous technological adaptation in Canadian Manufacturing, 1900–1929," *Canadian Journal of Economics*, 23, no. 4 (1990), pp. 856–872.
[13]Heather Robertson, *Driving Force: The McLaughlin Family and the Age of the Car* (Toronto: McClelland and Stewart, 1995).
[14]Ibid.

classic application of labour specialization and still exists today in both manufacturing and service operations.

During both World War I and World War II, Canada's production was geared towards wartime production. After the end of the World War II, Canada and the U.S. prospered because they were among the few industrialized countries whose infrastructure was not destroyed. However, this had some negative consequences for operations. The high demand and lack of international competition meant that companies did not think about operations strategically or as a competitive weapon. The operations function was assigned the responsibility of producing large quantities of standard products at minimum cost regardless of the goals of the firm. Issues such as quality took a back seat. Later, when foreign manufacturers, especially Japanese, entered the market with quality products, North American manufacturers were ill-equipped to respond quickly. This was foreseen by experts in operations, such as Wickham Skinner of the Harvard Business School, who suggested in the late 1960s that companies should place strategic emphasis on operations.[15] Today, of course, companies view operations as a competitive weapon and place great importance on operations management.

In Canada, operations management (OM) evolved under unique circumstances and in response to international influences. The signing of the Canada-U.S. Auto Pact in 1965, (whereby tariffs were reduced if a manufacturer of automobiles or automobile parts did some value-added manufacturing in Canada) gave impetus to growth in the auto industry. Changing processes, whether an adoption of existing technology or improving an existing process, has allowed Canadian companies to produce the same or better product at a lower cost. With the availability of better transportation and communication technology, Canadian firms have become more competitive. Developments in OM such as Materials Requirement Planning (MRP), Just In Time (JIT), Total Quality Management (TQM), and six sigma methods became available to Canadian companies soon after they were introduced. Canada also participates internationally in helping improve operations. The significant role played by the Canadian Standards Association (CSA) in developing international quality management system standards such as the ISO 9000 is a good example. On its 75th anniversary in 2003, the magazine *Canadian Business* profiled what it felt were the best 75 Canadian companies of all time.

The last quarter of the 20th century also saw the rise of Japan and Germany as major economies. Many Japanese companies, through investments in research and development and innovative manufacturing practices, became leaders in industries ranging from automobiles (light and heavy) and electronics to construction and shipbuilding. For example, Sony became a leader in designing and producing innovative electronic goods, while Toyota, with its Just-In-Time (JIT) innovation and high quality manufacturing, became a leader in automobile manufacturing. Chapter 14 is devoted to JIT, sometimes called the biggest revolution in manufacturing since the assembly line. Following their lead, companies from Korea and other Asian countries have also become formidable competitors. Other recent developments that affect international competition include the emergence of Eastern Europe from Communism.

A 1991 report by Professor Michael Porter of Harvard University and a follow-up report in 2004 by Porter and Professor Roger Martin, dean of the Rotman School of Management at the University of Toronto, studied Canadian products and their place in a globally competitive world. The study outlined how Canadian industry and government were doing on global issues. Topics of operational concern included Canadians' apparent

[15]C. Wickham Skinner, "Manufacturing—The Missing Link in Corporate Strategy," *Harvard Business Review*, 47, no. 3 (May–June 1969), pp. 136–145.

reliance on raw materials, improving productivity, quality in manufacturing, and government protectionist policy.[16,17]

Exhibit 1.13 gives a summary of the developments in operations management in the 20th century.

