CHAPTER
4

Environmental Strategies

LEARNING OBJECTIVES *The material in this chapter prepares students to:*

- Understand the business relevance of the environment to service companies.
- Describe the types of environmental issues that service companies face.
- Explain the role that service companies play in creating and mitigating environmental issues for both themselves and other companies.
- Evaluate the environmental impacts of a service company.

Until recently, a businessperson hearing the word *environment* in a sentence either thought about competitors and suppliers (i.e., "competitive environment") or got this nagging feeling that costs were about to go up (i.e., the Environmental Protection Agency). Business leaders and environmentalists have been opponents ever since Rachel Carson published *Silent Spring* in the early 1960s. (*Silent Spring* is an exposé about the effects of pesticides.) Yet since 1990, *Harvard Business Review* has published at least 15 articles about the role the natural environment plays in business specifically, or about "sustainability" in general. In fact, MBA programs are now ranked on how well they incorporate environment-business issues into their curricula. Every other year the World Resources Institute (WRI) publishes its *Beyond Grey Pinstripes: Preparing MBAs for Social and Environmental Stewardship*. Table 4.1 lists a few of the programs included in the 2003 rankings.

Most of this attention focuses on manufacturing companies. It is relatively easy to understand how Ricoh Electronics, DuPont, BMW, Kodak, Royal Dutch/Shell and other "smokestack" companies could hurt the environment. So when companies like these innovate in ways that improve both their business and the environment, it makes sense to everyone. For example, Royal Dutch/Shell developed an innovative approach to deal with carbon dioxide emissions that created a win-win situation with an important trading partner, which is described in Service Operations Management Practices: How Royal Dutch/Shell Relieved a Serious Gas Problem. As another example, by the end of 2001 all of Ricoh Electronics' manufacturing facilities in Europe and America reached the unprecedented goal of zero waste to landfills, or 100% resource recovery. Despite these

TABLE 4.1: *A Partial Listing of MBA Programs Ranked by the World Resources Institute*

University of North Carolina–Chapel Hill (Kenan-Flagler)	Harvard University
University of Texas–Austin (McCombs)	Northwestern University (Kellogg)
University of Pennsylvania (Wharton)	Stanford University
University of Michigan–Ann Arbor	Yale University
Cornell University (Johnson)	Dartmouth (Tuck)

Source: Adapted from *Beyond Grey Pinstripes: Preparing MBAs for Social and Environmental Stewardship*. The World Resources Institute, 2003.

manufacturing successes in the business-environment arena, little attention focuses on service companies and their impact on the environment.

Two separate issues need to be considered when thinking about services and the environment: the environmental impacts of service companies, and companies that offer environmental services. What immediately comes to mind is that without tangible products involved, no environmental issues exist. However, no process is 100% waste free, therefore services do create some environmental effects, and as will be shown, many services make a considerable impact.

Industries that focus on environmental services include waste disposal, cleaning services, environmental lawyers, and environmental consultants. These sorts of companies include ServiceMaster, Perma Fix Environmental Services, Allied Waste Industries, Inc., and the environmental law practices group at Skadden, Arps, Slate, Meagher & Flom, LLP, which, according to Hoovers.com, is the largest law firm in the country with more than 1,800 lawyers. Even the premier strategic consulting firm McKinsey & Company has an environmental service offering.

The big question remains: "Does all this focus on the environment really matter?" The next section is devoted to answering that question by providing the financial, strategic, operational, and marketing reasons why services need to understand the environment.

Environmental Management and Profitability

One could argue that companies of all types should manage environmental issues because it is the right thing to do. In other words, it is socially responsible. This view leads companies to evaluate their performance on measures beyond traditional financial dimensions. Companies like Anheuser-Busch, Dow Chemical, Lockheed Martin, Motorola, and Procter & Gamble now evaluate performance according to what John Elkington called the "triple bottom line" of financial, environmental, and social performance. The triple bottom line requires that companies track their performance on all three dimensions. Figure 4.1 shows some examples of triple bottom line performance metrics.

A triple bottom line focus can be a tough argument to make in a profit-driven world. *The Economist* calls this argument "the curse of the ethical executive," not to deride the importance of business ethics, but to point out that corporate social responsibility can negatively affect people's opinions about market capitalism as well as distract companies from their fiduciary responsibility of maximizing shareholder wealth. A more powerful argument demonstrates how services that successfully manage the environment end up financially more successful than those that don't.

Research demonstrates this real relationship between environmental and financial performance metrics. In other words, companies that manage their environmental performance well can achieve significant financial performance gains, while those that

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How Royal Dutch/Shell Relieved a Serious Gas Problem

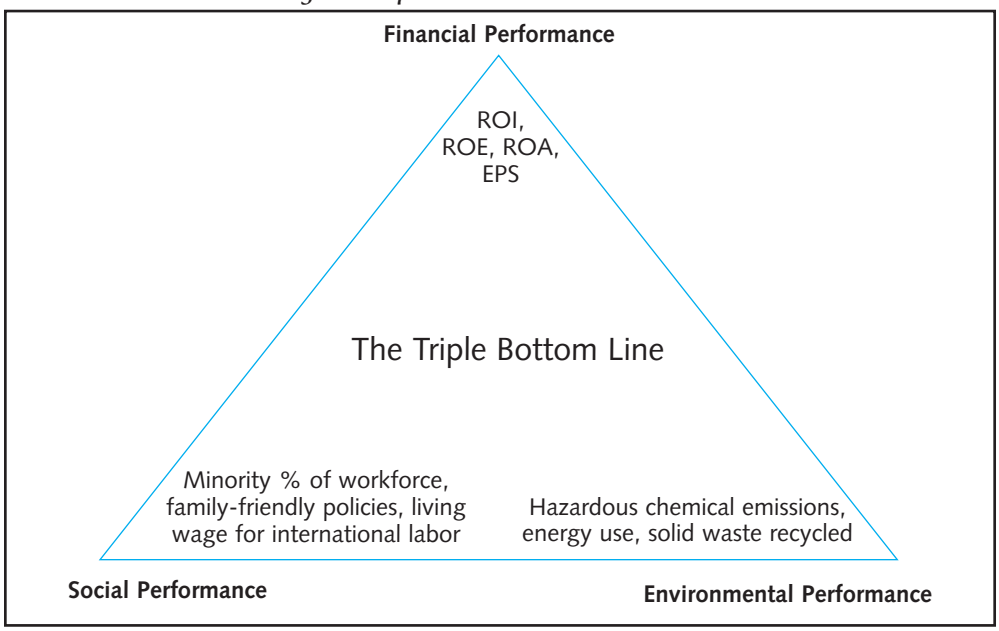
At the [Royal Dutch/Shell] Scotford plant in Alberta, Canada, more than 60% of carbon dioxide emissions, which were previously vented into the atmosphere as a waste product, are now recycled. Carbon dioxide, blamed by some scientists for being a principal cause of global warming, is produced as a by-product of fuel combustion and some chemical processes.

The plant recently began selling carbon dioxide to a neighboring company, Air Liquide, which processes the gas so that it can be used to carbonate soft drinks. Shell will eventually sell 62,000 tons of carbon dioxide a year to Air Liquide. In return Air Liquide is now the sole supplier of steam and electricity to the Shell complex, making the deal a win-win situation for both companies.

