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Preface



June 2004

The Global Environmental Management Initiative (GEMI) is proud to introduce this report, **Forging New Links** — **Enhancing Supply Chain Value Through Environmental Excellence**. It is the latest in a series of GEMI tools showing how environmental, health and safety (EHS) excellence can enhance the business performance of companies.

GEMI's exploration of supply chain management began with the publication in 2001 of *New Paths to Business Value: Strategic Sourcing — Environment, Health and Safety.* That report primarily examined how integrating EHS concerns into procurement processes could add business value. It became clear that many other EHS value creation opportunities exist throughout the complex web of relationships known as the supply chain. **Forging New Links** explores the potential value of integrating EHS capabilities into all of the business processes involved in providing products and services to fulfill customer needs.

The purpose of **Forging New Links** is to describe a broad range of opportunities for EHS professionals, in collaboration with other functions within their companies, to enhance supply chain performance. Both the report and the associated web site (http://www.gemi.org/supplychain) are intended as resources to assist managers in recognizing, prioritizing, and pursuing specific value creation opportunities. The intended audience includes both EHS and supply chain management professionals, as well as business executives.

With the globalization of companies and their supply chains, it is essential to look beyond the traditional role of EHS as a compliance function. EHS professionals can play an integral role in achieving improved financial performance and competitive advantage. This report reviews emerging trends in supply chain management that heighten the importance of EHS awareness, and shows how companies can construct a value proposition for EHS involvement. In addition, it provides a systematic methodology for each company to assess its situation, identify key issues, and pursue high-value opportunities. Case studies from GEMI member companies are used to illustrate these opportunities.

Forging New Links demonstrates that EHS professionals, working as part of a cross-functional team, can add value to typical supply chain processes and activities. Although much progress has been made, more needs to be done to integrate EHS value creation opportunities into supply chain decision-making. This report offers a pragmatic step in that direction. In the long run, it is only through collaboration between EHS and supply chain professionals that these business value opportunities will be realized.

We hope that you, the reader of this report, will find it a useful tool for driving improvements in your own supply chain that benefit both the enterprise and its stakeholders. GEMI would appreciate receiving any feedback you have with regard to this report. Please submit your comments to info@gemi.org.

Hugh M. (Bert) Share Anheuser-Busch, Inc.

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Co-chairs, GEMI Supply Chain Work Group

"At 3M we use cross-functional teams to coordinate our supply chain management business processes, and the EHS function often provides valuable insights that help to improve our capabilities and performance."

Gary Ridenhower
Director, Supply Chain Platforms Strategy Development
3M

"Our EHS team's involvement in business activities, well beyond traditional EHS scope, has generated significant value, cost savings and competitive advantages for Motorola."

Larry Gilbert
Director, North American Distribution and Logistics
Motorola, Inc.

"Pfizer EHS Colleagues are full partners in evaluating the suitability and performance capabilities of our contract manufacturers. Their contribution to the management of supplier relationships is required and essential to the overall success of our program."

Tom Lawlor Senior Director, Global Contract Manufacturing Pfizer Inc

Executive Summary

The goals of environmental, health and safety (EHS) excellence are no longer confined to compliance and cost avoidance. EHS groups are collaborating with other functions to enhance shareholder value throughout the supply chain — contributing to profitability, resource productivity, innovation, and growth.

Supply chain management (SCM) is evolving from a traditional focus on purchasing and logistics to a broader, more integrated emphasis on value creation. Leading companies increasingly view supply chain excellence as a source of competitive advantage, with the potential to drive performance improvement in customer retention, revenue generation, cost reduction, and asset utilization. Crossfunctional teamwork is essential to orchestrate the core SCM business processes — managing relationships with suppliers and customers as well as managing the flow of goods, services, and information along the supply chain.

As the scope and cross-functional integration of SCM increase, there is a growing need for effective EHS capabilities in all supply chain business processes. The emergence of globalization, outsourcing, and corporate social responsibility, along with regulatory changes and security concerns, has made EHS excellence a key success factor. Moreover, EHS issues can no longer be addressed in a reactive fashion. Manufacturers are increasingly expected to take responsibility for the disposal of products and packaging at the end of their useful life, so that designing for reverse logistics has become a strategic approach for converting wastes into assets and thus generating shareholder value. Likewise, anticipating safety and security risks and developing contingency plans is critical for assurance of business continuity.

This report provides a comprehensive review of the opportunities for EHS to create business value in the supply chain across a variety of industries. The broadening of EHS scope beyond compliance toward value creation is illustrated by case studies drawn from GEMI member companies. For example:

- Motorola expanded a worker safety project into a Six Sigma initiative that is projected to save \$5 million dollars in 2004 through inbound logistics discrepancy reduction.
- Duke Power worked with its cable supplier to devise an innovative "reel-less" cable technology that eliminates the use and disposal of wooden reels, and reduces supply chain costs by \$500,000 per year.
- Intel has saved millions of dollars annually by developing lighter-weight plastic trays that are used to move microprocessor units through the fabrication process and deliver them to customers.
- 3M, Eastman Kodak, FedEx Express, Dow Chemical and other companies routinely apply life cycle management principles to design products and processes that reduce supply chain costs, improve environmental performance, and meet customer expectations.

In order for companies to realize these types of benefits, management needs to foster improved collaboration between EHS and supply chain management professionals. Wherever appropriate, the EHS function needs to be integrated into cross-functional teams that are managing SCM business processes.

The focus of this report is on how EHS excellence contributes to shareholder value creation. Waste reduction, business continuity, resource efficiency, and stakeholder satisfaction are intrinsic elements of modern supply chain management. Thus, environmental and social benefits such as pollution prevention can be natural outcomes of supply chain business process improvements.

Sections 1 and 2 of this report provide an introduction to SCM business processes, global trends, and EHS-related pathways for business value creation. Then, beginning on page 12, **Sections 3 and 4** provide a step-by-step approach for companies to identify and prioritize value creation opportunities, develop a business case, assemble the needed resources, implement successful initiatives, and measure the results. Finally, **Section 5** presents guidelines for cross-functional teaming and external collaboration.

Table of Contents

<u>Section 1. Introduction</u>	
A Strategic View of Supply Chain Management	1
Supply Chain Business Processes	1
Relevant Trends in Supply Chain Management	
Implications for EHS Value Creation	5
Section 2. Business Case Formulation	6
Supply Chain Value Drivers	6
The EHS Value Proposition	7
Reciprocal Value Creation	
Overcoming Barriers to EHS Engagement	11
Section 3. Opportunity Identification	12
Finding High-Value Opportunities for Your Supply Chain	13
Assuring Compliance	16
Minimizing Risks	17
Maintaining Human Health and Safety	19
Protecting the Environment	20
Raising Supply Chain Productivity	21
Enhancing Supply Chain Relationships	23
Supporting Supply Chain Innovation	25
Enabling Enterprise Growth	28
Section 4. Value Creation Methodology	30
Methodology Overview	
Step 1: Identify Supply Chain Opportunities	
Step 2: Prioritize EHS Value Contributions	
Step 3: Develop Business Justification	
Step 4: Implement, Measure, and Iterate	36
Section 5. Effective Collaboration	
Engaging a Cross-Functional Team	
Achieving Organizational Alignment	
Establishing Supply Chain Partnerships	39
Collaborating with Customers and Suppliers	41
Collaborating with Stakeholder Organizations	42
Section 6. Conclusion	44
Appendix A. Tools and Resources	45
Appendix B. Glossary of EHS and SCM Terms	47

List of Figures

Figure 1: Pathways to Business Value	7
Figure 2: Reciprocal Value Flow in a Supply Chain	
Figure 3: Diagnostic Tool for Opportunity Identification	
Figure 4: Overview of Methodology for EHS Value Creation in the Supply Chain	
Figure 5: Methodology for Step 3, Business Justification	
Figure 6: Methodology for Step 4, Implementation	
Figure 7: Supply Chain Partnership Model	
List of Tables	
Table 1: How EHS Contributes to Supply Chain Performance	12
Table 2: Guide to Selecting Business-Specific Opportunities	
Table 3: Potential EHS-Related Contributions to Supply Chain Business Processes	
Table 4: Potential EHS-Related Contributions to Supply Chain Value Drivers	
Table 5: Template for Opportunity Presentation	
Table 6: Criteria for Opportunity Prioritization	
Table 7: Functional Group Roles in Supply Chain Business Processes	
List of Case Studies	
Motorola's Inbound Discrepancy Reporting System	9
Pfizer Standard for Contract Manufacturing and Research	
Dow Chemical — Behavior-Based Safety in Chemical Transport	18
Abbott Laboratories Contractor Safety Management	
Creating Environmental Value at FedEx Express	
Reel-Less Cable Packaging at Duke Power (a division of Duke Energy)	
Packaging Innovation at Intel Corporation	
Texas Instruments Banned and Restricted Materials Process	
Environmental Progress in Kodak Consumer Digital Cameras	
3M Novec™ 1230 Fire Protection Fluid — A Balanced Life Cycle Approach	
Anheuser-Busch Supply Chain Re-Engineering	
Supplier Expectations at Eastman Kodak, HP, and Motorola	
Clean Cargo Group	
Automotive Suppliers Partnership	42

Acknowledgements

Forging New Links was developed through a collaborative process by GEMI's Supply Chain Work Group. The Work Group was co-chaired by Bert Share of Anheuser-Busch Inc. and John Harris of Eli Lilly and Company, formerly with Ashland, Inc. The development of Forging New Links was managed by Joseph Fiksel of Eco-Nomics LLC, with support from Doug Lambert, Director of The Global Supply Chain Forum at Fisher College of Business, The Ohio State University, and from Les Artman, retired Partner from Accenture's Supply Chain Strategy Practice. The cover art and overall graphic design were created by Dawne Brooks. The web-based version of Forging New Links was developed by Joseph Fiksel and Allan Dudek. GEMI staff contributing to this document included Steve Hellem and Amy Goldman.

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Special thanks: During the course of the project, helpful background information and advice were provided by Bill Copacino of Accenture, Jim Fava and Ralf Nielsen of Five Winds International, Robert Axelrod and Susan Russell of Steele, Lisa Ellram of Arizona State University, Erica Plambeck of Stanford University, and Mark Sharfman of the University of Oklahoma.

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ON THE WEB

An interactive version of **Forging New Links** is available at http://www.gemi.org/supplychain



Section 1

INTRODUCTION

☐ A Strategic View of Supply Chain Management

Supply chains were once seen merely as physical channels for movement of raw materials or components and distribution of products. Today, supply chain management (SCM) is increasingly practiced in a broader and more strategic manner. The scope of SCM is expanding to include all of the business processes that enable rapid, precise fulfillment of customer expectations, from product development to relationship management. The supply chain itself is transforming into a network, as companies increasingly form partnerships to strengthen their competitive performance. Thus, the traditional concept of a linear, static supply chain is giving way to a complex web of dynamic relationships.1 Rather than focusing only on tangible infrastructure (plants, vehicles, and depots), the strategic view of SCM also incorporates more intangible elements: collaboration, information, and connective technologies that bridge time and space.

The following definition of SCM reflects this emerging strategic view:

Supply chain management is the integration of key business processes from end user through original suppliers, which provides products, services, and information that add value for customers and other stakeholders.²

□ Supply Chain Business Processes

This report utilizes a reference model developed by The Global Supply Chain Forum at The Ohio State University (http://fisher.osu.edu/scm), which defines the following eight SCM business processes.³

- Customer Relationship Management: Develops and maintains relationships with customers, including establishing product/ service agreements (PSAs) between the firm and its customers.
- **Customer Service Management:** Provides the firm's face to the customer, including management of the PSAs, and provides a single source of customer information.
- **Demand Management:** Balances the customer's requirements with supply chain capabilities.
- Order Fulfillment: Includes all the activities necessary to define customer requirements, design the logistics network, and fill customer orders.
- Manufacturing Flow Management: Includes all the activities necessary to move products through plants and to obtain and implement manufacturing flexibility in the supply chain.
- Supplier Relationship Management:

 Develops and maintains relationships with suppliers, including establishing PSAs between the firm and its suppliers.
- Product/Service Development and Commercialization: Provides the structure for developing and bringing to market new products or services, including collaboration with customers and suppliers.
- **Returns Management:** Includes all activities related to handling and disposition of various types of returns, including reverse logistics, gatekeeping, and returns avoidance or abatement.

¹ Some practitioners have introduced new terms such as "value chain" or "value web" to emphasize these changes. However, to avoid confusion, this report will adhere to the established term "supply chain."

² D.M. Lambert, M.C. Cooper, and J.D. Pagh, "Supply Chain Management: Implementation Issues and Research Opportunities," *The International Journal of Logistics Management*, Vol. 9, No.2 (1998). See http://www.ijlm.org.

³ Douglas M. Lambert, Editor, Supply Chain Management: Processes, Partnerships, Performance, Sarasota, FL: Supply Chain Management Institute, 2004. See http://www.scm-institute.org.

Different industries may have differing interpretations of the above business processes. For example, in the electric power industry, the order fulfillment and manufacturing flow management processes might be interpreted as fuel acquisition, power generation, system dispatching, power transmission, and power distribution. Any specific company can tailor the above reference model to fit its own particular business process definitions.

Many leading companies have recognized that each business process needs to be managed by a cross-functional team, and have deployed their personnel accordingly. For example, **Supplier Relationship Management** involves the following functions:

- **Finance:** Tracking procurement-related costs
- **Logistics:** Inbound flow & inventory management
- **Marketing:** Product customization & support
- **Purchasing:** Supplier transaction management
- **R&D:** Material or component specification
- Production: Requirements planning & scheduling

This report will clarify the important contributions that the **Environmental**, **Health and Safety** (EHS) function can make to these cross-functional business process teams, and will demonstrate how a more collaborative approach can deliver increased supply chain value.

Relevant Trends in Supply Chain Management

Over the past decade, SCM has been a constantly changing landscape as competitors vie to introduce both technological innovations and process improvements to increase speed, efficiency and responsiveness. As a consequence of these changes, SCM is increasingly viewed as a strategic lever in many industries. While total costs are difficult to estimate, logistics costs alone can range from about 4% to 15% of total sales, and the gap between the leading and

average players is two-fold or more and widening.⁴ Thus, the impact of SCM on profit margins can be a significant competitive factor. For example, the remarkable financial recovery of Apple Computer under Steve Jobs was largely credited to a complete overhaul of the supply chain system, shrinking inventory from 27 days to less than 2 days.⁵

The following SCM trends are particularly relevant for EHS engagement:

- **Globalization**. International capital flows and exports of products and services have made the global economy increasingly interdependent, while advances in logistics and communication have enabled global trade to progress rapidly. However, offshore sourcing results in greater regulatory complexity and longer lead times. In addition, globalization has raised concerns about inequities between rich and poor countries, as well as adverse environmental impacts such as energy consumption and greenhouse gas emissions.6 Varying regulatory requirements as well as cultural barriers tend to complicate the acquisition and integration of international businesses. Thus, tensions between economic opportunities and EHS and social concerns can be obstacles to global supply chain management.
- Outsourcing of key functions. The trend toward outsourcing has continued to expand, moving from basic logistics functions such as transportation and warehousing to broader and more critical functions such as technology development and contract manufacturing. Companies in many industries are now utilizing virtual enterprise models that blur the boundaries between suppliers and customers. For example, many semiconductor fabrication plants, which purchase and use large amounts of chemicals, are now utilizing supplier turnkey services to provide total chemical management, including procurement, chemical handling, and waste disposition.⁷ In these types of relationships, the EHS management capabilities of the supplier are an important competitive factor. Likewise, in

⁴ "A Global Study of Supply Chain Leadership and Its Impact on Business Performance," study conducted by Accenture, INSEAD, and Stanford University, 2003.

⁵D. Bovet and J. Martha, *Value Nets*, New York: Wiley, 2000.

⁶International Monetary Fund, Globalization: Threat or Opportunity?, January 2002.

⁷ "Chemical Management Case Study in the Semiconductor Industry," Semiconductor Fabtech, Spring, 2002.

outsourcing to third-party providers such as contract manufacturers, EHS competencies are needed to perform due diligence, review provider performance, and assure business continuity.

- **Collaboration**. To operate effectively in global markets, companies are increasingly forming alliances with suppliers, customers, and even competitors. One survey of partnering with suppliers projects a growth rate of over 60% between 2002 and 2005.8 It is generally believed that supply chain collaboration leads to lower total cost and enhanced service performance. In particular, establishment of supplier-customer partnerships enables companies to work more closely on designing integrated solutions for the end customer. For example, Procter & Gamble adds supplier experts to its planning teams to implement "Design for Environment" for its products and packaging, thus minimizing the total costs and adverse impacts of a product throughout its life cycle.
- **Reverse logistics**. Management of returns, including recalls, repairs, and exchanges, is a necessary part of supply chain management. An emerging trend is the deliberate recovery, recycling, re-use, and remanufacture of obsolete products, components, and materials. This trend has been spurred by government adoption in Europe and elsewhere of extended producer responsibility for the full product life cycle, including post-consumer disposition (known as "product take-back"). Companies are responding to new take-back requirements by designing products in ways that facilitate safe, efficient, and cost-effective recovery at the end of their useful life.¹⁰ However, it is often challenging to assure the reliability of recovered parts and materials.
- Corporate social responsibility. The increasing demands from stakeholders¹¹ for social responsibility and transparency are influencing companies in many industries to re-examine their behavior. Controversy over labor practices in

developing nations has raised customer sensitivity to the conduct of upstream suppliers. At the same time, governments and large corporations are beginning to adopt "environmentally preferable purchasing" practices that favor products with superior EHS characteristics, such as energy efficiency and absence of harmful emissions.¹² In response to these trends, the Institute for Supply Management recently announced a new set of Principles for Social Responsibility (see http://www.ism.ws).

