SECTION I

# Introduction to the Sustainable Supply Chain

# CHAPTER 1

# Sustainable Supply Chain Management—The Next Industrial Revolution

## Firms Map New Routes to Improved Profits and Sustainable Performance

Sustainability is viewed as "environmental, economic, and social well-being for today and tomorrow."

International Institute for Sustainable Development[1]

Supply chains are changing—consider for a moment the following:

- Working with supply chain executives, Accenture found empirical evidence of innovative firms creating more sustainable and high-performing supply chains by integrating and collaborating across three performance measures to drive value, namely, cost efficiency; quality of service; AND sustainability.
- All of GE's industrial business units conducted emission-reduction projects in 2010. The result was that their management identified 238 projects ranging from new technologies to enhancing the efficiency of existing equipment to engaging employees in energy conservation. The result—GE saved over $7 million with an average payback of 1.47 years.
- Praxair, a global Fortune 300 company that supplies atmospheric, process and specialty gases, high-performance coatings, and related coatings and related service, voluntarily began collecting

environmental key performance indicators in productivity projects. From 2009 to 2010, 8% of Praxair projects were tagged "sustainable development," and produced $32 million and 278,000 metric tons of $CO_2$ equivalent in savings.

- UPS utilizes more the 95,000 ground vehicles and more than 200 aircraft. In 2010, it introduced a new routing technology that provided savings of 63.5 million miles or equivalent of 6.3 million gallons of fuel. UPS currently offers carbon neutral shipping.
- The parent company of toy manufacturer, Lego, has decided to buy a 32% stake in one of Germany's largest offshore wind farms—a move intended to bolster the firm's green credentials and stay one step ahead of legislation.
- Starbucks has decided to focus part of its attention on the sustainable production of green coffee. It has introduced the C.A.F.E. Practices—a set of guidelines to achieve product quality, social responsibility, economic accountability, and environmental leadership.
- KPMG has found the primary drivers for sustainability are resource and energy efficiency while brand enhancement, regulatory policy, and risk management still remains a key drivers.

In reading these vignettes, several interesting sustainability features come to the forefront. First, these are well-established, highly regarded companies that represent mainstream business. Second, they have introduced new and innovative practices not simply because these practices are good for the planet and fair to people but because they are good for business and the bottom line. Third, these practices are potentially attractive to customers, thus increasing sales. Fourth, sustainability is becoming increasingly important globally. Finally, being sustainable, if done right, transforms the paradigm from "OR" to "AND." That is, in the past, sustainability was seen as being a trade-off—you could be more sustainable at the cost of profit. Now, we know that sustainability is an "AND" condition—you can be sustainable AND you can be profitable. This book explores how to manage this transformation and the next industrial revolution—from the "OR" to the "AND."

## Objectives

1. Define what sustainable supply chain management is and is not.
2. Introduce the paradigm shift of sustainability as not involving dichotomous trade-offs, but inclusive, collaborative, and integrative processes for improved performance.
3. Recognize that sustainability is not someone else's job, it's everyone's job!

## Sustainable Supply Chain Management—Will it Help Business?

It would be useful to start with the definition of a supply chain. It is the sum of a firm's customer relationships, order fulfillment, and supplier relationship processes as well as the interconnected linkages among the suppliers of services, materials, information, and the customers of the firm's services or products. Supply chain managers are the people at various levels of an organization who are responsible for managing supply and demand both within and across business organizations. There is a new collaborative opportunity for supply chain managers, and all of us, including a growing number of sustainability professionals, to work together on new dynamic business opportunities. There is substantial evidence of companies already solving existing business problems and proactively measuring and managing new profitable market segments.[2] The results of these collaborative efforts are a competitive advantage through differentiated products and services for some, and resource efficiency for all.

We want to help you understand processes and improve performance. How? Management professionals need measurement tools and models to understand the current state of operations. This understanding informs decision making and helps to predict the strategic opportunities coming from measuring new performance metrics, sustainability reporting, and increasing levels of transparency. Why? Insights from McKinsey's Global survey results[3] from over 2,900 respondents (Figure 1.1) show the integration of sustainability is widespread into processes ranging from mission and values, culture, operations, and strategic planning to employee engagement. Interestingly, supply chain management and budgeting lag

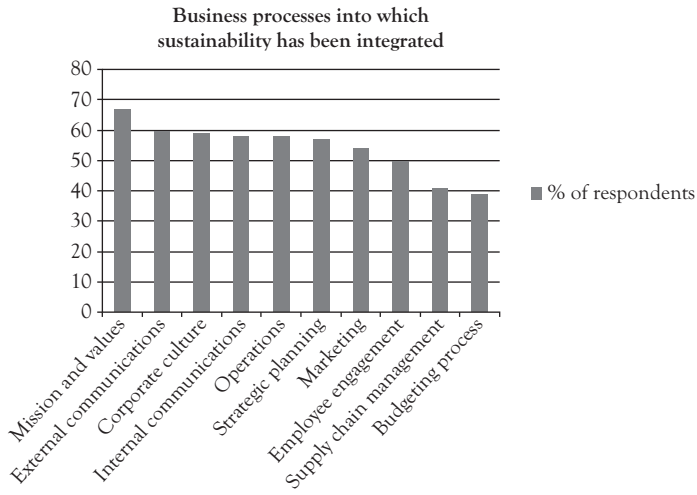


***Figure 1.1. Widespread integration.***

*Source*: McKinsey Global Survey Results (2011). *The business of sustainability*.

other areas of integration. Companies are finding supply chains hold the key to unlocking reduced environmental impacts, energy conservation, community connectedness, and improvements in performance that have been overlooked until the paradigm shift of sustainability, yet it seems we are just getting started.