Karl Blonski, Health, Safety and Environment, and Quality Manager at Scotford, says: "It's real synergy—Air Liquide will eventually buy much of our carbon dioxide and we are able to buy cheap, efficiently-produced electricity from them, which previously we bought from the Alberta Grid. It's a kind of partnership because we are reliant on each other and at the same time we are both reducing emissions and saving on energy."

Source: Adapted from Shell's Web site. For more information on this and other Royal Dutch/Shell environmental initiatives, go to http://www.shellchemicals.com/chemicals/magazine/article/ 0,1261,92-gen_page_id = 896,00.html or http://www.enn.com/news/enn-stories/2001/10/10302001/shell_45365.asp.

FIGURE 4.1: *Measuring the Triple Bottom Line*



fail to adequately manage environmental performance can face equally significant financial losses. Some of the financial implications of poor environmental performance include fines assessed by government agencies such as the U.S. Environmental Protection Agency (EPA), costs of litigation to defend against these fines, and the damage to the company's brand from environmental issues.

Companies that violate state or federal laws face stiff penalties, and the likelihood of violating a law increases with every page of environmental legislation that is passed. From 1972 to 1992, for example, the total number of pages of legislation related to the environment went from zero to more than 160,000. The cost of noncompliance is also large. Delta Air Lines was fined over $1 million by the Georgia Environmental Protection Department not for actually spilling anything but for failing to accurately report what hazardous chemicals they had on site. Borden Chemicals and Plastics signed a consent agreement with the U.S. Department of Justice to pay a $3.6 million fine as part of a settlement that included charges of illegally exporting mercury waste to South Africa.

This amount, though, hardly approaches the value of the damage caused when part of the 137,500 gallons of the highly toxic liquid metal leaked from its barrels, contaminating both the surroundings and the workers near the Thor Chemical Plant in Cato Ridge, South Africa. This matter is the focus of several criminal and civil investigations in South Africa, though the statute of limitations in the United States expired January 27, 2001. Ciba-Geigy was fined an impressive $120 million to clean up a 1,500-acre Superfund site in Alabama. Investigations into Ciba-Geigy began in 1979, and the prosecution concluded in 1992. Litigation costs for environmental problems are significant. The Cato Institute estimates that half of all public expenditures for Superfund litigation is spent on lawyers and consultants, about $60 million for the Ciba-Geigy site.

The message then is that companies can improve their financial performance while improving their environmental performance. These financial gains come from cost reductions, quality and yield improvements, improved relationships with regulators, reduced insurance costs, and enhancements to the company's revenue streams and brands. Delta Air Lines achieved significant cost reductions when they pioneered the practice of using only one engine while taxiing. Company estimates show that this change reduced fuel consumption by 40 million gallons per year, a significant improvement since fuel is typically the second largest cost airlines face (after labor costs). For the quarter ending December 2003, Delta's average fuel cost was $0.85 per gallon, for a total savings of $34 million. Of course, fuel not burned does not emit residual pollution, which contributes to a substantial environmental gain in the form of energy conservation and pollution prevention, and results in a major financial payoff. In 1997 the National Resources Defense Council recognized Delta for this innovation.

Home Depot began its environmental efforts in 1990, on the twentieth anniversary of Earth Day. One of their initiatives commits them to the principles of sustainable forestry (see Service Operations Management Practices: Home Depot's Commitment to Sustainable Forestry) and to offer environmentally preferred products for sale in their stores. According to the Sierra Club, Home Depot is responding to consumer demand for wood not harvested from old-growth forests. So Home Depot uses its environmental efforts to meet customer desires while strengthening its position as a market leader and adding value to the company's brand through its responsible leadership.

United Parcel Service (UPS) partnered with The Alliance for Environmental Innovation, a joint initiative of the Environmental Defense Fund and The Pew

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Lawyers in Love

One of the chief reasons for Superfund's exploding costs is the litigious free-for-all engendered by the act. Superfund calls for retroactive liability, meaning that corporate practices that might have been safe, legal, fully permitted, or even required under the law years ago can now be punished retroactively. "Potentially Responsible Parties" (PRPs), according to the law, are those who (1) own or operate a site; (2) owned or operated a site at the time of the disposal of wastes; (3) arranged for disposal, treatment, or transportation of waste; or (4) accepted waste for transport. The courts have interpreted Superfund as calling for joint and several liability, meaning that any party that ever touched that waste—no matter how tertiary the involvement or how minor the amount—can be held liable for the full cost of remediation. Finally, these laws shift the burden of proof from the government to the accused and does not require the government to meet any significant standards for admissible evidence. For example, the vague recollections of a garbage hauler about customers 40 years in the past have repeatedly been accepted as dispositive by the EPA and the courts.

Typically, the EPA tries to hunt down one or two "deep pocket" corporations that can somehow be linked to the site and then hits them with the full cost of cleanup. Those companies then go about finding any party that might conceivably have had anything to do with the site and then sue that party under the joint and several liability standard to pay the bill. Not surprisingly, lawyers, consultants, private investigators, and administrative overhead consume vast quantities of Superfund dollars. Such "transaction costs" eat up 35% of corporate Superfund expenditures, 88% of insurance company Superfund expenditures, and 50% of public Superfund expenditures. Before 1980 only 2,000 attorneys specialized in environmental litigation nationwide. After 15 years of Superfund, that number has increased tenfold. Although not all of those additional 18,000 attorneys were created by Superfund, best guesses from practitioners indicate that about 75% were.

Source: From "Salting the Earth: The Case for Repealing the Superfund," by Jerry Taylor. Used by permission from the Cato Institute. This document can be found at http://www.cato.org/pubs/regulation/reg18n2d.html.

Charitable Trusts, to redesign much of their packaging. For example, the redesign made UPS's Next Day Air service packaging both lighter and reusable. The company estimates that this change saved UPS about $1.6 million per year since 1998, as well as conserved enough energy to light 20,000 light bulbs for a year, eliminated 550 tons of solid waste, and saved more than 2,200 tons of trees.

More generally, researchers found a significant positive relationship between environmental events, both positive and negative, and stock market performance (Klassen and McLaughlin, 1996). When companies are mentioned in the media for positive environmental events, their share price is stronger than the broader market. Conversely, share price is weaker relative to the broader market for companies associated with negative environmental events. For example, Alcan Aluminum was awarded Kentucky's 1998 Governor's Environmental Excellence for Industrial Environmental Leadership on October 27, 1998. For the two weeks following the report of the award ceremony

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Home Depot's Commitment to Sustainable Forestry

As a home improvement retailer, we have worked diligently to educate ourselves and our suppliers about important forestry issues. In fact, The Home Depot was the first home improvement retailer to pioneer the U.S. market for wood products certified under the principles of the Forest Stewardship Council (FSC). Our Timber Task Force is continually striving for improvements in forest management practices.

As members of the FSC, we helped lay the foundation for the Certified Forest Products Council, an organization that facilitates the increased purchase, use, and sale of third-party, independent, certified forest products. Over the last six years, we have introduced new FSC-certified products and other alternatives for you to choose from. For example, in most of our stores you'll find:

- Royal Mahogany Doors from a certified forest in Costa Rica.
- Premwood Doors, an alternative to lauan (light yellow to reddish brown wood often called Philippine mahogany) interior doors.
- FSC-certified dimensional lumber from one of our largest Canadian suppliers.
- Flooring underlayment made from recycled newspapers and gypsum sold as replacement to lauan flooring underlayment.