■ Time-sensitive order fulfillment. The adoption of "lean" manufacturing and related approaches, such as "just-in-time" replenishment, has helped to reduce manufacturers' working capital and streamline their operations. An extreme example is Dell, which carries minimal inventory and

Sustainable Development

The emergence of extended producer responsibility and corporate social responsibility are part of a broader phenomenon. Many global corporations have made a voluntary commitment to *sustainable development*, often defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." In practice, sustainability involves:

- Supporting employee rights and quality of life
- Promoting community and societal well-being
- Upholding business ethics and transparency
- Building capacity for economic development
- Minimizing adverse environmental impacts
- Protecting and conserving natural resources

Sustainable business practices are described in a GEMI report, *Exploring Pathways to a Sustainable Enterprise: SD Planner*TM, which includes a software tool for self-assessment and strategic planning (see http://www.gemi.org).

⁸B.J. LaLonde and J.L. Ginter, The Ohio State University, 2003 Survey of Career Patterns in Logistics.

⁹T.P. Stank, S.B. Keller, and P.J. Daugherty, "Supply Chain Collaboration and Logistical Service Performance," *Journal of Business Logistics*, Vol. 22, No. 1, 2001.

¹⁰ V.D.R. Guide Jr., L.N. Van Wassenhove, "The Reverse Supply Chain," *Harvard Business Review*, Feb. 2002

¹¹ Important external stakeholder groups include employees, customers, suppliers, lenders, insurers, local communities, governments, advocacy groups, religious groups and indigenous peoples.

^{12 &}quot;Green Procurement: Good Environmental Stories for North Americans," Five Winds International, 2003.

actually has negative working capital. In Dell's direct-to-customer, build-to-order business model, they collect from customers before their suppliers get paid. Ironically, these approaches tend to shift the inventory burden onto suppliers, who are experiencing increasing demand for smaller, more frequent orders that may be less resource-efficient. EHS insights can help to reduce order fulfillment costs by devising lighter-weight, more energy-efficient packaging and transportation solutions.

- Advanced information technology. New information technology has the potential to revolutionize the field of SCM. For example, Procter & Gamble, Wal-Mart and others are introducing radio frequency identification (RFID) tags that pinpoint the locations of products and thus enable real-time, "adaptive" responses to supply or demand fluctuations. Other examples include: Pioneer Hi-Bred International, a DuPont company that markets hybrid seeds and uses a real-time expert system for remote diagnosis of crop diseases; and Nike, which uses an Internet-based information system to monitor market patterns, enabling it to reduce speculative inventories from 30% to 3% of volume.
- **B2B networks**. One of the most important trends in information technology is the growth of B2B (business to business) as well as B2C (business to consumer) Internet links, which enable networks of suppliers and customers to communicate seamlessly across the Internet. According to Forrester Research, despite the bursting of the "dot.com bubble," over 50% of buyers now collaborate with suppliers on the Internet.¹³ One area of opportunity for EHS is extension of the B2B approach to include reverse logistics and management of waste materials. Advanced communication techniques and "material pooling" could give companies much broader access to low-cost sources of recycled materials or components, and to potential market channels for their unwanted byproducts.
- **Supply chain security**. International terrorist activities have raised awareness of the vulnerability

Strategic Sourcing

Integration of EHS considerations into supplier selection, outsourcing, and procurement activities can identify hidden sources of business value and enhance supply chain performance. Examples of opportunities include:

- Reduction of direct procurement costs
- Reduction of indirect or contingent costs
- Improvement in speed and efficiency
- Enhancement of image and relationships
- Improvement in product characteristics

Tools for realizing these benefits are provided in a GEMI report, *New Paths to Business Value: Strategic Sourcing* — *Environment, Health and Safety* (see http://www.gemi.org).

of supply chain networks and supporting infrastructure to major disasters — natural, accidental, and intentional. Many firms have not yet implemented formal supply chain continuity preparedness programs, and only about 61% of US firms have disaster recovery plans.¹⁴ Most of these plans cover data centers, and only an estimated 12% cover total organization recovery. EHS experience in identifying vulnerabilities and developing emergency response plans can be helpful in reducing a company's susceptibility to business interruption. For example, the American Chemistry Council has developed guidance for security management.15 In both supply chain and EHS management, there is a renewed emphasis today on *resilience* — the capability to respond quickly to unforeseen disruptions.16

Implications for EHS Value Creation

The above trends suggest that EHS professionals have the potential to play a unique and largely untapped role in helping to improve SCM performance. Due to a combination of regulatory pressures and stakeholder expectations, EHS performance is becoming a more important driver

¹³B. Temkin, "Building a Collaborative Supply Chain," The ASCET Project, http://temkin.ASCET.com.

¹⁴O. Helferich and R.L. Cook, Securing the Supply Chain, Council of Logistics Management, 2002.

¹⁵ American Chemistry Council, "Implementation Guide for Responsible Care® Security Code of Management Practices," Washington, DC, July 2002.

¹⁶ J.B. Rice and F. Caniato, "Building a Secure and Resilient Supply Network," Supply Chain Management Review, September/October 2003.

of enterprise success. As a result, EHS know-how can be valuable when shared with internal groups as well as customers and suppliers. It is common today for EHS professionals to contribute to cost reduction through regulatory compliance, risk mitigation, and improved efficiency. More recently, leading companies have begun leveraging EHS-related strategic value drivers that contribute to top line growth — this is described further in Section 2.

Supply chain managers are continually searching for new approaches to increasing profitability and efficiency. This report shows that there are significant opportunities for EHS professionals to create business value, in collaboration with other functional managers, by enhancing supply chain performance. Examples of such opportunities relevant to supply chain management include:

- Assuring business continuity by anticipating and preventing potential disruptions such as permitting delays or transportation accidents.
- Improving brand differentiation and customer loyalty by offering unique capabilities to address EHS-related requirements and expectations.
- Enabling access to key markets through ISO 14001 registration or eco-label certification.
- Gaining stakeholder approval by reducing the supply chain environmental footprint.
- Designing innovative system solutions, such as closed-loop material recovery and re-use, through supplier-customer collaboration.

It is imperative that EHS groups reach out beyond traditional boundaries to establish relationships with SCM teams.

These opportunities are illustrated throughout the report by case studies of GEMI member company experiences. To realize the potential business value, it is imperative that EHS groups reach out beyond their traditional boundaries and establish stronger relationships with the cross-functional teams engaged in SCM. This will help to develop

credible business justifications for new initiatives, and to gain top management support.

Shareholder value creation is the ultimate goal of SCM, and this report seeks to demonstrate the business case for EHS engagement in supply chain management, with a focus on business performance. Rather than EHS issues placing constraints upon the supply chain, EHS performance improvements ideally should be natural outcomes of a company's efforts to increase supply chain speed, efficiency, and continuity.

□ What's Next

The balance of this report is organized as follows:

- **Section 2** develops the business case for EHS engagement more explicitly.
- **Section 3** provides a framework for identifying high-value EHS opportunities.
- Section 4 provides a step-by-step methodology for selecting the best opportunities, developing a business justification, and implementing a successful project.
- Section 5 describes methods for collaborating effectively both inside and outside the company.
- **Section 6** summarizes the conclusions.



SECTION 2 BUSINESS CASE FORMULATION

□ Supply Chain Value Drivers

How can value creation be measured? In order to understand the potential contributions of EHS to supply chain performance, it is helpful to use a common financial metric known as "economic value added" (EVA).17 In essence, a firm that is able to generate a flow of profits greater than its cost of capital is adding shareholder value, while a firm whose cost of capital exceeds its profits is destroying shareholder value. EVA can be used as a tool for measuring SCM performance and for developing a business case for SCM improvement projects. While EVA is used widely, the following description also applies to other common financial metrics such as return on investment (ROI) or return on net assets (RONA).

This report focuses on three major shareholder value drivers that represent the tangible outcomes of SCM improvements: **Profitability**, Asset Utilization, and Service Level.

- **Profitability**: After-tax operating profits can be increased through two main pathways: revenue growth and operating cost reduction.
 - Revenue Growth: Companies can increase revenues by growing their existing accounts, attracting new customers, acquiring new businesses, or entering new markets. SCM supports growth by assuring the availability of the right products (or services) in the marketplace, strengthening customer relationships, and identifying innovative solutions to customer needs.
 - Cost Reduction: Companies can reduce operating costs by improving their operating efficiency and reducing the cost of goods sold. SCM supports cost reduction by streamlining operations, reducing overhead expenses, and establishing favorable contracts.

■ **Asset Utilization**: Companies can reduce their total capital requirements by simplifying processes, retiring obsolete equipment, or increasing their production yields. SCM supports improved asset utilization by reconfiguring the supply chain, operating assets more efficiently, avoiding business interruptions, and reducing working capital, including inventory and work-in-process.

Economic Value Added = **After-Tax Operating Profits** minus Cost of Capital

■ **Service Level**: A fundamental measure of supply chain performance is the ability to meet product availability and delivery commitments. Service level is an important driver for customer satisfaction and loyalty, as well as for the ability to grow. One of the greatest challenges to SCM is managing order fulfillment and related processes in a way that balances cost pressures against service expectations.

The above value drivers are consistent with a worldwide Accenture study of how companies derive competitive advantage from their supply chains, which included a survey of 636 companies in 24 global industries.¹⁸ The study found that the most commonly cited operational performance drivers were supply chain cost, speed and efficiency, and service quality. Moreover, a strong correlation was observed between supply chain excellence and growth in shareholder value as measured by market capitalization.

¹⁷The term "economic value added" was first introduced and trademarked by Stern and Stewart. It is defined as the difference between after-tax operating profit and the opportunity cost of capital employed. Similar financial metrics are often designated by other terms such as "shareholder value added." (See http://www.sternstewart.com.)

¹⁸ "A Global Study of Supply Chain Leadership and Its Impact on Business Performance," Accenture, INSEAD, and Stanford University, 2003.

While EVA is strictly a financial metric, there are many intangible factors that are important leading indicators of financial performance but do not appear on financial statements. ¹⁹ For example, companies can reduce their capital costs by reducing the risk perceived by lenders and investment analysts. The following are examples of intangible value drivers that are relevant to SCM:

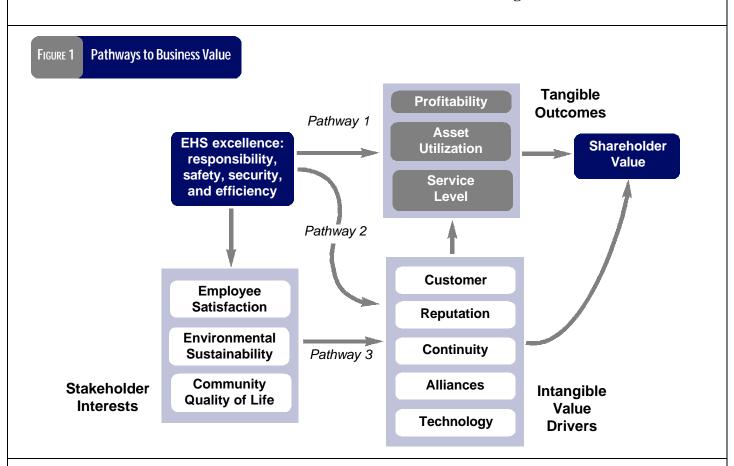
- Customer Relationships: Flexibility, responsiveness, customer satisfaction and loyalty.
- Brand Equity and Reputation: Perceived integrity, social responsibility, and brand image.
- Business Continuity: Stability of operations, ability to minimize interruptions.
- **Alliances**: Formation of partnerships and collaborative agreements.
- **Technology**: Strength of process know-how and key technical capabilities.

The Accenture study referenced previously confirms the importance of these types of intangibles, and predicts that future supply chain strategies will emphasize leadership in collaboration and use of technology.

□ The EHS Value Proposition

The SCM value drivers above provide a context for describing concretely how EHS capabilities can add value. The business case for EHS engagement rests upon the ability of EHS professionals to enhance supply chain capabilities and performance. Figure 1 depicts three main pathways for EHS contributions to SCM value creation:²⁰

Pathway 1. Tangible: EHS capabilities often contribute directly to financial performance; for example, by generating revenues from waste materials or reducing the costs of site remedia-



¹⁹ J. Low, and P.C. Kalafut, *Invisible Advantage: How Intangibles Are Driving Business Performance*, Cambridge: Perseus Books, 2002

²⁰ This analysis of pathways to value is based on J. Fiksel, "Revealing the Value of Sustainable Development," *Corporate Strategy Today*, Issue VII/VIII, 2003

tion. In addition, EHS makes the following important indirect contributions:

- **Profitability**: Enabling revenue growth by supporting expansion into new markets; reducing costs by helping to increase efficiency and minimize hidden EHS-related expenditures (see Motorola case study on page 9).
- **Asset Utilization**: Conserving capital by helping to prolong asset life, recover and re-use assets, minimize waste and obsolescence, and reduce downtime due to unplanned incidents.
- **Service Level**: Satisfying customers by providing timely information and technical assistance, reducing cost of ownership, and avoiding interruptions in order fulfillment.

Pathway 2. Direct, intangible: EHS capabilities contribute directly to improvements in key intangible value drivers that influence shareholder value (see box).

- Customer Relationships: Supporting customers in the safe and effective use of products; helping to improve the quality of products and services by addressing EHSrelated needs of customers.
- **Brand Equity and Reputation**: Establishing an image of corporate responsibility, integrity, and transparency, which increases the trust and satisfaction of both employees and external stakeholders.
- Business Continuity: Decreasing risks of business interruption by helping to monitor suppliers, assuring product and process safety, intervening rapidly and effectively when incidents do occur, and maintaining the company's license to operate.
- Alliances: Helping to establish mutually beneficial supply chain partnerships, and engaging with external stakeholders that may have concerns about the impacts of supply chain operations.
- **Technology**: Incorporating EHS skills and specialized knowledge into SCM technologies and business processes, e.g., reverse logistics.

Pathway 3. Indirect, intangible: EHS capabilities further enhance intangible value drivers by creating value for external stakeholders.

Linking EHS to Shareholder Value

EHS practices are known to contribute to the bottom line through reduced operating costs, insurance premiums, and capital costs. However, EHS excellence also contributes to shareholder value in a broader and more strategic way — by building critical intangible assets such as:

- Customer relationships
- Product and service innovation
- Leadership and strategy
- Brand equity and reputation
- Transparency and trust
- Risk and opportunity management
- Alliances and networks
- Technology and business processes
- Human capital and talent retention

These EHS-related value drivers are described in a GEMI report, *Clear Advantage: Building Shareholder Value — Environment Value to the Investor*, which supports investor relations (see http://www.gemi.org).

Commitment to environmental and social responsibility implies responsiveness to the needs of society, including employees, communities, public interest groups, and regulatory agencies. Because a company's supply chain extends outward beyond the company boundaries, both organizationally and geographically, it is critical that supply chain managers understand the needs and expectations of the many stakeholders that are affected by their operations.

Improving EHS performance, and thus creating value for society, indirectly benefits shareholders. The perceptions of key stakeholders influence many of the above intangible value drivers, including **Customer**

Relationships, Brand Equity and Reputation, Business Continuity, and Alliances.

Companies often choose to address those stakeholder issues that are aligned with their own interests and core competencies. For example, FedEx Express collaborated with the 100% Recycled Paperboard Alliance in the conversion of its overnight envelopes to 100% recycled materials (see page 20).

CASE STUDY of Creating EHS Value: Motorola's Inbound Discrepancy Reporting System

Motorola, a global leader in integrated communications and embedded electronics solutions, prides itself on excellence in EHS. In one Six Sigma project, that commitment to excellence transcended traditional EHS boundaries, as an initial EHS-led effort to reduce pallet-related injuries evolved into a major initiative yielding significant supply chain and customer service benefits.

Motorola's cross-functional team, comprised of EHS, Logistics, Quality, Finance, Packaging, and Sourcing representatives, developed a comprehensive approach that standardizes packaging and pallets; dramatically reduces the pallets handled, stored and disposed; maximizes the packaging density to reduce transportation costs; and addresses associated injury costs and occurrences. This project has already yielded over \$1 million in cost reduction, and is expected to save over \$5 million in 2004.

Critical to realization of these benefits is the compliance of Motorola's suppliers with new guidelines and specifications for all inbound shipments. To insure that compliance, the Motorola cross-functional team developed a customized Inbound Discrepancy Report (IDR) system. IDR is the key vehicle that Motorola is using to track supplier compliance, update supplier scorecard performance, and quantify the cost of noncompliance for potential recovery of costs due to supplier defects. IDR users at Motorola's distribution centers record all inbound discrepancies at the receiving dock, using simple keystroke entries,



scanning, and digital imaging. The IDR system is linked to several other enterprise systems (purchasing, inventory, order entry, etc.) to provide access to detailed vendor, shipments, purchase order, and stocking information.

This robust information system is providing significant and valuable "real time" information to both Motorola management and vendors that are linked on-line through the purchasing system. Automated Pareto reports can be viewed online or selectively emailed to focus on the vital few suppliers or defects that have the greatest impact upon distribution center operations. The IDR system uses discrepancy data to influence the supplier scorecard performance ratings, and automatically generates detailed cost breakdowns for use in supplier negotiations.

The IDR project has achieved significant, tangible results in the first two years, 2002-2003:

- 58% reduction in pallet-related injuries, saving \$400,000 in avoided Workmen's Compensation cost
- 12% reduction in discarded pallets, which equates to \$120,000 of cost avoidance in pallet purchases
- \$400,000 savings in reduced transportation expenses
- \$100,000 savings in reduced handling and storage of pallets
- 16% improvement in recycling rate of non-hazardous wastes.

As the global adoption of the IDR system continues at all Motorola distribution centers, cost savings and improved EHS performance are expected to increase exponentially. In April of 2004, the project received a Motorola CEO award for developing the IDR as a permanent institutionalized tool that drives not only EHS savings but also improvement in multiple Supply Chain organizations.