Supply chain and logistics analysts, procurement personnel, sustainability coordinators, and managers, and executives face new pressures from their customers and from regulations to reduce carbon emissions and run more efficient and "sustainable" supply chains. Although the impression persists in many managers that implementing sustainable technologies or processes will be costly, our own research and the research of well-known consultancies and leading scholars suggest that trade-offs between costs and sustainability are a false dichotomy. Companies that focus on and implement sustainability programs have greater profitability than their industry's average.

What is sustainability? If you are like most people these days, you use Google to find information. In doing so, and at the time of writing this book, searching for "sustainable development" yields over 171 million hits. If you searched more broadly for "sustainability," you would find over 75 million hits. The amount of information can be overwhelming and we have heard some say, it's like drinking from a fire hose. A common

thread to almost all definitions used by multinational companies includes the United Nations 1987 Brundtland Commission report "Our Common Future," which defined sustainable development as meeting the needs of a current generation without compromising the needs of future generations. All definitions of sustainable development require that we as decision makers see the world as a system—a system that connects space and time.

Prior definitions recognizing the evolution of supply chain management purposefully integrate the functions of purchasing and logistics while directing attention to the "green" attributes of processes with a focus on environmental performance. While this repositioning of the profession was a step in the right direction, it does not go far enough in recognizing the dynamic systems in which you, the reader, operate. For the purpose of this book, we build off of prior work[4] and see *sustainable supply chain management* (SSCM) as the integration of systems thinking and action into supply chain management that must include financial, AND environmental, AND social performance. These SSCM practices include stakeholder engagement, product/process design, life cycle assessment (LCA), materials selection and sourcing, manufacturing processes, waste, transportation of final products and services to consumers as well as end-of-life management of products, and closed-loop systems. An important new element of SSCM is the integration of systems thinking (the holistic approach to analysis focusing on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems).[5] SSCM as defined in this book highlights an important aspect of the transition of the supply chain management concept (Figure 1.2). Sustainability is not simply environmental sustainability, but corporate sustainability and something John Elkington coined in 1997 as the "triple bottom line" approach to measurement and management of all value created and impact upon financial, environmental, AND social systems performance.

> *What Is Sustainable?* Outdated notions of the "green corporation" are being replaced by a new model: the learning organization that rethinks products, processs, and corporate culture to unleash game-chaning innovation making better use of human and natural resources while solving global systemic problems.[6]

| THEN | | NOW |
|---|---|---|
| Recycle | ⇨ | Life-cycle |
| Good for brand | ⇨ | Good for bottom line |
| Let's not tell the customer | ⇨ | Be first to teach the customer |
| Ignore natural cycles | ⇨ | Mimic natural cycles |
| People are replaceable | ⇨ | People are capital |
| Organization as machine | ⇨ | Learning organization |
| Green is enough | ⇨ | Corporate social responsibility is a start |
| Business = Product or Service | ⇨ | Business = Organized human resource, systems |
| Internal, pollution prevention | ⇨ | External, new markets, systemic solutions |

***Figure 1.2. Sustainability: Then versus now.***

Defining the concept is a good starting point for proving a context in which businesses and managers can envision this fast-moving paradigm. A definition by itself will not do much for an organization as a critical part of the process of developing a definition is to realize that sustainability is in itself, the end goal. To realistically operationalize any vision, there is growing evidence that sustainability is the new foundation for innovation and strategic competition. This evidence will allow many firms to cross a chasm that separates the innovators and early adopters from the rest while continuously improving business processes and supply chains.

Our own research over the past fifteen years and recent work with sustainability and supply chain executives has uncovered many hidden opportunities surrounding the integration of sustainability into operations and supply chains. There is overwhelming evidence of organizations achieving both high customer service and cost effectiveness while also successfully integrating sustainability throughout their processes. To this end, Accenture,[7] worked with 245 supply chain executives to identify high-performing organizations as those who achieved top quartile performance on both cost effectiveness and customer service, while laggards occupied the lower quartile. The high-performing firms take practical and cost-effective steps to address their environmental impact. They are not just looking at only the important "last mile" of distribution, but are taking an integrated view through their entire supply chain (Figure 1.3). The research suggests high-performing firms are:

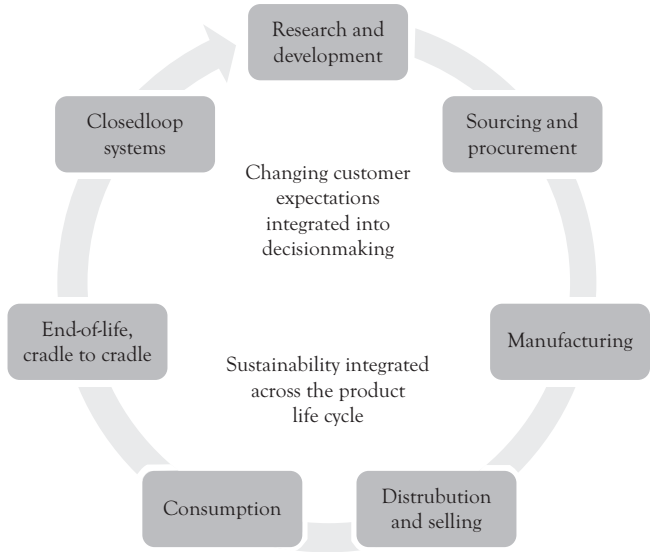


***Figure 1.3. Integrated view of supply chain management.***

- Designing products while integrating sustainability within the product development processes.
- Actively working with suppliers to lower their supply chain carbon footprint.
- Seeking the most practical solutions to their sustainability challenges.
- Choosing systems and processes investments that offer the best possible return.
- Creating value from the integration of sustainability across the supply chain.

These same firms recognize that now is the time to take action on sustainability.

Innovative firms are creating more sustainable and high-performing supply chains by integrating and collaborating across three performance measures to drive value: cost efficiency; service quality; AND sustainability. Integrating all three measures creates opportunities for profit improvement, through operating cost reduction and cash flow improvement. This integrated approach aligns with strategic opportunities by linking investments

in customer service with more sustainable business practices. Where a traditional business case would only look for the best balance between cost effectiveness and quality of service over the lifetime of the investment, Accenture suggests that top-performing firms are increasingly likely to develop a more sophisticated, three-dimensional business case to assess the value of supply chain projects[8] (Figure 1.4). Here, the value added or return on investment is better clarified by considering the sustainability improvement from a project, in addition to the cost and service implications.

The influence of sustainability on corporate behavior and performance outcomes is growing.[9] A comparison of firms that voluntarily adopted environmental and social policies years ago exhibited fundamentally different characteristics from a matched sample of firms that adopted almost none of these policies. Researchers from Harvard found the boards of directors of the adopting firms are more likely to be responsible for sustainability and incentives to top executives are more likely to be a function of sustainability metrics. Moreover, adopting firms are more likely to have organized procedures for stakeholder engagement, to be more long-term oriented, and to exhibit more measurement and disclosure of nonfinancial information. Additionally, they found that adopting firms significantly outperform their counterparts over the long term, both in terms of stock market and accounting performance. This performance is stronger in sectors where

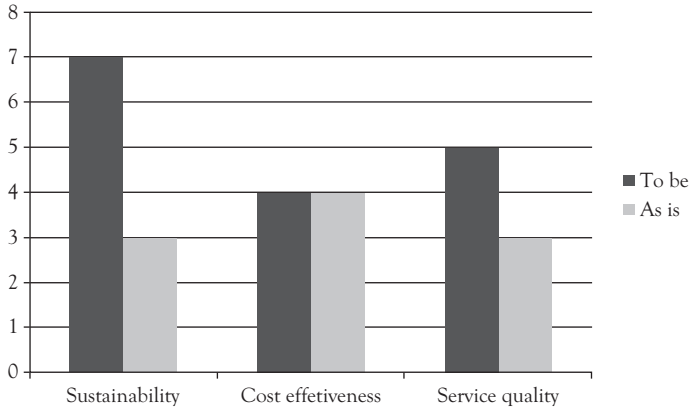


***Figure 1.4. A multidimensional approach to business supply chain opportunities.***

the customers are individual end consumers, compared to companies who compete on the basis of brands and reputation, and when products significantly depend on extracting large amounts of natural resources.

## Foundations of Sustainability

A system's approach to sustainability builds on certain fundamental premises, as summarized in Table 1.1. This approach encompasses a holistic and modular view of business processes synthesizing knowledge about the parts into understanding the whole. When given the opportunity to look at supply chains in this way, we can better grasp the entire system and its many details, and change focus when needed to view different levels so that we are not overwhelmed by overall complexity. As you will see throughout following chapters, this approach helps to reduce risk while improving performance so that the effects of waste or unforeseen problems can be confined within a subsystem, preventing system-wide collapse. These premises form the foundation of successful, effective sustainability through the supply chain.

Each element contributes to the creation of value and success of a supply chain.

*The focus of sustainability is on the 3Ps—product/process/packaging.* Supply chain sustainability involves focusing on three elements: product (primarily its design), process (how the items are made and delivered), and packaging (how the items are protected for storage and delivery). If these are managed in terms of their environmental impact, then the firm can significantly reduce its overall sustainability footprint.

