Pearson New International Edition

Supply Chain Management
From Vision to Implementation
Fawcett Ellram Ogden
First Edition



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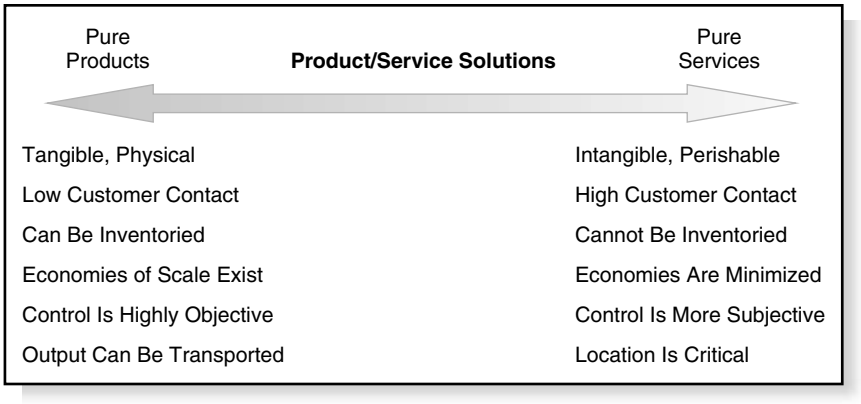


Figure 4 Continuum of Manufacturing and Service Operations

the things you are showing us?" This question prompted an unexpected response: "It has taken us years and years to develop and implement this system. We do not believe that you have the patience and determination to make it work."

Operations Management in the Services Setting

SC managers need to understand the distinctive characteristics of service operations for several reasons (see Figure 4). First, many SC processes are actually services. Purchasing, logistics, and new product development are examples of internal service operations. Second, services now dominate economic activity and service companies like banks rely on excellent SC practice. Finally, customers want to buy solutions, not just products.

This reality led IBM to transform itself from a computer manufacturer to an information solutions company. IBM offers consulting, hardware, and complete managerial support to companies interested in outsourcing their information needs. IBM even sells competitors' hardware as part of its information solutions. In the auto industry, General Motors discovered that setting up a finance division not only facilitated the purchase of its cars but also made it possible to use very low financing rates as a competitive weapon. General Electric likewise found that financing is an important aspect of selling turbines and other capital equipment. GE Capital is often the most profitable division at GE.

Critical differences between production and service operations are highlighted in the following sections.

Tangibility

Production outputs are tangible—they can be touched and closely examined. By contrast, service outputs are intangible—they cannot be touched, but must be experienced. When you buy a ticket to fly to Cancun for vacation, you cannot evaluate your satisfaction with the flight until you are consuming it. By then, it is too late to return the ticket for a refund. Because goods are physical, they can be stored and transported; services cannot. The physical nature of goods also allows for objective measures of quality, especially in terms of conformance to specifications. Intangibility affects many operations decisions, including facility location, facility layout, inventory, scheduling, and quality management.

Customer Contact

Customers of manufactured products have little contact with the production process. In services, customers are often involved in the delivery process.[11] For example, customers often bag their own groceries, and at Fuddruckers, the eclectic hamburger chain, customers assemble their own design-to-order hamburger from a set of fresh ingredients available in the dining area.

Perhaps the automated teller machine (ATM) in banking best exemplifies customer involvement. Using an ATM, a customer can perform routine transactions including deposits and withdrawals any time of the day or night without teller assistance. The customer becomes the service operator, enhancing productivity and satisfaction. On-line banking extends customer involvement in financial services, allowing the customer to perform a variety of transactions from the comfort of home 24 hours a day.

Ability to Inventory

Because physical goods can be stored, manufacturers can produce now to meet future demand. Services, by contrast, are generally produced and consumed simultaneously, making capacity and demand management critical. Companies can build for peak demand and live with excess capacity in off-peak hours, or they can build for average demand and lose sales during peak times. Matching capacity to demand is a challenge.