Exhibit 1.13

Historical Summary of OM

Year	Concept	Tool	Originator
1910s	Principles of scientific management	Formalized time-study and work-study concepts	Frederick W. Taylor
	Industrial psychology	Motion study	Frank and Lillian Gilbreth
	Moving assembly line	Activity scheduling chart	Henry Ford and Henry L. Gantt
	Economic lot size	Economic Order Quantity (EOQ) applied to inventory control	F. W. Harris
1930s	Quality control	Sampling inspection and statistical tables for quality control	Walter Shewhart, H. F. Dodge, and H. G. Romig
	Hawthorne studies of worker motivation	Activity sampling for work analysis	Elton Mayo and L. H. C. Tippett
1940s–60s	Extensive development of operations research tools	Simulation, waiting-line theory, decision theory, mathematical programming, project scheduling techniques of PERT and CPM	Many researchers globally
1970s	Widespread use of computers in business	Shop scheduling, inventory control, forecasting, project management, MRP	Led by computer manufacturers, in particular, IBM; Joseph Orlicky and Oliver Wight were the major MRP innovators
	Service quality and productivity	Mass production in the service sector	McDonald's restaurants
1980s	Manufacturing strategy paradigm	Manufacturing as a competitive weapon	Harvard Business School faculty
	JIT, TQC, and factory automation	Kanban, poka-yokes, CIM, FMS, CAD/CAM, robots, etc.	Tai-Ichi Ohno of Toyota Motors, W.E. Deming and J. M. Juran and engineering disciplines
1990s	Total quality management	Canada Awards for Excellence, ISO 9000, quality function development, value and concurrent engineering, continuous improvement paradigm	National Quality Institute (NQI), American Society of Quality Control (ASQC), and International Organization for Standardization (ISO)
	Business process reengineering	Radical change paradigm	Michael Hammer and major consulting firms
	Electronic enterprise	Internet, World Wide Web	U.S. government, Netscape Communication Corporation, and Microsoft Corporation
	Supply chain management	SAP/R_3, client/server software	SAP, Oracle
2000s	E-commerce	Internet, World Wide Web	Amazon, eBay, Canadian banks

Adapted from: Richard B. Chase, F. Robert Jacobs, and Nicholas J. Aquilano, *Operations Management for Competitive Advantage*, 10th ed. (New York: Irwin McGraw Hill, 2004), p. 16.

[16]Michael E. Porter and the Monitor Company, "Canada at the Crossroads: The Reality of a New Competitive Environment," *A Report to the Business Council on National Issues and Minister of Supply and Services* (Ottawa: Business Council on National Issues, 1991), p. 4.

[17]Martin, R. and M. E. Porter, 2001, "Canadian Competitiveness: A Decade after the Crossroads," www.rotman.utoronto.ca/research/competitive1.htm (accessed March 14, 2006).

Conclusion

Operations management is recognized today as a critical functional area within every organization. No longer is operations management considered to be subservient to the finance and marketing areas; instead, it is now treated as an equal. Firms that fail to recognize the significant contribution of the operations management function will lose profits and market share to those firms that do. The once-reactive role of operations management, which concentrated solely on minimizing costs, has been replaced by a more proactive position of maximizing the value added to the goods and services that the organization provides.

Some of the major issues facing operations management executives today in this constantly changing business environment include:

1. Reducing the development and manufacturing time for new goods and services.
2. Achieving and sustaining high quality while controlling costs.
3. Integrating new technologies and control systems into existing processes.
4. Obtaining, training, and keeping qualified workers and managers.
5. Working effectively with other functions of the business (marketing, engineering, finance, and human resources) to accomplish the goals of the firm.
6. Integrating production and service activities at multiple sites in decentralized organizations.
7. Working effectively with suppliers and being user-friendly for customers.
8. Working effectively with new partners formed by strategic alliances (for example, Wal-Mart and Exel Logistics).

All of these issues are interrelated. The key to success is for operations management to do all of these at a level that is competitive in both global and domestic markets.

Key Terms

global economy, global landscape, global village p. 14
moving assembly line p. 21
operations management p. 4
scientific management p. 20
transformation process p. 6
value chain p. 17
virtual enterprise p. 18

Review and Discussion Questions

1. What is operations management and how is it different from operations research?
2. What were the underlying reasons for the lack of emphasis on operations management in the post-World War II years?
3. What are the advantages of bringing customers into the transformation process or technical core?
4. Take a look at the want ads in *The Globe and Mail* and your local newspaper and evaluate the opportunities for an OM major with several years of experience.
5. What are the major factors leading to the resurgence of interest in OM today?
6. Explain the difference, from an operations management perspective, between cost minimization and value maximization.
7. Using Exhibit 1.3 as a model, describe the input–transformation–output relationships found in the following systems.
   a. An airline.
   b. A provincial penitentiary.
   c. A branch bank.
   d. A bakery.
   e. A clothing manufacturer.
   f. A dry cleaner.
   g. An automobile assembly line.
   h. An accounting firm.

8. What do we mean by the expression *value chain,* as it applies to the transformation process of a good or service?
9. Identify a product that is 100 percent goods without any service component. Identify a product that is 100 percent service without any goods component.
10. Speculate on the future role of the OM function within an organization and the future role of the operations manager.

Internet Exercise

Go to the Online Learning Centre (OLC) Web site at www.mcgrawhill.ca/olc/davis and visit the Web site of one of the companies that provides a virtual plant tour of their operations. Identify the company and describe the various operations presented in the tour. What do you think distinguishes this firm from its competition?