***Table 1.1. Foundations of Sustainable Supply Chain Management***

| |
|---|
| • Focus on the 3Ps—product/process/packaging |
| • Prevention is preferred to correction |
| • Sustainability must be integrated into the day-to-day life of the firm |
| • Sustainability must be captured within strategic, tactical, and operational performance |
| • Sustainability is a system opportunity |
| • Sustainability must be linked to the strategy and the bottom line |
| • Waste is a symptom, not the root cause |
| • Waste is ultimately linked to processes |
| • Waste elimination and management are economically driven |

*Product design*. Here we look at issues such as the material used (type and quantity), the ease with which the product can be disassembled, and the ease with which it can be recycled and whether we are dealing with recycling or downcycling. Introduced by McDonough and Braungart (2002),[10] downcycling is when an item is recycled into a usable but lower grade product that does not eliminate the initial need for the original product. White office paper is a good example of downcycling. When we use white, bright paper and we put it in a recycle bin, the paper can be transformed into a paper that is not quite as bright. It is impossible to completely separate the ink from the paper threads. Consequently, if we need paper that is not quite as bright or white, we can use the recycled paper.

The importance of product design should never be underestimated. Experience has shown that product design, while not expensive overall, has a great impact on the ultimate performance of the product. Statistics often cited for the importance of product design include the following: (1) it can influence between 70% and 80% of the resulting product costs; and, (2) changes can be made quickly and easily in product design that could cost far more if made at later stages (some have referred to this as the 1–10–100 rule or a design change that would cost $1 to make during the design phase would cost $10 to make during prototype and $100 to make during production).

To apply the lessons that we have learned from total quality management (TQM) to sustainability, we can say sustainability always begins with good product design.

*Process*. Here we focus on how the product is made—the processes involved in making and delivering the product. Here we look not only how the product is made within our firm but also within the systems of our suppliers. We look at the costs associated with transporting products from our suppliers. Our goal is to identify the waste created within this production process over the entire supply chain and understand how to significantly reduce it.

*Packaging*. Packaging is created to protect the product from damage, enable more efficient packing of transport (to reduce the amount of space left unused as well as protecting the product), and to facilitate its display. The problem with packaging is that, once it has fulfilled these needs, it is often thrown away, increasing the environmental impact of the products.

By focusing on packaging materials, we look at the challenges of meeting the needs of packaging while (1) reducing the amount of packaging used; (2) ensuring that the packaging material is part of closed-loop systems using recycled material; and (3) ensuring that the packaging itself can be reduced. As the experiences of Dell and In.gredient show, packaging offers many opportunities for sustainability.

Dell is focusing on both revolutionizing and simplifying computer package. At the heart of this new program, begun in 2008, is a focus on the 3 Cs—(1) Cube (what is the size of the box and can it be smaller); (2) Content (what is the packaging material made of and can it be made of something better); and (3) Curb (can the packaging material be easily recycled). Since 2008, Dell has shrunk packaging volume by 10%, increased the amount of recycled content by 45%, and increased recycled packaging material by 75%.

In.gredient is a new grocery store that opened in Austin, Texas, in the fall of 2011. What makes this store so unique is that it has been designed to reduce packaging waste by eliminating packaging. Shoppers are encouraged to bring their own containers to pack up items such as grains, oils, and dairy. If a shopper does not have a container, In.gredient will sell them a compostable container. The founders of In.gredient hope that this approach will make a significant impact on the level of waste created in grocery stores. Consider the following:

- Americans add 570 million pounds of food packaging to their landfills every day.
- Prepackaged food forces consumers to buy more than they need, stuffing both their stomachs and landfills.
- Approximately, 27% of the food brought into U.S. kitchens is thrown away.

*Sustainability must be integrated into the day-to-day life of the firm.* In many ways, experiences with sustainability parallel the firm's experiences with TQM. One of the major lessons of TQM was that quality could never be improved if the responsibility for quality was separated from the day-to-day life of the firm and its employees and assigned to a separate department. The reason is that this approach created a situation where

those responsible for quality problems are not held accountable for improving quality—a situation that management found to be untenable in the long term. Similarly, when it comes to sustainability, we can see that sustainability works best when it is integrated in the daily lives of the employees; when those who create problems with sustainability are also held accountable for generating the solutions that can reduce these problems.

*Sustainability must be captured within corporate performance measurement.* Performance measures play an important role in the life of every firm and supply chain. In many ways, the performance measurement and management system (PMMS) plays a role in the firm similar to the body's nervous system. The PMMS, like the central nervous system, is both a control and a communication system. It is a control in that we measure performance, compare that level of performance to a standard, and take appropriate corrective action. More importantly, the PMMSs are communication techniques. It communicates what is important by the simple action of measurement. If we measure something, then we are telling everyone within and outside of an organization it is important. Alternatively, if we do not measure something, then the message to the firm is that it is not important.