□ Reciprocal Value Creation

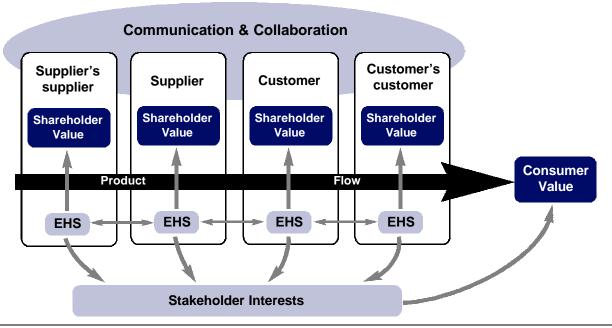
The emphasis of the EHS value proposition described earlier was on creating value for company shareholders. Because successful supply chains are based on mutually beneficial relationships between suppliers and customers, it is important to extend the scope of EHS value creation to other members of the company's supply chain. Embedding EHS expertise into the Customer Relationship Management and Supplier Relationship Management processes will benefit companies in several ways (see Figure 2).

- By sharing intelligence and know-how about EHS regulatory issues and emerging technologies, suppliers and customers can strengthen each other's performance.
- By incorporating EHS advantages into their products and services, e.g., reducing the customer's cost of ownership, suppliers can enhance differentiation and customer loyalty.
- By collaborating, customer-supplier teams can address EHS-related technical challenges that

affect the profitability and performance of the overall supply chain. For example, Intel has worked closely with its customers to develop efficient, low-cost packaging solutions (see case study on page 23).

In order to reinforce this type of reciprocal value creation, it is important that suppliers and customers be able to recognize and quantify each other's value contributions. Unfortunately, most existing supply chain management performance metrics (e.g., inventory turns) are internally focused, and do not take into account the interests of other supply chain participants. One possible improvement would be for suppliers and customers to share appropriate financial information, and align their SCM efforts in a way that improves profitability for both parties.21 An example is the "shared savings" approach, in which suppliers can benefit from reduced consumption that lowers overall supply chain costs and environmental impacts.²² The characteristics of mutually beneficial partnerships are explored further in Section 5.

FIGURE 2 Reciprocal Value Flow in a Supply Chain



²¹ D. Lambert and T.L. Pohlen, "Supply Chain Metrics," *The International Journal of Logistics Management*, Vol. 12, No. 1 (2001), pp. 1-19. (See http://www.ijlm.org.)

²² C.J. Corbett and G.A. DeCroix, "Shared-Savings Contracts for Indirect Materials in Supply Chains: Channel Profits and Environmental Impacts," *Management Science*, Vol. 47, No. 7 (2001), pp. 881-893.

☐ Overcoming Barriers to EHS Engagement

Proponents of EHS value creation opportunities will need to recognize and overcome the cultural and institutional barriers that exist in many corporations. The traditional responsibility of EHS groups has been liability avoidance through regulatory compliance and risk management. Therefore, EHS is generally seen as a necessary cost of doing business. Even among companies that are viewed as leaders in EHS and sustainability, it is common for employees, including EHS and SCM professionals, to retain these traditional perceptions. One study of supply chain environmental practices cited the following barriers to EHS value creation opportunities:²³

- Lack of resources or accountability for investigating innovative opportunities
- Limited capacity in EHS and sustainability capabilities due to personnel cutbacks
- Complexity of SCM practices that differ by region, business unit, and customer segment
- Fragmented supply chains characteristic of many global industries
- Lack of experience with partnership-based strategies and management practices
- Business opportunities seen through the lens of existing products, processes, and customers
- Fluctuating business conditions that lead to emphasis on short-term performance improvement.

The above types of barriers can be overcome if a change initiative is armed with a strong business justification and supported by effective internal collaboration. A common weakness of EHS initiatives is the lack of a clear business value proposition. Merely invoking the principle of "doing the right thing" does not provide sufficient business logic for making decisions that involve value trade-offs.

EHS value creation initiatives should focus on how EHS can contribute to shareholder value, rather than on how supply chain improvements can help to meet EHS goals. In many cases, benefits to society and the environment, such as pollution prevention, can be natural outcomes of efforts to improve the productivity of supply chain business processes. Inevitably, there will also be cases that require trade-offs between financial objectives and strategic objectives such as continuity and customer satisfaction. EHS factors typically need to be considered on both sides of the equation.

Benefits to society and the environment can be natural outcomes of efforts to improve supply chain productivity.

Even projects that have both business and EHS merits will need to compete for investment dollars. As a rule, limitations on resources will force companies to favor projects with a significant, plausible return on investment. To gain acceptance from supply chain executives, the business case for EHS value creation needs to be articulated clearly. As demonstrated by the Motorola case study (page 9) and numerous other examples from GEMI member companies, institutional barriers can be overcome through effective cross-functional teamwork with a consistent focus on business value.

■ What's Next

The balance of this report is organized as follows:

- Section 3 provides a framework for identifying high-value EHS opportunities.
- **Section 4** provides a step-by-step methodology for selecting the best opportunities, developing a business case, and implementing a successful project.
- **Section 5** describes methods for collaborating effectively both inside and outside the company.
- **Section 6** summarizes the conclusions.

²³ "Creating Value Through Strategic Supply Chain Partnerships," Natural Logic, Inc., 2003, http://www.natlogic.com.



SECTION 3 OPPORTUNITY IDENTIFICATION

The EHS function has gradually expanded its scope of activities to better support enterprisewide business processes. The traditional role of EHS has been to assure regulatory compliance and avoid liabilities, and even today this remains the dominant perception of EHS responsibilities. However, progressive organizations both in the U.S. and around the globe have found that EHS excellence can be leveraged to create business value in many ways. Table 1 summarizes both traditional and recently

emerging EHS contributions that benefit supply chain performance. Additional descriptions and case studies of these EHS contributions are provided on pages 16 through 29.

The following pages provide guidance for focusing on the particular types of EHS contributions that will be most valuable for a specific company. This information is also available in the form of an interactive tool on GEMI's web site, at http://www.gemi.org/supplychain.

TABLE 1

How EHS Contributes to Supply Chain Performance

Key EHS Contributions

■ **Assure compliance** of products and business processes with laws, applicable regulations, and industry standards (see p. 16)

- **Minimize risks** and maintain business continuity by assuring process safety and practicing product stewardship (see p. 17)
- Maintain health, both for employees and local communities, through industrial hygiene and facility management (see p. 19)
- **Protect environment**, including public health and natural resources, through pollution prevention and ecological stewardship (see p. 20)

■ Raise productivity of business processes through material conservation, energy efficiency, and conversion of wastes into byproducts (see p. 21)

- **Enhance relations** with customers, suppliers, and other external stakeholders that influence the company's license to operate (see p. 23)
- **Support innovation** in products, services, and process technologies that enhance financial performance or customer satisfaction (see p. 25)
- **Enable growth**, including acquisition and sales expansion, by performing due diligence and supporting access to new markets (see p. 28)

Potential Supply Chain Benefits

- Avoid unplanned costs
- Reduce potential liabilities
- Avoid delays and downtime
- Improve asset utilization
- Improve asset security and personnel safety
- Improve employee satisfaction and productivity
- Enhance relationships with key external stakeholders
- Strengthen license to operate
- Enhance public image
- Reduce operating costs
- Reduce inventory requirements
- Reduce resource requirements
- Improve customer satisfaction
- Enhance strategic supply chain alliances and relationships
- Improve competitive position due to proprietary technology
- Strengthen value proposition for marketing and sales
- Enable competitive entry into global markets

Traditional: Cost Avoidance Emerging: Value Creation

□ Finding High-Value Opportunities for Your Supply Chain

The range of opportunities suggested in Table 1 is very broad. Every company has unique supply chain characteristics, so that there are no clear-cut rules for identifying the highest-value opportunities. However, there are some useful guidelines that managers can follow in order to focus on the particular types of EHS initiatives that are likely to be most promising for their companies.

Table 2 on the following two pages provides a simple **Diagnostic Tool** to help you identify potential high-value opportunities for EHS value creation across all of your supply chain business processes. The tool, depicted in Figure 3, consists of a series of questions organized into four major "blocks" that characterize your *industry*, your *market*, your *processes*, and your

stakeholders. Each question will lead you to one of the eight specific opportunity areas defined in Table 1 (**EHS Contributions**) that may be worth exploring further. These eight areas are described on pages 16 to 28, and are demonstrated by company case studies.

This diagnostic tool represents one method of identifying opportunities, but there are other methods available. Section 4 describes some of these other methods, and provides more detailed guidance in the form of a step-by-step Value Creation Methodology for selecting and implementing the highest-value EHS-related opportunities.

NOTE: You can also access an interactive, Web-based version of **Forging New Links** that includes the Diagnostic Tool, EHS Contributions, and Value Creation Methodology at http://www.gemi.org/supplychain.

Diagnostic Tool for Opportunity Identification FIGURE 3 **EHS Contributions** Diagnostic Questions **Raise Productivity Your Industry Emerging: Enhance Relations** Value Your Market Creation **Support Innovation Your Processes Enable Growth** Your Stakeholders **Assure Compliance Minimize Risks Traditional: Maintain Health** Cost **Avoidance Protect Environment**

Guide to Selecting Business-Specific Opportunities

Your Industry

Does this statement fit your business?	If so, consider these opportunities	pages
We provide services (e.g., energy, communication, waste management) to industrial customers.	Enhance customer appeal by developing EHS solutions that lower their costs	23
We provide services to retail customers.	Collaborate with suppliers to improve EHS performance of supply chain operations	21
We extract and process raw materials.	Seek affordable options for energy and materials derived from renewable sources	20
We convert raw materials into commodities (e.g., energy or industrial feedstocks).	Build customer loyalty by sharing EHS regulatory and technical expertise	23
We manufacture specialty materials or packaging.	Differentiate your products in terms of their superior EHS characteristics	28
We manufacture components for durable goods.	Work with customers to design technologies that reduce the supply chain footprint	25
We manufacture and sell retail durable goods.	Design EHS-enhanced product attributes to support brand differentiation	25
We manufacture and sell retail consumable goods.	Apply risk management to protect human health and safety and supply chain security	17

Your Market

Does this statement fit your business?	If so, consider these opportunities	pages
We have a small number of dominant customers.	Include the EHS function in cross-functional customer account management teams	23
We view customer acquisition and retention as critical issues.	Strengthen sales and customer retention by supporting compliance with EHS requirements	16
We tend to customize our products and services.	Incorporate customized EHS technical support into the product or service offering	25
We perform a great deal of customer service and support.	Offer EHS expertise to customers as a value- added complement to products or services	23
We have tight product delivery requirements.	Work with suppliers and customers to expedite and streamline order fulfillment processes	21
We have short product life cycles.	Develop product innovations that enable value recovery and reduce cost of ownership	25
We have a high cost of product development.	Include early anticipation of EHS requirements in product development and commercialization	25
We need to manage a large flow of product returns.	Develop cost-effective capabilities for returns management, including re-use or recycling	21

Guide to Selecting Business-Specific Opportunities (continued)

Your Processes

Does this statement fit your business?	If so, consider these opportunities	pages
We procure inputs from numerous suppliers.	Incorporate EHS review into supplier selection and performance monitoring	19
We procure inputs from a few key suppliers.	Collaborate with key suppliers to reduce the footprint of products or services	20
We outsource many of our supply chain operations.	Provide technical support and auditing to assure compliance and best practices	16
We handle hazardous or controlled substances.	Conduct exposure and risk assessment to identify cost-effective risk mitigation options	17
We generate significant industrial waste streams.	Evaluate technical options to reduce, re-use, or recycle wastes into beneficial by-products	20
We have a relatively high cost of materials.	Explore strategies for reducing material intensity of products and services	25
We carry a relatively high level of inventory.	Identify hidden and indirect EHS costs to be included in inventory carrying costs	21
We have a relatively high cost of transportation.	Develop innovative methods for reducing fuel use, transport volume, or fleet size	21

Your Stakeholders

Does this statement fit your business?	If so, consider these opportunities	pages
We have numerous facilities in populated areas.	Engage in dialogue and voluntary initiatives with local community organizations	23
We are heavily regulated by multiple agencies.	Integrate and streamline enterprise-wide regulatory compliance processes	16
We operate our business(es) globally.	Leverage superior EHS and social performance to penetrate global markets	28
We rely upon alliances to be competitive.	Collaborate with business partners to improve supply chain EHS performance	21
We need to protect our brand image and reputation.	Report to key stakeholders on EHS and sustainability performance improvements	23
We need to retain our highly skilled employees.	Promote progressive EHS practices and employee well being at company facilities	19
We need to assure correct handling of our products.	Communicate pro-actively with downstream customers regarding safe product use	17
We are frequently challenged by advocacy groups.	Undertake collaborative initiatives to promote ecological and social well-being	20

Assuring Compliance

Compliance with laws and regulations is often taken for granted and only attracts attention when a company is penalized for inadvertent violations. Yet a lapse in compliance has the potential to cause significant disruptions in supply chain continuity. For example, in November 2001 Dutch officials banned the sale of Sony's PlayStation® PS one™ console because the cadmium content in the accessory cables exceeded allowable limits. As a consequence, Sony's lost sales and rework costs totaled about \$150 million.²⁴ With the increasing complexity of sourcing practices, the maze of regulatory issues at the state, Federal, and international level can be bewildering. Compliance issues that influence supply chain performance include:

 Product-related issues such as consumer safety, product constituents, and labeling

- Process-related issues such as operating permits, emission regulations, and process safety
- Logistics-related issues such as import-export and hazardous material transport requirements
- Adherence to non-governmental standards such as ISO 9000 for quality management and ISO 14000 for environmental management, which are favored by some industrial customers.

EHS professionals can help to reduce the cost and effort associated with compliance by integrating and streamlining the required reporting, documentation, and monitoring procedures. Using environmental management systems (see Appendix A), they can systematize these procedures so that operations personnel can be trained to carry them out routinely. Moreover, by studying emerging regulatory issues and positioning the company to meet them rapidly and efficiently, the EHS group can create lasting competitive advantage.

CASE STUDY: Pfizer Standard for Contract Manufacturing and Research

Pfizer, the world's largest pharmaceutical company, outsources a portion of its manufacturing and research activities, including active pharmaceutical ingredients, drug products, and packaging. To assure its revenue stream, guard against liabilities, and protect its brands, Pfizer emphasizes close monitoring of its Contract Manufacturers and Researchers (CMRs).

Since the mid-1990's, Pfizer has had a company standard for managing its worldwide outsourcing partners, and since 1998 has systematically conducted EHS reviews of these partners to assure that they are managing the EHS aspects of their business. The experience gained from over 100 on-site reviews has been codified into a new internal performance standard, which was released in 2001. Its objective is to safeguard against undesirable consequences resulting from unacceptable EHS performance at Pfizer's CMRs.

Pfizer's performance standard requires each operating group to:

- Determine whether a new CMR is acceptable before deciding to use it
- Assure that CMRs receive all relevant EHS information on its proprietary compounds and technology and update it as warranted so that they can manage EHS risks effectively
- Devote resources to conducting periodic EHS reviews of all CMRs
- Develop and implement a management system for EHS relationships with CMRs.

CMR reviews are conducted by the operating group EHS Staff, collaborating with facility and in-country colleagues. Issues covered as part of these reviews include:

- Adequacy of permits to operate
- Site conditions that may reflect environmental sensitivity
- Emissions and waste management and pollution prevention capabilities
- Occupational health and safety procedures, including process safety
- Financial resources for EHS management

²⁴ Source: Reuters.

CASE STUDY: Pfizer Standard for Contract Manufacturing (continued)



- Existing or potential EHS-related liabilities
- Regulatory compliance status, including violations.

These EHS reviews are conducted before contract manufacturing begins and at least once every four years thereafter. Review results fall into three categories: approved, approved with qualifications, or not approved. If not approved, the contract manufacturer is not used. If approved with qualifications, Pfizer follows up to assure key action items are completed.

In addition to addressing fundamental EHS requirements, Pfizer's on-site visits to CMRs often result in constructive suggestions regarding advanced EHS practices and opportunities for improving their cost-effectiveness. In India, for example, Pfizer collaborated with 3M and a local consultant to conduct a training workshop for Contract Manufacturers on the subject of workplace hazards.

Rather than merely policing its business partners, Pfizer hopes to stimulate EHS performance improvement. Pfizer has joined with several other companies, the U.S. Environmental Protection Agency, and the National Institute of Standards and Technology to form a pharmaceutical industry Green Suppliers Network. This collaborative venture plans to work with all levels of the manufacturing supply chain to achieve environmental and economic benefits, including improved products and processes, increased energy efficiency, cost savings, and waste elimination.

□ Minimizing Risks

Supply chain continuity is essential for sustained profitability. As supply chain networks grow more complex and sophisticated, they are increasingly vulnerable to a variety of uncertain factors that could interrupt the flow of goods or information, impose significant cost burdens, threaten personnel safety, generate negative publicity, or potentially damage key relationships. Examples of such risks include:

- Shortages of raw material supplies or natural resources (e.g., water)
- Interruptions in incoming deliveries due to supplier compliance or performance problems
- Loss of continuity in manufacturing or distribution due to spills or releases of hazardous materials
- Failures of critical equipment, including communication or data management systems
- Deliberate vandalism or sabotage.

Risk management has evolved from the traditional, passive approach of purchasing insurance to a more active, rigorous, and anticipatory approach. This involves several interrelated processes:

Risk identification and prioritization:Anticipating the most significant threats or

hazards, and screening their potential *likelihood* (or frequency) and *magnitude* (or severity)

- Risk assessment and option analysis:
 Quantifying the potential human, environmental, and financial consequences and evaluating alternative control measures for cost-effectiveness
- *Risk mitigation and monitoring:* Striving to reduce or eliminate risks through disciplined implementation of safety and security procedures, and measuring performance.