Rest assured, as more of these products become available, The Home Depot will carry them.

Source: From The Home Depot's Web site. Used by permission. This document can be found at http://www.homedepot.com.

(Monday, October 26, 1998 to Friday, November 6, 1998), the company's stock price increased 80% faster than the Dow Jones Industrial Average. On the other hand, on October 12, 2001, IBP, Inc., a meat packer owned by Tyson Foods Inc., agreed to pay $2.25 million to the EPA and $1.85 million to the state of Nebraska to settle charges that included emitting excessive hydrogen sulfide into the air and illegally discharging ammonia into a river near the company's slaughter and tannery operations in Dakota City, Nebraska, and disposing of spent stun-gun cartridges that contained lead into wastewater lagoons. The stock market reacted in the two weeks subsequent to this settlement announcement (October 11, 2001, to October 26, 2001) by taking more than 8% off Tyson's market capitalization, even though IBP is only one of Tyson's businesses. During those same two weeks the Dow rose by about 1.5%.

From a slightly different perspective, Hoover's estimate that, in the United States alone, the market for environmental services and equipment is worth about $200 billion per year. As a specific example, in February, 2004, the U.S. Air Force awarded a group of companies led by Tetra Tech, a leading environmental consultancy, a contract worth $200 million. The February 24, 2004 *Business Wire* reports that the firms will support the Air Force's Air Combat Command by providing consulting, engineering design, information management, and construction management over the life of the 7-year contract.

Service Operations and the Environment

The service process matrix (discussed in Chapter 1) is a powerful tool for classifying both environmental services and the environmental issues service operations in general face. Figure 4.2a shows the service process matrix with several examples of environmental services, while Figure 4.2b shows it with several examples of environmental issues for services operations in general.

Environmental Services

The main product of environmental services alters the environmental performance of another company. As shown in Figure 4.2a, these sorts of services are represented in every quadrant of the service process matrix. Some of these services are fairly obvious; others are highly innovative.

Professional environmental services provide customized environmental products to clients using labor-intensive processes. Such services include environmental consultants and architects.

Boston Consulting Group (BCG), as a member of the World Business Council for Sustainable Development (WBCSD), undertook projects, several pro bono, with significant environmental implications. For example, BCG developed a five-year strategic plan for the World Wildlife Fund and developed a comprehensive environmental plan for eastern Germany.

PriceWaterhouseCoopers, another member of WBCSD, offers a wide range of environmental services. Their services range from tactical issues (e.g., raw materials'

FIGURE 4.2a: *Example Environmental Services*

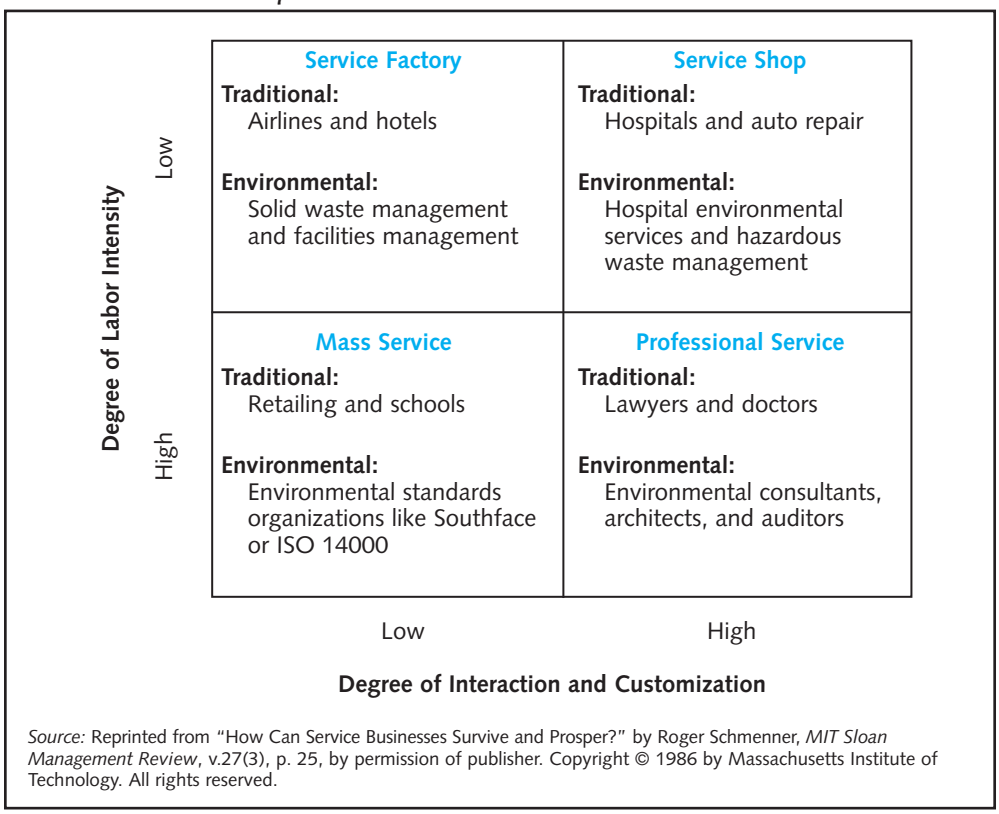

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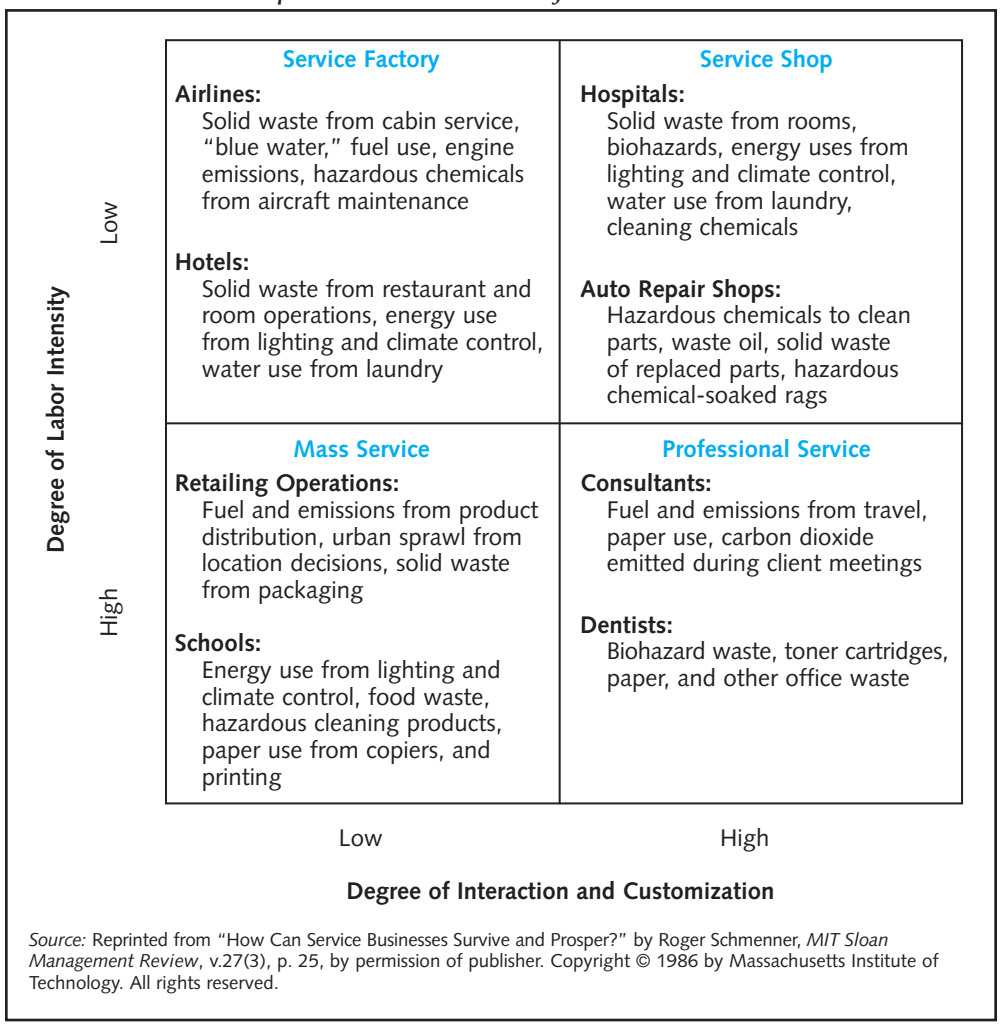
FIGURE 4.2b: *Example Environmental Issues for Service*



