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The New Supply Chain Edge

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At industry-leading companies, environmental, health, and safety (EHS) professionals are collaborating with other functions in the organization to enhance shareholder value throughout the supply chain. They are contributing to profitability, supply chain continuity, resource productivity, innovation, and growth. As a new report confirms, EHS excellence today means much more than the "greening" of the supply chain. It's a powerful source of competitive advantage as well.

A dozen years ago, leading manufacturers such as HP began adding environmental criteria to their supplier scorecards, encouraging practices such as recycling and energy conservation. But most supply chain managers tended to view those measures as more of an obstacle—an appeasement tactic for the environmental lobby, in effect—than as something that would add value.

Now the approach taken by leading companies is moving beyond the "greening of the supply chain" to a realization that environmental, health, and safety (EHS) factors can significantly bolster business value. EHS managers are joining cross-functional supply chain management (SCM) teams and are contributing to customer retention, revenue generation, cost reduction, and asset utilization. In other words, they are confirming the synergies between environmental excellence and supply chain excellence.

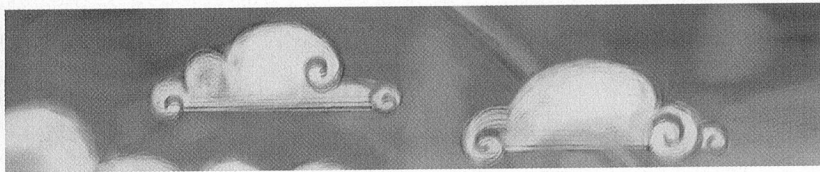
The environmental, health, and safety function has been quietly gaining influence for more than two decades. In most manufacturing companies, the corporate environmental, health, and safety responsibilities have been coordinated under a vice president who is typically one or two steps removed from the chief executive. Many companies have decentralized their EHS personnel so that they report to line managers at manufacturing sites. The EHS leader, long responsible for regulatory compliance, is now increasingly involved in championing the company's corporate social responsibility programs. In practice, the function is moving from a largely reactive cost-containment and risk-management role to a position that can influence innovation, revenues, and growth.

The purpose of this article is to demonstrate how EHS capabilities can create shareholder value. The article is based on a report published in June 2004 by the Global Environmental Management Initiative (GEMI), an industry association of about 40 major global corporations whose mission is to help businesses improve EHS performance, shareholder value, and corporate citizenship.¹ The report provides a comprehensive review of the opportunities for supply chain value creation across a broad variety of industries. Unlike previous work on "greening of the supply chain," the report focuses on real-life

JENNIFER MCCONNELL

examples of how environmental excellence can benefit the enterprise. It shows how EHS professionals are moving beyond their traditional competencies in assuring compliance and managing risks and are making contributions to profitability, resource productivity, innovation, and growth.

At leading companies, it is becoming standard practice to ensure that EHS managers become part of the cross-functional teams that guide supply chain business processes.



To realize these opportunities, however, EHS groups must reach beyond their traditional boundaries and establish stronger relationships up and down their organizations' supply chains. For their part, cross-functional SCM teams must welcome the inclusion of talented EHS members. The resulting relationships will help create credible business justifications for emerging EHS initiatives and will make it easier to gain top management support for these initiatives. 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.

Why EHS Matters Now

Environmental concerns have taken on a broader significance for politicians and for society as a whole. An entire generation has grown up with a good understanding of why environmental issues matter. Proponents of corporate social responsibility are increasingly vocal in influential arenas such as the World Economic Forum. And regulations are growing tighter all the time. A recent example: In the U.S., Europe, and Japan, stringent new rulings on air quality are adding complexity and cost for transportation companies, energy producers, and others.

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Increasingly, manufacturers are expected to take responsibility for disposal of products and packaging at the end of their useful life. 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 has become a critical issue with EHS implications.

The importance of the EHS perspective also is evident in the outsourcing trend that is blurring the boundaries between suppliers and customers. For example, many semiconductor fabrication plants, which purchase and use large volumes of chemicals, are now utilizing supplier turnkey services to provide total chemical management, including procurement, product handling, and waste disposition.² In these types of relationships, the supplier's EHS management capabilities are an important competitive factor. Similarly, the push for supplier-customer partnerships enables companies to work more closely on designing integrated solutions for the end customer. 3M and other companies routinely apply lifecycle management principles to design products and processes that reduce supply chain costs, improve environmental performance, and meet customer expectations.³

Less obvious (at least until demonstrators and police clash at the next global business forum) are concerns about inequalities between rich and poor countries, as well as adverse environmental impacts such as energy consumption and greenhouse gas emissions.⁴ There are significant tensions between economic opportunities and environmental and social concerns—tensions that can raise real barriers to effective global supply chain management.

