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INTRODUCTION TO THE SPECIAL ISSUE ON TEACHING SUPPLY CHAIN MANAGEMENT

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Few topics in production and operations management have had the impact, both on industry and academia, as supply chain management. Managers in nearly every industry have begun to realize that competition in the 21st century will no longer be firm against firm, but supply chain against supply chain. Spawning an entire industry of supply chain software and consulting companies, demand for supply chain expertise exploded in closing years of the 2nd millennium. As late as 1995, few business or engineering schools had courses dedicated to supply chain management. Now nearly every top business and engineering school has at least one dedicated course, and many more have integrated supply chain topics into core curricula.

In this issue we explore some of the leading-edge thinking around supply chain education. We begin the issue with our paper that examines how supply chain management is being taught, both in management and engineering schools. We develop a framework for supply chain education and highlight many of the important cases and readings that are available. The next four papers address the use of experiential learning in supply chain education. The paper by Fangruo Chen and Rungson Samroengraja analyzes the popular beer distribution game and shows how the game can be extended to examine many facets of information flows, incentives, and the bullwhip effect. Next Bob Jacobs shows how the beer game can be readily adapted to a web environment with many interesting pedagogical benefits. Joyce Mehring's paper describes a more detailed supply chain simulation used extensively within Siemens to expose managers to supply chain concepts. Edward Anderson and Douglas Morrice describe a version of the beer game that has been adapted to the delivery of a service, rather than a product.

The next three papers cover several broader topics. Ann Campbell, Jarrod Goentzel, and Martin Savelsberg examine the use of industrial supply chain software in the classroom. They provide many useful hints and ideas for integrating popular software into the classroom. Thomas Vollmann, Carlos Cordon and Jussi Heikkila present approaches for teaching supply chain concepts to executives. Finally, Laura Kopczak and Jan Fransoo describe their experience with extended global projects jointly conducted by students in the US, Asia, and Europe.

We hope that this special issue will be a valuable resource for instructors of supply chain courses and modules, expanding their repertoire of materials and exercises.

A FRAMEWORK FOR TEACHING SUPPLY CHAIN MANAGEMENT*

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The rise of global markets and increasingly virtual companies has focused management attention on competition between supply chains. Many schools of management and engineering are adopting integrated curricula that prepare students to design and manage the resulting complex global web of material and information flows. In this paper, we examine the curricula used by many top engineering and graduate business schools for courses in supply chain management. We present a framework for supply chain management and highlight supporting material and pedagogy. We also classify popular supply chain case studies within our framework and provide useful references to recent business press treatment of these issues.

(SUPPLY CHAIN MANAGEMENT, EDUCATION)

Introduction

In April, 1995 a panel of academics gathered at the Spring INFORMS meeting to discuss the emerging interest in supply chain management. At that time, only a handful of universities taught a course with the title "supply chain management," although some were teaching supply chain concepts in courses under the label "logistics" or "operations management." Today, many top business schools along with some engineering programs have courses titled "supply chain management" and more are added each year. In nearly all of the top MBA programs, core operations management courses have been augmented with significant content on supply chains (van Wassenhove and Corbeyz 1998).

Skeptics would argue that this rush to change curriculum was little more than a repackaging of topics long covered in operations management such as logistics, inventory control, and facility location. Or that, as with quality control in the 1970s and lean manufacturing in the 1980s, supply chain was the popular management fad of the late 1990s. But a closer look at both business practice and MBA programs reveals stronger forces at work, creating an environment ripe for supply chain concepts. Integration, long the dream of management gurus, was slowly sinking into the minds of western managers and business school deans. As we shall see, integration may be the key unifying theme behind supply chain curriculum and practice. For example, product design, manufacturing, and logistics are coming head-to-head with channel design and category management; traditional functional silos of marketing, R&D, manufacturing, and logistics are consolidating into the integrated supply chain.

*Names of the authors in this paper appear in alphabetical order. Received December 1998; revision received June 1999; accepted September 1999.

Others would contend that managers have long been interested in integration, but the lack of information technology made it impossible to implement a more “systems-oriented” approach. Clearly industrial dynamics researchers dating back to the 1950s (Forester 1958, 1961) have maintained that supply chains should be viewed as an integrated system. With the recent explosion of inexpensive information technology, it seems only natural that business would become more supply chain focused. However, while technology is clearly an enabler of integration, it alone can not explain the radical organizational changes in both individual firms and whole industries. Changes both in technology and in management theory set the stage for integrated supply chain management.

While integration and information technology may have been key catalysts in the surge of interest surrounding supply chains, eBusiness is fueling even stronger excitement. eBusiness facilitates the virtual supply chain, and as companies manage these virtual networks, competition is increasingly no longer business-to-business but rather supply-chain-to-supply-chain. In other words, the importance of integration is magnified.

Still many would argue that the language and metaphors are wrong. “Chains” evoke images of linear, unchanging, and powerless. “Supply” feels pushy and reeks of mass production rather than mass customization. Better names, like “demand networks” or “customer driven webs” have been proposed by many a potential book author hoping to invent a new trend. Yet, for now, the name “supply chain” seems to have stuck. And under any name, the future of supply chain management appears bright.

In this paper, we examine the curricula used by many top engineering and graduate business schools for courses in supply chain management. We first present a framework comprising 12 key components of a “typical” supply chain management course. Next we discuss how each of the components is taught and present references that are useful as student reading assignments. Using our framework, we categorize popular teaching cases and recent business news stories related to supply chain management. We also briefly discuss pedagogy and the use of games, projects, and simulations. Finally, we examine the structure of several courses at U.S. institutions.

Key Components of Supply Chain Management

Supply chain management is an enormous topic covering multiple disciplines and employing many quantitative and qualitative tools. In our survey of class syllabi we observed a wide range of topics and a great diversity in the detail with which those topics were examined. Most of the graduate level classes did not use a textbook but rather relied on case studies and on articles from managerial journals. Within the last 3 years, several textbooks for supply chain have arrived on the market providing both managerial overviews and detailed technical treatments. For examples of managerial introductions to supply chain management see Copacino (1997), and Handfield and Nichols (1998), and for logistics texts see Lambert et al. (1997) and Ballou (1998). For more technical, model-based treatments see Silver, Pyke, and Peterson (1998) and Simchi-Levi, Kaminsky, and Simchi-Levi (1998). Also, there are several casebooks that give emphasis to global management issues including Taylor (1997), Flaherty (1996), and Dornier, Ernst, Fender, and Kouvelis (1998). In this paper, we will concentrate on courses that are primarily supported by recent articles and cases.

Since integration is an overriding theme in supply chain, many different functional areas are addressed within a single course. At most U.S. business schools, supply chain management is taught from an operations or logistics perspective. This paper is most closely tied to such a perspective. To enhance the theme of integration, some schools employ the participation of several instructors from different functional perspectives—most frequently from operations, logistics, marketing, and organizations. In courses taught by a single faculty member, this same idea may be accomplished by guest lectures or by the instructor actively

presenting different perspectives. By its very nature supply chain is integrative, so it might seem inappropriate to “dis-integrate” it when presenting it to students. However, it is impossible to address all the dimensions of supply chain management at one time. Therefore, most instructors discuss certain dimensions in depth before moving on to others. Integration, of course, can be addressed in each category.