Effective risk management requires close collaboration between EHS and operations, engineering, and logistics groups. For example, periodic audits of plants and distribution centers, including outsourced operations, can help to assure operational integrity. Emergency planning and response capabilities are also important for minimizing the impact of unexpected events. Moreover, risks associated with the full product life cycle, including product distribution, use, and disposal can be reduced through "product stewardship" — communicating with customers and other supply chain participants regarding potential hazards and preventive practices.

CASE STUDY: Dow Chemical—Behavior-Based Safety in Chemical Transport

Both in Europe and the U.S., the chemical industry considers safe transportation of its products as an integral part of the Responsible Care® initiative (see Appendix A), and strives for continuous improvement of safety performance. Increasing volume and work pressures have been imposing greater stresses on drivers of heavy goods vehicles. In an effort to further reduce the incidence of chemical transport highway accidents, a Behavior-Based Safety (BBS) program was launched by a group of industry associations — the European Chemical Industry Council (CEFIC), the European Chemical Transport Association (ECTA), and the European Petrochemical Association (EPCA). Two GEMI members, Dow Chemical and DuPont, were among



the participating companies. Dow Chemical introduced the BBS program in North America and subsequently has extended it to Europe, Latin America, and the Pacific. BBS is being systematically applied to each transportation mode, and Dow Chemical is measuring the results of implementation by its carriers.

BBS principles offer a proven, effective approach for influencing the behavior of drivers through observation, coaching and communication. To encourage consistent implementation of BBS in Europe, a joint working group with representatives from chemical and transport companies reviewed existing European programs and developed a set of best practice BBS Guidelines (available at http://www.cefic.org/Files/Publications/55908_Guidelines21102003.pdf). These Guidelines outline how to improve transportation safety performance, and also demonstrate that safety and economic interests go hand in hand for all parties involved. For example, safety improvement has a positive effect on fuel consumption and other related costs such as maintenance costs and insurance premiums. The results of a pilot project at a Dutch transport company showed a decrease in fuel consumption of 4 to 8%, a decrease in accidents of more than 40%, and an annual net saving of approximately \$1000 U.S. per driver.

The recommended process for a carrier to implement BBS involves the following steps:

- 1. Company management develops a BBS implementation plan and training program based on best practices.
- 2. BBS trainers are recruited internally or externally (e.g., from a training institute) and provided with instructional training.
- 3. BBS trainers provide individual training to drivers, including on-the-road observation and coaching.
- 4. BBS trainers produce an assessment report for each trained driver, which is stored in a database.
- 5. The drivers have access to a copy of their assessment report.
- 6. The company tracks performance indicators such as incident/accident statistics, fuel consumption, maintenance costs, insurance premiums, and fines.
- 7. Management analyzes the results and determines further steps toward continuous improvement.
- 8. The BBS implementation is verified during a tri-annual safety and quality assessment of the carrier.

The program requires active participation by various functions, including transportation planners, dispatchers, trainers, and drivers. For example, dispatchers need to avoid extended working hours, rush-orders, delayed or late instructions, and unrealistic delivery times. Therefore, successful implementation of BBS requires a top-down management commitment, and full integration into the carrier's culture, organization, and management systems.

□ Maintaining Human Health and Safety

Supply chain speed and efficiency depend upon the smooth operation of a variety of facilities, from major manufacturing centers to distribution depots. Human health, safety, and satisfaction are important intangible value drivers in SCM. A healthy and productive workforce increases the quality of products and services, while a thriving community provides the "social capital" to support facility operations. An increasing number of companies have outsourced parts of their logistics and manufacturing, so that they no longer own and operate all supply chain facilities. Nevertheless, the viability of the supply chain may be influenced by the EHS and labor practices of suppliers or contractors. Providing adequate care for employees and neighboring communities may involve activities beyond compliance, such as:

 Promoting employee well being, including health and safety, ergonomics, indoor air

- quality, lighting and climate control, as well as overall benefits and work-life balance. These factors contribute to employee satisfaction, pride, productivity, and retention, as well as recruitment of new talent
- Monitoring of health and safety practices through periodic auditing of company-owned sites, as well as technical support and auditing of outsourced operations to assure compliance and best practices
- Incorporating EHS criteria into supplier selection and performance monitoring, in order to assure that the supplier practices conform to the company's own EHS policies and values
- Promoting supplier diversity, as does Bristol-Myers Squibb (see http://unitedinpurpose.com)
- Engaging in dialogue and voluntary initiatives with local governments and community organizations; examples include helping to organize community events and convening community advisory panels.

CASE STUDY: Abbott Laboratories Contractor Safety Management

Abbott Laboratories has for many years utilized comprehensive, highly interactive contractor safety programs to assure the best possible safety performance. But to be most successful, safety

elements need to be fully integrated into business management systems. Therefore, when Abbott's corporate engineering division began work on its new electronic contract management system several years ago, EHS professionals were part of the team from the very earliest stages of development.

The Engineering Tool for Communication (ETC) was designed to automate and simplify contractor management — including selection, contracting, invoicing, project tracking, and performance reporting. Its develop-



ment was championed and coordinated by the engineering division's contract administration group, which established a multi-divisional Engineering Review Team to approve and support every element of ETC; including the embedded elements of the contractor safety program. Integrated into the ETC system are all key aspects of the contractor safety program, including policies, procedures, and training. Abbott engineers can access and edit safety-related pre-qualification requirements, contractor meeting records, EHS incident reports, and contractor performance reviews. Contractors must maintain positive safety performance to remain on Abbott's preferred list and retain access to the paperless ETC system.

ETC was implemented at Abbott's Lake County, Illinois operations — where the number of on-site contractor employees averages greater than 700 each day and where each year over 2,500 contractor employees attend the Abbott-required Safety Orientation. These operations have seen significant improvement in contractor safety performance in the past several years, with both Lost Time Accidents and Total Recordable Incident Rates falling well below industry averages.

□ Protecting the Environment

At a minimum, environmental protection involves complying with regulations that govern emissions and waste management at supply chain facilities. However, the environmental policies of most companies extend beyond compliance, reflecting an ongoing commitment to corporate citizenship and environmental stewardship. Sometimes this involves incremental expenditures (e.g., land restoration), but in many cases reducing pollution also improves operating efficiency and reduces costs. Moreover, EHS programs create value by improving employee satisfaction and community relationships (see page 8). Approaches for reducing the environmental footprint of supply chain operations include the following:

 Undertaking voluntary initiatives to improve local natural habitats and quality of life

- Working with suppliers to reduce mass throughput and increase recycled content (see page 21)
- Seeking affordable options to purchase energy and materials derived from renewable sources
- Developing environmentally sensitive technologies, products, and services (see page 25)
- Developing cost-effective capabilities for returns management, including re-use or recycling.

EHS-related policy trends in Europe, Asia, and other regions of the world have helped to stimulate interest in environmentally friendly supply chain management. For example, the European Union issued a series of directives prescribing manufacturer responsibility for take-back of packaging and obsolete products, limits on greenhouse gas emissions, and design of electrical and electronic products.

CASE STUDY: Creating Environmental Value at FedEx Express

FedEx Express, the global express delivery firm, has been a leader in minimizing the environmental impact of its packaging. In 1998, led by the Director of Global Brand Marketing, FedEx decided to convert its signature paperboard letter to a more environmentally preferable package. A Corporate Packaging Team was formed, including packaging engineers, marketing personnel, procurement staff, and representatives from operations, with the EHS department serving as an advisor.



The team fully embraced the idea of improving the environmental aspects of FedEx packaging. Their first goal was: Transform overnight letter packaging from nearly 100% virgin bleached fiber to 100% recycled in one year. This was to be accomplished with no adverse impact on customer satisfaction and tight control over costs.

The team worked with their existing supplier to develop the recycled packaging, which involved an arduous process of material selection, production design, and performance testing. In

November 1999, FedEx released new packaging made of 100% recycled whiteboard, 35% of which was post-consumer content. To better distinguish the new packaging, the name was changed from the FedEx Letter to the FedEx Envelope and FedEx obtained agreement with the 100% Recycled Paperboard Alliance to display a "100% Recycled Paperboard" icon.

The FedEx Envelope has a slightly different appearance — the unbleached exterior is not as bright and the interior is brown paperboard. FedEx used customer focus groups to ensure that there would be no degradation to either the FedEx image or the perception of quality in packaging and service. FedEx believes that its environmental initiatives are an important factor in sustaining its leadership position. However, because FedEx provides over 300 million envelopes each year to its customers free of charge, any packaging cost increase must be scrutinized. Over several years FedEx has worked with its suppliers to refine the production process and reduce the unit cost back to its original level.

Raising Supply Chain Productivity

Supply chain productivity is determined by the total resources — including labor, materials, and capital — that are required to support the target customer service level. Thus, productivity is a driver of both operating cost and asset utilization. Although EHS compliance is sometimes viewed as a burden or a cost of doing business, it has been shown repeatedly that EHS excellence can contribute directly to productivity and profitability. Many leading companies have encouraged collaboration between EHS and other functions to improve their overall business processes. The following are examples of how companies can leverage their EHS knowledge to raise productivity in the supply chain.

- Working with suppliers and customer service teams to expedite and streamline order fulfillment processes, e.g., developing innovative methods for energy use reduction and container recycling
- Identifying EHS factors related to incentives or market forces that may skew demand patterns

- Developing cost-effective capabilities for asset recovery, refurbishment, or recycling, including returns management and take-back of obsolete products at end of life (see p. 25)
- Seeking cost-effective options for utilizing recycled or refurbished materials and components, and for reducing the material and energy intensity of products and services (see p. 25)
- Identifying hidden and indirect EHS costs, e.g., specialized training or hazardous material handling, which should be included in inventory carrying costs (see Appendix A, Full cost accounting)
- Establishing operational discipline through management systems that encourage process improvement and documentation, in accordance with both the ISO 9000 and 14000 standards.

Participation of EHS in these activities depends on cross-functional teamwork within the company and on effective collaboration with supply chain partners.

CASE STUDY: Reel-Less Cable Packaging at Duke Power (a division of Duke Energy)

Historically, electric utilities have stored and transported power cables on large wooden reels to facilitate cable handling and prevent damage. In 2000, Duke Power, in an alliance with their cable supplier, Southwire, launched an innovative initiative to reduce supply chain costs and waste through the use of reel-less cable packaging for underground service cables. Elimination of reels turned out to be a technical and logistical challenge, but an innovative reel-less packaging approach was devised that resulted in immediate annual savings of over \$650,000 in purchased materials and expenses, as well as additional savings through transportation efficiency. Southwire invested in the new plant equipment necessary to manufacture the cable, and Duke Power agreed to share cost savings with Southwire up to a specified amount. In addition, the reduced demand for wood preserves 135 acres of forest per year.

The investigation of reel-less packaging was initiated by a team of personnel from Southwire and Duke Power purchasing, engineering, and EHS. They undertook a series of field trials to test and refine the new processes and equipment, and to verify that no cable damage would occur. During these trials, the team overcame numerous technical obstacles, including the following achievements:

■ A technology had to be developed to hold coils of cable and facilitate handling without damaging the cable. The team decided to utilize tubular steel stems and selected a manufacturer of industrial equipment to produce the units. Initially, the team thought that stems would be required for storage of coils. However, during field trials it was determined that coils could be stored and handled without damage, so that stems were only needed for coils placed onto construction vehicles. This was made possible through the use of discarded coal conveyor belts from generating plants, which provide a smooth surface to store coils of cable without damage.

CASE STUDY: Reel-Less Cable Packaging at Duke Power (continued)

- Payoff equipment for line construction vehicles had to be developed. After evaluating several designs, the team selected an industrial version of a common lazy-susan that included a brake, truck mounting provisions, and a cable payoff arm. It was originally thought that every construction vehicle would need up to three payoff devices. However, the field trials revealed that any vehicle with lifting equipment, such as a trencher or a trackhoe, could lift the stems containing coils of cable with a swivel in order to pay-off the cable. That reduced the required lazy-susans from more than 400 to less than 10, avoiding an expense of over \$320,000.
- A new packaging system for coils had to be developed. Initially, coils were wrapped with cardboard on both the outer and inner surfaces, and the entire outside of the coil was then covered with many layers of shrink-wrap. This approach was later replaced with a single wrap of heavy plastic that is recyclable but sturdy enough to be re-used repeatedly in a closed-loop fashion. Thus, the discarded plastic wrap is returned to Southwire and placed on new coils that are delivered to Duke Power.
- Cable handling techniques had to be developed to prevent damage to the cable. This involved shipping, storing, mounting coils on stems, field construction site delivery, and picking up fallen coils. Supply chain personnel at Duke Power developed a cable handling training program and presented it to warehouse personnel, contractors, and trucking companies.

In mid-2002, based on the success of the field trials, reel-less cable packaging for underground service cables was fully adopted.

Business Case Summary

Cost Savings:

- Annualized savings due to the elimination of wood reels on the Duke Power system are estimated at \$500,000 per year.
- Easier handling of short cable lengths results in reduced cable waste of over \$140,000 per year.
- Tipping charges for wood disposal at landfills are reduced by \$10,000 per year. Also, labor to dispose of the unusable reels has been eliminated.
- Shipping charges are reduced because an additional 9,000 pounds of cable can now be placed on a delivery truck this was the weight of the wooden reels.
- Field trials showed no additional labor is required to handle and store reel-less packages.

Environmental Benefits:

- Reduced demand for wood is equivalent to 135 acres of forest each year.
- Wood waste delivered to landfills is reduced by 660 tons per year.
- Protective wrap over the cable is recycled and re-used.
- Worn conveyor belt material that would normally be landfilled is used for storing coils.

In summary, the reel-less packaging project has met or exceeded the requirements of the customer, industry, shareholder, regulator, public, and landowner. This was accomplished through significant cost reductions and reductions in waste without sacrificing reliability, safety, productivity, or efficiency. Until now, most utilities did not believe that reel-less cable could be used without incurring excessive cable damage, but by working together Duke Power and Southwire proved that damage could be prevented. Innovative thinking enabled them to move beyond existing standards and develop an environmentally benign technology that many other utilities are likely to adopt in the future.



CASE STUDY: Packaging Innovation at Intel Corporation

Intel Corporation, the world's largest chipmaker, has a proud history of technological innovation, resulting in quantum improvements in both its products and supply chain network. Intel strives to be a leader in EHS performance and product stewardship, and is constantly exploring options to reduce the mass throughput of its supply chain operations. For every high-tech product that leaves Intel, equally high-tech packaging designs and materials must be developed to protect



the product. In 2001, Intel engineers discovered a way to reduce by 58% the weight of the trays used to transport microprocessors by switching from injection-molded plastic to thermoformed plastic (PET). This innovation is yielding millions of dollars in annual savings and a reduction of over 1.5 million pounds of plastics material per year, with minimal up-front capital investment.

The new concept was first developed by Intel's Transport Materials Engineering Group, and after careful review it was approved for implementation. A cross-functional team was formed in 2001, including representatives from engineering, manufacturing, commodity management and supplier qualification, EHS, various Intel product groups, and key customers. The team worked intensively for about 18 months, overcoming many technical challenges in order to meet the demanding requirements of semiconductor fabrication, including material rigidity, precise tolerances, compatibility with process automation, and electro-static discharge issues. The trays are designed to support product flow throughout the supply chain, from initial delivery of substrates by material suppliers through the multiple steps of fabrication, and then delivery to customers. Intel will also be working on the closed-loop processes that will enable the empty trays to be collected from customers, de-contaminated, and re-used.

The results of this project have significantly reduced both Intel's consumption of plastic materials and the costs associated with product packaging and transportation. The reduction in packaging purchase costs alone is approximately 30%, resulting in millions of dollars cost savings annually. In addition, Intel has reduced its environmental footprint in terms of both energy consumption and waste generation, helping to meet its environmental performance goals. This is but one example of a continuing series of innovative initiatives in which EHS and supply chain professionals work closely together to assure that Intel's products and processes are both profitable and environmentally sustainable.

□ Enhancing Supply Chain Relationships

Effective partnerships and collaboration are key aspects of supply chain excellence. By establishing and continuously reinforcing strong customer relationships, companies can gain competitive advantage and enhance their market share. Likewise, strong relationships with suppliers enable efficient and timely fulfillment of demand, as well as innovation in response to market changes. Most large companies depend on partnerships or alliances to operate their supply chains. Some suppliers have specialized in

providing outsourcing of key functions, including not only logistics and warehousing, but also manufacturing and product design. In addition, companies often find it helpful to collaborate with organizations outside of their supply chains. As described in Section 5, these can range from community advisory panels at the plant level to public interest groups, such as Environmental Defense, that establish corporate-level alliances.

EHS professionals can contribute in a number of ways to developing and enhancing these different types of relationships. Examples include:

- Strengthening sales and building customer loyalty by sharing EHS regulatory and technical expertise as a value-added complement to products or services
- Clarifying end-customer requirements and developing innovative material and packaging solutions
- Working with suppliers to drive continuous improvement in their EHS processes and performance
- Collaborating with suppliers on low-cost, environmentally benign product and process technologies
- Engaging in dialogue and voluntary initiatives with local community organizations
- Communicating with interested parties regarding EHS and sustainability performance improvements
- Collaborating on the development of new standards for EHS-related information

CASE STUDY: Texas Instruments Banned and Restricted Materials Process

Manufacturers of electronic equipment, including computers and cell phones, have been working voluntarily with their suppliers for years to eliminate hazardous substances such as toxics and heavy metals from their supply chains. However, the enactment in 2002 of European legislation called Restriction of Hazardous Substances (RoHS) has propelled the industry globally into action. As a supplier of critical components, Texas Instruments routinely receives requests from its customers to document its procedures and performance with regard to limitations on banned and restricted materials.