For example, once an airplane takes off, an empty seat cannot be sold. The capacity is lost forever. American Airlines pioneered yield management to put a body in seats that would otherwise go unfilled. Yield management attempts to maximize revenue by offering reduced-fare seats on each flight in a way that minimizes lost opportunities to sell full-fare seats. Using its automated reservation system SABRE (semiautomated business research environment), American uses historical demand information, forecasts of future demand, and seat availability to allocate discounted fares on each flight. If a flight is relatively empty, more seats are discounted at a higher rate. As seats become scarce, fares rise. Variable pricing increases the likelihood of filling as many seats as possible at the highest fare possible. American estimated that yield management increased its revenues by $1.4 billion in the period from 1989 to 1992, a number 50 percent higher than its net profit of $892 million for this same period.[12] Marriott Hotels and other service companies now use yield management to help them match supply to demand.

Economies of Scale

Labor productivity tends to be higher in production operations than in service operations. Because physical goods can be produced for future consumption and shipped to customers worldwide, manufacturers can build huge facilities that leverage scale economies. These large-scale operations are often highly automated and capital intensive. Services typically rely on smaller operations located close to customers. Service operations tend to be labor intensive. Thus, production operations tend to produce greater revenues and profits per labor hour than service operations.

For example, in 2005, Wal-Mart generated revenues of $285 billion and employed almost 1.7 million people. Wal-Mart's revenue per employee was about $167,778. By contrast, General Electric generated revenues of $134 billion with 305,000 employees. Its revenues per employee were over $482,147. The contrast is even greater when the focus is on profitability per employee. Wal-Mart earned $6,039 per employee compared to General Electric's $53,267 per employee. Table 3 shows similar comparisons for typical *Fortune* 50 manufacturing and service companies.

Table 3 Labor Productivity in Manufacturing and Service Companies (2003–2004)

Manufacturers	Employees	Revenues	Revenues/ Employee	Profits	Profits/ Employee
Exxon Mobil	85,900	$263,989,000,000	$3,073,213	$25,330,000,000	$294,878
General Motors	324,000	$193,517,000,000	$597,275	$2,805,000,000	$8,657
General Electric	307,000	$148,019,000,000	$482,147	$16,353,000,000	$53,257
Altria Group	156,000	$63,963,000,000	$410,019	$9,416,000,000	$60,359
Pfizer	115,000	$51,298,000,000	$446,070	$8,085,000,000	$70,304
Procter & Gamble	110,000	$56,741,000,000	$515,827	$7,257,000,000	$65,973
Dell	55,200	$49,205,000,000	$891,395	$3,043,000,000	$55,127
Dow Chemical	43,203	$46,307,000,000	$1,071,847	$4,515,000,000	$104,507
Microsoft	61,000	$39,788,000,000	$652,262	$12,254,000,000	$200,885
Boeing	159,000	$52,457,000,000	$329,918	$1,872,000,000	$11,774
Manufacturer Average			$846,997*		$92,573**
Service Companies	**Employees**	**Revenues**	**Revenues/ Employee**	**Profits**	**Profits/ Employee**
Wal-Mart	1,700,000	$285,222,000,000	$167,778	$10,267,000,000	$6,039
Verizon Com.	210,000	$71,283,000,000	$339,443	$7,831,000,000	$37,290
Home Depot	325,000	$73,094,000,000	$224,905	$5,001,000,000	$15,388
State Farm Insurance	79,200	$58,800,000,000	$742,424	$5,300,000,000	$66,919
Federal Express	250,000	$29,363,000,000	$117,452	$1,449,000,000	$5,796
Target	292,000	$46,839,000,000	$160,408	$3,198,000,000	$10,952
Time Warner	84,900	$42,089,000,000	$495,748	$3,363,000,000	$39,611
Morgan Stanley	53,284	$39,549,000,000	$742,230	$4,485,000,000	$84,172
UPS	384,000	$42,581,000,000	$110,888	$3,870,000,000	$10,078
Walgreen	163,000	$42,201,000,000	$258,902	$1,559,000,000	$9,564
Service Average			$336,018*		$28,581**

*Average revenue per employee
**Average profit per employee

Objectivity of Control

Productivity and quality can be objectively measured in manufacturing. Intangibility and customer involvement complicate the control of a service operation. For example, the dimensions and characteristics of a product can be, and are, measured to determine if it is fit for use. By contrast, the customer experience in the service setting is seldom measured directly. Customer comment cards and suggestion boxes are often used in the service setting; however, the accuracy, frequency, and quality of the feedback provided are limited. Beyond that, customer behavior is often beyond the control of the service provider. We've all had to wait in the checkout line of a grocery store for the person in front of us to find a lost debit card.