To help order our discussion, we have divided supply chain management into 12 areas. We identified these 12 areas from our own experience teaching supply chain management, from analysis of syllabi of many supply chain courses, and from our discussions with other instructors. Each area represents a supply chain issue facing the firm. For any particular problem or issue, managers may apply analysis or decision support tools. For each of the 12 areas, we provide a brief description of the basic content and refer the reader to recent articles that make suitable class reading assignments. We also mention likely operations research-based tools to aid in analysis and decision support. In the subsequent section, we present an extensive list of recent (since 1990) teaching cases, each categorized within our framework (Table 1). We will also present a list of recent news articles classified into the 12 areas.

The 12 categories we define are as follows:

- location
- transportation and logistics
- inventory and forecasting
- marketing and channel restructuring
- sourcing and supplier management
- information and electronic mediated environments
- product design and new product introduction
- service and after sales support
- reverse logistics and green issues
- outsourcing and strategic alliances
- metrics and incentives
- global issues.

Before launching into a particular selection of topics, most courses begin with an introduction to supply chain, often emphasizing the importance of integration. There are numerous suitable first day readings including Cooper, Lambert, and Pagh (1997a), Davis (1993), Johnson (1998a), and Lee and Billington (1992).

Location pertains to both qualitative and quantitative aspects of facility location decisions. This includes models of facility location, geographic information systems (GIS), country differences, taxes and duties, transportation costs associated with certain locations, and government incentives (Hammond and Kelly 1990). Exchange rate issues fall in this category as well, as do economies and diseconomies of scale and scope. Decisions at this level set the physical structure of the supply chain and therefore establish constraints for more tactical decisions. Optimization models play a role here, as do simple spreadsheet models and qualitative analyses. There are many advanced texts specially dedicated to the modeling aspects of location (Drezner 1996) and most books on logistics also cover the subject. Simchi-Levi, Kaminsky, and Simchi-Levi (1998) present a substantial treatment of GIS, whereas Dornier, Ernst, Fender, and Kouvelis (1998) dedicate a chapter to issues of taxes, duties, exchange rates, and other global location issues.

The transportation and logistics category encompasses all issues related to the flow of goods through the supply chain, including transportation, warehousing, and material handling. Depending on the intent of the instructor, this may include many of the current trends in transportation management, including vehicle routing, dynamic fleet management with global positioning systems, and merge-in-transit. Also included are topics in warehousing and distribution, such as cross-docking and materials handling technologies for sorting, storing, and retrieving products. This category contains much of what was traditionally taught in logistics courses, and there are many excellent texts on the subject. Useful short articles

TABLE 1
Recent Cases in Supply Chain Management

	Location	Logistics	Inventory	Marketing	Sourcing	Information	Product Design	Service	Reverse SC	Outsourcing	Metrics	Global Issues
Case (School, Contact person or author)												
7-11 Japan (Stanford, 1997, Seungjin Whang)			•			•						
Amhall Paper Products (Stanford, 1997, Seungjin Whang)				•		•						
A Note on the U.S. Transportation Industry (HBS, 1995, Jan Hammond and J. Morrison)		•										
A Tale of Two Electronic Components Distributors (HBS, 1997, Bharat Rao and Ananth Raman)				•								
Alden Products - European Manufacturing (HBS, 1989/98)	•											•
Apparel Exports and the Indian Economy (HBS, 1995, Ananth Raman),					•							
Apple Computer's Supplier Hubs (Stanford, 1996, Laura Kopczak)		•								•	•	
Applichem (HBS, 1986, Therese Flaherty)					•						•	•
Barilla SpA (HBS, 1994, Jan Hammond)			•	•								
Baxter Healthcare: North American Supply Chain Management Experience (CLM, 1996, Kevin Boberg and Arnold Maltz)		•										•
Benetton (HBS, 1989, Howard Stevenson)			•				•					
Bose: JITII (HBS, 1994, Roy Shapiro)				•	•							
Bradco/Taylor (Tuck, 1999, Dave Pyke)	•	•										
Brueggers and Chesapeake Bakeries (Duke, 1997, Gerard Cachon)			•									
Burlington Northern (HBS, 1989, Jan Hammond)		•										
Campbell Soup: A Leader in Continuous Replenishment (HBS, 1994, Theodore Clark)			•	•								
Cummins Engine Co: Starting up "B" Crankshaft Manufacturing at the San Luis Potosi Plant (HBS, 1994, Robert Hayes)					•							•
Ergonomics, Inc (CLM, 1997, Omar Heiferich and Robert Sroufe)		•						•				
Emerson Electric Co. ACP Division: The Fan Subpack Sourcing Decision (Darden, 1993, Keith Paige and Edward Davis)					•							•
Frito-Lay: The Backhaul Decision (HBS, 1992, Jan Hammond)		•										
General Appliance (Wharton, 1994, Morris Cohen)	•				•							

include Kopczak, Lee, and Whang (1995) and Hammond and Morrison (1995). Because of globalization and the spread of outsourced logistics, this category has received much attention in recent years. However, we will define a separate category to examine issues specifically related to outsourcing and logistics alliances. Again, optimization models can be used here, as can spreadsheet models and qualitative analysis. Recent management literature has examined the changes within the logistics functions of many firms as the result of

TABLE 1 (cont'd)

	Location	Logistics	Inventory	Marketing	Sourcing	Information	Product Design	Service	Reverse SC	Outsourcing	Metrics	Global Issues
Glu Lam (Tuck, 1993, Dave Pyke)			•									
Heineken Netherlands BV: Reengineering IS/IT to Enable Customer-Oriented Supply Chain Management (IMD, 1997, D. Marchand, T. Vollmann, K. Bechler)			•			•						
H.E. Butt Grocery Company: A Leader in ECR (HBS, 1991, Theodore Clark)			•	•								
Hewlett Packard Spokane Division: Order Fulfillment and Inventory Control (Vanderbilt, 1995, Eric Johnson)			•									
HP Deskjet Printer Supply Chain (Stanford, 1993, Hau Lee and Laura Kopczak)			•				•					
HP's da Vinci Project (Stanford, 1996, Glen Schmidt, Hau Lee, Seungjin Whang)						•						
HP Universal Power Supply (Stanford, 1997, Hau Lee)			•				•					
IBM After Sales Service (HBS, 1995, Andrew Dutkiewicz and Jan Hammond)								•				
Information Flows under SAP/R3 (Stanford, 1996, Seungjin Whang and Hau Lee)						•						
Intercon (HBS, 1991, K. Mishina and M. Flaherty)					•							
International Sourcing in Athletic Footwear: Nike and Reebok (HBS, 1994, Philip Rosenzweig)					•							
Kodak Business Imaging Systems Division (HBS, 1992, Steve Wheelwright)					•							•
Laura Ashley and Fedex Strategic Alliance (HBS, 1996, Robert Anthony and Gary Loveman)		•							•			
LL Bean (HBS, 1993, Arthur Schleifer)			•									
Massimo Menichetti (HBS, 1988, Ramchandran Jaikumar)					•						•	
Mattel: Vendor Operations in Asia (Vanderbilt, 1998, Eric Johnson)	•											•
Merloni Elettrodomestici SpA (HBS, 1996, Jan Hammond)		•										
National Bicycle (Wharton, 1993, Marshall Fisher)							•					
National Wine and Spirits (A&B) (Vanderbilt, 1994/1998, Eric Johnson)	•											
Nike - Global Supply Chain (Stanford, 1998, Ann-Kristen de Verdier and Seungjin Whang)						•						•
Nike in China (HBS, 1993, Jame Austin)					•							•
Orange Juice Logistics: Oceana Fruit Juice Co. (Stanford, 1994, Seungjin Whang) and The Orange Juice Logistics Case Study Florida, Richard Beilock)	•											

functional integration (Greis and Kasarda 1997) and the role of logistics in gaining competitive advantage (Fuller, O'Connor, and Rawlinson 1993).