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use and waste disposal) to strategic issues (e.g., developing sustainable product strategies) to global issues (e.g., strategic advice related to global climate change and the "Kyoto Protocol," an international environmental agreement regarding global warming).

In addition to consultants, architects and builders offer important environmental services. Not surprisingly, the environmental performance of a building is primarily determined by decisions made in the design of the building. The U.S. Green Building Council developed the Leadership in Energy and Environmental Design (LEED™) program, which sets guidelines for designing and constructing environmentally friendly buildings. LEED emphasizes five design areas: (1) building site selection and erosion control, (2) water efficiency, (3) energy and atmosphere, (4) materials and resources, and (5) indoor environmental quality. Currently, 83 buildings in the United States are LEED-certified, but the standards are quickly gaining acceptance. Emory University, for example, is in the process of constructing three different buildings to the LEED standard. Estimates suggest that the operations of

buildings constructed to this standard generally cost about half of those for non-LEED buildings (as low as $0.60 per square foot versus $1.50 per square foot). Productivity is also affected by building to this standard because it addresses indoor environmental quality and natural lighting. West Bend Mutual Insurance Company experienced a 16% increase in productivity when it moved into a LEED-certified building. Another environmental building design standard exists for residential buildings. An Earthcraft House™ must meet a similar set of requirements that LEED commercial buildings meet, and delivers similar cost savings. Southface Energy Institute designs and manages the Earthcraft House standards.

Environmental service shops also provide customized environmental services, but use processes with significantly lower labor intensity. Environmental service shops include the environmental services division in hospitals and hazardous waste management companies such as Perma-Fix. Massachusetts General Hospital's Environmental Services Department, for example, is responsible for services ranging from routine cleaning that frequently requires hazardous chemicals, to disposal of medical waste including sharps (e.g., needles) and chemotherapy waste, to ultrasonic cleaning of instruments and other objects. Another example of an environmental service shop is a company that provides chemical management. Interface-LLC is a relatively small chemical management company in Atlanta, Georgia, that does much more than just sell chemicals to the airline industry. Interface-LLC is an important business partner for Delta Air Lines, Northwest, and Comair because of the additional, environmentally oriented, value-added services it provides, such as compliance reporting data management and hazardous chemical inventory management. The case at the end of the chapter explores the relationship between Delta and Interface-LLC in greater detail.

Environmental service factories offer a fairly standard environmental service using processes with significant capital intensity (i.e., lower labor intensity). Environmental service factories often perform relatively low value-adding hygiene services like solid waste management or industrial site management. Even so, companies like the creatively named waste management company Waste Management can generate significant environmental opportunities. In December 2000, four Waste Management facilities were recognized by the EPA for innovative environmental programs such as using compressed natural gas as fuel for refuse trucks, a wetlands conservation program, and landfill gas recovery projects. Landfill gas, composed of about 50% methane and 50% carbon dioxide, is produced when organic waste decomposes in the absence of oxygen. The EPA estimates that about 6,000 landfills in the United States are currently producing methane, making it the largest source of human-made methane emissions in the country. Landfill gas poses an environmental risk, smells bad, and can blow up. It can seep underground, potentially onto adjoining property, and be ignited by things like furnace pilot lights.

Contracting for services provided by environmental service factories is risky though. Because of "joint and several liability" associated with some environmental legislation, a company that chooses its waste management provider poorly may face noncompliance penalties for things that happened after the waste leaves its facility. A manufacturer of high-end office furniture, located in North Carolina, was named a potentially responsible party for one of the top 100 Superfund sites in the country. The company is strictly liable for the 19 drums they disposed of during three years of doing business with a waste disposal contractor. Even in instances in which the company is not liable in a legal sense, public perception can hold a company liable for the actions of its contracted service providers. In the wake of the September 11th

attacks, much of the public held the airlines responsible for the security breakdowns even though that responsibility had been outsourced.

Environmental mass services offer environmental services with little customization but with significant labor intensity. These services come in two types: physical services and informational services. Examples of physical environmental mass services include cabin cleaning and other ramp services for the airlines, residential pest control, and residential landscaping services. ServiceMaster Aviation Services group conducts cabin cleaning, lavatory servicing (i.e., blue water service), aircraft exterior cleaning, and maintenance for ground service equipment like trucks and baggage carts. TruGreen Chemlawn and Terminix, both ServiceMaster companies, use hazardous chemicals to deliver their relatively standard service to homeowners.

Informational environmental mass services generate environmental information content that other companies use, such as standards for evaluating environmental performance. Two such groups are CERES (the Coalition for Environmentally Responsible Economies) and Southface Energy Institute. The CERES Principles are a set of environmentally oriented practices that companies commit to as guiding business principles (see Table 4.2). American Airlines, Coca-Cola, Northeast Utilities, General Motors, and Wainright Bank are just a few of the companies that subscribe to the CERES Principles. A later section of this chapter will explore how companies use the CERES Principles in practice.

Services and Their Environmental Impacts

In addition to services that influence the environmental performance of other companies, many services create significant environmental impacts of their own. Many of these environmental impacts arise from activities behind the line of visibility that separates the back office from the front office. Even in those instances where customer contact determines the environmental direction a service firm takes, many of the environmental issues are still back-office issues. For example, many hotels now offer guests the choice to not have sheets and towels changed every day, which saves water, saves electricity, and reduces the amount of residual laundry soap discharged into the sewer system. Even though this decision belongs to the customer (i.e., high customer contact), its benefits are generated by changes in back-office behavior (i.e., laundry services). This same sort of discussion holds for ski resorts, restaurants, hospitals, and virtually all other services.

