

# INTEGRATED SUMMARY

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## BACKGROUND

This document is a compilation of papers presented at the “Top Forum on Green Productivity” from May 25-27, 2000. The forum brought together experts from Japan, Taiwan, Europe, and North America to share experiences and discuss the issue of greening the supply chain. The conference addressed several key aspects of supply chain management, including:

1. The importance of enhancing Green Productivity (GP) through incorporating consideration of numerous environmental characteristics in the purchasing of material and products, including: dematerialization, minimizing the energy intensity of goods and services, enhancing recyclability, and maximizing the use of renewable resources;
2. Approaches to developing new partnerships among firms that enhance environmental and sustainability performance;
3. Identification of new roles for government such as developing eco-labeling programs and promoting ISO 14000 that will provide a framework for firms to adopt green purchasing;
4. Strategies for stimulating new consumption patterns; and
5. Technological breakthroughs needed to increase green purchasing.

## WHAT IS “GREENING THE SUPPLY CHAIN”?

Broadly speaking, greening the supply chain is the process of incorporating environmental criteria or concerns into organizational purchasing decisions and long-term relationships with suppliers. The value of greening of the supply chain depends very much on the nature of the organization. Governments view it as a useful tool for stimulating the development of environmentally friendly products to reduce overall environmental loading and help move economies along the path of sustainable development. Businesses tend to see greening the supply chain as a competitive or image issue; initiatives to green supply chains can stimulate the development of “greener” products, decrease risks and liabilities, and lower costs of the chain as a whole.

As the papers presented in this document demonstrate, there are a number of initiatives underway in both the public and private sector to stimulate the greening of supply chains. Initiatives generally fall into two categories. The first involves improving coordination with suppliers on environmental efforts to facilitate the development of

greener or more environmentally friendly products. The second type is: demanding improved environmental performance at suppliers' operating facilities, such as requiring suppliers to obtain ISO 14000 certification or achieve a set standard of performance. The key distinction between the two types of initiatives: the first emphasizes the role of the supplier in assisting the customer with product design and resolution the customer's environmental problems; the second focuses on the suppliers' internal performance combined with customers' desire to reduce risks/liabilities or to lower costs through implementation of better environmental management throughout the supply chain.

### **WHY GREEN SUPPLY CHAINS?**

Greening the supply chain represents a tremendous opportunity for all stakeholders concerned with issues of sustainable consumption and business environmental performance. As several of the authors point out, the heart of the sustainability challenge lies in changing our patterns of mass production and mass consumption. In his essay, Kuo Zhong Liu discusses many of the conflicts between current business principles and global ecological sustainability.

As companies and consumers, we must rethink our product designs and manufacturing techniques to develop more environmentally friendly products that generate a lower environmental burden in their use and manufacture; we must increase the "eco-efficiency" and "eco-effectiveness" of our products and businesses, in the words of William Shireman and Niven Huang. Several authors, including Takeo Takagi and Hiroaki Koshibu, also describe the need to develop closed loops within societies to recycle and reuse products at the end of their functional life as a strategy for reducing demand for new raw materials and resolving our waste disposal dilemma. These changes will have profound implications for all companies, and a company's long-term success will depend on its ability to manage and coordinate supplier relationships, and, most importantly, to green its supply chains.

From a macro-perspective, greening is important both as a mechanism for strengthening our ability to design green products and as a vehicle for creating markets for eco-friendly industrial products. Supply chain greening will require a range of new inputs and materials that, in turn, will create a market for companies willing to invest in the design and manufacture of products to meet sustainability needs. Most importantly, this market will include not just consumer products, but also upstream industrial inputs manufactured by SMEs, thereby drawing them into the emerging green markets.

### **THE VALUE OF A GREEN SUPPLY CHAIN**

Supply chain greening initiatives have benefits on the level of the individual firm as well as on the national level. For individual firms, supply chain greening programs bring distinct competitive advantages in terms of lower costs, greener products, and better integration with suppliers. On a national level, greening of supply chains can stimulate markets for green products, while also creating incentives for SMEs to adopt better environmental practices.

At its most basic, greening a supply chain can improve the overall competitiveness of a company by lowering costs. As many case studies have already documented, smaller companies often have substantial opportunities to reduce costs through the implementation of GP, industrial waste minimization (IWM), or other environmental programs. The papers on the Republic of China's CSS program show the financial benefits accrued by several companies who drove IWM implementation in groups of suppliers. Pushing suppliers to become more efficient often helps lower the overall production costs for a given item, thereby increasing the overall competitiveness of the entire chain. For companies in industry sectors with low margins, lower supply chain costs can translate into a significant market advantage.

