Journal of Transportation Management

Vol 11 No 2
Fall 1999

-
- 1 **Exploring Alternative Purchasing Strategies: Just-in-Time or Just Enough?**
Julie J. Gentry, Matthew A. Waller, and Scott B. Keller
- 16 **Maritime Unions and The U.S. Merchant Marine**
Richard L. Clarke
- 25 **Defining Dyadic Cost and Risk in International Trade: A Review of INCOTERMS 2000 with Strategic Implications**
Drew M. Stapleton and Virginie Saulnier
- 44 **Leading Without Bleeding: An Information Technology Case Study at Union Pacific Railroad**
Uma G. Gupta, Randy W. Butler, and Thomas D. Milner
- 55 **Truckload Transportation Requirements: In Anticipation of Y2K with Epilogue**
John L. Kent, R. Stephen Parker, and Charles E. Pettijohn
-

Delta Nu Alpha Transportation Fraternity

Journal of Transportation Management

Vol 11 No 2
Fall 1999

-
- 1 **Exploring Alternative Purchasing Strategies: Just-in-Time or Just Enough?**
Julie J. Gentry, Matthew A. Waller, and Scott B. Keller
- 16 **Maritime Unions and The U.S. Merchant Marine**
Richard L. Clarke
- 25 **Defining Dyadic Cost and Risk in International Trade: A Review of INCOTERMS 2000 with Strategic Implications**
Drew M. Stapleton and Virginie Saulnier
- 44 **Leading Without Bleeding: An Information Technology Case Study at Union Pacific Railroad**
Uma G. Gupta, Randy W. Butler, and Thomas D. Milner
- 55 **Truckload Transportation Requirements: In Anticipation of Y2K with Epilogue**
John L. Kent, R. Stephen Parker, and Charles E. Pettijohn
-

Published by
Delta Nu Alpha Transportation Fraternity
and
Georgia Southern University

Journal of Transportation Management

Editor

Jerry W. Wilson
Georgia Southern University

Associate Editor

Stephen M. Rutner
Georgia Southern University

Associate Editor

Brian J. Gibson
Auburn University

Office of Publications and Faculty Services
Georgia Southern University

Linda S. Munilla
Director

Carol L. Waller
Special Projects Assistant

Editorial Review Board

James W. Adams
Auburn University

Frederick J. Beier
University of Minnesota

Joseph Cavinato
Pennsylvania State University

Martha Cooper
The Ohio State University

Michael R. Crum
Iowa State University

William A. Cunningham
Air Force Institute of Technology

James M. Daley
John Carroll University

Patricia J. Daugherty
University of Oklahoma

Kathryn Dobie
North Carolina A&T State University

M. Theodore Farris II
University of North Texas

Curtis M. Grimm
University of Maryland

Jon S. Helmick
U.S. Merchant Marine Academy

Ray A. Mundy
University of Missouri at St. Louis

John Ozment
University of Arkansas

Terry L. Priest
Coors Brewing Company

James P. Rakowski
University of Memphis

E. James Randall
Georgia Southern University

David L. Shrock
University of South Carolina

Theodore P. Stank
Michigan State University

Evelyn A. Thomchick
Pennsylvania State University

Theodore O. Wallin
Syracuse University

E. Cameron Williams
Massachusetts Maritime Academy

DELTA NU ALPHA

1999-2000 Officers

President

Gary Nichols
Contract Freighters, Inc.

Vice-President/Secretary-Treasurer

Jeff Wilmarth
Silver Arrow, Inc.

Foundation Liaison

Lynda Siegel
Siegel Enterprises, Inc.

Directors

Cathy Davis
MCD Transportation, Inc.

Patrick O'Connell
Menlo Logistics

Kay Dobie
North Carolina A&T State University

Robert B. Simons
Mark VII Transportation

Dr. Jerry W. Wilson
Georgia Southern University

Administrator

Judy Plummer
530 Church Street, Suite 700
Nashville, TN 37219
Phone: (615) 251-0933
Fax: (615) 244-3170

Membership Information:

Silver Membership	\$75.00	Annually
Gold Membership	\$125.00	Annually

Applications:

Contact Judy Plummer at (800) 453-3662.