Professional services, including doctors, lawyers, and consultants, generate significant waste. Medical waste from dentists and doctors includes soiled or blood-soaked bandages, culture dishes and other glassware, used surgical gloves, used surgical instruments, needles, cultures, swabs used to inoculate cultures, and removed body organs. To give you a sense of the magnitude of this issue, the EPA estimates that more than 1 billion syringes and lancets are used annually in the United States just for the treatment of diabetes. In addition, virtually every professional service generates significant office waste, such as discarded paper and toner cartridges.

TABLE 4.2: *The CERES Principles*

- Protection of the biosphere
- Sustainable use of natural resources
- Reduction and disposal of wastes
- Energy conservation
- Risk reduction
- Safe products and services
- Environmental restoration
- Informing the public
- Management commitment
- Audits and reports

Source: Adapted from the CERES Web site at http://www.ceres.org.

Environmental issues for service shops overlap somewhat with those of professional services. For example, hospitals generate many of the same waste streams as doctors and dentists. The American Medical Association estimates that hospitals generate approximately 2 pounds of infectious waste per patient per day. For a hospital like Mass General, with its 853 beds at about a 75% occupancy rate, it means 1,284 pounds of hazardous medical waste every day, or 468,660 pounds per year at this one hospital, not counting waste generated by outpatient services.

Another example of a service shop is an automotive repair shop. These operations work with refrigerants and hazardous cleaners. They also must dispose of worn-out parts, used motor oil, used antifreeze, and other hazardous wastes. Much used motor oil is disposed of improperly. In fact, 200 million gallons of used oil nationwide—20 times the oil that was lost in the *Exxon Valdez* spill—is improperly disposed of each year, nearly all by do-it-yourselfers. Moreover, 2 gallons of recovered motor oil delivers sufficient electricity to power an average American household for nearly a full day.

Service factories face an equally challenging set of environmental issues. Some of these environmental issues overlap with service shops. For example, transportation-oriented services deal with many of the same issues as automotive repair shops in the general maintenance and operation of their own fleet. UPS, for example, maintains a fleet of more than 80,000 motor vehicles that travel more than 2 billion miles per year. If it changes the oil every 2,500 miles, it means approximately 800,000 oil changes a year. These transportation-oriented services also deal with fuel use issues. In 2003, Delta consumed 2.37 billion gallons of fuel at an average cost of 81.78¢ per gallon, for a total fuel cost of more than $1.93 billion.

Cruise lines, hotels, and resorts present other examples of service factories with significant environmental impact. Many resorts and most cruises operate in environmentally sensitive areas, so their environmental impact is magnified. For example, Holland America Line and Royal Caribbean together paid nearly $10 million in fines for dumping "black water" and "gray water" overboard in Alaska's fjords. According to *The Economist*, only 1 in 80 black water samples (i.e., treated sewage) met federal standards. *The Economist* also reports that some gray water samples (from showers, dishwashers, and laundries) contained 50,000 times more fecal coliform than accepted standards (May 17, 2001).

Mass services share some environmental characteristics with service factories, particularly the transportation-intensive mass services such as retail operations with delivery models. Webvan, the now-defunct grocery delivery company, demonstrates quite a few of the environmental issues these companies face. Webvan's business model allowed customers to pick delivery times, forcing the company into inefficient routings. Unlike UPS, it could not optimize delivery routes. Switching to home delivery significantly increased both the volume of emissions generated (by at least a factor of 25) and of fuel consumed (by more than 50%, see Table 4.3). As another example of environmental issues at a mass service, consider Emory University. Emory recycles more than 125 tons of white paper and 100 tons of cardboard every year. In addition, 20,000 cars come to Emory's campus every day, all of which affect land use (through the 13,000 parking spaces on campus), fuel use, and air emissions.

Wal-Mart changed the design of their new facilities to include an innovative skylight/dimming system to reduce energy usage. This system dims the lights in the facility as more natural light comes through the skylight. The system can even turn off the lights on brighter days. Wal-Mart estimates that the "daylighting system" reduced electricity use by 250 million kilowatt hours per year, enough energy to power about

TABLE 4.3: *Environmental Impacts of Webvan's Delivery Model*

Issue	Supermarket	Webvan	Difference
Number of households	10,000	10,000	0
Average round trip of complete route (miles)	5	62	+57
Number of trips per month	8	4	−4 trips
Percent of route dedicated to groceries	25%	100%	+75%
Grocery miles driven per month	100,000	89,067	−10,933
Fuel consumed (gallons)	3,994	6,177	+2,183
Carbon monoxide emission (grams)	340,000	10,022,300	+9,682,300
NOx emissions (grams)	40,000	3,879,600	+3,839,600
Particulate matter emissions (grams)	8,000	387,960	+379,960

Source: Galea and Walton. 2002. "Is E-commerce Sustainable? An Analysis of Webvan."

23,000 homes each year. Wal-Mart is also retrofitting the lighting in its stores with low-mercury fluorescent lights with electronic ballasts (the "starters" for fluorescent bulbs). They estimate that a retrofitted store saves 15% to 20% of its energy load.

Environmental Strategies for Service Operations

The preceding discussion provides a framework for thinking about services and the environment. But a critical question remains unanswered: What strategies are available for service companies that want to improve their business performance by improving their environmental performance? These strategies are not service-specific; manufacturing companies could pursue similar initiatives. These initiatives can be broadly classified as either process- or product-focused. Process focused environmental strategies include process improvements, process certification, and implementing e-commerce models and methods. Product focused environmental strategies include redesigning the service offering, offering new value-added services, and "dematerializing" the product.

Process Opportunities

Process Improvement

Services can use any of the currently popular process improvement methodologies to improve their environmental performance. For example, any company that uses Total Quality Management (TQM) can easily adopt Total Quality Environmental Management (TQEM). Although they share many of the same characteristics, TQEM focuses the improvement effort on environmental performance. Companies adopting a Six Sigma approach to quality can extend that approach to include Six Sigma environmental management. Both TQEM and Six Sigma environmental management impose requirements of structured thinking, management by fact through data analysis, and systematic business process improvement.

Process Certification

Service companies can take three different approaches to process certification: self-certification, ISO 14000 certification, or subscribing to environmentally oriented standards, like the CERES Principles. Self-certification allows an individual company to audit its own and its suppliers' environmental performance. Delta Air Lines, like many companies, publishes an annual environmental report describing the results of its self-certification. The advantage of self-certification is that it is relatively

inexpensive. The obvious disadvantage is that no independent third party examines the operations, data, and results.

Some companies choose to extend certification requirements to their suppliers. Disney, for example, maintains a "Code of Conduct for Manufacturers" that dictates business practices, social performance, and environmental performance requirements that all Disney suppliers must follow. The Code requires that all suppliers meet at least a minimum standard of compliance with all relevant environmental laws and regulations. The Code also allows Disney or "its designated agents" to monitor any supplier's process to confirm compliance to the Code. (See Disney's Web site for more details about the Code at http://www.disney.com.)

The most common third-party environmental certification is ISO 14000. ISO 14000 is a standard of the International Organization for Standardization, the same group that established ISO 9000. ISO 14000 requires companies to document the way they manage environmental issues. The standard looks at six major areas: environmental management systems, environmental auditing investigations, environmental labels and declarations, environmental performance evaluation, life cycle assessment, and terms and definitions. Companies that choose to pursue ISO 14000 document their processes in these six areas and in most cases hire an independent auditor to evaluate their performance relative to the documented processes.