Texas Instruments recognized RoHS as a competitive issue, since inability to comply could result in delayed time to market and loss of market share, and could also threaten established customer relationships. Industry experience has shown that slight deviations in restricted substance content can result in product recall costs on the order of hundreds of millions of dollars. Accordingly, in mid-2002 Texas Instruments formed a cross-functional team to address this issue, championed by the Director of Quality, and including representatives from Quality, EHS, Legal, Procurement, and Manufacturing. The role of EHS was to characterize customer expectations and raise awareness of relevant legislation.

The goal of the team was to develop a systematic process for assuring compliance with regulatory and customer requirements regarding banned and restricted substances. The team encountered a number of barriers in developing the process, including:

- Great variability in customer information requests, although all were driven by the same need
- Time and effort required to communicate the importance of this issue to internal stakeholders
- Challenge of assigning responsibility for managing this issue to the appropriate internal group.

The team engaged in many internal meetings and communications to determine the scope of the issue and design a process that addressed it satisfactorily. The resulting action plan included:

- Review and expansion of existing chemical screening specifications to cover the new requirements
- Development of the new process, including procedures and software
- Development and administration of training for all stakeholders
- Modification of audit mechanisms to include the needed verifications
- External stakeholder communication, including customers, regulatory agencies, and electronics industry associations in the U.S., Europe, and Japan.

Texas Instruments believes that the costs of the initiative were well worth the outcome: the ability to demonstrate to customers an effective process that assures tight control over restricted substance utilization. Initial customer response has been very positive, but it will take time to measure and quantify the overall benefits in terms of profitability, market share, and customer retention. One thing is clear — the process could not have been developed and integrated so rapidly without the established insights of EHS personnel into the company's operations and business processes.

disclosure, such as the Material Composition Declaration Guide jointly drafted by the global electronics industry.

Establishment and strengthening of relationships with stakeholders — forging new links — is a central theme in all of the EHS contributions described in this report. Relationships are the key to EHS value creation, whether by internal pursuit of process excellence or external pursuit of reciprocal value.

□ Supporting Supply Chain Innovation

Continuous improvement is the hallmark of successful businesses, and this implies being alert for innovations that will improve the quality, speed, efficiency, and reliability of supply chain management. Innovation need not involve advanced technology, although many companies have made large investments in supply chain information systems. Simply thinking more broadly about the product life cycle can yield major breakthroughs. There are three main categories of potential innovation:

- Product technology, including both new product development and enhancement of existing products
- Industrial process technology, including manufacturing, logistics, and other operations
- Business processes, including planning, forecasting, communication, and decision-making.

There are many opportunities for EHS contributions in each of the above areas. Reductions in labor intensity, material and energy consumption, process hazards, and waste tend to translate into lower capital requirements, lower economic risks, and lower operating costs. Leading companies have realized value by:

- Considering EHS requirements in the early stages of product development and commercialization, thus supporting rapid time to market and product differentiation
- Teaming with suppliers and customers on life cycle performance improvements, e.g., collaborating with customers to develop improved solutions that reduce both risk and

- cost of ownership, or collaborating with suppliers to improve workplace safety and reduce environmental burdens
- Designing facilities and equipment that are more energy-efficient, less costly to operate and maintain, and more conducive to employee safety and productivity.

Thinking more broadly about the product life cycle can yield major breakthroughs.

Products that involve a series of discrete assembly processes along the supply chain can generate a significant "environmental footprint" in terms of material, energy, and land use, as well as industrial wastes and emissions. Manufacturers such as 3M and HP often use "Design for EHS" techniques to reduce the supply chain footprint of manufacturing and logistics operations.²⁵ These techniques include:

- Simplifying product architecture to reduce the number of distinct parts and assembly operations
- Eliminating process steps, e.g., solvent-based cleaning of electronic components
- Recovering and re-furbishing or recycling materials and components from discarded products
- Reducing energy use through transportation efficiency (e.g., improved pallet geometry)
- Using "lean" manufacturing (e.g., just-in-time inventory replenishment) to reduce work-inprocess.

In continuous process industries such as chemical manufacturing, footprint reduction can be achieved by several methods:

■ Developing new process technologies, synthesis routes, catalysts, and separation or extraction methods that improve process yield and reduce harmful byproducts. For example, in 2003 Pfizer received the United Kingdom Award for Green Chemical Technology in recognition of an innovative, environmentally

²⁵ Joseph Fiksel, Design for Environment: Creating Eco-Efficient Products and Processes, New York: McGraw-Hill, 1996.

CASE STUDY: Environmental Progress in Kodak Consumer Digital Cameras

In the past five years, Eastman Kodak's consumer digital cameras have made great strides in capabilities, performance, and portability. At the same time, Kodak's Design for Health, Safety, and Environment (DfHSE) Program has made these cameras significantly more environment-friendly. The success of the DfHSE Program requires knowledgeable design and management decisions across all life cycles of a product in order to minimize environmental effects and capitalize on business opportunities.

The formal DfHSE procedure uses a "stage-gate" approach that considers nine specific stages, from product concept proposal to product end-of-life. The actual product design stage falls about midway through the consideration process. In the case of Kodak digital cameras, DfHSE factors



have been considered with each succeeding model and the results have been evident.

Since digital picture-takers prefer a relatively small camera body, Kodak was motivated to reduce the camera mass. This was made possible by advances in both battery technology and image sensors, thus boosting power efficiency. The early models required four AA alkaline batteries, which increased the weight of the camera bodies. The image resolution of the early models was 0.9 megapixels and a user could expect to capture about 50 images before changing the batteries. The

2003 models are less than half the size and mass of the 1998 models, yet have as much as four times the resolution. Consumers can now capture as many as 400 images with a resolution of 2 to 5 megapixels from cameras that use a single 2-cell Lithium battery.

Kodak has also introduced a docking station to handle the battery recharging function, enabling a consumer to use only one set of batteries and eliminating used batteries from municipal waste streams. At the same time, Kodak's technological advances have greatly reduced both the power and the time required to download images onto a personal computer. The newest models with EasyShare 3.2 software allow a camera user to download 1000 images in just minutes, saving about 75% of the computer power required with the earlier generation software.

Progress is also evident on one other critical frontier — heavy metals. As the Kodak digital camera models have evolved, the company has systematically eliminated lead from the lenses and cadmium from the photosensors and batteries, in keeping with the company's heavy metals reduction goals. In 2003, Kodak introduced the LS633, the world's first digital camera with an organic light emitting diode (OLED) display. The OLED display is small, lightweight, and does not require a backlight, which eliminates the need for a mercury lamp in the camera. Furthermore, because OLED displays emit their own light, they consume less energy than LCD style displays.

These improvements reflect Eastman Kodak's strong heritage of product stewardship. But the journey is not over. Kodak is continuing to work with its suppliers and commercialization teams to identify additional environmental improvements across the life cycle of digital cameras.

benign synthesis process for the manufacture of sildenafil citrate (Viagra $^{\text{\tiny TM}}$). The process has significantly reduced not only waste and emissions but also manufacturing costs.

■ Identifying cost-effective methods for transforming waste products into useful process

inputs. For example, cement manufacturers incinerate waste materials in cement kilns as a substitute for fossil fuel, effectively reducing global warming emissions; electric utilities recycle fly ash from boilers for blending into cement, and capture waste heat for local use.

CASE STUDY: 3M[™] Novec[™] 1230 Fire Protection Fluid -- A Balanced Life Cycle Approach

There is an expanding need for fire protection of vital communications and electronic equipment as well as property and occupied spaces, including both commercial and military applications. When production of halons was banned in the early 1990's because of their high ozone depletion potential, several replacement products were rushed to the market in order to fill a void. Concerns continue, however, about the toxicity, regulatory restric-



tions, and impact on the environment of these "first generation" halon replacements. Specifically, most of them are hydrofluorocarbons (HFCs) that have high global warming potentials. 3M recognized that, as global climate change policy continues to develop, there would be a significant market opportunity for a sustainable halon alternative.

In fire protection, a "sustainable" technology can be defined as one that extinguishes fires effectively; is economical to install and maintain; and perhaps most important in today's business climate, offers a favorable EHS profile — allowing it to be used both today and in the foreseeable future with little or no regulatory restriction. Because fire protection systems are typically built into an infrastructure intended to last for years, there should certainly be a monetary value placed on the choice of a sustainable technology.

Several years ago, 3M embarked on an extensive research program that investigated hundreds of compounds to evaluate their potential as halon replacements. This effort began as a small-scale project championed by a divisional lab manager but quickly escalated into a major initiative. The team, comprising several disciplines including laboratory, environmental, and marketing, was assigned the challenge of determining the "best of the best" from the compounds that made the final list.

The team used 3M's Life Cycle Management (LCM) process as one of its key tools in selecting a halon replacement. LCM is a formal part of 3M's new product development process worldwide. The halon-HFC replacement team, like all cross-functional, new product development teams, used LCM to systematically and holistically address the EHS opportunities and issues at each stage of the potential halon replacement's life — development, manufacturing, distribution, customer use, and disposal.

The result of 3M's ongoing efforts was the development of 3M[™] Novec[™] 1230 Fire Protection Fluid. This new technology platform, based on fluorinated ketones, is superior in both extinguishing efficiency and safety. It provides a significant reduction in greenhouse gas emissions over HFCs, with a Global Warming Potential of 1 (one), the lowest for any halocarbon alternative to halon. It also has an atmospheric lifetime of 5 days, compared to years, decades or even centuries for other halocarbon alternatives. In addition, it is low in acute toxicity and provides a significant margin of safety at design concentrations, making it ideal for use in occupied spaces. Unlike most halon replacements, it is a liquid at room temperature, so that handling and charging of fire protection systems is easier. Novec[™] 1230 fluid is marketed by 3M Electronic Markets Materials Division.

Before introducing into the marketplace, 3M met with representatives of the U.S. EPA to demonstrate the product and explain its benefits over first generation halon replacements. This meeting helped to increase EPA's comfort with the new product and develop additional champions. Although it was introduced only recently, the product has already been qualified for use by several major fire protection equipment manufacturers. A major manufacturer of pharmaceuticals and diagnostics, the Roche Group, has used NovecTM 1230 as a replacement fire protection agent in its efforts to both eliminate ozone depleting substances and reduce its greenhouse gas emissions. As climate change policy continues to evolve and HFC specific regulations are developed in the European Union and elsewhere, it is expected that NovecTM 1230 fluid will become a cornerstone in fire protection systems.

□ Enabling Enterprise Growth

In addition to increasing the bottom line through cost reduction, EHS professionals can support top-line growth by contributing to a number of supply chain business processes, including Customer Relationship Management and Product/Service Development and Commercialization. Specifically:

- Including EHS professionals on account teams can strengthen existing customer relationships by offering valuable expertise and supporting superior customer service (see page 23). Moreover, EHS support and product stewardship can enhance the value proposition for attracting new customers.
- Addressing EHS issues systematically as part of the new product (and service) development process can accelerate speed to market by anticipating roadblocks, and can enhance the customer appeal and differentiation of the offering (see page 25).
- Fulfillment of growing demand in existing markets can be facilitated through efficient re-deployment of existing assets, including improved disposition of discarded materials (see Anheuser-Busch case study).

Penetration of new markets, especially overseas, can be facilitated by analyzing critical EHS issues, and presenting a demonstrable track record of corporate environmental and social responsibility.

EHS capabilities are also an important element of growth strategies based on acquisition of new businesses. EHS contributions are needed at several points in the process.

- Proper EHS due diligence is essential for assuring environmental and social responsibility in the evaluation of potential acquisitions.
- EHS participation can be instrumental in securing a license to operate new facilities, which may involve engaging with regulatory agencies and other stakeholders.
- Once acquisitions are completed, EHS capabilities are critical to rapidly assure that the new facilities and products are in full compliance with applicable laws and regulations.

Finally, EHS professionals may provide unique insights into emerging market trends and regulatory issues that could change the basis of competition, such as the impact of global climate concerns.

CASE STUDY: Anheuser-Busch Supply Chain Re-Engineering

Since 1980, Anheuser-Busch, the world's largest brewer, has increased the number of brands produced from 5 to over 50. This rapid growth has greatly increased supply chain complexity, with over 1000 brand-package combinations distributed to over 600 wholesaler locations in the U.S. alone. In 1994, Anheuser-Busch established a multi-disciplinary Production and Logistics team, charged with re-engineering the supply chain to better cope with the challenges of complexity. The team quickly recognized that Anheuser-Busch was involved in two logistically distinct businesses — established high-volume products and low-volume "growth" products, with the latter accounting for over 80% of brand/package combinations and only 10% of total volume. Growth products represent important market opportunities and must be managed effectively, but have greater demand variability than the established products, require greater flexibility, and impose more costs and complexity throughout the supply chain.

After considerable investigation, the team recommended a series of strategic initiatives, beginning with re-engineering of production and inventory deployment, proceeding to transportation, and culminating in order fulfillment. The growth products were assigned to fewer plants with shorter production cycles, and their inventory was predominantly deployed across 35 wholesaler support centers throughout the U.S. The resulting improvements have been dramatic:

- 90% of low-volume items are now within 200 miles of their destination, compared to 25% previously.
- Costs of purchasing, operations, and transportation are minimized without loss of customer service.
- Anheuser-Busch is well positioned for future expansion in its growth segment.

CASE STUDY: Anheuser-Busch Supply Chain Re-Engineering (continued)

An important element of the re-engineering effort was an initiative called "Transportation Advantage," which involved review and re-configuration of the transportation processes for both long-haul and short-haul delivery of beer to wholesalers. The objective was to lower costs and improve service by leveraging the buying power for all brewery inbound and outbound transportation, including truck and rail, through one customer — Anheuser-Busch. This provides a flexible transportation infrastructure that can be used to increase capacity utilization and acquire backhaul revenue. The results to date have been impressive:

In Brewery Operations:

- Partial pallets into support center territories have been reduced 56%.
- Interplant shipments have been reduced 78%.
- Items per brewery load have been reduced 41%.
- Transportation costs have been reduced 15%.

In Wholesaler and Support Center Operations:

- Wholesale support center costs are 7% below expectations.
- Transportation service is 99% on-time or early.
- Wholesaler Out-of-Stocks have decreased 30%.



Anheuser-Busch involved its wholesalers in development of the strategy, and part of the transportation cost savings is shared with the wholesalers, who had previously managed most short-haul operations.

The Role of EHS

Anheuser Busch has continuously demonstrated a strong commitment to environmental protection, frequently going beyond compliance and demonstrating that profitability and environmental excellence can go hand-in-hand. As the supply chain re-engineering efforts evolved, corporate EHS personnel have identified a number of areas in which increased supply chain efficiency has also yielded environmental performance improvements. For example:

- Taking a strategic view of transportation resources has enabled Anheuser-Busch to reduce transportation costs by maximizing the utilization of available distribution vehicles. Wherever possible, the company identifies opportunities to backhaul packaging materials or expired products in empty trucks previously used for delivering beer to wholesalers, thereby reducing the number of empty trucks on the road. In some cases, lighter weight vehicles have been adopted for short-haul deliveries. These types of actions not only increase fleet productivity, but also reduce the consumption of fuel and the associated emissions of greenhouse gases.
- In 2000, the company began a program to help wholesalers recycle the stretch film used to secure pallets of Anheuser-Busch beer during transportation. Anheuser-Busch Recycling Corporation coordinates pickup of recovered film from the 18 participating distribution sites on empty beer trucks, and delivers bales to film recyclers. Anheuser-Busch has worked with the distribution centers to help finance the cost of balers. The program has now expanded to more than 250 wholesalers.

The EHS group at Anheuser-Busch is working to establish appropriate performance metrics and data management systems to account for the EHS performance benefits of the dramatic improvements in supply chain efficiency described above. The ability to report these benefits will only strengthen the company's reputation as a leader in responsible business practices.

Source: C. Gregory John and Michael Willis, "Supply Chain Re-engineering at Anheuser-Busch," Supply Chain Management Review, Fall 1998, pp. 29-35.



Section 4

VALUE CREATION METHODOLOGY

■ Methodology Overview

Identifying an attractive opportunity is only the beginning of the value realization process. This section presents a step-by-step methodology that provides guidance to EHS and other functional groups in their efforts at supply chain value creation. It consists of four logical steps for managing value creation opportunities, as shown in Figure 4. The methodology resembles the Plan-Do-Check-Advance cycle, in that it provides a feedback loop for continuous improvement. Each step is described on the following pages.

Step 1. Identify supply chain opportunities.

This step provides several methods for identifying company-specific value creation opportunities related to EHS in the supply chain.

Step 2. Prioritize EHS value contributions. This step prioritizes opportunities based on their feasibility and attractiveness as well as the relevant competencies of the organization.

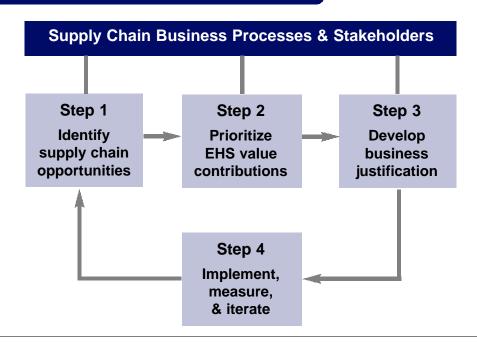
Step 3. Develop business justification. This step develops a business case for selected high-priority opportunities, and may include dialogue with external stakeholder groups.

Step 4. Implement, measure, and iterate. This step uses measurement tools to quantify the business value achieved by the selected initiatives, and to support continuous improvement.