For measures to act effectively as communication, they must be *meaningful*. That is, they must make sense to the various levels involved. Metrics reported to top management are not necessarily reported in the same way to the employees working on the floor. People working on the floor think in terms of units made, lead time, or reject rates; top management views activities in terms of sales, profits, gross margins, and return on assets. Consequently, measures must communicate with these various groups using different terms.

Finally, we should also recognize that measures can be used to develop a scorecard—to show where we are doing well in terms of sustainability and where further improvement is needed. We will drill down deeper into sustainability measures in later in Chapter 3.

*Sustainability is a systems opportunity*. We must recognize that problems with sustainability are not the sole responsibility of any one group or area. After all, problems with sustainability arise from the action taken by many different groups in the firm:

- Purchasing (how they manage the purchasing process, the type of suppliers they buy from, how they evaluate supplier performance, and how they develop potential suppliers).
- Engineering (how products and processes are designed).
- Accounting (how performance is measured and communicated; how costs are captured).
- Human resources (how people are recruited and trained, the type of people we have in the system).
- Manufacturing (how the processes are managed and controlled).
- Logistics (how products are shipped and how the costs of shipping are determined).
- Top management (determining what is important and the role played by sustainability in the future of the firm).

Because many employees are responsible for impacting the attainment of sustainability, it must be recognized that they should be involved in its management. Just like a cross-functional team is most effective for product design, so too is a cross-functional team most appropriate for sustainability. Furthermore, in many cases, this team should also involve representatives from the supplier and the customer sides of the business.

We should recognize that sustainability is an opportunity. When a problem involving sustainability occurs, we have a chance to understand what contributed to that problem and to correct the underlying root causes once and for all.

Sustainability only works if it is something that everyone thinks about every day. That only occurs if it is integrated. If we think back to Union Carbide, prior to the Bhopal India accident, they were often viewed as a leader in many business performance metrics. Yet internally, environmental compliance was looked at as some other department's responsibility, as this was a separate function. If environmental risks are ignored, these risks will only be reviewed after there is a problem. Sometimes, this manifests as a fine from the government, other times it can lead to an accident (Bhopal, India - December 1984) with more than 3,000 dying within weeks and over 8,000 since killed from gas-related diseases. A later governmental affidavit in 2006 claims the incident caused 558,125 injuries including 38,470

temporal and partially disabling injuries. The impact on this firm was significant and a postmortem revealed a lack of integration of environmental issues into day-to-day operations, most of the safety systems were in poor condition, and tanks were overfilled. Ultimately, a runaway reaction caused a tank rupture releasing a large volume of toxic gas. Workers did not know they should not clean pipes with water and may have helped to cause the problem.

*Prevention is preferred to correction.* When dealing with the problems created by the lack of sustainability (e.g., excess pollution, employee unrest), we are faced with two options. The first is that we can focus on and treat the effects. If pollutants are too high, we install scrubbers to catch the particulates and to prevent them from getting into the air. In the short term, this approach can be effective. However, over long term, it is doomed to fail because the processes that caused the problems still continue to operate; the pollution is still being created. Over the long term, the costs, direct and indirect, hidden and obvious, continue to accumulate. Ultimately, managers must realize that the only effective long-term solution is to prevent the problems from being created in the first place. Thus, our second option is uncovering the reasons for the problems and attacking those reasons directly.

*Waste is a symptom, not the root cause.* Waste is anything that does not add value to a product or service. Raw materials have a first cost in their acquisition, yet other unintended costs in process inefficiencies. Waste in the form of pollution has additional costs to handle, track, and dispose of, and should be recognized as a process and supply chain inefficiency. Simply stated, pollution is a *symptom*—a quantitative indicator of a problem. It tells us that something has gone wrong; not why it has gone wrong. It tells us the magnitude of the problems; it does not show what factors have contributed. It is equivalent to a thermometer—it shows improvements and decreases in performance. Yet stop for a moment and think about the implications of placing a dollar value on pollution by metric ton, volume, or pound …, how will this change process and supply chain management as we look for new forms of efficiency and effectiveness during the next industrial revolution of waste elimination?

When dealing with symptoms, we must remember certain management "truths." First, we should think in terms of whole *systems* and never attack a symptom directly. If we attack symptoms, then we experience a "good news/bad news" situation. That is, in the short term, the symptoms

being experienced will fall only to reappear at the same place in the future or to appear in another place today. For example, we decide to attack the high level of particulates by installing a scrubber. The number of particulates emitted falls—the good news; we now have tons of captured particulates that must be safely and inexpensively disposed of—the bad news. Second, when we encounter a symptom, we must be prepared to take a step back, to understand the system and to identify the processes that are giving rise to these problems/symptoms.

*Waste is ultimately linked to processes.* One thing that we have learned from lean/just-in-time (JIT) systems is the importance of understanding the set of following relationships:

- Pollution is an output
- Outputs are results of processes
- If you don't like the output, change the process

In other words, to reduce pollution and to improve sustainability, we must focus on the process that generates these outputs. It is only by changing the processes that we can develop true mastery over sustainability, waste management, and pollution elimination. It is also one reason that this book contains a chapter devoted solely to this topic.