From the Editor...

Welcome to the Fall 1999 issue of the *Journal of Transportation Management*. If you take just a few minutes of your valuable time to scan the contents, I think that you will find something of interest both personally and professionally. The diversity of articles and topics covered goes beyond what you would expect to find and is indicative of the diversity defining our industry. I am always indebted to the authors for their patience, quality of research and writing, and for thinking of the *JTM* as an outlet for their work. I offer my sincere gratitude to the members of the Editorial Review Board who contribute to the success of this and every issue. Remember that the reviewers are volunteers—they agree to give their time and expertise and ask for nothing in return. I could not do my job without them. Steve Rutner and Brian Gibson, my associate editors, continue to add quality leadership and direction to the *Journal*. Many people contributed to the completion of this issue. I'm sure that you will enjoy the end result!

The lead article in this issue, by Julie Gentry, Matthew Waller, and Scott Keller, reports the results of a study of purchasing strategies among manufacturing firms. They identify four hybrid purchasing strategies that fall between the two extremes of transaction-based and just-in-time purchasing. The second article, by Rick Clarke, chronicles the development of U.S. maritime unions and, more recently, their decline in membership and influence. Changes in union power and influence are also discussed within the context of maritime policy and regulation. Drew Stapleton and Virginie Saulnier discuss the history of INCOTERMS in the third article. In addition to carefully contrasting the 1990 and 2000 versions of the INCOTERMS, the article provides a clear and concise description of each of the 13 international commercial terms. Uma Gupta, Randy Butler, and Thomas Milner offer an inside look at the development of an automated gate system at Union Pacific Railroad in the fourth article of this issue. The case study follows the implementation of the system for fully automating the data collection, inspection, assessment, and reporting of damage claims to rail equipment. In the final article of this issue, John Kent, Stephen Parker, and Charles Pettijohn summarize the results of a 1999 survey of truckload shippers concerning the impact of Y2K on their anticipated volume of shipments and equipment needs. They also look at what actually occurred in the dry van, temperature controlled, and flatbed segments of this industry after the new year began. They provide a unique look at the "before and after" activity associated with the Y2K scare. There should be something for everyone here. I hope that you take the time to read each of the articles in this issue. I think you will be glad that you did.

As always, I thank John Youngbeck, CEO of the International Intermodal EXPO, and his board of directors for their commitment not only to the *Journal of Transportation Management* and Delta Nu Alpha International Transportation Fraternity but also to the future of logistics and transportation education.

Speaking of commitment and financial support, remember that we cannot survive and continue to publish without reader support. Please join or renew your membership in Delta Nu Alpha International Transportation Fraternity and subscribe to the *Journal of Transportation Management*. Share this issue with a colleague and encourage him/her to subscribe today!

Jerry W. Wilson, Editor
Journal of Transportation Management
Georgia Southern University
Southern Center for Logistics and Intermodal Transportation
P.O. Box 8154
Statesboro, GA 30460-8154
(912) 681-0257 (912) 871-1523 FAX
jwwilson@gsaix2.cc.gasou.edu

Stephen M. Rutner, Associate Editor
(912) 681-0588
srutner@gsaix2.cc.gasou.edu

Brian J. Gibson, Associate Editor
(334) 844-2460
bgibson@cob-1.business.auburn.edu

And visit our web sites:

Delta Nu Alpha Transportation Fraternity: www.wmgt.org/deltanualpha
Georgia Southern University Logistics: www2.gasou.edu/coba/centers/lit

Journal of Transportation Management

OBJECTIVES

Editorial Policy. The primary purpose of the *JTM* is to serve as a channel for the dissemination of information relevant to the management of transportation and logistics activities in any and all types of organizations. Articles accepted for publication will be of interest to both academicians and practitioners and will specifically address the managerial implications of the subject matter. Articles that are strictly theoretical in nature, with no direct application to the management of transportation and logistics activities, would be inappropriate for the *JTM*.