In addition to lowering costs, closer cooperation with suppliers can also lead to greener products. Most manufacturers rely on a wide array of suppliers to provide the inputs necessary to produce their goods. As Lynn Johannsen noted, LCA studies have indicated that up to 70 percent of a product's environmental impact and resource demands are determined by its design. Improving design, however, requires close cooperation with suppliers to identify inputs or changes to make products more recyclable, to reduce the amount of toxic materials used in design, to enhance reusability, to dematerialize the goods, and apply other similar principles. Indeed, as William Shireman points out, virtually all companies will have to rethink their products to make them more eco-effective as the global economy continues to be transformed by new technologies and the demands of sustainability. Companies will require strong cooperative relationships with suppliers to succeed.

Green supply chains can also open new markets for companies. As the papers by Ning Yu, Loretta Legault, and Lynn Johannsen describe, governments in Taiwan, Indonesia, the United States, and Canada are developing programs to purchase environmentally friendly products. Hiroaki Koshihara describes the emergence of the Green Purchasing Network in Japan which is comprised of both public and private sector buyers. In all cases, the passport to entry into the market is having a product that is competitive in terms of performance and offers desirable environmental characteristics. Indeed for companies seeking to export to large buyers in Japan, Europe, and the U.S., environmental criteria are becoming highly important as consumer expectations and new product take-back laws are forcing companies such as Fuji-Xerox to rethink their product design. The growth of eco-label programs around the world is part of this overall trend.

On a broader level, many of the benefits of greening a chain also relate to the increasingly integrated nature of manufacturing supply chains. In an era of growing global competition, companies no longer compete alone in the market, but rather engage on the basis of their entire production chain and its ability to innovate. The emerging competitive environment requires strong cooperation between a company and its suppliers and the ability to rapidly improve product design and quality while still controlling costs. As sustainability emerges as a major force in the market due to new regulations and consumer expectations, the ability to efficiently manufacture products that provide both functional and environmental value (e.g., resource efficient, non-toxic, etc.) will become the key to success. Indeed even if one doesn't believe in an emerging "green market," one of clear lessons of the last five years is still relevant: improved environmental performance typically is a sign of higher efficiency and therefore lower costs. In this context, greening the supply chain offers an opportunity to gain competitive advantage.

On a national level, green supply chains will also be important to governments in assessing the overall international competitiveness of their country's industrial sector. As Lung Sheng Chang describes, the Republic of China's National Science Council has targeted eco-materials as a strategic industry for the future. The leading companies in Japan have already made a clear commitment to eco-design out of a conviction that it is the key to long-term competitiveness. As economies seek to meet the challenges of sustainability, the ability of a nation's industry to design and manufacture green products that minimize resource demands will become central to maintaining its market position.

For national-level organizations seeking to promote eco-design, private sector initiatives to green their supply chains are important for their role in establishing a market for green products. Government green procurement plans can also play an important role, although their significance varies depending on the product. Government procurement programs can help create baseline demand, but, as Hiroaki Koshibu points out, complementary efforts by the private sector to increase its green purchasing are also essential. Demand from green procurement and green supply chains can also help complete the recycling and reuse loops for products that are increasingly important to overall national sustainability strategy in countries such as Japan.

Increased demand for green products or green suppliers also offers an important mechanism for influencing the behavior of small and medium-sized enterprises. Traditionally, governments have found SMEs extremely difficult to regulate due to the limited resources within SMEs for environmental management. Furthermore, the vast number of SMEs in Asian countries (typically upwards of 60,000) makes it difficult to conduct routine inspections. Weaving environmental criteria into the fabric of the market provides a powerful and inescapable motivation for SMEs to improve their environmental performance. Furthermore, criteria can potentially influence a vast number of SMEs within a short time frame. The papers by Shen Yan Chiu and Wen Huei Chen describe the relationships between major purchasers and SMEs and the level of influence inherent in buying relationships. Their papers, along with that of Deng Ming Lee, describe some of the improvements in SME performance that can result from greening efforts. One of the key conclusions is that major buyers may have more immediate influence over the behavior of SMEs than do government agencies.

## **MECHANISMS FOR SUPPLY CHAIN GREENING**

The clear message arising for those interested in supply chain greening (SCG) is that it starts with establishing demand for greener products. It is important to remember that demand can come from users of products including consumers, government agencies, or corporate purchasers as well as regulatory expectations. Companies such as TECO, an appliance and electronics manufacturer in Taiwan, will undertake SCG initiatives when there is a clear need due to direct consumer interest, green bid specifications from corporate or government clients, or regulatory demands for product take-back. The demand then begins a cascade effect down the value chain as TECO passes its "green" needs to its suppliers who, in turn, send the demands further upstream to their suppliers. Clear demand and expectations provide the incentive for companies to establish purchasing criteria for suppliers, which in turn creates an incentive for suppliers to develop environmentally friendly products.