Throughout this section, it is assumed that the process of identifying, screening, and implementing opportunities will be a collaborative effort involving a cross-functional team. As the team progresses from Steps 1 through 4, its membership typically will grow and change. In addition to personnel from EHS, logistics, and other internal functions, the composition of the team could include supplier and customer representatives as well as other interested parties. Section 5 provides guidance for engaging a cross-functional team, developing organizational alignment, and involving external stakeholders.

FIGURE 4

Overview of Methodology for EHS Value Creation in the Supply Chain



☐ Step 1: Identify Supply Chain Opportunities

To identify EHS value creation opportunities relevant to your supply chain, there are several alternative approaches. Section 3 has provided one approach:

Based on the characteristics of your industry, your market, your processes, and your stakeholders, focus on specific types of relevant EHS contributions (see page 14).

Other possible approaches for identifying opportunities include:

- Identify **emerging EHS issues** that may affect your industry (e.g., new regulations), and make a case for launching an initiative to develop a plan of action. This approach is illustrated by the Texas Instruments response to Restriction of Hazardous Substances legislation (see page 24).
- Identify an SCM **business process** that your company has designated for improvement, and focus on EHS opportunities related to that process. As shown in Table 3, EHS professionals can contribute in many ways to the supply chain business processes defined in Section 1.

TABLE 3

Potential EHS-Related Contributions to Supply Chain Business Processes

Customer Relationship	 Provide valuable technical services to customers (see p. 23) Maintain reputation for corporate responsibility (see p. 20)
Management Customer Service Management	 Collaborate on innovative EHS solutions (see p. 25) Promote safe and responsible product handling and use (see p. 17) Transfer EHS technologies and expertise (see p. 23) Reduce the customer's cost of ownership (see p. 25) Facilitate and streamline product service and support (see p. 21)
Demand Management Order Fulfillment	 Identify EHS factors related to demand patterns (see p. 21) Enable expansion into new markets (see p. 28) Reduce costs and increase resource efficiency (see p. 21) Avoid and mitigate business interruptions (see p. 17)
Manufacturing Flow Management	 Assure safety and continuity of production facilities (see p. 17) Reduce process wastes and seek by-product synergies (see p. 21) Develop employee loyalty and community support (see p. 19)
Supplier Relationship Management	 Screen or audit suppliers' EHS practices (see p. 17) Collaborate on streamlining and waste conversion (see p. 21) Perform due diligence for acquisition of new operations (see p. 28) Transfer EHS technologies and best practices (see p. 23) Develop management systems and shared performance metrics (see p. 23)
	 Support brand differentiation through EHS features (see p. 25) Anticipate regulatory constraints and emerging issues (see p. 16) Identify and reduce hidden or indirect EHS-related costs (see p. 21) Influence specification of benign materials (see p. 20)
Returns Management	 Enable cost-effective recovery and re-use of materials (see p. 21) Develop collaborative reverse logistics strategy (see p. 23) Minimize end-of-life environmental burdens (see p. 20)

■ Identify the main SCM value drivers for your business and focus on EHS opportunities that will enhance those **value drivers**. Table 4 lists some of the value drivers described in Section 2 and suggests how they might be linked to the EHS contributions outlined in Section 3. The entries in each cell provide a basis for selecting performance indicators to quantify the expected value contribution (see Step 3).

For example, if your company emphasizes improved **Asset Utilization** as a business objective, then you can scan the second row of the matrix to identify value creation opportunities that fit with your business. If your company's inventory costs are particularly high, then you might focus on the column titled **Raise Productivity** and consider how EHS insights into material use reduction can help to reduce inventory costs (see page 21).

TABLE 4 Potential EHS-Related Contributions to Supply Chain Value Drivers

	Assure Compliance	Reduce Risk	Maintain Health	Protect Environment	Raise Productivity	Enhance Relations	Support Innovation	Enable Growth
Profitability	Avoid regulatory fines & penalties	Reduce incident costs & liabilities	Reduce Workmen's Compensation	Reduce cost of waste management	Reduce logistical & operating costs	Improve customer retention	Improve product differentia- tion	Replicate systems efficiently
Asset Utilization	Increase asset availability & effective capacity	Reduce asset downtime	Maintain asset productivity	Reduce environmen- tal footprint	Reduce inventory costs	Enable effective outsourcing	Reduce capital intensity	Enable flexible use of assets
Service Level	Reduce fulfillment delays	Improve incident response	Assure safety & reliability of logistics	Avoid spills in transport & handling	Improve operational agility	Reduce cost of owner- ship	Support process stream- lining	Provide flexible solutions
Quality	Maintain rigorous standards	Improve product safety	Eliminate operational hazards	Reduce environmen- tal hazards	Reduce ratio of waste to product	Assure process depend- ability	Increase product life cycle value	Adopt global best practices
Reputation	Maintain company track record	Avoid adverse publicity	Enhance employee satisfaction	Enhance stakeholder perceptions	Enhance investor perceptions	Improve right to operate	Enhance talent recruitment	Enhance access to new markets
Continuity	Avoid regulatory delays	Minimize business interruption	Reduce absenteeism & employee turnover	Enhance community relations	Support process streamlining	Avoid stakeholder opposition	Design effective logistical solutions	Expedite acquisition & business integration
Alliances	Enhance partner compliance	Verify partner reliability	Support partner EHS practices	Reduce supply chain footprint	Improve joint resource utilization	Strengthen partnership linkages		Leverage external resources
Technology	Implement manage- ment systems	Prioritize & prevent risks	Reduce worker exposures	Develop waste elimination methods	Improve supply chain eco-efficiency		Develop proprietary technology	Automate routine procedures

Whatever the source of the opportunity, it is important to develop a clear description of the motivation and rationale for investigating it further. When multiple opportunities are being considered, it is helpful to adopt a common for-

mat. The template in Table 5 illustrates how an EHS-related opportunity for SCM improvement can be presented, based on the Motorola case study on page 9.

TABLE 5 Template for Opportunity Presentation

Opportunity Title	Inbound discrepancy reporting			
Brief Description	Discrepancies in inbound pallet shipments are causing injuries to workers and are generating extra costs for disposal, replacement, and re-skidding. Initial analysis suggests that better control of discrepancies could result in substantial cost savings.			
Relevant SCM Process(es)	Order fulfillmentSupplier relationship management			
Relevant Value Driver(s)	 Transportation costs Waste disposal costs Pallet utilization rate Worker productivity Workers' Compensation cost 			
Indicator(s) of Success	 Reduction in out-of-spec or discarded pallets Reduction in worker injuries Reduction of operating costs on the receiving dock 			
Recommended Analyses	 Root-cause analysis for worker injuries Root-cause analysis for pallet, packaging, and labeling defects Financial analysis of impact on logistical costs 			
Suggested Participants	 EHS Logistics Quality Finance Packaging and Sourcing Hourly employees 			
Other Stakeholders	Motorola managementSuppliersFreight forwardersOSHA			
Potential Actions	 Clarify supplier performance expectations Document and analyze inbound discrepancies Quantify discrepancy costs and hold suppliers accountable Develop procedures and training for injury reduction 			
Preliminary Timeline	 Form cross-functional team by February 28, 2002 Develop initial analysis and recommendations by April 30, 2002 			

Step 2: Prioritize EHS Value Contributions

The process of generating opportunities described in Step 1 could yield a wide variety of interesting options. However, resource limitations will inevitably require choices to be made. even if all of the opportunities have merit. Additional resources will be required to investigate a proposed project initiative in greater detail and justify an implementation decision. In developing a business rationale for these priorities, it is important to consider the overall strategic priorities of the company. For example, an electronics company that emphasizes accelerated innovation might focus its EHS resources on designing "sustainable" products, while a petroleum company concerned with occupational safety might focus on enhancing its pipeline risk management systems.

Therefore, a company will need to adopt a screening or priority-setting procedure to filter out those projects that are most attractive for further investigation. This can be accomplished through a straightforward criteria-based

approach, whereby each project is ranked or scored relative to a set of decision criteria. Table 6 suggests three main types of prioritization criteria:

- Feasibility of the project, based on practical constraints and barriers
- Attractiveness of the project, both financial and intangible
- Competency of the organization to execute the project.

The latter criterion suggests a careful evaluation of the required *EHS capabilities*, which might include risk management, pollution prevention, product stewardship, life cycle management, emergency response, stakeholder communication, regulatory issue tracking, auditing, environmental accounting, and due diligence. Likewise, a company should consider where its core competencies lie among the principal supply chain management processes, and where they might be augmented by suppliers, customers, or third-party providers. Leveraging these organizational strengths will greatly increase the chances of success.

TABLE 6 Criteria for Opportunity Prioritization

	Specific Criteria	Example Questions
Feasibility	Technical barriersInstitutional barriersComplexityResource availability	 Are there any significant obstacles or risks that can threaten the success of the project? How straightforward is this project to execute in terms of internal and external collaboration requirements? What are the resource needs, both financial and human, and do we have the capacity to support this project?
Attractiveness	Strategic alignmentStakeholder interestMagnitude of improvement	 Is this project well aligned with the current strategic priorities of the company? Will this project be enthusiastically received by our key external stakeholders? Are we likely to realize a significant improvement in the proposed indicators of value?
Competency	Supply chain managementEHS capabilities	 Do we have the right set of SCM and/or EHS skills and competencies in-house? Can we acquire the needed competencies externally?

□ Step 3: Develop Business Justification

The opportunities that meet the criteria in Step 2 can then be evaluated from different perspectives by the cross-functional team. The business case analysis should be initiated and coordinated by the team leader, and will typically consist of the following types of efforts, illustrated in Figure 5:

- Financial analysis, e.g., discounted cash flow, to determine net present value and financial payback.
- Intangible value analysis, specifically examining whether the initiative will support the type of value proposition outlined in Section 2. Some projects may be justifiable on purely financial grounds, while others may require consideration of intangible benefits.
- Risk analysis of pros and cons, including the risk of maintaining status quo.

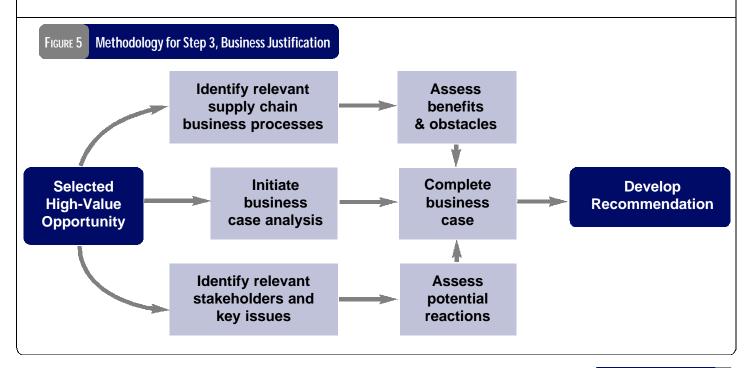
The team should assess both the potential benefits and obstacles from the perspective of existing supply chain business processes. In addition, the team may benefit from dialogue with external stakeholders that can influence the success of the initiative. There are two categories of stakeholders to be considered.

 Supply chain participants, including the suppliers and the suppliers' suppliers (Tier 1 and higher), the customers and customers'

- customers (up to the end consumer), and partners such as contract manufacturers, service providers, contractors, and technology solution providers
- Interested parties, including those with an economic stake shareholders, financial analysts, lenders, insurers, and labor unions and those with a public interest stake advocacy groups, regulators, communities, non-governmental organizations, academics, consultants, and the media.

Early involvement of external stakeholders may help to clarify the relevant business drivers, to assure acceptance of the initiative, and eventually to communicate its progress. Collaboration between customers and suppliers is a common practice. However, dialogue with other interested parties may require coordination with public affairs, communications, or investor relations. It is important that the goals of the stakeholder dialogue be well articulated, and that the roles and responsibilities of company staff be defined clearly. Adequate preparation will ensure that these interactions deliver genuine value and will protect against unintentional miscommunications.

The business case analysis should culminate in a recommendation to either proceed with the initiative, refine the initial plan to account for new factors and re-evaluate, or to discontinue the initiative.



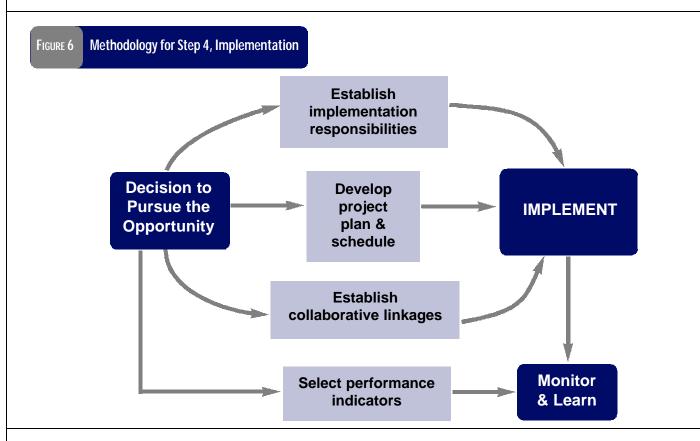
☐ Step 4: Implement, Measure, and Iterate

Once management has approved a project recommendation, the team can proceed to the implementation stage. Implementation can be managed and measured using the same procedures and tools that any cross-functional initiative would employ. As illustrated in Figure 6, this involves:

- Securing budget approval and authorization of the needed resources
- Establishing the team that will be responsible for implementation, which may include the same functions as the evaluation team, but may involve different individuals
- Developing a project plan, including a schedule of milestones and deliverables
- Establishing the needed linkages among internal and/or external collaborators to assure that the implementation can proceed smoothly
- Selecting performance indicators that will be used to track the results of the project.

The last point is particularly important. It is essential that (a) the results of the project be measurable, and (b) the organizational learning be captured for the benefit of future SCM initiatives. Therefore, it is important to establish quantitative measures of value and realistic targets for performance improvement. This will increase the credibility and transparency of the initiative, and provide a foundation for future analysis and continuous improvement.

In the case of companies that use multi-dimensional measurement systems such as the Balanced Scorecard, the selected metrics ideally should mirror those multiple dimensions. Examples of potential value metrics in a Balanced Scorecard include *financial* metrics (e.g., unit profit margins, cost reductions), *strategic* metrics (e.g., market share, customer retention), and metrics (e.g., inventory turns, service level, resource productivity). Table 4 (page 32) suggests a variety of indicators that can be chosen to capture the value contribution of EHS initiatives to supply chain management.



²⁶ P.C. Brewer & T.W. Speh, "Using the Balanced Scorecard to Measure Supply Chain Performance," *Journal of Business Logistics*, Vol. 21, No. 1 (2000), pp. 75-93.



Section 5

EFFECTIVE COLLABORATION

□ Engaging a Cross-Functional Team

Strong internal collaboration is essential for a successful supply chain improvement initiative of the type described in Section 4. Once influential managers of supply chain processes become convinced that the initiative will deliver significant value, they will be prepared to commit resources and sweat equity to assure successful implementation. Early engagement of key internal stakeholders will increase their sense of ownership, and will likely result in a more pragmatic and well-focused approach. There are two categories of personnel that need to be considered as part of any SCM cross-functional team:

■ Line operations personnel, including operations executives, division managers,

- plant managers, and functional groups such as purchasing, logistics, manufacturing, sales, service, and site EHS
- Corporate or divisional staff, including functional groups such as strategic planning, finance, research and development, marketing, engineering, legal affairs, human resources, communications, public affairs, EHS, and information services.

Table 7 shows the typical roles of selected functional groups in each of the SCM business processes. As described in Section 4, the composition of a cross-functional team typically will grow and change as an initiative proceeds from identification and screening through implementation and monitoring.

Functional Group Roles in Supply Chain Business Processes²⁷

	Marketing & Sales	Research & Development	Logistics	Production	Purchasing	Finance	EHS
Customer Relationship Management	Account management	Requirements definition	Requirements definition	Manufacturing strategy	Sourcing strategy	Customer profitability	Product stewardship
Customer Service Management	Account administration	Technical service	Performance specifications	Coordinated execution	Priority assessment	Cost to serve the customer	Technical service; cost of ownership
Demand Management	Demand planning	Process requirements	Forecasting	Capability planning	Sourcing	Trade-off analysis	EHS influences
Order Fulfillment	Special orders	Custom modifications	Network planning	Plant direct shipment	Supplier selection	Cost of distribution	Compliance & safety
Manufact- uring Flow Management	Packaging specifications	Process speed & stability	Prioritization criteria	Production planning	Integrated supply	Cost of production	Compliance; process safety
Supplier Relationship Management	Order booking	Material specifications	Inbound material flow	Integrated planning	Supplier contract management	Cost of materials	Supplier EHS performance
Product/ Service Development	Business projection	Product and process design	Movement requirements	Process specifications	Material specifications	Cost of R&D	EHS requirements
Returns Management	Secondary markets	Design for end of life	Reverse logistics	Refurbishment remanufacture	3	Life cycle costing	Recycling strategies

²⁷ Adapted from Keely L. Croxton, Sebastián J. García-Dastugue, Douglas M. Lambert, and Dale S. Rogers, "The Supply Chain Management Processes," *The International Journal of Logistics Management*, Vol. 12, No. 2 (2001), pp. 13-36. Note that the EHS function is added.

Achieving Organizational Alignment

Even the most attractive SCM opportunities can falter due to lack of organizational acceptance. In fact, the most creative opportunities will often encounter the greatest resistance. Therefore, any team that is pursuing an EHS value creation initiative should consider how to achieve organizational alignment. This involves issues such as:

- How EHS can be engaged on cross-functional business process teams
- How to identify a champion that will help to legitimize an initiative
- How to communicate the merits of a new initiative to management.

Even the most attractive SCM opportunities can falter due to organizational resistance.