Similar to ISO 9000, the benefits from becoming ISO 14000 certified vary widely depending on the company's commitment to the ideals of the standard, but companies can achieve significant results from getting certified. For example, the Saunders Hotel Group, owners and operators of two upscale hotels in Boston, earned ISO 14000 certification as part of their SHINE program (Saunders Hotels Initiatives to Nurture the Environment). Through SHINE, the company annually saves 4 million gallons of drinking water, eliminates 109 tons of trash, and saves 225,000 kilowatt hours of electricity, and realizes the associated financial benefits of such changes.

The most common environmentally oriented standard is the CERES Principles. Unlike ISO 14000, which does not define what should be considered appropriate environmental business practices, the CERES Principles describe a fairly detailed set of activities to which a company must commit, including adherence to "generally accepted environmental audit procedures." The standards provide a sort of seal of approval to companies that subscribe to the Principles. In subscribing to the Principles, the company publicly takes a pledge that affirms their "belief that corporations have a responsibility for the environment, and must conduct all aspects of their business as responsible stewards of the environment by operating in a manner that protects the Earth." The biggest complaint leveled at the CERES Principles is its extensive reporting and auditing requirements. Several service companies claim that the work required to translate their internal environmental reports into a format acceptable under the CERES Principles requires at least one new full-time employee. In fact, in the face of these reporting requirements, several companies agreed to follow all the principles except the reporting requirement.

E-Commerce

Service companies can use e-commerce to improve the environmental performance of their processes. The companies can migrate processes that are traditionally paper-based to an e-commerce model, use e-commerce to refine existing processes, or use e-commerce to develop new processes.

Most airlines and financial service companies transferred their traditionally paper-based processes to an e-commerce model that includes e-tickets and online statements. Most U.S. domestic tickets issued now are e-tickets. US Airways issues

more than 90% of their tickets electronically, while American has quit issuing paper tickets altogether for directly booked domestic travel. Not only do e-tickets reduce paper use (which obviously reduces the airline's costs), but e-tickets also improve customer satisfaction. Surveys conducted by United Airlines suggest that 90% of customers using e-tickets prefer them to paper tickets.

E-commerce presents many opportunities to improve existing processes. As the case at the end of the chapter shows, the data transmission capabilities embodied in e-commerce played a prominent role in the process automation between Delta Air Lines and Interface-LLC. In many instances, electronically exchanged purchase orders enabled both trading partners to use the more timely and accurate information to reduce inventory and delivery cycle time.

The opportunity is unlimited for companies able to figure out how to use e-commerce to develop new processes that impact environmental performance. One example of such an opportunity is reverse logistics services. Most supply chains are designed to move materials and information forward, toward the end customer. Without an infrastructure in place to move failed products back for disposition, those products are usually thrown away. Yet, disposition could include returning the product to the manufacturer for rework, selling the product to a liquidator, or selling the various components through different channels. Each of these other disposition methods extracts residual value from the product for the company and decreases the amount of material going to the landfill. In the electronics and consumer products industry, a start-up company called 180Commerce developed a Returns Management Platform™, which provides the information infrastructure that allows manufacturing companies to offload the reverse logistics process to 180Commerce as their preferred service provider.

Product Opportunities

Product Redesign

In manufacturing, even though the design phase represents less than 10% of the total cost of a product over its lifetime, the decisions made in design commit the company to more than 80% of those lifetime costs. For example, the decision in design to use screws to attach two pieces of wood instead of glue affects issues such as the cost of raw materials, the type of tools and equipment needed, labor productivity, and types of product quality failures. The same holds true for services; the decision to design a high-contact service commits the company to a different set of costs than a low-contact service would entail. Changing the service design is, therefore, a high-impact way to improve the environmental performance of a service.

Design for the Environment (DFE) provides one approach to service process design/redesign to improve environmental performance. DFE's stated goal includes designing products and services with a favorable environmental footprint. For example, BMW designs its cars to be easily disassembled because of regulations in Europe that require car companies to take back their vehicles for disposition (disassembly, metal and component recycling, and shredding of the remaining automotive hulk).

One important tool often used as a part of DFE is lifecycle analysis (LCA). In this context, lifecycles mean something different from the stages of introduction, growth, maturity, and decline as studied in marketing classes. Instead, the lifecycle of a product focuses on an individual unit of a product from the moment it first begins to come into existence until when it reaches its final disposition. Table 4.4 shows some dimensions of a lifecycle analysis comparison of the decision of kegs or cans.

TABLE 4.4: *A Lifecycle Analysis of Kegs Versus Cans*

Kegs	Cans
Aluminum to make keg	Aluminum to make can
Soap and water used to clean keg before each refill	Packaging the cans come in (cases and plastic rings)
Transportation to return keg	Transportation to recycle cans
Plastic cups used	Additional ice needed to keep cans cold
Materials required to make pump	Number of cans needed to equal the volume of a keg

One essential question that comes up during lifecycle analysis is "How far back should I go?" When describing the environmental impacts of the kegs, do you need to include the energy used to mine the bauxite? Should it include scrap and waste generated in the smelting process? Questions like these are important because they lead the analyst to a deeper understanding of the full implications of a product or service. However, LCA risks falling into "analysis paralysis" because the method allows the analyst to determine how far back to go. In the end the analyst must strike a balance between completeness and usability.

Value-Added Services

A second way service companies can influence environmental outcomes is to redesign their service offerings to include value-added services along environmental dimensions. For example, UPS's Service Parts Logistics (UPS SPL) group manages critical repair component distribution systems for telecommunication and computer companies. They provide an extensive network of distribution centers and transportation carriers that allows them to stock components needed to repair their customers' electronic products and to deliver these critical parts as quickly as within one hour.

Interface-LLC is another service company that offers extensive value-added services. They provide the airline industry with inventory tracking and maintenance, compliance reporting data management, bar coding and e-commerce-oriented data transmission and management, and other valuable services.

Dematerialize

Companies can also improve their environmental performance by dematerializing their products. This strategy presents some challenges for services because their "products" are already intangible, but it is worth describing because it allows manufacturing companies to behave much more like service companies.

In many instances, consumers don't want a product; they want the functionality the product can provide. A creative company can find ways to decouple the functionality from the form of the product. For example, DuPont is best known as a manufacturer of chemicals. But in Europe, DuPont dematerialized one of their products, paint for auto manufacturing. When a company makes and sells paint, their goals revolve around making and selling more paint. But paint is generally a hazardous product. Most formulations of paint require solvents, which are volatile organic compounds. Consider then that if the company sells Ford the service of painting cars, it is now motivated to meet the painting quality requirements set by Ford while using as little paint as possible. Dematerializing the product removes the "moral hazard" associated with wanting to sell more of a hazardous product.