*Waste elimination and management are economically driven.* Some years ago, one of the authors was talking with Chrysler's Vice President (VP) of Environmental Affairs. In the conversation, the VP had a strong statement—he never encountered a well-thought-out environmental management proposal that failed to generate a positive return on investments. More importantly, he continued, this insight was good because it showed everyone in Chrysler that pollution reduction was not only good for the environment, but also good for the bottom line. This is an important lesson. We must recognize that most managers are conservative and risk adverse. They will invest in, and more importantly support only those initiatives that are economically justifiable—that is, where the benefits exceed the costs. If a sustainability oriented initiative cannot be shown to be economically viable, then it will be pursued only when (1) the law requires it; or (2) it is the "right" thing to do. These conditions occur infrequently and they are not likely to generate widespread support or enthusiasm for such initiatives.

In reality, the challenge of ensuring that pollution management is economically driven requires that management take a total cost perspective. That is, we must consider not only direct cost saving (e.g., reduced material or labor costs) but also indirect costs (e.g., reduced floor space, fewer inspections, less sorting, fewer bills of material, less training) and the potential for increased revenue (due to the potential attractiveness of the resulting products). These costs must not only consider cost savings but also cost avoidances (a more difficult concept to measure). This is why *life-cycle costing* is so critical as we will point out and discuss in Chapter 3.

Here are three issues to consider:[11]

- In most firms, the ratio between value-adding and nonvalue-adding activities (as measured both in terms of time and costs) is 1 to 1000–2000.
- In world-class firms, this same ratio is 1 to 200–300.
- According to the same Chrysler VP previously referenced, for every $1 saved in direct savings, typically $6 are saved in indirect costs.

This emphasis on economic justification forces managers to view sustainability not as a moral imperative but as an investment—an investment in financial, natural, AND ultimately human capital.

*Sustainability must be linked to the strategy and the bottom line.* Ultimately, for sustainability to be integrated within a firm, it must be first embraced by top management. Top management is widely recognized as critical for the success of any management/corporate initiative. Every textbook or management text that deals with such developments as TQM or JIT/lean always emphasizes the need for top management involvement and commitment. When top management is involved and publically supports a management/corporate initiative, that action lends credibility to the initiative. When top management is involved, then necessary resources can be devoted to the initiative. When top management is involved, everyone in the firm knows that the initiative is important and that it must be supported.

Yet, to secure this support, we have to show top management that in supporting the initiative, they also help themselves. This occurs most clearly when we can link the sustainability initiative to the strategy or to the bottom line. In the previous point, we talked about the linkages to the

bottom line. Yet, the linkage to the corporate strategy is even more important. A good example can be found in the approach taken by Dell Computing to its environmental initiatives.

Dell has introduced a wide range of sustainability initiatives, including the following:

- *Dell Ecovative Design for Packaging.* In 2011, Dell introduced a new kind of innovative mushroom-based packaging created by Ecovative Design. This new packaging reduced the total amount of solid waste and consumption of fossil fuels. It is made from completely compostable material and only takes one-tenth of the total time to produce, unlike styrofoam.
- *Dell India Green Initiative.* Dell India sends out a special coupon to encourage recycling of computers. If you send in old Dell Systems to Dell for recycling, you receive a special discount for your next Dell computer purchase. Then there is the Dell Go Green Challenge. This challenge raises community awareness and involvement in green projects throughout India.
- *Recycling for Home and Business Initiatives.* Dell offers an extensive recycling program for its home and business customers. Dell has partnered with FedEx to provide an at-home product pickup program. For business users, this program is especially attractive as Dell will assume responsibility for any subsequent disposal issues. Hard disks, for example, are overwritten and destroyed using military-specified procedures. The program is absolutely free and can be used for any Dell products as well as non-Dell products, if the customer purchases a similar type of product from Dell. This program has enabled Dell to differentiate itself from competitors such as Apple, Lenovo, or Hewlett-Packard. It has generated a great deal of positive visibility for Dell.

When such initiatives are linked to corporate strategy, we take a step to the "and" system discussed at the beginning of this chapter. When these two elements are linked, then top management knows that they are not forced to make trade-offs between profit/strategic advantage and improved sustainability.

## Risks of Waiting: Compliance Is Not Enough

Commodity volatility, adverse weather conditions (e.g., Superstorms), and a range of other threats were very visible in 2011 and 2012. Despite the measures taken to combat these events, the sentiment among procurement executives is that weather-related events will only continue to increase costs. When projected against the Forbes Global 2000, the total predicted loss amounts to a staggering €280 billion, according to research by the Procurement Intelligence Unit.[12] The research, which took into account the views of 181 senior procurement executives in mid-2011, also showed that the procedures aimed at reducing the impact of unexpected events are limited. The majority of businesses assume that suppliers will take responsibility for managing supply continuity. A tiny minority of firms actively deploy strategies that extend to suppliers' suppliers.