The following suggests some approaches for addressing these issues through alignment with the needs and cultural characteristics of the company:

- Engagement on cross-functional teams. SCM business processes should be managed by cross-functional teams, as indicated in Table 7. While the EHS function is nominally represented on these teams, the EHS contribution is often confined to a passive, regulatory review role, and consequently the value creation potential of EHS may be under-utilized.²⁸ In order to increase their participation, EHS personnel can request the team's permission to attend team meetings as an observer in order to learn more about the relevant business issues. Greater familiarity with the overall process can better position them to suggest opportunities for EHS value creation initiatives.
- **Identifying a champion**. The most effective approach toward launching a change initiative is to secure a senior-level internal champion. This individual need not be involved in detailed exploration of the opportunity. Ideally, the champion should have accountability for busi-

ness performance that would directly benefit from the initiative, and should command the respect of his/her colleagues and superiors. If the champion's expectations can be met, then he/she will help to legitimize the initiative.

- Communicating with senior management. While grassroots communication can be effective, the active endorsement of senior management is important for organizational acceptance of change initiatives. Therefore, senior management should be engaged early in understanding the opportunity and the need for action. Techniques for accomplishing this include internal strategy workshops, competitive benchmarking exercises, and meetings with external stakeholders or thought leaders.
- Linking with existing programs. It is helpful if a new SCM initiative can be linked with EHS and corporate responsibility programs in which the company already participates, e.g., the U.N. Global Compact. Such programs provide broad principles related to product stewardship and sustainability, and lead naturally to the types of value creation initiatives described in this report. They also lend credibility and help to overcome barriers, so that the team can focus on the benefits of the initiative.
- Quantifying the value added. Perhaps the most critical element of any new initiative is clear articulation of the potential value added (see Section 4). Eventually, the success of the initiative must be demonstrated through quantifiable performance indicators, as illustrated in the Anheuser-Busch case on page 28 or the Duke Power case on page 21. *Leading* indicators, such as improvements in speed or accuracy, measure the achievement of process improvement goals, while *lagging* indicators, such as increased profit margins, measure the tangible business impact of the initiative.
- Using mainstream language. Both EHS and SCM have specialized vocabularies that may be unfamiliar to others. Acceptance of an initiative is greatly enhanced if its central ideas can be expressed in everyday business language and associated with the core mission of the company.

²⁸ This observation is based on a 2003 survey of 18 GEMI member companies across a number of industries.

□ Establishing Supply Chain Partnerships

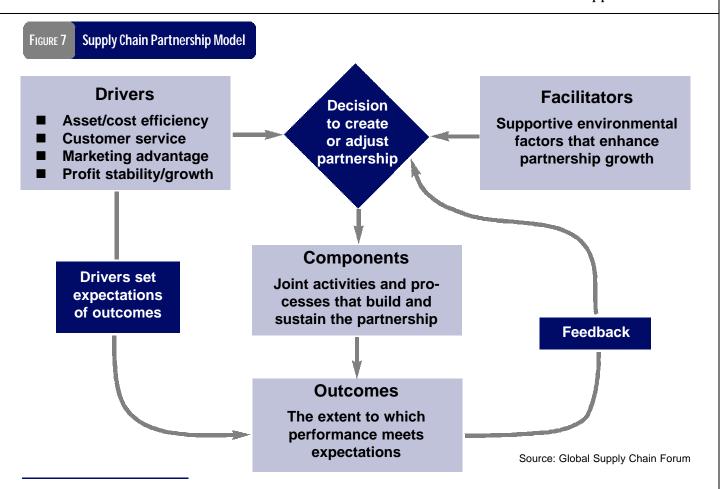
Many companies believe that supply chain partnerships are essential for their continued success. However, to establish and maintain genuine partnerships requires a considerable investment of time and resources. It is important for companies to identify those key relationships for which partnering would create exceptional advantages, and to manage their other supplier and customer relationships with appropriate expectations. An in-depth study of supply chain relationships by The Global Supply Chain Forum arrived at the following definition of a true partnership:²⁹

"A partnership is a tailored business relationship based on mutual trust, openness, shared risk, and shared rewards that yields a competitive advantage, resulting in business performance greater than would be achieved by the firms working together in the absence of partnership."

This study classified supply chain partnerships into three main types, listed below, reflecting an increasing level of commitment. Only in a few cases will a Type 3 partnership be justifiable.

- **Type 1:** Agreement to coordinate selected supply chain activities, with limits on time and scope
- **Type 2:** Agreement to integrate a broader range of selected activities over a longer time frame
- **Type 3:** Commitment to a significant level of operational integration, with no anticipated end date.

The study produced a partnership model, illustrated in Figure 7, which provides a basis for making decisions about partnering with suppliers or customers on EHS value creation opportunities.



²⁹ Douglas M. Lambert, Margaret A. Emmelhainz, John T. Gardner, "Developing and Implementing Supply Chain Partnerships", *The International Journal of Logistics Management*, Vol. 7, No. 2, 1996. (See http://www.ijlm.org.)

A decision to partner will be influenced by driving factors that indicate mutual benefits, as well as facilitating factors that increase the likelihood of a successful relationship (e.g., cultural compatibility, managerial approaches, mutuality, and symmetry.) For example, the partnership between Coca-Cola and McDonald's is enhanced by the fact that both companies are the leaders in their industry. Coca-Cola is McDonald's largest supplier, and McDonald's is Coca-Cola's largest customer. Other potential facilitators include exclusivity, shared competitors, close proximity, prior history, and shared end users.

While EHS issues are seldom the primary motivation for partnerships, there are cases in which a partnering decision can be reinforced by important EHS-related factors, such as:

- Opportunities to increase overall supply chain efficiency through process streamlining, e.g., shared assets, redesigned packaging, reduced transportation, inventory reduction, and waste reduction
- Opportunities to reduce joint risks and liabilities through closer communication regarding compliance and risk management strategies, as well as sharing of technical expertise

- Outsourcing opportunities that leverage the capabilities of one or both partners, e.g., total chemical management services provided by a chemical supplier
- Marketing and/or public relations advantages based on a shared commitment to environmental and social responsibility.

Once a partnership is initiated, the parties must establish and manage a number of components that make the relationship operational. These include joint planning processes, joint operating controls, communication links, and risk/reward sharing mechanisms. Partnerships are strengthened by trust and commitment, streamlined contract style, broad scope of activities, and shared financial investment. It is important that the partners' mutual expectations be expressed in terms of performance indicators, so that the outcomes of the partnership can be monitored and the components can be adjusted as needed. Also, each partner must allocate sufficient resources to adequately support the relationship. Since EHS resources are typically limited, the required staff commitments must be explicitly planned and supported. (For more detail on implementation of this partnership model, see reference 29.)

CASE STUDY: Supplier Expectations at Eastman Kodak, HP, and Motorola

Companies that view EHS performance as an important aspect of their overall brand identity and reputation are increasingly placing expectations on the EHS performance of key suppliers. For example:

- Eastman Kodak's EHS policy includes a commitment to provide products that protect the health of the customer, are safe, and minimize environmental burdens. To help meet this commitment, the company has developed Supplier Performance Expectations that include an explicit section on EHS excellence beyond compliance. The company also publishes a detailed set of EHS standards for suppliers that encourage economic value creation through life cycle thinking and resource productivity. (http://www.kodak.com/US/plugins/acrobat/en/corp/environment/SupplierStds.pdf)
- HP's commitment to EHS excellence was stated simply by the CEO, Carly Fiorina: "We will provide leadership on the journey to an environmentally sustainable future, with efficient products and creative recycling systems." More than 80% of HP's products are manufactured through alliances and partnerships. HP's Supplier Code of Conduct expects suppliers to act as responsible corporate citizens to take a positive, proactive stance regarding EHS, labor, and human rights, and to seek continuous EHS improvement. (http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/supcode.pdf)
- Motorola's EHS policy emphasizes corporate citizenship, product stewardship, and long-term sustainability. The company's Code of Business Conduct is based on principles of uncompromising integrity and respect for people, and it expects similar conduct from its suppliers. Accordingly, Motorola publishes its supplier expectations with regard to ethics, EHS, and labor practices, and assesses supplier conformance. (http://www.motorola.com/EHS/environment/supplier/)

☐ Collaborating with Customers and Suppliers

The nature of a supplier-customer relationship can range from spot purchasing to a long-term contract to preferred provider to strategic partner. Although not every relationship will be a Type 3 partnership, the EHS opportunities described in this report will frequently require communication and/or collaboration with customers and suppliers. For certain EHS issues, where industry standards are desirable, broader collaboration may be warranted among a group of companies within an industry segment (see Clean Cargo case study).

Successful collaboration on EHS value creation with customers or suppliers will require a disciplined effort to assure that each company is contributing the required effort and expertise.

Teaming with the collaborators early in the opportunity development process will assure a genuine commitment. In the context of the methodology described in Section 4, teaming may include joint development and assessment of innovative ideas (Steps 1 and 2), evaluation of the business case (Step 3), and coordinated implementation (Step 4). Among the activities that may require collaboration are:

- Identifying and communicating with external stakeholders
- Developing focused opportunities that leverage each company's strengths
- Developing mutually beneficial value propositions that justify the opportunity
- Establishing systems for measuring results and tracking shared savings.

CASE STUDY: Clean Cargo Group

A number of global companies, including HP, Home Depot, IKEA, Mattel, Nike, and other shippers, have joined with ocean freight carriers to form a Clean Cargo Group, dedicated to sustainable product transportation by ocean. This group represents approximately 33% of containerized cargo carriers and

20% of the top 50 U.S. importers of containerized cargo by volume. Working in collaboration with Business for Social Responsibility (BSR), a non-profit group, they developed voluntary specifications and guidelines to elevate the environmental performance of their fleets or carriers. In November 2003, they released the Environmental Performance Survey (EPS), a supply chain management tool that facilitates information exchange, including:

- Standardized environmental reporting guidelines for carriers
- Emissions calculation methods to measure a shipper's greenhouse gas releases from product transported by ocean.

The EPS enables shippers to evaluate the environmental commitment and actions of their carriers, as well as complete emissions footprints for the transportation impacts of their product. For carriers, it provides a standardized format for reporting on their environmental performance, thereby reducing the amount of time spent completing customer surveys. Participants anticipate the following business benefits:

- **Increased Trust**: By working to address environmental challenges, shippers and carriers build mutual trust and are more likely to gain the support of outside stakeholder groups.
- **Enhanced Brand**: In a crowded marketplace, leadership companies attract both consumers and investors, many of whom are placing increasing emphasis on environmental performance.
- **Competitive Advantage**: By proactively managing the environmental impacts of product transportation and minimizing emissions, companies gain first-mover advantages while setting up systems to mitigate the financial impact of future regulations.



³⁰GEMI, New Paths to Business Value: Strategic Sourcing - Environment, Health and Safety, 2001.

☐ Collaborating with Stakeholder Organizations

As mentioned on page 8, one important pathway for generating shareholder value is building intangible assets such as reputation and brand equity. External stakeholder groups are playing an increasing role in shaping the public image and brand identity of global organizations, especially in the areas of corporate responsibility and transparency. Collaborating with stakeholders can be an effective business strategy for both overcoming adversarial relationships and harnessing external knowledge and resources.

■ Collaborating with governments. Many companies are engaged in voluntary collaboration with government agencies, preferring a proactive approach to the traditional adversarial relationships. Although the majority of the budgets of regulatory agencies such as the U.S. EPA are still devoted to enforcement, there is continued interest in more innovative, voluntary programs that seek alternative approaches for achieving environmental goals in a more flexible manner.

Proactive engagement with government agencies enables companies to anticipate emerging regulatory issues, such as end-of-life product take-back schemes, and to assure that public policy development is based on realistic information about business constraints and options. In some cases, companies are able to obtain government funding to support the development of commercially viable technologies that benefit society and the environment. For example, the U.S. Department of Energy's Industries of the Future program supports cost-shared R&D for nine major industrial sectors.

■ Collaborating with NGOs. The influence of non-governmental organizations (NGOs) in the EHS field has changed dramatically due to their increased mastery of information technology and the mass media. Many companies are establishing alliances with NGOs in order to support and validate their efforts to pursue environmental and social responsibility. For example, the Alliance for Environmental Innovation, an outgrowth of Environmental Defense, has

CASE STUDY: Automotive Suppliers Partnership

The Suppliers Partnership for the Environment (SP), a trade association that was created in 2002, is a collaborative initiative among automobile original equipment manufacturers (OEMs) including General Motors and DaimlerChrysler, their suppliers, and the U.S. EPA. SP addresses the goals of the membership by creating new and innovative business-centered approaches to environmental protection that improve the environment while providing value throughout the automobile supply chain. GEMI members that participate in SP include Ashland Inc., Johnson Controls, Inc., and Motorola, Inc.

SP provides value to its members by providing a forum for small, mid-sized and large automotive and vehicle suppliers to work together, learn from each other and share environmental best practices through task forces and work groups to study specific issues, identify and address externally driven environmental impacts, provide facility-specific technical assistance workshops, and retain the cost

savings realized through those workshops. SP is a "member-driven" activity that provides quantifiable value to members, and several Work Groups have been organized to address issues that the members consider important, including:

- Design for the Environment (DfE)
- Environmental Performance Metrics
- Energy Use Optimization
- SP Technical Assistance Workshops.

Additional information is available at http://www.supplierspartnership.org.



collaborated with leading companies such as FedEx Express to help design environmentally benign products and supply chain processes. According to a recent report from the University of Michigan:³¹

"As mutually beneficial collaborative activities that leverage competencies within dissimilar organizations, environmental partnerships can be an important alternative to costly and unpredictable strategies that rely on conflict, litigation, or special interest lobbying."

In the context of supporting EHS value creation opportunities, the critical success factors for company-NGO collaboration include the following:

- Selecting an NGO whose interests and capabilities are well matched to the opportunity
- Clearly documenting agreed-upon goals, collaborative processes, and outcome metrics
- Maintaining transparency, trust and frequent communication over the course of the project.

GEMI's Transparency Project

GEMI is developing a report that explores the risks and rewards associated with taking a strategic approach to transparency. This report, *Transparency: A Path to Public Trust*, describes the results of a collaborative effort by GEMI members and other companies, including participants from the NGO community. The report defines transparency as "the openness of an organization with regard to sharing information about how it operates." It uses the fundamental management system process of Plan-Do-Check-Advance as a framework to outline how an organization may:

- Evaluate the business case for transparency
- Understand the organizational context for transparency
- Develop an appropriate transparency strategy
- Implement the strategy
- Evaluate the effectiveness of the strategy.

The process is supported by a series of tools that may be adapted for use by an organization to implement their own approach to transparency.

The report also identifies leadership and governance, stakeholder relations, and performance reporting as the three key elements of transparency, and discusses the contribution each may make to the openness of an organization. Finally, the report looks ahead to the challenges and trends affecting organizations as they work to achieve an appropriate level of transparency.

³¹ Mark Tholke, *Collaboration for a Change: A Practitioner's Guide to Environmental Nonprofit-Industry Partnerships*, University of Michigan and Green Business Network, September 2003.



Section 6

CONCLUSION

The field of supply chain management is undergoing many changes, as is the field of environment, health and safety. Customers and suppliers are becoming more interdependent, and are capable of virtually instantaneous global communication. There are growing pressures for corporate responsibility from external stakeholders, including both governmental and nongovernmental organizations. Both supply chain excellence and EHS performance are increasingly recognized as drivers of shareholder value. Moreover, this report has demonstrated that the goals of EHS and SCM are aligned in many ways — building value for the enterprise through continuous improvement in operational speed, efficiency and continuity as well as the strength of stakeholder relationships.

There are some key lessons to be learned from those companies that have succeeded in leveraging their EHS capabilities to improve supply chain performance:

- The barriers that can prevent realization of EHS value creation opportunities are similar to those that have impeded past efforts at supply chain innovation resource limitations, resistance to change, lack of adequate models, and lack of a champion for integrated thinking. These barriers can be overcome by articulating a clear business case to gain senior management endorsement.
- There are several important pathways to shareholder value creation that leverage EHS capabilities:
 - Direct financial contributions through SCM process improvement, such as converting waste materials into useful byproducts
 - Contributions to key value drivers, such as technological innovation, employee safety and productivity, and business continuity
 - Enhancement of the company image, right to operate, and ability to recruit talent by assuring that supply chain

- operations meet the expectations of external stakeholders with regard to environmental and social responsibility.
- EHS professionals can help create reciprocal value in relationships with key suppliers and customers. Collaboration between EHS staff in supplier and customer organizations can reveal new, mutually beneficial solutions to materials management, transportation, and other supply chain issues.
- Incorporating EHS awareness and life cycle thinking into new product development can help to avoid costly delays in time to market, and can improve the overall characteristics of the product, including manufacturability, maintainability, recyclability, consumer acceptance, and cost of ownership.
- Finally, the creative capabilities of EHS professionals may be underutilized if they are applied mainly for reviewing the regulatory compliance aspects of business decisions. The EHS function can be better leveraged by integration into cross-functional supply chain business process teams.

The primary mission of every business is to serve its customers in a way that generates superior value for shareholders. At the same time, both executives and industry analysts recognize that short-term profitability is not sufficient — responsible governance and social responsibility are necessary to achieve sustainable profitability and shareholder value over the long run. However, effective EHS management does not need to be a drain on company resources. On the contrary, EHS insights can be woven into SCM business processes in order to discover new paths to business value. Worldclass supply chain management requires operating in a lean, agile, and responsive manner, with a focus on continuous improvement. This is entirely consistent with the business objectives of EHS excellence — minimizing waste, assuring business continuity, and maximizing resource productivity.