Transportability

Because physical goods can be transported, manufacturers can locate production anywhere as long as their landed cost—the sum of production and transportation costs—is competitive. Services are generally consumed where they are produced. They are very difficult to transport—unless of course the output can be digitized. For example, on-line banking can be done from the customer's own home. The outsourcing of services such as call centers and software programming has become an important

economic and political phenomenon. More exotic examples exist. An MRI can be performed in Boston, shipped via cyberspace to Bangalore where it is interpreted by an Indian radiologist, with the results being sent back the next day. India has become a popular destination for these service jobs because of its large, highly educated, English-speaking workforce. Forecasts suggest that over 3 million service jobs will be outsourced by 2015. However, for the vast majority of services that cannot be easily digitized, customers must come to the service. Peapod, the pioneer in grocery home delivery, continues to struggle to achieve consistent profitability.

Operations Skills for a Supply Chain World

Achieving great operational performance within the walls of the organization via the application of lean principles is the goal of most operations. However, in a world where rival supply chains compete, companies must strive for operational excellence throughout their chains by (1) careful outsourcing management, (2) supplier integrated manufacturing, and (3) the dissemination of best practices. Today's managers need the skills to do this; otherwise, they risk obsolescence. After all, the supply chain is only as strong as the weakest link.

Outsourcing

Outsourcing allows a company to invest in a few specific skills while relying on outsource partners to perform other vital activities. Managed appropriately, this specialization can improve both service and efficiency. Dell's business model relies on ultra-efficient contract manufacturers and exemplifies the opportunity to use outsourcing to enhance overall SC efficiency. Dell's challenge is to add enough value to retain its role as the SC captain.

Supplier Integrated Manufacturing

Defining what needs to be done and who should do it is a critical part of supply chain design. Increasingly, companies are learning to share resources in new and unique ways to improve their value-added capabilities. Volkswagen's truck assembly facility in Resende, Brazil, is an interesting experiment in the shifting of value-added roles and responsibilities. Volkswagen built the assembly facility and invited seven key suppliers to establish assembly lines within the facility. Suppliers provide their own capital equipment and assembly personnel, and they do not get paid until the finished vehicle passes final inspection.

Best Practices Dissemination

Companies need to learn how to share best practices across organizational and geographic boundaries. Payless ShoeSource uses an annual audit to share best practices with its suppliers. When an outstanding practice is identified at one supplier, it is incorporated into the audit so that the practice can be shared with other suppliers. The goal must be to create the learning supply chain.

Delivering the Goods: The Nature of Logistics Management

Logistics is the art and science of moving things from one point to another and storing them along the way. Logistics bridges the physical and temporal gaps in a global supply chain. Indeed, efficient logistics makes a global economy possible, lowering the

costs of living for the people of the world. Today, a supermarket in London might sell fish from Maine and Vietnam and fruits from California and Chile. A North American apparel retailer might sell products sourced from over 50 countries in over 4,000 retail outlets located on 3 continents. People can also vacation in once-remote locations or visit family across continents. The performance of modern logistics systems affects almost every aspect of our lives, and they work so well that we take them for granted.

The Council of Supply Chain Management Professionals (CSCMP), the leading professional association of logistics and supply chain managers and educators, has defined logistics as follows:

> Logistics management is that part of SCM that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.

Logistical excellence has become a cornerstone of the competitive strategy of such well-known companies as Benetton, Hershey's, The Limited, and Whirlpool. Outbound logistics costs account for between 7 and 10 percent of each sales dollar. Though logistics costs are sizable, the real potential of logistics lies in its ability to help differentiate the company from the competition, increasing customer loyalty, sales, and profits. Donald Bowersox, a logistics thought leader, pointed out that today's customers want (1) to receive exactly what they ordered: no more, no less, no substitutions, no defects, no breakage, no spoilage; (2) delivery of their perfectly filled orders at the agreed-upon time; and (3) to pay as little as possible. This is today's logistical mandate.