Inventory and forecasting includes traditional inventory and forecasting models. Many business school instructors had been teaching this material for years until, about 10 years ago, it seemed to fall out of favor as qualitative approaches came to dominate operations courses. However, because of the advent of supply chain management, these models have reemerged in the classroom. Inventory costs are some of the easiest to identify and reduce when

TABLE 1 (cont'd)

	Location	Logistics	Inventory	Marketing	Sourcing	Information	Product Design	Service	Reverse SC	Outsourcing	Metrics	Global Issues
P&G - Wal-Mart (Darden, 1994, Mark Parry)				•								
P&G: Improving Consumer Value Through Process Redesign (HBS, 1995, Theodore Clark)				•								
Partnerships in the Supply Chain: Introducing Co-Managed Inventory at Guinness GB (CLM, 1998, Helen Peck)			•	•								
Pellton International: Partnerships or Tug of War? (UCLA, 1997, Charles Corbett and Luk van Wassenhove)					•							
Polaroid Europe (HBS, 1995, Afroze Mohammed)	•											•
Rosenbluth: Supply Chain Management in Services (Western Ontario, 1993, Allan Kamauff)					•	•						
Sara Lee: QR at Hanes (HBS, 1993, Benn Konsynski and Jiro Kokuryo)				•								
Saturn Corporation: Improving the Plant-Retail Link in the Auto Industry Supply Chain (CLM, 1996, Brian Gibson)		•										
Sof-Optics (HBS, 1991, W.E. Sasser, R. Jaikumar, D.C. Rikert)								•				
Sport Obermeyer (HBS, 1996, Ananth Raman)			•		•							
StWork (Northwestern, 1997, David Simchi-Levi)	•											
Supplier Management at Sun Microsystems (Stanford, Charles Holloway, David Farlow, Glen Schmidt, and Andy Tsay)					•							
Tenko (Stanford, 1997, Warren Hausman)								•				
The Jewel Box: A Life Cycle Case Study (CLM, 1996, Omar Helderich and Robert Sroufe)									•			
Tong Yang Cement (Stanford, 1997, Seungjin Whang, Hau Lee, Glenn Schmidt)			•									•
Toys "R" Us Japan (A&B) (CLM, 1996, Mark Kay)		•		•								
Toyota Motor Manufacturing, U.S.A., Inc. (HBS, 1995 K. Mishina, K. Takeda)					•							
Vandelay Industries (HBS, 1997, David Upton)						•						
Vanity Fair Mills (HBS, 1993, Robert Buzzell)				•								
Walls (China) Co., Ltd (CLM, 1997, Peter Gilmour)		•	•									•
Whelan Pharm. (Washington Univ., 1997, Panos Kouvelis)	•											•

attacking supply chain problems. Students need to be facile with simple models that can identify the potential cost savings from, for example, sharing information with supply chain partners (Lee and Nahmias 1993). Many schools teach some inventory theory before discussing broader supply chain issues. Of course there are many full texts on the subject such as Silver, Pyke, and Peterson (1998) and Graves, Rinnooy Kan, and Zipkin (1993). Useful managerial articles focusing on inventory and forecasting include Davis (1993) and Fisher, Hammond, Obermeyer, and Raman (1994).

Marketing and channel restructuring includes fundamental thinking on supply chain structure (Fisher 1997) and covers the interface with marketing that emerges from having to deal with downstream customers (Narus and Anderson 1996). While the inventory category

addresses the quantitative side of these relationships, this category covers relationship management, negotiations, and even the legal dimension. Most importantly, it examines the role of channel management (Anderson, Day, and Rangan 1997) and supply chain structure in light of the well-studied phenomena of the bullwhip effect (Lee, Padmandbhan, and Whang 1997). These include, for example, issues related to pricing and trade promotions (Buzzell, Quelch, and Salmon 1990) and channel initiatives, such as vendor managed inventory, coordinated forecasting and replenishment, and continuous replenishment (Fites 1996; Waller, Johnson, and Davis 1999). Because many of these initiatives involve channel partnerships and distribution agreements, this category also contains important information on pricing, along with anti-trust and other legal issues (Train 1998). The opportunities for interacting with marketing faculty are, of course, the greatest here.

While marketing focuses downstream in the supply chain, *sourcing and supplier management* looks upstream to suppliers. Make/buy decisions (Venkatesan 1992; Carrol 1993; Christensen 1994; Quinn and Hilmer 1994; Kelley 1995; Robertson and Langlois 1995) fall into this category, as does global sourcing (Little 1995; Pyke 1994). The location category addresses the location of a firm's own facilities, while this category pertains to the location of the firm's suppliers. Supplier relationship management falls into this category as well (McMillan 1990; Womack, Jones, and Roos 1991). Some firms are putting part specifications on the web so that dozens of suppliers can bid on jobs. General Electric (GE), for instance, has developed a trading process network that allows many more suppliers to bid than was possible before. The automotive assemblers are developing a similar capability. Other firms are moving in the opposite direction by reducing the number of suppliers, in some cases to a sole source (Helper and Sako 1995; Cusumano and Takeishi 1991). Determining the number of suppliers and the best way to structure supplier relationships is becoming an important topic in supply chains (Cohen and Agrawal 1996; Dyer 1996; Fine 1998; Magretta 1998; Pyke 1998).

The information and electronic mediated environments category addresses long-standing applications of information technology to reduce inventory (Woolley 1997) and the rapidly expanding area of electronic commerce (Benjamin and Wigand 1997; Schonfeld 1998). Often this subject may take a more systems orientation, examining the role of systems science and information within a supply chain (Senge 1990). Such a discussion naturally focuses attention on integrative ERP software such as SAP (Whang, Gilland, and Lee 1995), Baan, and Oracle, as well as supply chain offerings such as i2's Rhythm and Peoplesoft's Red Pepper. To stay abreast of this rapidly changing field, many instructors supplement class readings with guest lectures from industry. Much of the teaching related to specific software is limited to developing an awareness of what the applications claim to do and the experience of firms that spend up to \$200 million to implement them. Finally, the many supply chain changes wrought by electronic commerce are particularly interesting to examine, including both the highly publicized retail channel changes (e.g., Amazon.com) and the more substantial business to business innovations (such as the GE trading process network). It is here that we interface most directly with colleagues in information technology and strategy, which again creates opportunities for cross-course integration (Lee and Whang 1999).