Another factor is the movement to recover, recycle, and remanufacture obsolete products, parts, and materials. The trend has been spurred by government adoption in Europe and elsewhere of extended producer responsibility for the full product lifecycle, including post-consumer disposition ("product take-back"). Companies are responding by designing products in ways that facilitate safe, efficient, and cost-effective recovery at the end of their useful life.⁵

The heightened emphasis on corporate social responsibility gives EHS a more important role too. External stakeholders—which can be insurers, lenders, local communities, and advocacy groups as well as customers and suppliers—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.⁶ In response to these trends, the Institute for Supply Management recently announced a new set of principles for social responsibility (see www.ism.ws).

An EHS perspective is also valuable for dealing with a by-product of "lean" production and other time-sensitive order fulfillment approaches: the tendency to shift inventory burdens onto suppliers. These techniques usually lead to demand for smaller, more frequent orders that may be less resource-efficient. EHS best practices can help to reduce order fulfillment costs by devising lighter-weight, more energy-efficient packaging and transportation solutions.

Another area of opportunity for EHS is to extend the utility of business-to-business (B2B) Internet networks to handle reverse logistics and management of waste materials. B2B processes and "material pooling" could give companies much broader access to low-cost sources of recycled materials and components as well as to potential market channels for unwanted by-products.

We can identify one more way in which EHS will play a greater role in supply chain efficiencies: in pinpointing vulnerabilities and developing emergency response plans to reduce a company's susceptibility to business interruption. In both supply chain and EHS management, there is now an emphasis on resilience—the capability to respond quickly to unforeseen disruptions.⁷ Regrettably, it has taken the horrors of international terrorist activities to bring supply chain vulnerability sharply into focus. Yet even now, many firms have not yet implemented formal supply chain continuity preparedness programs, and only about 61 percent of U.S. businesses have disaster recovery plans. Most of these plans cover data centers, and only an estimated 12 percent cover total organization recovery.

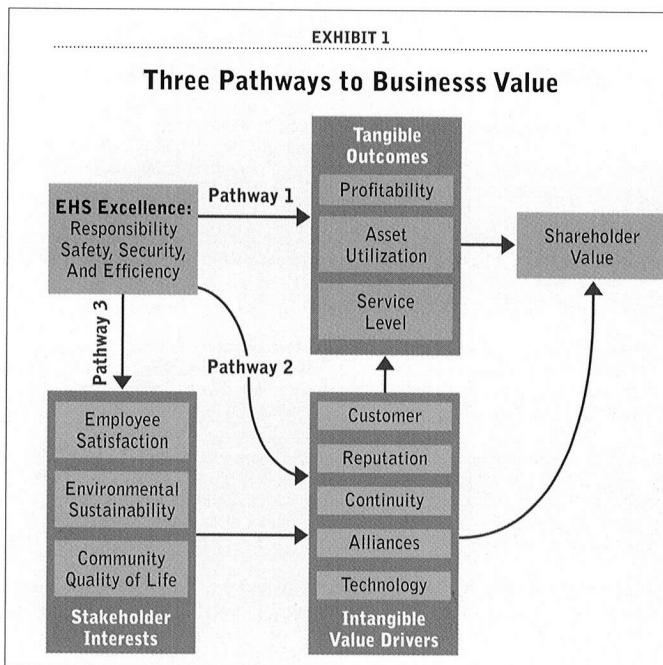
Three Pathways for EHS to Create Value

To better understand the available pathways for environmental, health, and safety value creation, it helps to refer to a common financial metric: "economic value added" (EVA).⁸ EVA is defined as the difference between after-tax operating profit and the opportunity cost of capital employed. In essence, a company that can generate a flow of profits greater than its cost of capital is adding shareholder value, while a firm that has a cost of capital that exceeds its profits is destroying shareholder value. EVA can be used as a tool to measure supply chain performance and to develop a business case for EHS-related initiatives.

There are three main pathways for EHS to contribute to EVA by adding value to the supply chain. These pathways are illustrated in Exhibit 1. More specifically, Exhibit 2 lists eight categories of EHS value contributions along these pathways, together with brief, illustrative examples. (Detailed case studies can be found in the GEMI report.⁹)

Pathway 1: Tangible value contributions. EHS capabilities often contribute directly to financial performance. For example, they can generate revenues from waste materials or cut the costs of site remediation. 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 (such as the cost of specialized equipment and training for handling hazardous waste).