The Logistical Process

The logistics process often is discussed in terms of inbound and outbound flows. **Materials management** is concerned with the inbound movement and storage of raw materials, purchased components, and subassemblies entering and flowing through the conversion process. The central objective of materials management is to ensure that production has the necessary inputs at the right time and place. *Physical distribution* focuses on the outbound transportation and storage of finished products from point of manufacture to where customers wish to acquire them. The goal of physical distribution is to meet or exceed customer service expectations at the lowest possible costs.

A company's overall logistics capability is defined by the way it organizes and manages people, facilities, equipment, and operating policies. Table 4 shows the basic roles and responsibilities of core logistical activities. These activities must be planned in concert with other internal and external processes. For instance, logistics must coordinate forecasting and inventory control decisions with production management. Packaging decisions must involve marketing input and downstream customer concerns.

Order Fulfillment

Logistics creates value by delivering orders when and where they are needed. The order cycle is the sequence of activities that begins when a need is recognized and ends when the product is delivered and available for use. Figure 5 shows the key activities that comprise a typical order cycle. By definition, the order cycle begins and ends with the buying company. The buyer must recognize a need and place an order. The supplier must then process the order. Order processing involves (1) order entry, (2) production or picking of the order, and (3) preparation and packaging for

Table 4 Basic Logistics Activities

Activity	Basic Roles and Responsibilities
Customer Service	Customer service focuses on understanding what customers want and measuring logistics performance against these customer requirements.
Demand Forecasting	Forecasts—estimates of demand—must be developed to help plan other logistics activities, allocate resources, and provide high levels of service at low costs.
Documentation	Accurate documentation helps assure that the product gets to the customer on time. Documentation is particularly vital in international shipments.
Information Management	Data on carriers, customers, and inventories must be turned into useful decision-making information. Information replaces inventory in today's logistics systems.
Inventory Management	Product must be available to meet production requirements and customer demand. However, inventory is expensive. Inventory control must support high levels of customer service with as little inventory as possible.
Material Handling	Because handling materials costs money and can lead to damage, factories and warehouses are designed to minimize the total amount of required handling.
Order Processing	Order processing initiates work. Many orders are transmitted electronically, improving the speed and accuracy of the fulfillment process.
Packaging	Packaging protects the product throughout the distribution process. Packaging also conveys information about the product and presents an attractive appearance.
Parts and Service Support	Needed spare and replacement parts must be available to support sales. Caterpillar promises delivery of needed replacement parts anywhere in the world within 48 hours. This type of after-sales support increases customer loyalty.
Site Selection/Location	Location can provide access to inputs like low-cost labor and materials. It can also affect customer service levels, providing access to important consumer markets.
Return Goods Handling	Defective products and inaccurate orders must be returned efficiently. "Reverse logistics" is very important to achieving high levels of customer satisfaction.
Salvage and Recycling	Handling excess materials is often overlooked. However, this is an important logistics activity, especially when hazardous materials or recyclable items must be managed.
Transportation Management	Transportation is the most visible logistics activity. Six modal options exist: rail, truck, air, water, pipeline, and cyberspace.
Warehouse/ DC Management	Storing products until they are ready for use is the role of warehousing. A variety of products are also consolidated into a single customer shipment.

shipment. The order is then shipped from the supplier to the buyer. Once the order arrives at the buyer's receiving dock, it must be inspected and accepted before it is moved to the point of use.

An important issue is to reduce order cycle times. Managers realize that much of the fulfillment lead time is nonproductive time. A measure known as the **dwell time ratio** evaluates the number of days inventory sits idle compared to the number of days the inventory is moving. In many instances 90 percent of the total order cycle is nonproductive. To reduce the cycle time, one or more of the activities that make up the order cycle must be managed more efficiently. Figure 6 shows the five primary activities that must be managed to improve order fulfillment.