Product design and new product introduction deals with design issues for mass customization, delayed differentiation, modularity, and other issues for new product introduction. With the increasing supply chain demands of product variety (Gilmore and Pine 1997; Fine 1998) and customization (McCutcheon, Raturi, and Meredith 1994), there is an increasing body of material to cover. One of the most exciting applications of "supply chain thinking" is the increased use of postponed product differentiation (Feitzinger and Lee 1997). Here we find an interface with engineering and development, with clear implications for product cost and inventory savings. Inventory models are often used to identify some of the benefits of these initiatives (Lee, Billington, and Carter 1993). Also important are issues related to managing new product introduction and product rollover (Billington, Lee, and Tang 1998).

Many excellent cases illustrate these issues, and we find that students can easily identify with many of the examples.

The service and after sales support category addresses the critical, but often overlooked, problem of providing service and service parts (Cohen and Lee 1990). Some leading firms, such as Saturn and Caterpillar, build their reputations on their ability in this area, and this capability generates significant sales (Cohen, Zheng, and Agrawal 1997). Some instructors teach inventory models for slow-moving items in this category.

Reverse logistics and green issues are emerging dimensions of supply chain management (Marien 1998). This area examines both environmental issues (Corbett and van Wassenhove 1993; Herzlinger 1994) and the reverse logistics issues of product returns (Padmanabhan and Png 1995; Clendenin 1997; Rudi and Pyke 1998). There are few teaching cases, and not many models available for this area (Fleischmann et al. 1997). Nevertheless, because of legislation and consumer pressure, the growing importance of these issues is evident to most managers. Managers are being compelled to consider the most efficient and environmentally friendly way to deal with product recovery.

Outsourcing and strategic alliances examines the supply chain impact of outsourcing logistics services. With the rapid growth in third party logistics providers, there is a large and expanding group of technologies and services to be examined. These include fascinating initiatives, such as supplier hubs managed by third parties. The rush to create strategic relationships with logistics providers and the many well-published failures have raised questions about the future of such relationships. (See Bowersox 1990; SCMR 1998), and the news stories in Table 2.) In any case, outsourcing continues to raise many interesting issues (Cooper et al. 1997b).

Metrics and incentives examines measurement and other organizational and economic issues. This category includes both measurement within the supply chain (Meyer 1997) and industry benchmarking (CLM 1994; PRTM 1997). Because metrics are fundamental to business management, there are many reading materials outside of the supply chain literature, including accounting texts for instance. Several recent articles concentrate on the link between performance measurement and supply chain improvement (O’Laughlin 1997; Johnson and Davis 1998).

Finally, *global issues* examines how all of the above categories are affected when companies operate in multiple countries. This category goes beyond country specific issues, to encompass issues related to crossborder distribution and sourcing (Arntzen, Brown, Harrison, and Trafton 1995). For example, currency exchange rates, duties and taxes, freight forwarding, customs issues, government regulation, and country comparisons are all included. Note that the location category, when applied in a global context, also addresses some of these issues. As we mentioned earlier, there are several texts devoted to global management and a growing number of cases probe specific issues. Many recent articles also examine challenges in specific regions of the world [e.g., for Asia see Lee and Kopczak (1997) or for Europe see Sharman (1997)].

Course Structure and Pedagogy

As with other courses, instructors are rapidly innovating in the classroom. In our survey, we observed many different teaching tools and approaches. In most business school classes, the overall approach is still case dominated, with more than half of the sessions dedicated to case discussions. Table 1 provides an extensive list of recent (since 1990) cases used by instructors to illustrate supply chain concepts. The cases are classified within our framework of 12 areas. Since many cases cover multiple areas, we limited the classification to 2 or 3 of the most important points. As can be seen from the table, there are some areas where cases are lacking—specifically in areas of service and after-sales support, reverse logistics and green issues, outsourcing and strategic alliances, and metrics and incentives. Besides the

TABLE 2
Supply Chain News Clippings

1. Location

- "Green is Good," *Economist*, May 17, 1997.
 "Shape of Supply Chain," *Traffic World*, June 8, 1998.
 "Texas Instruments' Global Chip Payoff," *Business Week*, August 7, 1996, 64.

2. Logistics and Transportation

- "Just Get it to the Stores on Time," *Business Week*, March 6, 1995, 66.
 "More Often, Delays and Snafus Grip America's Rail Freight," *Wall Street Journal*, May 29, 1998.
 "Logistics for Profit," *Fortune*, April 1, 1996.
 "Frito-Lay Devours Snack Food Business," *The Wall Street Journal*, October 27, 1995.
 "Logistics Revolution Spreads Stealthily," *Chicago Tribune*, November 12, 1995.
 "U.S. Questions Sales Practices at Frito Lay," *Wall Street Journal*, Friday May 24, 1996.
 "Next-Day Delivery: Cadillac Lowering Costs and Raising Satisfaction by Getting Cars to Consumers Faster," *Chicago Tribune*, April 2, 1998.
 "Delivering the Goods," *Fortune*, November 28, 1994.

3. Inventory and Forecasting

- "Global Pile-Up," *Economist*, May 10, 1997, 21.
 "Burned By Busy Signals," *Business Week*, March 6, 1995, 36.
 "Capacity Boosts Take Toll on Many Firms," *Wall Street Journal*, October 21, 1996.
 "Hot Wheels," *Business Week*, September 15, 1997, 56.
 "Autos: How Do You Get a Hot GMC Suburban? You Wait for a Computer to Dole One Out," *Wall Street Journal*, April 10, 1996.
 "Publishing Industry's Focus Shifts To Limiting Returns," *New York Times*, July 27, 1998.
 "At Christmas, Retailers Are Like Kids Who Ask Santa Claus for a Pony," *Wall Street Journal*, October 27, 1997.
 "Beetlemania Hits America Again Fueling Gray Market, Waiting Lists," *Wall Street Journal*, May 1, 1998.
 "Tired of Renting 'Shanghai Surprise'? Blockbuster, Hollywood Hope to Help," *Wall Street Journal*, March 25, 1998.
 "Sold Out: Corvette's 6-Speed Manual More Popular than Expected," *Chicago Tribune*, April 12, 1998.
 "Laptop Buyers Struggle with Shortages," *Wall Street Journal*, November 20, 1996.
 "Compaq Shuts Down Its Biggest Plant To Rid Inventory of Unsold Computers," *Wall Street Journal*, April 24, 1998.
 "Market Place: Sales Gain for Sunbeam Is Costly to Investors," *New York Times*, May 7 1998.