Summary

This chapter demonstrated the importance of the environment as a business issue, one that matters to both manufacturing and service companies. Even though most attention focuses on manufacturing companies, the dominance of services in the economies of most developed countries suggests that environmental management in services warrants more attention. By considering the location of a company in the service process matrix, one gains insight into the type of environmental issues a service company might face. The rewards for understanding how to manage environmental issues in services can be significant because environmental excellence can be used as a driver for company financial success. Services affect the environment directly as well as the environmental performance of other companies. Hence, service companies can embark on both process and product changes to improve their environmental performance. Methods available to improve environmental performance range from self-certification of business processes to implementing e-commerce models and dematerializing the product.

Review Questions

1. Describe the negative financial impacts that service companies face for failing to properly manage environmental performance. What specific financial impacts are services more likely to experience than manufacturing companies?
2. Aside from those listed in the chapter, describe an environmental service in each quadrant of the service process matrix. Name a company as an example of each service.
3. Describe the environmental impacts of a service company in each quadrant of the service process matrix.
4. Select a service offering and conduct a lifecycle analysis of the offering. How far back did you choose to go? Why?
5. Can video conferencing "dematerialize" business travel? Why or why not?

Selected Bibliography

Anonymous. 1994. The Challenge of Going Green, *Harvard Business Review*, 73(4), 37–50.

Carson, R. 1962. *Silent Spring*. Houghton Mifflin, Boston.

The Economist. 2001. The Things They Leave Behind. *The Economist* (May 17).

Elkington, J. 1997. *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. Capstone Publishing, Oxford, England.

Foster, S., Sampson, S., and S. Dunn. 2000. The Impact of Customer Contact on Environmental Initiatives for Service Firms. *International Journal of Operations and Production Management*, 20(2), 187–203.

Galea, C., and S. Walton. 2002. *Is E-Commerce Sustainable? An Analysis of Webvan. In Ecology of the New Economy: Sustainable Transformation of Global Information, Communication, and Electronics Industries*. Greenleaf Publishing, Sheffield, UK.

Hart, S. 1997. Beyond Greening: Strategies for a Sustainable World. *Harvard Business Review*, 75(1), 66–76.

Klassen, R., and C. McLaughlin. 1996. The Impact of Environmental Management on Firm Performance. *Management Science*, 42(8), 199–214.

Magretta, J. 1997. Growth Through Global Sustainability: An Interview with Monsanto's CEO, Robert Shapiro. *Harvard Business Review*, 75(1), 78–89.

Porter, M., and C. van der Linde. 1995. Green and Competitive. *Harvard Business Review*, 73(5), 120–134.

Reinhardt, F. L. 1999. Bringing the Environment Down to Earth. *Harvard Business Review*, 77(4), 149–158.

Walley, N., and B. Whitehead. 1994. It's Not Easy Being Green. *Harvard Business Review*, 72(3), 46–52.

CASE STUDY

Chemical Management at Delta Air Lines

What would happen if a company bought chemicals "the same way we bought widgets," as one Delta Air Lines manager put it? In Delta's case, you end up with no centralized way to reconcile purchased amounts, usage, air emissions, and disposal amounts. And you risk fines in excess of $1 million from the Georgia Environmental Protection Division (EPD). Prior to implementing an innovative chemical management program with Interface-LLC, chemical management at Delta meant each group in the company that used chemicals could buy them when they needed them at the lowest unit cost they could find. One example of what happens under this sort of purchasing policy was that acetone (a solvent used to clean parts during aircraft maintenance and repair) was purchased in 55-gallon drums even though the mechanic needed only a few ounces at a time. The time required for a mechanic to transfer the acetone into smaller containers was never considered as a cost of using the chemicals.

Other chemicals approved for use on aircraft have shelf lives of between 6 and 24 months, often less time than the chemicals were held in inventory. Chemicals not used by their expiration date had to be disposed of as hazardous waste. Tracking the chemicals purchased and used was difficult and extremely labor intensive. These and other critical factors were not included in Delta's purchasing decisions. This case looks at what Delta did to design and implement a chemical management system that avoided costs of nearly $1 million from reduced inventories, lowered insurance premiums, and fewer instances of expired shelf life materials in fiscal years 1996 and 1997, and continues to pay off (with projected savings of $500,000 per year).

From 1994 to 1997, Delta Air Lines undertook a reengineering effort they dubbed "7.5." Like so many efforts of this type, 7.5 was designed to reduce Delta's cost measure (cost per available seat mile, or CASM) from 10.8 cents to 7.5 cents. To meet this goal, Delta reduced head count through early retirement and refocused on core businesses by outsourcing ancillary services. In 1994, the Georgia Environmental Protection Agency alleged that Delta's chemical management system was inadequate and levied a fine of more than $1 million on Delta. The EPD cited the chemical management system's weaknesses in tracking, managing, and reporting chemical usage and disposition in Delta's Technical Operations center at Hartsfield International Airport in Atlanta. These two seemingly unrelated events of 7.5 and the EPD fine set the stage for Delta's innovative response: They devised a new way to manage chemicals that improved operational performance, reduced chemical usage, and met all reporting requirements from the EPD.

Prior to 1995, integrated chemical management did not exist at Delta. For example, systems were in place for chemical purchasing but these systems were not integrated with point of use monitoring. This limitation prevented individual managers from reconciling chemicals purchased and used with chemicals disposed of. Myles

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Craig, who started working at Delta while he was in college and took a full-time position in 1980, had some ideas about how this situation might be changed but felt like he needed more information. Craig decided to benchmark against other companies, intentionally avoiding other air carriers. He visited Saturn Automotive, GE Engines, Ford Motor Company, General Motors, and Boeing to understand the different methods these companies were applying to chemical management. Craig used the best attributes of each system as the basis for the system he designed at Delta.

Delta set three main goals for the chemical management system Craig was developing: (1) to manage chemicals better than they currently did, (2) to capture all required and relevant data concerning chemical use, and (3) to accomplish these tasks at a lower cost. These goals focused internal attention on the critical issues of service levels, systems performance, and cost. It became clear that Delta needed a more integrated chemical management system.

Part of this integrated view was to move from making purchasing decisions based on unit cost to making these decisions on total cost of ownership. "Total cost of ownership" is the idea that a company pays more than just the per-unit purchase price when it buys materials and supplies. Total cost of ownership would include costs of procurement, handling, warehousing, environmental fees, late deliveries, poor quality, incomplete deliveries, inventory costs, and so on. Table 4.5 shows some of the total cost components Delta considered when redesigning the chemical management program.

Chemicals at Delta

In 1994, chemical management at Delta was a complex task because of the sheer scale of operations, the number of suppliers they dealt with, and the decentralized use of chemicals bought through a centralized purchasing process. To provide a sense of the scale, Table 4.6 shows the four main ground-based activities and example waste streams and chemicals used in each activity. Managing chemicals was complex in part because it was difficult to monitor and manage what was in these waste streams. The addition of the wrong thing into a waste stream could make an otherwise harmless waste stream hazardous, which meant additional disposal costs.