Instead, there is growing evidence of businesses taking practical actions to embed sustainability within their day-to-day supply chain operations.[13] The vignettes at the start of this chapter highlight companies and some results, but what most need is a vision and steps for integrating sustainability into supply chain management. This vision starts with an understanding of and an integrated view of the entire supply chain from raw material extraction to disposal or opportunities for closed-loop, cradle-to-cradle (C2C) systems. Next is a focus on the integration of performance measurement that includes cost effectiveness, but also a focus on customer service and simultaneous sustainability improvement while considering the total cost of ownership. When looking for new performance measures, start with carbon. Why carbon? Well there is already a price on carbon and as previously mentioned, it represents waste from a process that adds no value to a product or process. Calculate the carbon footprint of your own operations and those of your supply chain and take steps to incrementally integrate carbon into the business case for projects with goals for carbon reduction. Finally, when making the business case for new sustainability projects, deploy the most cost-effective and proven technologies. Deploying your vision of sustainability requires a systematic approach. Those organizations that take the lead in developing innovative supply chain strategies and then proactively embed sustainability within their operations will be among those firms that most

likely stay ahead on supply chain performance over the longer term. What's your vision?

## Systems Integration: A Foundation of Competition

There is now a shift in supply chain management. Historically, we have seen price-driven yet strategically decoupled supply chain management. The move for many is now value driven AND strategically coupled supply chain management. We see an increasing emphasis on integrated and a more comprehensive set of outcomes, where the integration draws on the following six outcomes: value, resilience, responsiveness, security, sustainability, and innovation. As the language of sustainability has evolved over time, so too will the ways in which we measure performance. Environmental performance has given way to sustainability, and innovation is yet another lens we can use to see this evolving paradigm. To take this concept further, others are extending sustainability to understanding and enabling the purpose of corporations as creating "shared value"[14] not just profit. So what are we getting at? Sustainability calls for the integration of systems like no other business paradigm.

Why focus on sustainability beyond the firm to the supply chain? Systems integration and the increasing importance of supply chains as the basis of competition call for every business to go beyond its own four walls to better measure, monitor, and manage sustainable supply chains. The reality of managing supply chains is dynamic and requires a concerted effort to align with new programs and opportunities such as sustainability. Ironically, the realities of managing supply chains are the same as sustainability (i.e., visibility, control, risk, transparency, complexity, and collaboration). There is a need for a common language of sustainability to overcome one of the most important obstacles for any initiative and paradigm change.

## Trends to Watch

Evidence of changing customer expectations and sustainability moving up the corporate agenda confirmed by a KPMG global survey of 378 senior executives[15] which found:

- 62% of firms surveyed have a strategy for corporate sustainability with 23% of firms in the process of developing a plan.
- Primary drivers for sustainability are resource and energy efficiency, with brand enhancement, regulatory policy, and risk management still remaining key drivers.
- 44% of executives in the study see sustainability as a source of innovation, whereas 39% see sustainability as a source of new business opportunity.
- Firms are increasingly measuring and reporting their sustainability performance and businesses want a successor to the Kyoto Protocol.
- 67% of executives believe a new set of rules to replace those ending in 2012 is "very important" or "critical" to having a clear road map for sustainability with corporate-lobbying efforts pushing for tighter rules.

With increasing scrutiny of corporate carbon emissions, freight and transportation providers now have every opportunity to strategically impact and realize sustainable value from their operations. Emissions from freight in the U.S. are projected to increase by 74% from 2005 to 2035 and China is expected to increase its use of freight transportation fuels by 4.5% a year from 2008 to 2035 with predictions of freight emissions increasing 40% globally.[16] Given this growth, we paradoxically have significant control over the carbon footprint of supply chain operations. Decisions on how products are designed and packaged, along with where products are made, store locations, offsetting, and how much time is allotted for transit all have an impact on GHG emissions and waste within business systems.[17] We should all have a strategy for corporate sustainability, its measurement, and how we will report our progress. Shippers will find there are cleaner and more cost-efficient freight practices and integrated systems with good returns on investment. Sustainability is a way to differentiate operations, improve brand loyalty, and provide new services and a road map for long-term goals.

With sights set on achieving more sustainable supply chains by 2020,[18] objectives for some companies (i.e., the Consumer Goods Forum, HP, Microsoft, and others) include optimizing shared supply chains, engaging technologically savvy consumers, while also improving consumer health and well-being. The ability to achieve these objectives is essential to the

consumer goods industry. Additionally, it was noted that the difference between success and failure in this industry will be the ability to adapt to rapid and significant change.[19] The trends with the biggest impact on driving industry objectives for the next 10 years include the following:

1. Increased urbanization
2. Aging population
3. Increasing spread of wealth
4. Increased impact of consumer technology adoption
5. Increase in consumer service demands
6. Increased importance of health and well-being
7. Growing consumer concern about sustainability
8. Shifting of economic power
9. Scarcity of natural resources
10. Increase in regulatory pressure
11. Rapid adoption of supply chain technology capabilities
12. Impact of next-generation information technologies

Within the context of these trends, industry needs a fundamental change in the way consumer products companies and retailers business models integrate for serving consumers. This means working collaboratively with industry, governments, NGOs, and consumers. The four primary objectives coming out of the study are (1) making business more sustainable, (2) optimizing a shared supply chain, (3) engaging with technology-enabled consumers, and (4) serving the health and well-being of consumers.