4. Marketing and Channel Restructuring

- "The Gap Plots Panty Raid on Victoria's Secret," *Wall Street Journal*, October 1, 1998.
 "P&G, Seeing Shoppers Were Being Confused, Overhauls Marketing," *Wall Street Journal*, January 15, 1997.
 "Some Companies Let Suppliers Work on Site And Even Place Orders," *Wall Street Journal*, January 13, 1995.
 "Chain Reaction: Book Superstores Bring Hollywood-Like Risks to Publishing Business," *Wall Street Journal*, May 29, 1997.
 "In Publishing, Bigger is Better," *New York Times*, March 31, 1998.
 "PepsiCo Chief's Stand on Exclusive Pacts Adds to Cola Wars' Charged Atmosphere," *Wall Street Journal*, May 15, 1998.
 "How Magazines Make It to Stores—And Why They Soon May Not," *Wall Street Journal*, February 26, 1998.
 "The Dumbest Marketing Ploy," *Fortune*, October 5, 1992.
 "Anheuser-Busch Chugs On Amid Probe of Distribution," *Wall Street Journal*, March 9, 1998.
 "New World, Ordered," *INC*, (Solomon) December, 1995.
 "The \$30 Billion Promise," *Traffic Management*, December, 1993, J.A. Cooke.
 "Efficient Consumer Responses," *Food Processing*, February, 1994, F. Crawford.

5. Sourcing and Supplier Management

- "Is this the Factory of the Future," *New York Times*, July 26, 1998.
 "Strange Bedfellows: Some Companies let Suppliers Work on Site and Even Place Orders," *Wall Street Journal*, January 13, 1995.
 "VW, Suppliers Work Side By Side, Seek Big Gains in Productivity, At 'Factory of the Future', in Brazil," *Automotive News*, June 9, 1997.
 Walton, M. "When Your Partner Fails You . . ." *Fortune*, May 26, 1997, 151-154.
 "How IBM Turned Around Its Ailing PC Division," *Wall Street Journal*, March 12, 1998.
 "GM, in Possible Blow to U.S. Steel Firms, Is Broadening Its Suppliers World-Wide," *Wall Street Journal*, April 14, 1998.
 "Gibson Greetings Plans to Outsource Manufacturing of Cards, Gift Wraps," *Wall Street Journal*, April 1, 1998.

TABLE 2 (cont'd)

6. Information and Electronic Mediated Environments
- "It's a Wired, Wired World," *CFO*, September 1997, 63–68.
- "High-Tech Inventory System Coordinates Retailer's Clothes With Customers' Taste," *Wall Street Journal*, June 12, 1996.
- "On-Line Investors Don't Sing Praises of Music Seller N2K," *Wall Street Journal*, March 6, 1998.
- Electronic Commerce. *The Economist*, 1–18, May 10, 1997.
- Engardio, P. "Souping Up the Supply Chain." *Business Week*, August 31, 1998, 110–112.
- Gross, N. "Leapfrogging a Few Links." *Business Week*, June 22, 1998, 141–142.
- Hof, R. D., McWilliams, G., and Saveri, G. "The 'Click Here' Economy." *Business Week*, June 22, 1998, 122–128.
- Stepanek, M. "Rebirth of the Salesman." *Business Week*, June 22, 1998, 146–147.
- "A Small Card Maker Finds Itself Atop the Web," *New York Times*, June 4, 1997.
- "Online Sellers Learn How to Get Packages to Consumers," *New York Times*, March 30, 1998.
- "Cyberspace Grocery Shoppers Can't Squeeze Produce," *New York Times*, May 12, 1998.
- "An Online Grocer Bets Against Bananas and Meat," *New York Times*, May 4, 1998
- "Whirlwind on the Web," *Business Week*, April 7, 1997.
- "Spain's Zara Cuts a Dash With 'Fashion on Demand,'" *Wall Street Journal*, May 29, 1998.
7. Product Design and New Product Introduction
- "Can Butterfly Help IBM Fly Higher?," *Wall Street Journal*, June 6, 1995.
- "Can Honda Build a World Car," *Business Week*, October 8, 1997, 100.
- "Goodyear Posts Small Profit, Unveils Improvement Plans," *Wall Street Journal*, February 10, 1998.
- "Ford Motor Reaches Agreement To Create Retail Network in Utah," *Wall Street Journal*, May 19, 1998.
8. Service and After Sales Support
- "You Need It, We Got It," *Forbes*, May 20, 1996.
9. Reverse Logistics and Green Issues
- "Some Vendors Pay Big Sums to Get Competing Goods Off Store Shelves," *Wall Street Journal*, May 15, 1998.
- "The Greening of the Supply Chain," *Supply Chain Management Review*, Summer, 1998, 76–86.
10. Outsourcing and Strategic Alliances
- "Messy Divorce," *American Shipper*, March, 1998, 22–26.
- "Driving Force: In Today's Economy, There is Big Money to be Made in Logistics," *Wall Street Journal*, September 6, 1995.
- "New Dana Illustrates Reshaping of Auto Parts Business," *Wall Street Journal*, September 2, 1997.
- "Dell to Outsource all its Shipping to Roadway Unit," *Wall Street Journal*, February 15, 1995.
- "Short Supply: Success of AIDS Drug has Merck Fighting to Keep up the Pace," *Wall Street Journal*, November 5, 1996.
- "Ryder Sys Unit To Manage Ford Motor N. Amer Supply Chain," *Wall Street Journal*, July 21, 1998.
- "Carpet Makers Confront Era That Extols Wood Floors," *Wall Street Journal*, March 31, 1998.
- "What is the future for Third-Party Logistics?" *Supply Chain Management Review*, 1998.
11. Metrics and Incentives
- "Give Them What They Want," *Management Review*, November, 1998.
- "Seven Greatest Myths of Measurement," *Management Review*, May 1997, 29–32.
12. Global Issues
- "Gillette Won't Meet Certain Goals While Emerging Markets Face Turmoil," *Wall Street Journal*, September 30, 1998
- "Whirlpool Found U.S. Methods Didn't Always Apply in Europe," *Wall Street Journal*, April 10, 1998.
- "Orient Express: Just How Hard Should A U.S. Company Woo Foreign Markets?" *Wall Street Journal*, April 6, 1998.
- "Nike Plans Changes at Asia Plants, Raising Workers' Minimum Age," *Wall Street Journal*, May 13, 1998.
- "Levi Strauss, Citing Rights Gains, to Expand Role in China," *New York Times*, April 9, 1998.
- "Trying to Avoid Tariffs, Old World Pasta Makers Go American," *New York Times*, February 28, 1998.

listed cases, there are several texts that contain cases including Flaherty (1996), Dornier, Ernst, Fender, and Kouvelis (1998), and Cavinato and Young (1996). Additionally, the Council of Logistics Management (CLM) publishes cases related to logistics. To supplement case discussions, some instructors use recent business press stories to update issues in the

TABLE 3
*Class Structures for a Selection of Successful Supply Chain Classes and Supply Chain Modules
 within Other Classes*