- **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 value contributions. While EVA is strictly a financial metric, there are many *intangible* factors that are important leading indicators of financial performance, even though they do not appear on financial statements.¹⁰ EHS capabilities contribute directly to improvements in key intangible value drivers that influence shareholder value. Here are a few examples:

- **Customer Relationships:** Supporting customers in the safe and effective use of products and improving the quality of products and services by addressing the EHS-related needs of customers. (Increasingly, customers have detailed questions about sources of materials and labor practices, for example.)

- **Brand Equity and Reputation:** Establishing an image of corporate responsibility, integrity, and transparency to increase the trust and satisfaction of both employees and external stakeholders.

- **Business Continuity:** Decreasing risks of business interruption by helping to monitor suppliers, by assuring product and process safety, by intervening rapidly and effectively when incidents do occur, and by 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.

EXHIBIT 2

Real World Examples of Where EHS Makes a Contribution

Assure compliance of products and business processes with laws, applicable regulations, and industry standards.

Texas Instruments responded to customer needs by developing a systematic process for assuring compliance with requirements regarding banned and restricted substances.

Minimize risks and maintain business continuity by assuring product and process safety throughout the supply chain.

Dow Chemical has adopted a behavior-based approach to transportation safety that cuts accident rates while decreasing fuel consumption and costs.

Maintain health and well-being, both for employees and local communities through responsible management of operating sites.

Abbott Laboratories reduced contractor safety incidents to well below the industry average by integrating safety protocols into its automated contractor performance management system.

Protect the environment, including public health and natural resources, through waste elimination, pollution prevention, and ecological stewardship.

FedEx Express redesigned its overnight letter packaging to utilize 100% recycled fiber, strengthening its environmental leadership without compromising product performance or long-term costs.

Raise productivity with material conservation, energy efficiency, and conversion of wastes into by-products.

Intel has saved millions of dollars annually by developing lighter-weight plastic trays that are used to move micro-processor units through the fabrication process and deliver them to customers.

Further relations with customers, suppliers, and other stakeholders that influence supply chain effectiveness and license to operate.

Eastman Kodak, Hewlett-Packard, and Motorola have published their expectations for suppliers' EHS performance, including corporate citizenship, product stewardship, and sustainable business practices.

Support innovation in products, services, and technologies that enhance financial performance or customer satisfaction.

Kodak uses "design for EHS" principles that have helped cut the weight of its digital cameras while the products' performance has dramatically improved.

Enable growth, including acquisition and sales expansion, by performing due diligence and supporting access to new markets.

Anheuser-Busch reengineered its supply chain systems to cope with the increasing complexity of its products, simultaneously improving operating efficiency and environmental performance.

Source: GEMI, *Forging New Links: Enhancing Supply Chain Value through Environmental Excellence*.

■ **Technology:** Incorporating EHS skills and specialized knowledge into supply chain technologies and business processes, such as reverse logistics.

Pathway 3: Indirect, intangible value contributions. EHS capabilities further enhance intangible value drivers by creating value for external stakeholders. Commitment to environmental and social responsibility implies responsiveness to the needs of society, which includes 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 affected by their operations.

Improving EHS performance indirectly benefits shareholders, because the perceptions of key stakeholders can profoundly influence many of the above intangible value drivers, including customer relationships, brand equity and reputation, and business continuity. In particular, companies need to consider EHS-related opportunities for *reciprocal* value creation in the context of alliances with suppliers and customers. For example:

■ 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—for instance, reducing the customer's cost of ownership—suppliers can differentiate themselves and increase customer loyalty.

■ By collaborating, customer-supplier teams can address EHS-related technical challenges that affect overall supply chain profitability and performance.

There are plenty of examples of EHS initiatives in action across the supply chain. (See Exhibit 2.) Additionally a compelling story is an initiative at Motorola, which is highlighted in the sidebar on page 56. This initiative was originally motivated by EHS concerns and then evolved into a broad supply chain improvement project leveraging all of the above pathways to value.