Like the information technology and quality megatrends of the past, sustainability will touch every function, every business line, and every employee.[20] Companies that excel in sustainability make shifts in leadership, the systematized use of tools, strategic alignment, integration, reporting, and communication. These firms move from tactical, ad hoc, and siloed approaches to strategic, systematic, and integrated practices.

## Summary and Next Steps

This chapter starts by answering the question "Will sustainability help business"? The overwhelming response to this is yes across multiple

dimensions of performance. More of these dimensions will be explored in the remaining chapters of this book. We next define SSCM within the larger context of systems stressing the integration of financial, environmental, and social performance measurement along with management throughout a product's life cycle. When defining the SSCM concept, we are actually introducing a paradigm shift of sustainability as not involving dichotomous trade-offs, but as an inclusive, collaborative, and integrating process for improved performance. By the end of this book, you will see that sustainability is not someone else's job, but it's everyone's opportunity to improve products and processes across multiple dimensions of performance and an integrated bottom line.

By reading this book and purposefully setting aside some of your time to gain insight from a series of Action Items (AIs) and Audit Questions (AQs) found within each chapter, the end goal of this process should be a tailored approach to supply chain transformation. This transformation starts with an understanding of sustainable supply chains and their benefits before we go on to systematically asses your own supply chain to help identify and execute sustainable practices. This assessment process will help develop a sustainable supply chain vision and strategy; create an executable plan for new sustainable supply chain projects; provide opportunities to integrate sustainable practices throughout your company, as well as among suppliers and customers; bring about better clarity regarding supply chain processes; leverage existing enterprise-resource-planning (ERP)-enabled manufacturing activities (energy consumption, emissions, scrap and waste, recycling, remanufacturing, packaging); help guide you as to where to look for improvements in warehousing and fleet management; enable strategic sourcing highlighting the importance of design thinking, programs for sustainable raw materials and packaging; and how to plan for closed-loop systems and reverse logistics activities, while leveraging existing systems and programs to identify and operationalize opportunities for existing and new sustainability practices.

Information within this book is sequenced in a way to help accomplish all of the aforementioned while taking the complex paradigm of sustainability and breaking it down into constituent parts focusing on how systems work. Chapters begin with evidence-based management, highlighting short vignettes, recent trends, and sustainability initiatives from innovative and early adopting

firms. Information within chapters reveals applicable frameworks, tools, and proven standards as enablers of SSCM initiatives. The end of each chapter challenges readers to reflect on their own operations through applied action-learning opportunities focusing the reader on AIs and AQs.

A companion SSCM web site is available to help audit and benchmark your own practices within and across industries. The remaining chapters include:

**Section II The Foundations of Sustainable Supply Chain Management**

Chapter 2 Sustainability—Reducing Waste, Enhancing Value, and Generating a Strategic Competitive Advantage

Chapter 3 Performance Measurement and Metrics-Enabling Transparency, Visibility, AND Sustainability

**Section III The Key Activities of a Sustainable Supply Chain**

Chapter 4 Standards and Tools in Support of Sustainable Supply Chain Management

Chapter 5 Design for Sustainability—Collectively Transforming Systems and Process

**Section IV Emerging Issues in Sustainable Supply Chain Management**

Chapter 6 Integrating Sustainability-Enabling People and Customers

**Section V Sustainable Supply Chain Management Planning and Future Systems**

Chapter 7 Sustainable Systems—Order Winners of the Future

Chapter 8 Sustainable Supply Chain Management—The End of the Beginning

## Applied Learning: Action Items (AIs) and Action Questions (AQs)—Steps you can take to apply the learning from this chapter

AI: Look for a definition of sustainability from a competitor and reflect on how this can be improved upon and aligned within your own firm.

AI: What are the environmental and social impacts of your supply chain?

AQ: To what extent can you impact the 3Ps to eliminate waste?

AQ: What are the three most important trends in your industry?

AQ: How rapid or intense is each of the following in your industry: changes in marketing, rate of product or service obsolesce, actions of competitors, and changes in production/service technology?

For a more in-depth assessment, and to receive summary information about your AQs relative to others, you can access the sustainable supply chain assessment tool for this book at www.duq.edu/sustainable-supply-chain-management

## Further Reading

Lubin, D., & Esty, D. (2010). The sustainability imperative. *Harvard Business Review*, *8*(5), 43–50.

Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review, 65,* b-64,

Laszlo, C., & Zhexembayeva, N. (2011). *Embedded sustainability*. Stanford, CA, Stanford Business Books.

Werbach (2009). *Strategy for sustainability: A business manifesto*. Harvard University Press.

SECTION II

# The Foundations of Sustainable Supply Chain Management