However, even in situations where demand is present, there are often barriers to implementing SCG and green procurement initiatives. The first is a shortage of information about the environmental aspects of products. Assessing the life cycle impacts of products is a highly complex task requiring access to substantial amounts of technical data and environmental expertise. Many companies lack the resources to conduct life cycle assessments (LCA) for their products, and national LCA research infrastructures in many countries are still weak. In situations where purchasers have significant buying power, it is possible to work directly with suppliers to develop information on key aspects and request changes based on the results. Some large buyers have developed internal eco-design standards to guide both purchasing decisions and suppliers' product engineering efforts. However, in markets where individual buyers have less leverage over companies, information on the environmental characteristics of products might not be available.

Even when information is available, buyers need easy-to-use information tools to allow them to discriminate amongst products and suppliers. Eco-labels are a first step, but in most countries they still only cover a limited range of products and are relatively slow at developing specifications for new product categories. Organizations such as the Green Purchasing Network in Japan have begun to develop supplemental materials to allow companies to rank products against each other. In situations where individual companies do not have significant buying power to influence key suppliers, it is important to develop industry standards to consolidate buying power and give suppliers clear standards by which to design products.

For larger companies seeking to design environmentally friendly products, it is essential to develop frameworks or systems for transferring key skills to suppliers. Skills transfer can help improve efficiency leading to bottom line improvements and can also ensure the ability of suppliers to meet their customers' design needs. Takeo Takagi provides a detailed example of the types of internal systems that major Japanese companies use to guide their design efforts and which they hope to transfer to suppliers in the Asia-Pacific region. Several papers discuss the possibilities of cooperation between government and the private sector to establish skill-sharing frameworks through mechanisms such as center satellite or corporate synergy systems (Augustine Koh, Shen Yan Chiu, Chin Ho Su, and Wen Huei Chen).

The issue of frameworks for skill-sharing is also relevant for companies whose focus is helping suppliers upgrade their environmental skills to lower costs or reduce management risk, rather than green product design. Grace Liu describes the overall environmental strategy of Acer Inc. and the company's interest in seeing suppliers improve their on-site environmental performance. Companies wishing to see suppliers adopt ISO, IWM, or other environmental management practices may need to consider providing direct assistance or partnering with government agencies to help.

The role of government in supply chain greening is complex. As several writers point out, government purchasing represents a significant portion of demand in certain sectors of the economy. However, devising and implementing purchasing standards is often not an easy task. Loretta Legault describes the experience of Environment Canada and some of the issues that arose such as the need to balance green criteria against other issues such as guaranteeing purchases from minority businesses. Niven Huang also provides examples of recent efforts by the United States EPA.

In addition to its role as a buyer, government also plays an important role in setting the rules for the market. Regulations such as take-back requirements stimulate interest on the part of companies in developing green products because it simply makes good business sense. Governments also can provide a valuable service to the market by setting product standards through programs such as eco-labels. Beyond setting rules, government can also provide important support to the private sector as it seeks to implement supply chain greening programs.

## CONCLUSION

Greening the supply chain undoubtedly represents a key component of both future national level sustainability strategies as well as business competitive strategies. As business competition becomes increasingly intense, companies are beginning to seek to leverage competitive advantages across their entire supply chain as opposed to solely their operations. As Tae Joo Hua discusses, overall product design needs are driving a closer integration of quality management just as pressure to supply greener products is requiring closer cooperation with suppliers. Companies are finding significant advantages in terms of improving both their own eco-efficiency and the eco-effectiveness of their products through such efforts.

Broadening the application of supply chain greening will require more dissemination of information about the practices and advantages. While there is strong anecdotal evidence for the business value of supply chain greening, more research is needed to quantify the business case. In addition, while not discussed in detail during the symposium, more work is needed in building the regional LCA infrastructure to allow companies to make good eco-design decisions. Companies such as Hitachi and Fuji Xerox have incorporated LCA into their product design, but many other companies are still unable to do so in a rigorous manner.

Lastly, excellent models for skill transfer have been developed in Taiwan and other locations, and the next step is to expand their scale. The CSS model represents one viable option, but the number of companies within CSS systems is still only a small percentage of the total number of enterprises in the country. Market forces will undoubtedly help push more companies to independently establish CSS systems or alternative arrangements. However, governments must also consider how they can help this process along.

Work on the area of supply chain greening is still in its early stages, but it is undoubtedly a key piece in the puzzle of sustainability. Greening efforts can serve as a catalyst for the development of environmentally friendly products as well as for helping drive improvements in business environmental management. The "Top Forum on GP" is just one step in the longer, but vital, process of learning how to harness this powerful force for change.