Session	Topic	Case
Stanford University, GSB (Winter 99, Whang/Lee)—Graduate Engineering/MBA Elective		
1	What is Integrated SCM?	
2	Information Distortion	
3	Inventory Models	
4	Countering Bullwhip	Barilla
5	Postponement	HP Deskjet
6	Product Universality	HP Network
7	Mass Customization	National Bike
8	Accurate Response	Obermeyer
9	Data-Driven SCM	Seven Eleven Japan
10	SCM Performance Measures	
11	SC Restructuring	Amhall
12	Supplier Hub	Apple Computer
13	Supply Chain Design	Mattel Inc.
14	Information and Logistics Restructuring	
15	E-Commerce and SCM	
16	Distribution Network	Polaroid
17	After Sales Service Support	
18	Right SC for Right Product/Time	
19	SC Integration	
Vanderbilt University (Fall 98, Johnson)—MBA Elective		
1	Introduction	
2	Supply Chain Metrics	Guest Speaker
3	Inventory	HP: Spokane Division
4	Inventory Laboratory	
5	Mass Customization/Postponement	HP: Deskjet
6	Short Product Life	L.L. Bean
7	Global Facility Location	Mattel: Vendor Operations in Asia
8	Transportation and Distribution	
9	Distribution System Design	National Wine and Spirits: A
10	Distribution System Implementation	National Wine and Spirits: B
11	Product Introduction and Rollover	
12	Optimizing Logistics Flow	General Appliance
13	Information, EDI, and VMI	Vanity Fair Mills
14	Plant Trip—FedEx Midnight Sort	
15	Outsourcing logistics services (3PL)	Apple Computer
16	E-Commerce and Direct Distribution	
Ohio State University, (Spring 98, Cooper)—MBA Elective		
1	Introduction	
2	Integration: Process and Function	
3	Interfirm Integration	Guest Speaker
4	Beer Game	
5	Beer Game Debrief	
6	Military Logistics	
7	Economics of Integration	Guest Speaker
8	Cost Issues	
9	Consulting in SC	Guest Speaker
10	Opportunities and Pitfalls	
11	Managing Components	
12	Changing Role of Purchasing & Sales	
13	Outsourcing	
14	Japanese Keiretsu	Guest Speaker
15	Reverse Logistics and Recycling	

TABLE 3 (cont'd)

Session	Topic	Case
Ohio State University, (Spring 98, Cooper)—MBA Elective (cont'd)		
16	GIS and Modeling	Guest Speaker
17	Symposium	
18	International Issues	
19	Future Perspectives	
Duke University (Fall 98, Cachon)—MBA Elective		
1	Introduction	
2	Transportation	Frito-Lay
3	Incentives, Contracts & Legal Issues	
4	Postponement	HP: Deskjet
5	Managing Product Variety	Brueggers and Chesapeake Bakeries
6	Transit point and cross docking	Merloni SpA
7	Vendor Managed Inventory	Barilla
8	Accurate/Quick Response	Sport Obermeyer
9	Procurement/Supplier Management	Supplier Management at Sun
10	Outsourcing	
11	International SC	International Sourcing in Athletic Footwear
12	Electronic Commerce	
Northwestern University (Fall 98, Simchi-Levi)—Graduate Engineering/MBA Elective, Three-hour sessions [based on textbook: Simchi-Levi et al. (1998)]		
1	Introduction, Information, and DSS	
2	Network Planning and Design	StWork Corp.
3	Inventory Management	Sport Obermeyer
4	SC Integration	Computerized Beer Game
5	Strategic Alliances and Outsourcing	Barilla
6	Product Design and Postponement	HP Deskjet
Penn State (Fall 98, Tyworth)—MBA Elective		
1	Introduction and Strategy Overview	
2	Customer Service	
3	Collaborative Forecasting	Guest speaker
4	Beer Game	
5	Bullwhip Phenomenon, VMI	Barilla
6	Inventory—Stochastic Models	
7	Inventory—TPOP Models	
8	Transportation	Burlington Northern
9	Process Management/Transportation	Saturn Corp.
10	Mass Customization and Postponement	HP Deskjet
11	Third Party Logistics	Apple Computer
12	Global Logistics	Guest speaker
13	Information Technology	Guest speaker
14	Performance Measurement	
15	Future Perspectives	
Dartmouth College (Spring 99, Pyke)—A supply chain module as part of a 18-session MBA elective on Manufacturing Strategy		
1	Supply Chain Structure	National Bicycle Industrial Co.
2	Facilities Location; European country differences	Alden Products, Inc.
3	Manufacturing in Asia; Currency Fluctuations	Mattel—Asia Manufacturing
4	Distribution Strategy	Bradco/Taylor
5	Third party logistics	Apple Supplier Hub
6	Postponement and Inventory	Hewlett Packard Universal
7	Supply Relationships	Intercon Japan
8	Supply Chain Restructuring	Massimo Menichetti
9	Lecture on Supply Relationships	

TABLE 3 (cont'd)

Session	Topic	Case
Wharton (Spring 99, Cohen and Ellison)—Supply chain treatment in a 12-session core MBA class on Operations Strategy		
1	Introduction	
2	Matching Capacity to Demand	General Appliance
3	Supply Chain Simulation	Beer Game
4	Beer Game Debrief	
5	Vendor-Managed Inventory	Barilla Pasta
6	Inventory Management: Lecture	
7	Applications of Inventory Management & Postponement	Hewlett Packard Deskjet
8	Mass Customization	National Bicycle
9	Accurate Response	Sport Obermeyer
10	Yield Management	Piedmont Airlines
11	Product Development	Cyclone Grinder
12	Concurrent Design Lecture	

case or to highlight emerging business trends. Table 2 provides a list of such news stories, again categorized within our framework. Another common supplement to lectures and cases is guest industry speakers, particularly for rapidly changing, technology-based content.

Beyond the lecture and case format, many instructors use at least one game/simulation or interactive exercise. By far the most popular simulation is the Beer Game (Sterman 1989, 1992). This game has a rich history, growing out of the industrial dynamics work of Forrester and others at MIT (Forrester 1961; Jarman 1963). The game is so widely used, that in some cases, it is not used in supply chain electives simply because students have already played the game in an earlier class. There are many variants of the game including computer-based versions (Simchi-Levi, Kaminsky, and Simchi-Levi 1998; Chen and Samroengraja 1997) and Web-based versions (Jacobs 2000; Porteus 1998).

The Siemens Briefcase game is another supply chain game designed to be played by small groups (12–18 people) over an extended period of 1 to 3 days. The game illustrates many details of an order-based system with significant customization (Siemens 1996; Mehring, Kotler, and Kiesel 1997). The Llenroc Plastics game (Jackson 1995) is another more detailed simulation that can be played over several class periods. The Poster game is a simple game to illustrate the difficulties of forecasting and inventory planning for perishable goods (Johnson 1998b). Finally, class projects are an important part of many courses.

Table 3 contains abbreviated class syllabi for several different supply chain classes and modules. All of these classes have been successfully conducted for 4 to 5 years, garnering high teaching ratings. These classes were chosen to show a range of treatments from both graduate business programs and engineering. As one would expect, engineering classes tend to be more technical with less reliance on cases. The last two examples show supply chain modules within other courses. In general, we can see most of the 12 key components of supply chain management in each of these courses. However, there is divergence in the treatment of the topics and their relative importance within the course. Least represented is material on reverse logistics and green issues, possibly because of the dearth of teaching material.