Cross-Functional Teamwork and Business Processes

Clearly, EHS issues can no longer be addressed in a reactive fashion. At leading companies such as Intel, FedEx, Dow Chemical, and Pfizer, it is becoming standard practice to integrate EHS managers into cross-functional teams that guide supply chain business processes. In addressing these processes, the GEMI report utilized a reference model developed by The Global Supply Chain Forum at The Ohio State University (fisher.osu.edu/scm). This model defines eight

SCM business processes, flowing from customer relationship management to returns management. Exhibit 3 shows EHS's contribution to each supply chain business process.

These companies continue to recognize the importance of EHS traditional roles of cost avoidance and risk reduction, while also exhibiting a clear understanding that EHS insights and relationships can create many growth opportunities. "Our EHS colleagues are full partners in evaluating the suitability and performance capabilities of our contract manufacturers," says Tom Lawlor, Pfizer's senior director of global contract manufacturing. "Their contribution to the management of supplier relationships is essential to the overall success of our program."

The contribution of EHS is less clear in other companies—at least, not clear enough to knock down the barriers that keep EHS professionals off SCM teams. And those barriers are many. In addition to the complexity of having to communicate with extra team members, EHS and SCM managers find that they have different vocabularies and ways of quantifying value. These barriers must be identified and cleared away if businesses are to attain their full potential.

The GEMI report gives detail on how such organizational alignment can be achieved.¹¹

As illustrated in the Motorola case study, strong internal collaboration is essential for EHS-related supply chain improvement initiatives. Early engagement of key internal stakeholders will increase their sense of ownership and will likely result in a more pragmatic and well-focused approach.

Practical Issues in Value Creation

Based on the experiences of GEMI member companies, a number of practical issues must be addressed if EHS is to add value to the supply chain. They include:

Opportunity Selection. Given the broad spectrum of environmental, health, and safety opportunities, a company must prioritize them based on how compatible they are with its business. 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. GEMI offers a user-friendly, interactive tool, called the Value Wizard, which recommends EHS value-creation opportunities based on a company’s business characteristics, strategic priorities, principal markets, and key stakeholders.¹²

Once potential opportunities have been identified, a com-

pany will need to apply filters to select the most attractive projects. There are 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 last criterion suggests a careful evaluation of the required EHS capabilities. These capabilities might include risk management, pollution prevention, product stewardship, lifecycle 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.

Performance Measurement. Pinpointing quantitative measures of value and declaring realistic targets for performance improvement will boost the credibility and visibility of any EHS supply chain initiative. It would also lay the foundations for future analysis and continuous improvement. In the case of companies that use multidimensional measurement systems such as the Balanced Scorecard, the metrics ideally should mirror those dimensions. Examples of potential Balanced Scorecard measurements include financial metrics (such as unit profit margins and cost reductions), strategic metrics (like market share and customer retention), and operational metrics (like inventory turns and service level).

To reinforce reciprocal value creation, it’s important for suppliers and customers to be able to recognize and quantify each other’s value contributions. Unfortunately, most existing supply chain performance metrics 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 ways that improve profitability for both parties.¹³ An example is the “shared savings” approach in which suppliers can benefit from reduced resource consumption that lowers overall supply chain costs and environmental impacts.

External Stakeholder Engagement. Value creation initiatives may benefit from collaboration with external stakeholders that can influence their success. The stakeholders may be:

—*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, nongovernmental organizations, academics, consultants, and the media).

Early involvement of external stakeholders may help to

EXHIBIT 3	
Potential EHS-Related Contributions To Supply Chain Business Processes	
Customer Relationship Management	• Provide valuable technical services to customers. • Maintain reputation for corporate responsibility. • Collaborate on innovative EHS solutions.
Customer Service Management	• Promote safe and responsible product handling and use. • Transfer EHS technologies and expertise. • Reduce the customer’s cost of ownership. • Facilitate and streamline product service and support.
Demand Management	• Identify EHS factors related to demand patterns.
Order Fulfillment	• Enable expansion into new markets. • Reduce costs and increase resource efficiency. • Avoid and mitigate business interruptions.
Manufacturing Flow Management	• Assure safety and continuity of production facilities. • Reduce process wastes and seek by-product synergies. • Develop employee loyalty and community support.
Supplier Relationship Management	• Screen or audit suppliers’ EHS practices. • Collaborate on streamlining and waste conversion. • Perform due diligence for acquisition of new operations. • Transfer EHS technologies and best practices. • Develop management systems and shared performance metrics.
Product Development & Commercialization	• Support brand differentiation through EHS features. • Anticipate regulatory constraints and emerging issues. • Identify and reduce hidden or indirect EHS-related costs. • Influence specification of benign materials.
Returns Management	• Enable cost-effective recovery and re-use of materials. • Develop collaborative reverse logistics strategy. • Minimize end-of-life environmental burdens.

clarify the relevant business drivers, to ensure acceptance of the initiative, and eventually to communicate its progress. Collaboration between customers and suppliers is commonplace. However, dialogue with other interested parties may require coordination with public affairs, communications, or investor relations to assure adequate preparation and to protect against unintentional miscommunications. Examples of collaborative stakeholder engagements are described below.

