

Supply Chain Management: Technology, Globalization, and Policy at a Crossroads

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Supply chain management is an important application area for INFORMS, with many opportunities for our community to contribute models and insight. The seemingly relentless forces of globalization and technology continually present us with new supply chain challenges and opportunities for further progress. Over the past decade, researchers and practitioners have developed many models and methods that have influenced supply chain practices. However, as managers and management scientists have embraced these new approaches for improving supply chain competitiveness, these initiatives have slipped into the middle of many important corporate and public debates.

Key words: supply chain management; professional: comments on.

The forces of globalization and technology are changing supply chains. In many cases, the supply chains are literally disintegrating. Product designers, marketers, and manufacturers that were previously housed in a single facility are now spread over several continents in organizations with different cultures, languages, and business objectives. For example, not long ago, apparel firms, such as Levi Strauss and Company, did it all—operating their own US production plants along with their core design and marketing activities. In the past few years, Levi Strauss has shuttered the sewing plants that once dotted the southeastern US and outsourced much of that production and even design (Johnson 2004). The same transition is also true for many other products, from PCs to lawn mowers. Ten years ago, Hewlett-Packard designed and manufactured PCs for regional markets in Europe and the US. Now, designers, assemblers, and marketers are scattered across different geographies and firms.

These changes have brought new risks and challenges. Long-standing challenges, such as short product lives and uncertain demand, have become even more vexing. In some cases, the technologies and approaches for enhancing supply chain competitiveness have been the subject of corporate and public debate, with supply chain complexity leading

to new risks of disruption, supply chain efficiency generating complaints of price discrimination, and low-cost sourcing creating job migration. Lean supply chains reduce inventory costs but are susceptible to such shocks as natural disasters (Reidy 2005) or global pandemics (Wysocki and Lueck 2006); technologies that enable sophisticated pricing improve supply chain efficiency but leave some customers crying foul (Soto 2000); and outsourcing creates global winners and losers as shifting jobs leave some without work (Kinetz 2003).

At a recent roundtable hosted by Dartmouth's Tuck School of Business, supply chain scholars considered some of the challenges for researchers, managers, and policy makers (Johnson 2005). After two days of discussion, the group distilled the important issues into five areas:

—Globalization and outsourcing, including the impact of China and India on supply chain structure and coordination;

—New information technologies, such as radio frequency identification (RFID) and tools that enable enterprise integration and collaboration;

—Economic forces within and between supply chains, from consumer pricing to supplier contract negotiation;

—Risk management, including risks rising from supply chain complexity and from security threats;

—Product life-cycle management, including post-sale service and product recovery.

While researchers are investigating these evolving issues, they have published few detailed articles on the broad concerns, substantial applications, and implementations within organizations. As a result of the roundtable, we agreed to edit a special issue of *Interfaces* highlighting supply chain practice and the impact of these issues.

The call for papers elicited more submissions than *Interfaces* could publish in a single issue. For this issue, we chose papers that fall into one or more of the five categories.

Globalization and Outsourcing

As their global production systems become increasingly complex and integrated, firms need sophisticated models to allocate production throughout world. Fleischmann, Ferber, and Henrich (“Strategic Planning of BMW’s Global Production Network”) describe an application of mathematical programming at BMW to address its time-phased planning problem, including obtaining materials and distributing finished cars to global markets. The model determines the investments needed by the three production departments—body assembly, paint shop, and final assembly—for every site and the financial impact on cash flows.

Information Technologies

Global firms often invest in procurement strategies, including carefully negotiated contracts, but fail to obtain the projected benefits because of poor global implementation of the strategy. Aligning business strategy and policy is often the real problem. Kulp, Randall, Brandyberry, and Potts (“Using Organizational Control Mechanisms to Enhance Procurement Efficiency: How GlaxoSmithKline Improved the Effectiveness of E-Procurement”) examined GlaxoSmithKline’s sourcing practices to understand how to use information technology to improve compliance when organizational control mechanisms are not aligned with supply chain strategy. They describe how GlaxoSmithKline changed its information and compliance

systems to increase the benefits it obtained from its procurement strategy.

Supply Chain Risk Management

Globalization and outsourcing have created many supply chain risks as well as benefits. Amaral, Billington, and Tsay (“Safeguarding the Promise of Production Outsourcing”) examined the operational aspects of outsourcing production, including the opportunities and hazards. Based on their experience within Hewlett-Packard, they describe a disciplined approach to managing when to outsource production, with the goal of preserving supply chain power and minimizing risk.

The long product lead times associated with global supply chains increase the risks to be considered in planning capacity and production. Wu, Aytac, Berger, and Armbruster (“Managing Short Life-Cycle Technology Products for Agere Systems”) focus on the very risky production of short-lived products and describe an approach to characterizing demand for short-lived products using leading indications. Working with semiconductor manufacturer Agere, they developed a clustering approach the firm uses to predict the performance of a group of semiconductor products. Such approaches are powerful tools for reducing risk in planning internal capacity and negotiating with supply chain partners.

Supply Chain Economics

The research literature on supply chain economics has blossomed in the past decade with much work focused on competitive games and pricing. Earlier work on revenue management and capacity management in passenger air travel is now finding applications throughout the supply chain. Popescu, Keskinocak, Johnson, LaDue, and Kasilingam (“Estimating Air-Cargo Overbooking Based on a Discrete Show-Up-Rate Distribution”) consider air freight, the backbone of many global supply chains. Like yield management in the passenger business, revenue management in air freight is rapidly becoming more sophisticated. A key element in the stochastic models airlines use to maximize revenue by overbooking capacity is the show-up distribution. Working with Sabre Airline Solutions, the authors developed techniques for improving estimates of the show-up distribution in real-world settings.

Supply Chain Life-Cycle Management

Supply chain management doesn't end when products are sold. Many firms encounter their most important profit opportunities after they sell their original products. For these firms, service and after-sales support have become strategic parts of their revenue portfolios. Moreover, the growing requirements for complete product-life-cycle engagement, including taking back products at the end of their lives, means supply chain strategies must expand their view of customer needs. Cohen, Agrawal, and Agrawal ("Achieving Breakthrough Service Delivery Through Dynamic Asset Deployment Strategies") describe Cisco Systems' extensive service business and the approach the authors developed to manage the service-parts supply chain. Termed *dynamic asset deployment*, their hierarchical approach to asset management uses updated forecasts of supply and demand to increase flexibility and reduce cost.

In forthcoming issues, *Interfaces* expects to publish related articles concerning emerging supply chain technologies and the role of low-cost countries. For the great success of this special issue, I thank the focused issue editorial board: Gerard Cachon

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References

- Johnson, M. E. 2005. Technology, globalization and policy at a crossroads. Retrieved March 14, 2006. <http://mba.tuck.dartmouth.edu/digital/Programs/CorporateRoundtables/SupplyChainThoughtLeaders.html>.
- Johnson, M. Eric. 2004. Harnessing the power of partnerships. *Financial Times* (October 8) 4–5.
- Kinetz, E. 2003. Who wins and who loses as jobs move overseas. *New York Times* (December 7) B5.
- Reidy, C. 2005. U.S. economy to feel Katrina's force. *Boston Globe* (September 2) Business 1.
- Soto, M. 2000. Amazon price test revised new policy: Refunds automatic for customers who paid more. *Seattle Times* (September 13) C1.
- Wysocki, B., S. Lueck. 2006. Just-in-time inventories make U.S. vulnerable in pandemic. *Wall Street J.* (January 12) A1.