APPENDIX A

TOOLS AND RESOURCES

There are many different tools that companies use to better understand and manage the EHS aspects of their supply chain management strategies. Tools generally can be divided into the following categories:

- Business process mapping tools are used to capture the dependencies and flows of information between business processes. Visual mapping techniques such as workflow analysis help to depict existing processes and to develop alternative, more streamlined processes.
- Brainstorming tools are used to identify innovative opportunities for product development or business process improvement. For example, structured brainstorming is a key element of Six Sigma, a comprehensive approach toward eliminating waste and maximizing speed and efficiency. Six Sigma has been widely adopted by leading companies, such as 3M, Dow Chemical, DuPont, and Motorola (see page 9). Many of the resulting projects have included EHS considerations.
- Checklists and screening tools are used to review whether business decisions conform to company policies and guidelines. Many companies have incorporated EHS criteria, such as lists of preferred materials or points to consider, into business processes including procurement, outsourcing, and product development. For example, 3M has incorporated a life cycle management tool into their worldwide new product development process (see page 27).
- Quantitative decision support tools are used to evaluate and compare the costs, benefits, and risks associated with specific projects or business decisions. For example, BASF Corp. has uti-

- lized an Eco-Efficiency Analysis tool to develop products and processes with a reduced environmental footprint and lower life cycle costs.³³ The tool has been used in over 100 different BASF product applications such as asphalt microsurfacing, nylon fiber, building materials, automotive coatings, plastics, and adhesives, and the results have influenced business decisions regarding capital investments, process selection, and supply chain partnerships.
- **Full cost accounting tools** provide a means for measuring the true costs associated with a product or process. One example is a U.S. EPA guidebook that synthesizes best practices in improving both financial and environmental performance through materials management.34 Another important quantitative tool is the Total Cost Assessment (TCA) approach developed through a collaborative project involving several GEMI member companies, including Bristol-Myers Squibb, Dow Chemical, Eastman Kodak, Georgia Pacific, and Merck.³⁵ This methodology seeks to quantify the full monetary impact of business decisions, including indirect EH&Srelated costs, contingent liabilities, and intangibles such as public perception. For example, Dow Chemical has used TCA to supplement conventional accounting methods and influence major business expansion decisions.
- Performance measurement tools are used to evaluate and track the results of improvement initiatives. A variety of resources are available for selecting EHS metrics that align with supply chain performance, and the process of environmental performance evaluation has become standardized as part of the ISO 14000 series of environmental management system standards.

³² P.S. Pande, R.P. Neuman, and R.R. Cavanagh, The Six Sigma Way: How GE, Motorola, and Other Top Companies are Honing Their Performance, New York: McGraw-Hill, 2000.

³³ P. Saling, A. Kicherer, B. Dittrich-Krämer, R. Wittlinger, W. Zombik, I. Schmidt, W. Schrott and S. Schmidt, "Eco-efficiency Analysis by BASF: The Method," International Journal of Life Cycle Analysis, 2002.

³⁴ The Lean and Green Supply Chain: A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance, http://www.epa.gov/opptintr/acctg/pubs/lean.pdf.

^{35 &}quot;Total Cost Assessment," Center for Waste Reduction Technology, American Institute of Chemical Engineers, Washington, 1999.

The types of performance indicators used in conventional EHS reports include wastes and emissions, lost-time injuries, notices of violation, and spills and releases. More recently, many companies have adopted value-oriented EHS indicators such as eco-efficiency. Supply chain EHS performance measurement is challenged by boundary issues — for example, should a company be accountable for emissions from outsourced operations? Also, expansion of EHS concerns to include social responsibility presents new challenges, since the measurement of human well-being introduces subjective and intangible factors. A popular system for combining financial, operational, and organizational process indicators is the Balanced Scorecard,36 which is well suited for supply chain applications, as mentioned on page 36.

- **Risk management tools** are used to identify, assess, and mitigate a variety of risks to the enterprise, including business interruption and EHS liabilities. Traditional risk management has focused on insurance strategies, but modern risk management has expanded to include a broad range of proactive techniques for analyzing and controlling risks in many different arenas markets and currency, political and social, technical innovation, project management, safety and security, and others. EHS risk management focuses specifically on threats to human health, safety, and the environment. There are a broad variety of risk management tools in use, ranging from qualitative hazard identification and screening tools to sophisticated probabilistic risk assessment.
- Life cycle assessment tools provide a systematic method for identifying and quantifying the environmental burdens associated with the life cycle of a product or process.³⁷ Pro-active companies usually consider the full life cycles of their products and services, including resource extraction, procurement, transportation, manufacturing, product use, service, and end-of-life disposition or asset recovery. A life cycle *inventory* can be used to profile the system-wide energy and material consumption and waste genera-

- tion in terms of flows per functional unit. Life cycle *impact assessment* attempts to evaluate the actual significance of these flows in terms of human effects and ecosystem perturbations. Despite uncertainties and data quality issues, life cycle methods can be useful for relative comparisons of alternative system designs, thus supporting supply chain business decisions.
- **Environmental management systems** are analogous to quality management systems such as ISO 9000, except that they address EHS rather than product quality. They establish a repeatable, verifiable process whereby companies can set performance objectives, measure their progress in meeting those objectives, and pursue continuous improvement. There are a variety of different frameworks in use today, ranging from company-specific systems to international standards such as ISO 14000 that require external verification. Standards bodies are exploring the potential for integrating standards for quality, environment, health and safety, and even social performance into a single system. Many companies have already developed in-house management systems that integrate EHS and sustainability considerations, often extending to relevant aspects of supply chain performance.
- **Responsible Care**® is a global chemical industry initiative to safely handle products from inception in the research laboratory, through manufacture and distribution, to ultimate disposal, and to involve the public in decision-making processes. Born in Canada in 1987, Responsible Care has spread to 45 countries, and is administered in the U.S. by the American Chemistry Council. The program includes basic codes of management practice that cover EHS concerns in the areas of Community Awareness and Emergency Response, Distribution, Process Safety, Occupational Health and Safety, Pollution Prevention, and Product Stewardship. It also includes Supply Chain Protocols for evaluating the EHS practices of carriers, and offers partner memberships to chemical industry suppliers. Recent program enhancements include management system protocols, and a new Security Code.

³⁶ R.S. Kaplan and D.P. Norton. *The Balanced Scorecard*. Cambridge: Harvard Business School Press, 1996.

³⁷ Mary Ann Curran, Environmental Life-Cycle Assessment, New York: McGraw-Hill, 1996.



Appendix B

GLOSSARY OF EHS AND SCM TERMS

Balanced Scorecard. A framework for measuring both financial outcomes and non-financial drivers, including Learning and Growth, Business Process Excellence, and Relationships.

Brand equity. The intangible value associated with a particular brand identity.

Business case. A rationale for a business decision, based on analysis of costs, risks and benefits.

Champion. A person that actively endorses a proposed initiative and thus influences its adoption.

Corporate citizenship. Treatment of stakeholders in an ethical and socially responsible manner.

Corporate governance. The system by which business corporations are directed and controlled.

Corporate social responsibility (CSR). Commitment to uphold human rights, behave according to accepted ethical standards, and contribute to socio-economic development and quality of life.

Cost of ownership. The total cost incurred by a customer in acquiring, using, and disposing of a product. **Design for Environment (DfE).** A systematic process for incorporating environmental life cycle awareness into the development of new products and processes. Design for EHS is a similar practice that includes health and safety.

Differentiation. A competitive business strategy that seeks to offer products with distinctive features in order to differentiate the brand from those of competitors.

Economic value added (EVA). A measure of a company's financial performance, calculated by deducting its opportunity cost of capital from its after-tax operating profit.

Eco-efficiency. A measure of the resource intensity of a company's operations, including the inputs of materials, natural resources, and energy required to produce and deliver a unit of output.

Energy intensity. A measure of environmental efficiency in production, calculated by dividing the net energy consumption by the quantity or monetary value of the output.

Environmental footprint. The total environmental burden associated with a business operation, including resource consumption, land use, waste and emissions, and ecological impacts.

Environmental health & safety (EHS). A professional discipline concerned with protecting the environment, human health, and safety through scientific, engineering, and management methods.

Extended producer responsibility. A doctrine that assigns responsibility to manufacturers for minimizing the adverse environmental impacts of their products during customer use and end-of-life disposition.

Global warming. Gradual increase in average temperatures at the earth's surface, attributed to increased atmospheric concentrations of carbon dioxide and other greenhouse gases (GHGs), also known as global warming gases (GWGs).

Green purchasing. A business practice whereby purchasing agents in business or government evaluate products and services based upon selected environmental performance attributes.

Human capital. The set of skills which employees acquire on the job, through training and experience, and which increase their value in the marketplace.

Intangible asset. A non-monetary asset or value driver, including people, ideas, networks, and processes, which is not traditionally accounted for on the balance sheet.

License to operate. The ability of a corporation or business to continue operations based on ongoing acceptance by external stakeholder groups.

Logistics. The business function that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information.

Management system. A management approach that enables an organization to identify, monitor and control its performance, including financial, environmental, or social aspects.

Material intensity. A measure of environmental efficiency in production, calculated by dividing the net material consumption by the quantity or monetary value of the output.

Non-governmental organization (NGO). A not-for-profit organization that is not associated with government, e.g., charitable foundations, advocacy groups.

Non-renewable resource. A natural resource that cannot be replaced within the same time scale that it is consumed for industrial purposes, e.g., fossil fuels.

Partnership. A tailored business relationship that yields a competitive advantage, resulting in business performance greater than would be achieved by the firms working together routinely.

Product life cycle. (1) A series of stages in the physical life of a product, including resource extraction, procurement, transportation, manufacturing, product use, service, and end-of-life disposition or recovery. (2) A series of stages in the commercial life of a product, including concept development, design, introduction, growth, extension, phase-out, and discontinuance.

Product stewardship. Integration of EHS and sustainability considerations into the management of a product's life cycle, including relationships with customers and suppliers.

Product take-back. A program, either voluntary or mandatory, whereby manufacturers take responsibility for recovering and recycling obsolete products at the end of their useful lives.

Renewable resource. A natural resource that can be replaced within the same time scale that it is consumed for industrial purposes, e.g., lumber.

Return on investment (ROI). A measure of a corporation's profitability, equal to a fiscal year's income divided by common stock and preferred stock equity plus long-term debt.

Return on net assets (RONA). A measure of a corporation's profitability determined by dividing net income for the past year by total average assets minus total liabilities, i.e., net worth.

Risk management. The process of identifying and evaluating risks and selecting and managing techniques to adapt to risk exposures.

Risk. (1) The possibility of losing rather than gaining. (2) A measure of price fluctuation relative to the market. (3) The possibility of an adverse incident due to hazards or uncertainties.

Shareholder value. The value that a shareholder is able to obtain from his/her investment in a company, including capital gains, dividends, and proceeds from buyback programs.

Stakeholder. Any party that has an interest, financial or otherwise, in a firm — shareholders, creditors, employees, customers, suppliers, the community, interest groups, and the government.

Strategy. A set of goals and aspirations combined with an action plan for achieving those goals.

Supply chain. A network of suppliers and customers that add value in the form of materials, components, or services, ultimately resulting in a final product.

Supply chain management (SCM). The integration of key business processes from end user through original suppliers, which provides products, services, and information that add value for customers and other stakeholders.

Sustainability. Conditions or characteristics supportive of sustainable development, encompassing the environmental, social, and economic aspects of a corporation.

Sustainable development. Economic development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Time to market. The time interval or cycle time between the launch of a new product development effort and the market introduction of the new product.

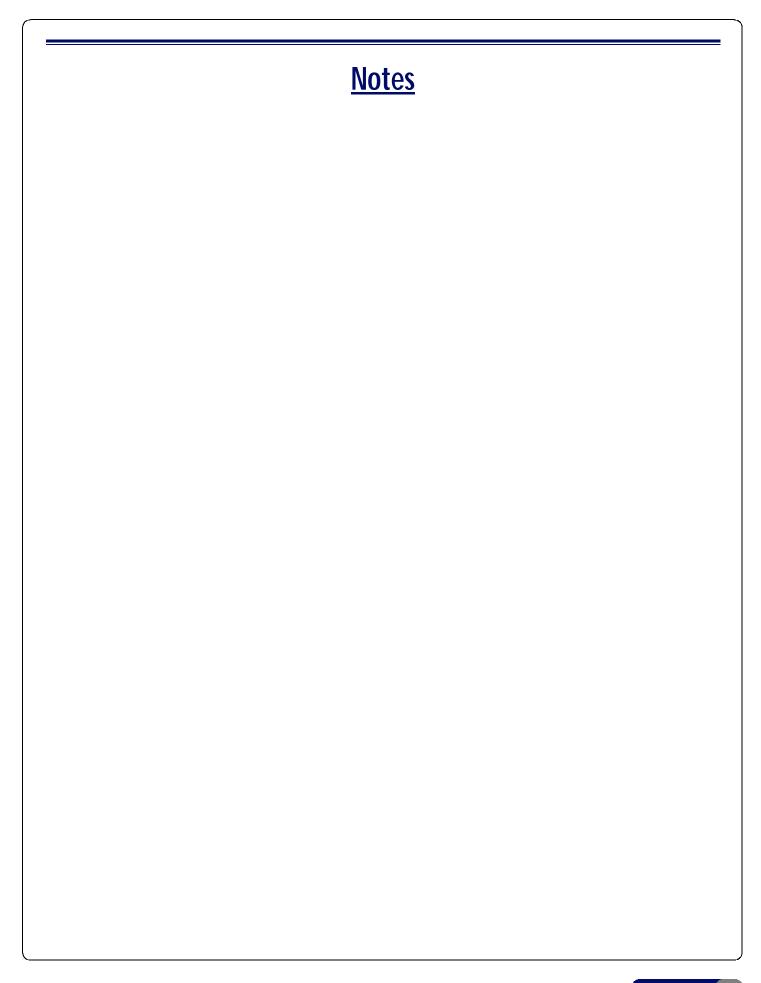
Transparency. Openness of a company or organization with regard to disclosing information about its policies, principles, and decision-making processes.

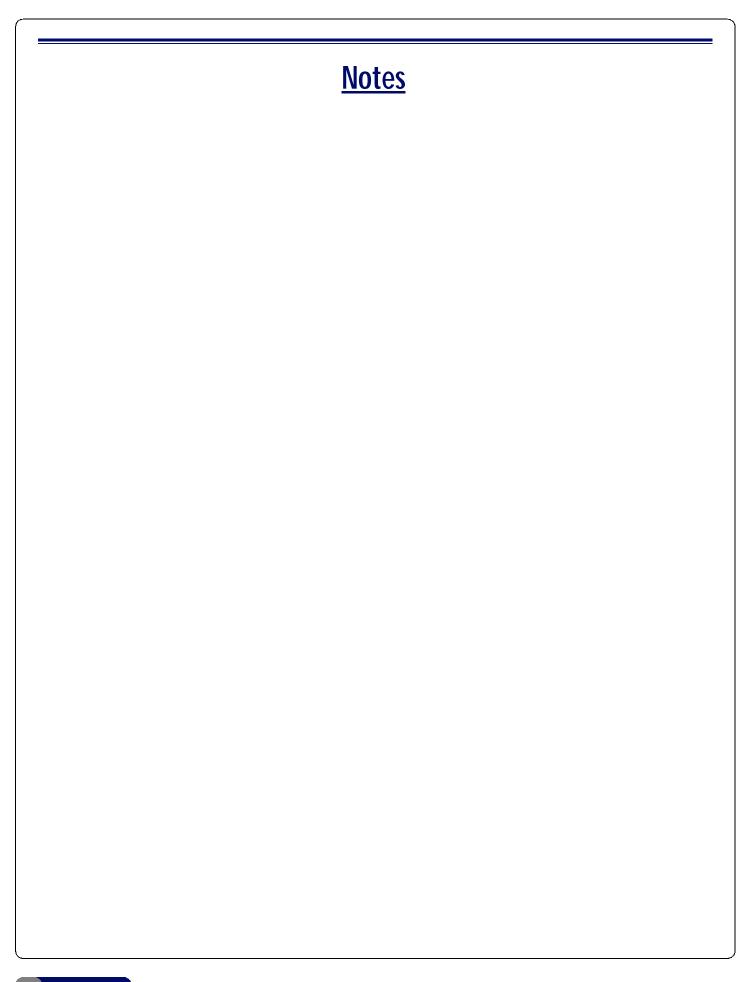
Triple bottom line. A framework for sustainable development that defines three fundamental aspects of corporate performance — economic, environmental, and social.

Upgradeable design. A design for a durable product that allows the product to be upgraded by the replacement of outdated components.

Value creation. Activities that generate shareholder value for a company, e.g., value-based management. **Value driver.** A fundamental and persistent characteristic of a business enterprise that influences its market value positively.

Sources: New York Times Financial Glossary, Eco-Nomics LLC, The Global Supply Chain Forum, Council of Logistics Management, and GEMI.









Enhancing Supply Chain Management Through Environmental Excellence

Home

SCM Basics

EHS Value

Methodology

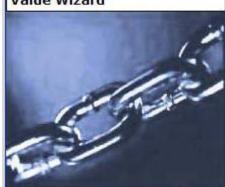
Relationships

Resources

Case Studies

Value Wizard

Value Wizard



Value Wizard

Welcome to the Value Wizard! This tool will help you quickly identify opportunities relevant to your company. There are four possible approaches that you can try, in any order.

Company Characteristics

Identify opportunities that are relevant to the basic characteristics your industry, your market, your processes, and your stakeholders.

Emerging EHS issues

Identify opportunities that are relevant to emerging business, regulatory or technological issues that may affect your industry.

Business Processes

Identify opportunities relevant to supply chain management business processes that your company has designated as priorities for improvement.

Identifying Opportunities for EHS Value Creation in Supply Chain Management

Value Drivers

Identify opportunities relevant to the key business value drivers that are the focus of your supply chain management efforts.

Each approach will add specific recommendations to your <u>Opportunity Bin</u>, which you can examine at any time.

Clear all My Previous Responses

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An interactive version of Forging New Links is available at http://www.gemi.org/supplychain. It includes a tool called the "Value Wizard" that helps to identify value creation opportunities based on specific company characteristics and priorities.