■ **Strategic partners.** Establishing and maintaining 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 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: "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."

A decision to partner will be influenced both by the attractiveness of mutual benefits and by facilitating factors such as cultural compatibility. For example, the partnership between Coca-Cola and McDonald's is enhanced by the fact that both are the leaders in their industries. Coca-Cola is McDonald's

largest supplier, and McDonald's is Coca-Cola's largest customer. Collaboration among partners on EHS issues is frequently required in the context of process streamlining, risk management, or outsourcing.

■ **Customers and Suppliers.** Not every relationship will be a true partnership, of course. Yet pursuit of EHS opportunities frequently requires robust communication and/or collaboration with customers and suppliers. In certain cases where industry standards are desirable, broader collaboration may be warranted among a group of companies within an industry segment. For example, a number of global companies including HP, Home Depot, IKEA, Mattel, and Nike have joined with ocean freight carriers to form a Clean Cargo Group, dedicated to sustainable ocean transportation.

■ **Governments.** Many companies prefer proactive and voluntary collaboration with government agencies. Those companies can anticipate and respond to emerging regulatory issues, such as end-of-life product take-back schemes. At the same time, they also can help to ensure that public policy is based on realistic information about business constraints and options. Although regulatory agencies focus primarily on enforcement, there is continued interest in more innovative, voluntary programs that seek to achieve environmental goals in a more flexible manner. One example is the Suppliers Partnership for the Environment, a trade association created in 2002 through a collaborative initiative among General

How EHS Drives Savings and Efficiencies at Motorola

Motorola has learned firsthand what EHS excellence can do for the bottom line. As part of a Six Sigma project at one of the company's major distribution centers (DC), EHS led an effort to reduce pallet-related injuries. This effort has evolved into a major initiative that is yielding multi-million dollar benefits for the supply chain while enhancing customer service.

Employees at the DC's loading dock were being hurt by pallets, with injuries ranging from serious splinters to broken bones. A team led by EHS worked up a root-cause analysis and discovered that pallets coming from suppliers often did not conform to specifications. Many were too small, or out of square, or too vulnerable to breakage.

So the team developed a comprehensive approach that standardizes packaging and pallets; dramatically reduces the number of pallets handled, stored, and disposed; maximizes the packaging density to reduce transportation costs; and addresses associated injury costs and occurrences. The project has already reduced costs by more than \$1 million—and is expected to save over \$5 million in 2004. Once it became apparent that the impact was greater than originally imagined, management encouraged other functions to join the team.

The Motorola approach uses a customized inbound discrepancy report (IDR) system that tracks supplier compliance, updates supplier scorecard performance, and quantifies the cost of supplier defects. IDR automatically communicates the data to Motorola's pallet suppliers and even withholds payment to suppliers whose

products are out-of-spec.

The automated system—now endorsed for use at all of Motorola's distribution centers—allows workers to record all inbound discrepancies at the receiving dock, using simple key-stroke entries, scanning, and digital imaging. The system is linked to several other enterprise systems (purchasing, inventory, order entry, and so forth) to provide access to detailed information on vendors, shipments, purchase orders, and stocking data.

The project has achieved these tangible results in the first two years (2002-2003):

- A 58-percent reduction in pallet-related injuries, saving \$400,000 in avoided workers' compensation costs.
- A 12-percent reduction in discarded pallets, equivalent to \$120,000 in new pallet purchases.
- A \$400,000 saving in reduced transportation expenses.
- A \$100,000 saving in reduced handling and storage of pallets.
- Improvement of 16 percent in the recycling rate of nonhazardous wastes.

As the global adoption of the inbound discrepancy report system continues at all Motorola DCs, cost savings and improved EHS performance are expected to increase exponentially. In April of 2004, the IDR project received a Motorola CEO award for developing a permanent institutionalized tool that drives not only environmental, health, and safety savings but also improvement in multiple supply chain organizations.