Delta spends between $15 and $16 million on chemicals annually, including $1.8 million per year for cabin cleaning chemicals like window cleaner and gum remover. They buy approximately 1,500 different stock-keeping units (SKUs), 1,000 of which are routine stock items, and 500 are rare use or special order items, ranging from epoxies and baking soda to plasma-spray compounds for refinishing specialty aircraft components. Per-unit costs range from $0.67 for a container of cleaner to about $10,000 for a three-pound container of brazing powder, used for the metal build up on landing gear components. Thirty percent of these SKUs have a limited shelf life, ranging from 6 to 24 months. Upon expiration, most of these products become hazardous waste. The materials' cost for expired chemicals alone

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TABLE 4.5: *Example Total Cost of Ownership Components*

Component	Examples
Quality	Labor cost of conducting incoming materials inspection, return of out-of-date chemicals, replacement of defects not detected until later in the maintenance process
Delivery	Process disruptions from not having the right chemical to degrease a part during maintenance
Inventory	Storage space required to stock chemicals, insurance costs for holding significant quantities of hazardous chemicals, labor cost to stock chemicals
Compliance	Record-keeping and reporting requirements, potential EPA fines for failure of various noncompliance opportunities
Material cost	Unit price for chemical material purchase
Inventory carrying cost	Generally 11% (Interface-LLC) to 18.5% (Delta) of unit price; cost to handle, label, and shelve material until it is requested
Labor cost	Cost of Delta mechanic to transfer contents of larger container to smaller container, relabeling, etc. to meet application need and OSHA Employee-Right-to-Know or HAZCOM requirements
Safety/risk cost	Assigned costs (relative to potential for occupational exposure down the road, immediate risk to Delta property, as well as future liability for any cleanups from mishandling/mismanagement) associated with handling and exposure to chemicals based on health and flammability rating as well as studied number of transfers
Disposal cost	Extra costs associated with disposal of expired unused material

was about $250,000 in 1996. All of the chemicals bought were stored in general use at the Technical Operations Center in Atlanta, which required that significant space be set aside for inventory.

Prior to implementing the chemical management program, Delta's chemical vendor database included 350 different suppliers. Many of the chemicals could be sourced through distributors, which would reduce the number of suppliers Delta needed to manage. However, the main result of this supply base reduction would be to add another layer of administration that had to be paid for their services. For this reason, Delta chose to buy many chemicals from the manufacturer, which bypassed intermediaries, but kept the vendor base large.

Decentralized usage of chemicals caused the centralized chemical buying process to work poorly. Automotive mechanics working on ground service equipment, for example, often found it was easier to make a trip to a local hardware store

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TABLE 4.6: *Waste Streams at Delta Air Lines*

Activity	Description	Waste Streams	Chemicals
Airport Customer Service (ACS)	Provides baggage handling, cabin cleaning, security	Garbage and trash from cabin services, "blue water" from lavatories	Deicing chemicals, cabin cleaning chemicals like gum remover and window cleaner
Line Maintenance	Conduct repairs to aircraft on the ramp	Replaced parts, tires, oil, and hydraulic fluid	Solvents like acetone, degreasers, and engine oils, paint, primer, sealant, hydraulic fluid
Hangar Maintenance	Conduct major repairs, maintenance, and overhauls	Solvents, oils, paints, plating shop waste, paint strippers	Solvents and cleaners like acetone and methyl ethyl ketone engine oils, paint, primer, sealant, hydraulic fluid
Ground Service Equipment	Provide and maintain the vehicles and equipment for ACS	Solvents, oils, paints, paint strippers	Solvents like acetone, degreasers, and engine oil

to buy more carburetor, glass, or upholstery cleaners than it was to process a purchase order, resulting in many "maverick buys" of chemicals and making it difficult for a manager to track chemical use, quantities, and locations throughout the maintenance facility. It also meant that Delta lost its leverage as a large buyer. As one manager put it, "Maverick buying is like stepping over a dollar to save a nickel."

The regulatory requirements for holding large quantities of chemicals were significant. For example, the Community Right to Know Act set a threshold of 10,000 pounds of hazardous chemicals; any facility that purchased or stored more than that had to report to the EPA. The Occupational Safety and Health Administration required that Materials Safety Data Sheets be available for any hazardous material the employees used. The Clean Air Act demanded that companies track and report on emissions from certain chemicals used in their operations. Delta's large chemical inventory required that they comply with these and other regulatory requirements, each with its own set of data collection and reporting requirements.

A New Way to Manage Chemicals

Carroll Rushing, a long-time supplier to Delta, approached Craig with a way to completely change the chemical management system. Craig worked with Rushing to create a new company, Interface-LLC. According to the original agreement, reached in late 1995, Interface-LLC would purchase Delta's inventory of

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chemicals and move them off-site to a nearby location owned by Interface-LLC. Interface-LLC would then act as the "gatekeeper" of chemicals and sell the chemicals back to Delta using Delta's existing information infrastructure along with new environmental chemical tracking software developed for Delta and implemented by Interface-LLC. Although the process sounds inefficient, it turned out to be a great start to a successful program. Moving the chemicals out of Delta's stores freed up 30,000 square feet of space to be used for maintenance in one of its buildings at the Technical Operations Center, at a value of $30 per square foot. It also immediately solved Delta's conflicting desires to simplify the supplier base and minimize intermediaries in transactions. Delta suddenly went from 350 suppliers to one.

As part of the 1995 agreement, Interface-LLC absorbed all of Delta's existing supplier-negotiated contracts. Interface-LLC also agreed to deliver all routine orders in three hours, and all expedited deliveries in two hours. They also agreed to a 95% fill rate (fill rate is the proportion of orders a company receives that can be met with inventory on hand). Interface-LLC opened a small distribution center a mile and a half from Delta's Technical Operations Center in Atlanta. Delta transmitted orders to Interface-LLC through Delta's existing requisition system (a database management system), fax, Electronic Data Interchange, or a Web-based electronic catalog.

Implementation of the system took about six months of bumps and headaches to debug. One unexpected issue that arose was the resistance within Delta to give up responsibility for the tasks of chemical purchasing and management. Continued operational successes eventually won over the skeptics by clearly demonstrating the value that could be gained by the new program. According to Craig, "We overcame their concerns by improving upon service levels. We lowered costs and improved performance. Bottom line, it was a culture change for Delta to handle chemicals in a modern way."

These operational improvements, though, were only a part of the total benefit Interface-LLC was able to generate for Delta. Interface-LLC offered other value-added services including streamlining MSDS management, bar coding and tracking chemicals delivered to shops throughout the operation, development of an "approved chemical" list, and negotiating with chemical manufacturers. Interface-LLC also extended the scope of the chemical management program to include sourcing safety products. Because the structure of the contract allows for joint cost savings, Interface-LLC is motivated to continue to find innovative ways to save Delta money. For example, when grease was bought in 5-gallon buckets, 35% of the grease ended up as waste. Interface-LLC was able to shift the purchase to 14 oz. tubes, finding ways to increase efficiency through better packaging.

The chemical management program also provided Interface-LLC with a new tool to win business. Interface-LLC was now able to approach other airlines and clearly demonstrate the success of their chemical management system. Interface-LLC now

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services Northwest and Comair in addition to Delta. Interface-LLC is also in the process of negotiating several other chemical management contracts.

Questions:

- What strategic risks and opportunities does Delta face in entering into this relationship with Interface-LLC? What risks and opportunities does Interface-LLC face?
- What product- and process-oriented environmental strategies are available to Interface-LLC as they continue to expand their service offerings? To Delta?
- If you were in charge of the chemical management program at Delta, what changes would you make to further improve environmental performance? If you were in charge of the chemical management program at Interface-LLC, what changes would you make to further improve environmental performance?