Conclusion

As we have shown, there is a wide and growing body of materials for teaching supply chain management. As with many areas in management education, however, very current cases on hot topics are always in short supply. Since supply chain concepts are so closely integrated with other functional areas, there is a vast set of topics to cover, and specific

classes often concentrate on specific areas such as logistics, manufacturing, or marketing. Likewise, supply chain concepts are often taught by instructors in several functional areas including marketing, operations, and logistics. In the future, we expect supply chain issues to become increasingly important as eBusiness and globalization drive the need for closer functional integration. This will only serve to fuel the demand for supply chain education.¹

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References

- ANDERSON, E., G. DAY, AND V. RANGAN (1997), "Strategic Channel Design," *Sloan Management Review*, Summer, 59–69.
- ARNTZEN, B. C., G. G. BROWN, T. P. HARRISON, AND L. L. TRAFTON (1995), "Global Supply Chain Management at Digital Equipment Corporation," *Interfaces*, 25, 1, 69–93.
- BALLOU, R. H. (1998), *Business Logistics Management: Planning, Organizing, and Controlling the Supply Chain*, 4th ed., Prentice Hall, New York.
- BENJAMIN, R. AND R. WIGAND (1997), "Electronic Markets and Virtual Value Chain on the Info Super Highway," *Sloan Management Review*, Winter, 62–72.
- BILLINGTON, C., H. L. LEE, AND C. S. TANG (1998), "Successful Strategies for Product Rollovers," *Sloan Management Review*, Spring, 23–30.
- BOWERSOX, D. J. (1990), "The Strategic Benefits of Logistics Alliances," *Harvard Business Review*, July/August, 36–45.
- BUZZELL, R., J. QUELCH, AND W. SALMON (1990), "The Costly Bargain of Trade Promotions," *Harvard Business Review*, March–April, 141–149.
- CARROLL, P. (1993), *Big Blues*, Crown Publishers, New York.
- CAVINATO, J. L. AND R. R. YOUNG (1996), "Logistics Casebook," Smeal College of Business Administration, Penn State University, State College.
- CHEN, F. AND R. SAMROENGAJA (1997), "Supply Chain Simulations," Columbia Business School, New York.
- CHRISTENSEN, C. M. (1994), *The Drivers of Vertical Disintegration*, Harvard Business School, Cambridge, Mass.
- CLENDENIN, J. A. (1997), "Closing the Supply Chain Loop: Reengineering the Returns Channel Process," *International Journal of Logistics Management*, 8, 1, 75–85.
- CLM (1994), "Integrated-Supply-Chain Performance Measurement," *Council of Logistics Management Consortium*, October.
- COHEN, M. A. AND N. AGRAWAL (1996), "An Empirical Investigation of Supplier Management Practices," The Wharton School, Operations and Information Management Department, University of Pennsylvania, Philadelphia.
- COHEN, M. AND H. LEE (1990), "Out of Touch with Customer Needs? Spare Parts and After Sales Service," *Sloan Management Review*, 31, 2, 55–66.
- COHEN, M. A., Y. ZHENG, AND V. AGRAWAL (1997), "Service Parts Logistics: A Benchmark Analysis," *IIE Transactions*, 29, 8, 627–639.
- COOPER, M. C., D. M. LAMBERT, AND J. D. PUGH (1997a), "Supply Chain Management: More Than a New Name for Logistics," *International Journal of Logistics Management*, 8, 1, 1–14.
- , L. M. ELLRAM, J. T. GARDNER, AND A. M. HANKS (1997b), "Meshing Multiple Alliances," *Journal of Business Logistics*, 18, 1, 67–89.
- COPACINO, W.C. (1997), *Supply Chain Management: The Basics and Beyond*, St. Lucie Press/APICS Series on Resource Management, Falls Creek, VA.
- CORBETT, C. AND L. VAN WASSENHOVE (1993), "The Green Fee: Internalizing and Operationalizing Environmental Issues," *California Management Review* 36, Fall, 116–135.
- CUSUMANO, M. A. AND A. TAKEISHI (1991), "Supplier Relations and Management: A Survey of Japanese, Japanese-Transplants, and U.S. Auto Plants," *Strategic Management Journal*, 12 (Nov–Dec).
- DAVIS, T. (1993), "Effective Supply Chain Management," *Sloan Management Review*, 34, 4, 35–46.
- DORNIER, P.-P., R. ERNST, M. FENDER, AND P. KOUVELIS (1998), *Global Operations and Logistics: Text and Cases*, John Wiley & Sons, New York.
- DREZNER, Z. (1996), *Facility Location: A Survey of Applications and Methods*, Springer Series in Operations Research, Springer-Verlag, New York.
- DYER, J. H. (1996), "How Chrysler Created an American Keiretsu," *Harvard Business Review* July–August, 42–56.
- FEITZINGER, E. AND H. L. LEE (1997), "Mass Customization at Hewlett-Packard: The Power of Postponement," *Harvard Business Review*, Jan–Feb, 116–121.

- FINE, C. H. (1998), *Clock Speed: Winning Industry Control in the Age of Temporary Advantage*, Perseus Books, Reading, Mass.
- FISHER, M. (1997), "What is the Right Supply Chain for your Product?" *Harvard Business Review*, March–April, 105–116.
- , J. HAMMOND, W. OBERMEYER, AND A. RAMAN (1994), "Making Supply Meet Demand in an Uncertain World," *Harvard Business Review*, May/June, 83–93.
- FITES, D. V. (1996), "Make Your Dealers Your Partners," *Harvard Business Review*, March–April, 84–95.
- FLAHERTY, M. T. (1996), *Global Operations Management*, McGraw-Hill Company, New York.
- FLEISCHMANN, M., J. M. BLOEMHOF-RUWAARD, R. DEKKER, E. VAN DER LAAN, J. A. E. E. VAN NUNEN, AND L. N. VAN WASSENHOVE (1997), "Quantitative Models for Reverse Logistics: A Review," *European Journal of Operational Research*, 103, 1, 1–17.
- FORRESTER, J. W. (1958), "Industrial Dynamics: A Major Breakthrough for Decision Makers," *Harvard Business Review*, July/August, 37–66.
- (1961), *Industrial Dynamics*, Productively Press, Cambridge Mass.
- FULLER, J. B., J. O'CONOR, AND R. RAWLINSON (1993), "Tailored Logistics: The Next Advantage," *Harvard Business Review*, May/June, 87–93.
- GILMORE, J. H. AND B. J. PINE (1997), "The Four Faces of Mass Customization," *Harvard Business Review*, Jan–Feb, 1997, 91–101.
- GRAVES, S., A. RINNOOY KAN, P. H. ZIPKIN (1993), *Logistics of Production and Inventory*, North-Holland, New York.
- GREIS, N. P. AND J. D. KASARDA (1997), "Enterprise Logistics in the Information Era," *California Management Review*, 39, 4, 55–78.
- AND M. KELLY (1990), *Note on Facility Location*, Harvard Business School Note 689-059.
- AND J. E. P. MORRISON (1995), "A Note on the U.S. Transportation Industry," Harvard Note 9-688-080.
- HANFIELD, R. B. AND E. Z. NICHOLS (1998), *Introduction to Supply Chain Management*, Prentice Hall Press, New York.
- HELPER, S. AND M. SAKO (1995), "Supplier Relations in Japan and the United States: Are They Converging?" *Sloan Management Review*, Spring, 77–84.
- HERZLINGER, R. (1994), "The Challenges of Going Green," *Harvard Business Review*, July–August, 37–50.
- JACKSON, P. J. (1995), "Llenroc Plastics Corporation," Cornell University, Department of Operations Research and Industrial Engineering.
- JACOBS, R. (2000) "Playing the Beer Distribution Game Over the Internet," *Production and Operations Management*, to appear.
- JARMAN, W. E. (1963), *Problems in Industrial Dynamics*, MIT Press, Cambridge, Mass.
- JOHNSON, M. E. (1998a), "Give Them What They Want," *Management Review*, November, 62–67.
- (1998b), "A Note on the Poster Game," Owen Graduate School of Management, Vanderbilt University.
- AND T. DAVIS (1998), "Improving Supply Chain Performance Using Order Fulfillment Metrics," *National Productivity Review*, Summer, 3–16.
- KELLEY, B. (1995), "Outsourcing Marches On," *Journal of Business Strategy*, July–Aug, 39–42.
- KOPCZAK, L., H. L. LEE, AND S. WHANG (1995), "Note on Logistics," Stanford University.
- LAMBERT, D. M., J. R. STOCK, L. M. ELLRAM, AND J. STOCKDALE (1997), *Fundamentals of Logistics Management*, McGraw Hill Text, New York.
- LEE, H. AND C. BILLINGTON (1992), "Managing Supply Chain Inventories: Pitfalls and Opportunities," *Sloan Management Review*, 33, 3, 65–73.
- AND S. WHANG (1999), "Information Sharing in a Supply Chain," *International Journal of Technology Management*, to appear.
- LEE, H. L., C. BILLINGTON, AND B. CARTER (1993), "Hewlett-Packard Gains Control of Inventories and Service Through Design for Localization," *Interfaces*, 23, 4, 1–11.
- AND L. KOPCZAK (1997), "Responding to the Asia-Pacific Challenge," *Supply Chain Management Review*, Spring, 8–9.
- AND S. NAHMIA (1993), "Single-Product, Single-Location Models," in *Logistics of Production and Inventory*, S. Graves, A. Rinnooy Kan, and P. H. Zipkin, eds., North-Holland, New York.
- , V. PADMANDBHAN, AND S. WHANG (1997), "The Bullwhip Effect in Supply Chains," *Sloan Management Review*, Spring, 93–102.
- LITTLE, A. D. (1995), *An Exchange of Knowledge Among Leading Practitioners in Supply Chain Management*, A.D. Little and Associates, Boston, Mass.
- MAGRETTA, J. (1998), "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," *Harvard Business Review*, March–April, 72.
- MARIEN, E. J. (1998), "Reverse Logistics as Competitive Strategy," *Supply Chain Management Review*, Spring, 43–52.
- MCCUTCHEON, D. M., A. S. RATUR, AND J. R. MEREDITH (1994), "The Customization-Responsiveness Squeeze," *Sloan Management Review*, Winter, 89–99.