Motors and DaimlerChrysler, their suppliers, and the U.S. Environmental Protection Agency. This initiative seeks to create new and innovative business-centered approaches to environmental protection that improve the environment while providing value throughout the automobile supply chain.

■ **Nongovernmental Organizations (NGOs).** The influence of nongovernmental organizations in the EHS field has changed dramatically with their recent mastery of information technology and the mass media. Many companies are establishing alliances with NGOs to support and validate their efforts to pursue environmental and social responsibility. For example, the Alliance for Environmental Innovation, an outgrowth of the nonprofit organization Environmental Defense, has collaborated with leading companies such as FedEx Express to help design environmentally benign products and supply chain processes. Critical success factors for company-NGO collaboration include selecting an NGO with interests and capabilities that are well matched to the opportunity; clearly documenting agreed-upon goals, collaborative processes, and outcome metrics; and maintaining transparency, trust, and frequent communication over the course of the project.

The Value Contribution

The goals of 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.

So what can be learned from the companies that successfully leverage their EHS capabilities to improve supply chain performance? There is plenty to be passed along.

There are good lessons in how EHS professionals can help create reciprocal value in relationships with key suppliers and customers. Collaboration with their counterparts at supplier and customer organizations can reveal new, mutually beneficial solutions to materials-management, transportation, and other supply chain issues. And their integration into cross-functional supply chain process teams can influence product development to help avoid delays in time to market, and improve overall product characteristics, including manufacturability, maintainability, recyclability, consumer acceptance, and the cost of ownership.

The barriers that can prevent EHS from adding value are similar to those that have impeded past efforts at supply chain innovation—namely, resource limitations, resistance to change, lack of adequate models, and lack of champions for integrated thinking. But just as earlier impediments have been overcome by articulating a clear business case to gain senior management endorsement, so too can barriers to EHS-led initiatives be overcome.

Today it is imperative for industry executives to tap the expertise and creative capabilities of EHS professionals. They already know that short-term profitability is not sufficient—that responsible governance and social responsibility are neces-

sary to nourish profitability and shareholder value over the long run. World-class supply chain management now requires businesses to operate in a lean, agile, and responsive manner, with a focus on continuous improvement. It is clear that EHS goals—goals such as minimizing waste, assuring business continuity, and maximizing resource productivity—can contribute significant value to world-class supply chains. 

Footnotes

¹GEMI. *Forging New Links: Enhancing Supply Chain Value through Environmental Excellence*, Washington DC: GEMI, June 2004. An interactive version of the report is available on the Web at www.gemi.org/supplychain and the full report can be downloaded at no charge. To request a hard copy or learn more about GEMI, contact info@gemi.org.

²"Chemical Management Case Study in the Semiconductor Industry." *Semiconductor Fabtech*, Spring, 2002.

³Fiksel, Joseph, ed. *Design for Environment: Creating Eco-Efficient Products and Processes*. New York: McGraw-Hill, 1996.

⁴International Monetary Fund. *Globalization: Threat or Opportunity*, Jan. 2002.

⁵Guide, V.D.R. Jr. and L.N. Van Wassenhove. "The Reverse Supply Chain," *Harvard Business Review*. Feb. 2002.

⁶Commission for Environmental Cooperation of North America. *Green Procurement: Good Environmental Stories for North Americans*. Five Winds International, 2003.

⁷Rice, J.B. and F. Caniato. "Building a Secure and Resilient Supply Network," *Supply Chain Management Review*. Sept./Oct. 2003.

⁸The term "economic value added" was first trademarked by Stern and Stewart. (See www.sternstewart.com.) Similar financial metrics are often designated by other terms such as "shareholder value added." While EVA is used widely, this article is also applicable to other common financial metrics such as return on investment (ROI) or return on net assets (RONA).

⁹See Section 1 of GEMI report: www.gemi.org/supplychain. The processes fit with the authors' strategic definition of SCM as "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." Reference 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 www.ijlm.org.)

¹⁰Low, J. and P.C. Kalafut. *Invisible Advantage: How Intangibles Are Driving Business Performance*. Cambridge: Perseus Books, 2002.

¹¹See Section 5 of GEMI report: www.gemi.org/supplychain.

¹²The Value Wizard can be viewed at www.gemi.org/supplychain.

¹³Lambert, D. and T.L. Pohlen. "Supply Chain Metrics," *The International Journal of Logistics Management*. Vol. 12, No. 1 (2001), pp. 1-19. (See www.ijlm.org.)