- McMILLAN, J. (1990), "Managing Suppliers: Incentive systems in Japanese and U.S. Industry," *California Management Review*, Summer, 38–55.
- MEHRING, J. S., M. KOTLER, AND J. KIESEL (1997), *Improving Supply Chain Performance at BCG Company: Learning with Lego Blocks*, University of Massachusetts, Lowell.
- MEYER, M. (1997), *The Performance Imperative*, Wharton School Working Paper, University of Pennsylvania.
- NARUS, J. A. AND J. C. ANDERSON (1996), "Rethinking Distribution: Adaptive Channels," *Harvard Business Review*, July/August, 112–120.
- O'LAUGHLIN, K. A. (1997), "Five Steps to Improved Performance Measurement," *Supply Chain Management Review*, Fall, 52–58.
- PADMANABHAN, V. AND I. P. L. PNG (1995), "Return Policies: Make Money by Making Good," *Sloan Management Review*, Fall, 65–72.
- PORTEUS, E. L. (1998), "Web-Based Beer Game," Stanford University Executive Seminar, August.
- PRTM (1997), "The Keys to Unlocking Your Supply Chains Competitive Advantage," Pittiglio Rabin Todd & McGrath, Waltham, Mass.
- PYKE, D. F. (1994), "Global Sourcing at Second Glance," *Global Competitor*, 1, 3, 70–74.
- (1998), "Strategies for Global Sourcing," *Financial Times*, February 20, (part 4 of 10 on "Mastering Global Business"), 2–4.
- ROBERTSON, P. L. AND R. N. LANGLOIS (1995), "Innovation, Networks, and Vertical Integration," *Research Policy*, 24, 4, 543–562.
- RUDI, N. AND D. F. PYKE (1998), "Product Recovery at the Norwegian Health Insurance Administration," *Interfaces*, to appear.
- QUINN, J. B. AND F. HILMER (1994), "Strategic Outsourcing," *Sloan Management Review*, Summer, 43–55.
- SCHONFELD, E. (1998), "The Customized, Digitized, Have-it-your-way Economy," *Fortune*, September 28, 115–124.
- SCMR (1998), "What is the future for Third-Party Logistics?" *Supply Chain Management Review*, 2, 1.
- SENGE, P. (1990), *The Fifth Discipline*, Doubleday, New York.
- SHARMAN, G. J. (1997), "Supply Chain Lesson From Europe," *Supply Chain Management Review*, Fall, 11–13.
- SIEMENS (1996), "Supply Chain Workshop: Briefcase Game," Siemens Corporation, Corporate Logistics North America, Newark, N.J.
- SILVER, E. A., D. F. PYKE, AND R. PETERSON (1998), *Inventory Management and Production Planning and Scheduling*, 3rd ed., John Wiley & Sons, New York.
- SIMCHI-LEVI, D., P. KAMINSKY, AND E. SIMCHI-LEVI (1998), *Designing and Managing the Supply Chain*, Irwin/McGraw-Hill, New York.
- STERMAN, J. D. (1989), "Modeling Managerial Behavior: Misperceptions of Feedback in a Dynamic Decision Making Experiment," *Management Science*, 35, 3, 321–339.
- (1992), "Teaching Takes Off: Flight Simulators for Management Education," *OR/MS Today*, October, 40–43.
- TAYLOR, D. (1997), *Global Cases in Logistics and Supply Chain Management*, International Thomson Business Press, New York.
- TRAIN, J. (1998), *Legal Issues Affecting Distribution and Supply*, Fuqua School of Business Working Paper.
- VAN WASSENHOVE, L. AND M. CORBEYZ, (1998), *Production and Operations Management Core Course Teaching at the Top 20 MBA Programmes in the USA*, INSEAD Working Paper, Fontainebleau Cedex, France.
- VENKATESAN, R. (1992), "Strategic sourcing: To make or not to make," *Harvard Business Review*, Nov–Dec, 98–107.
- WALLER, M., M. E. JOHNSON, AND T. DAVIS (1999), "Vendor Managed Inventory in the Retail Supply Chain," *Journal of Business Logistics*, 20, 1, 183–203.
- WHANG, S., W. GILLAND, AND H. L. LEE (1995), *Information Flows in Manufacturing under SAP R/3*, Stanford University Working Paper.
- WOMACK, J. P., D. T. JONES, AND D. ROOS (1991), *The Machine that Changed the World: The Story of Lean Production*. Harper Perennial, New York, New York.
- WOOLLEY, S. (1997), "Replacing Inventory with Information," *Forbes*, March 24, 54–58.

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