Acceptable topics for submission include, but are not limited to carrier management, modal and intermodal transportation, international transportation issues, transportation safety, marketing of transportation services, domestic and international transportation policy, transportation economics, customer service, and the changing technology of transportation. Articles from related areas, such as third party logistics and purchasing and materials management are acceptable as long as they are specifically related to the management of transportation and logistics activities.

Submissions from industry practitioners and from practitioners co-authoring with academicians are particularly encouraged in order to increase the interaction between the two groups. Authors

considering the submission of an article to the *JTM* are encouraged to contact the editor for help in determining relevance of the topic and material.

The opinions expressed in published articles are those of the authors and do not necessarily reflect the opinions of the editor, the Editorial Review Board, Delta Nu Alpha Transportation Fraternity, the International Intermodal Expo, or Georgia Southern University.

PUBLISHING DATA

Manuscripts. Four (4) copies of each manuscript are to be sent to Dr. Jerry W. Wilson, Georgia Southern University, P. O. Box 8154, Statesboro, GA 30460-8154. Manuscripts should be no longer than 25 double-spaced pages. Authors will be required to provide electronic versions of manuscripts accepted for publication. Guidelines for manuscript submission and publication can be found in the back of this issue.

Subscriptions. The *Journal of Transportation Management* is published twice yearly. The current annual subscription rate is \$35 in U.S. currency. Payments are to be sent to: *Journal of Transportation Management*, Delta Nu Alpha Transportation Fraternity, 530 Church Street, Suite 700, Nashville, TN 37219.

EXPLORING ALTERNATIVE PURCHASING STRATEGIES: JUST-IN-TIME OR JUST ENOUGH?

Julie J. Gentry
University of Arkansas

Matthew A. Waller
University of Arkansas

Scott B. Keller
Michigan State University

What are the prevalent purchasing strategies used by manufacturing firms to purchase components that are critical to the quality of their most important products? This research reports the findings from data on purchasing strategies collected from 248 companies. The data indicate that although firms seem to be moving away from a transaction-based purchasing strategy towards "partnership" relations necessary for successful just-in-time strategies, firms are likely to embrace one of four hybrid purchasing strategies that on a spectrum would fall somewhere between the two "pure" strategies. These identified strategies offer purchasing managers viable alternatives to moving directly into a just-in-time environment.

INTRODUCTION

Effective purchasing strategy can contribute significantly to the success of most modern organizations. Surveys of U.S. manufacturing firms indicate that purchased materials account for an average of 57 percent of the sales dollar, while total labor costs (wages, salaries, and fringe benefits) consist of only one third of the purchase percentage (U.S. Bureau of Census 1989). Therefore, purchasing dollars must be managed strategically in order to improve the financial position of organizations (Reck and

Long 1988). It is also well understood that the overall quality and service capabilities of any manufacturing firm are heavily influenced by the performance of its suppliers. Research suggests that 50 percent of a company's quality non-conformances are caused by defective purchased materials (Leenders and Fearon 1993). Recognizing the importance of the purchasing functions and their overall effect on a firm's financial and quality performance, organizations are expanding the role of purchasing in the corporate strategic planning process (Fearon 1988).

Several strategic decisions under the discretion of purchasing managers in a manufacturing environment have been identified in the literature. Each of these decisions has the potential to influence a firm's competitive position (Waller 1993). The most frequently cited of these decisions are (1) the number of suppliers of critical components to use, (2) length and type of contract to use with suppliers, if any, (3) frequency with which to share production scheduling or forecasting information, (4) criteria to be used in selecting suppliers, and (5) the frequency of deliveries of critical components.

These five purchasing decisions are strategic in the sense that they have long-term consequences, pertain to the mutual sharing of critical information, and result in the selection and dismissal of suppliers. Reducing the number of suppliers of critical components has a long-term consequence because it can often take months or even years for new suppliers to be able to produce highly specialized, critical components. This can be due to the need for specialized manufacturing equipment or due to the capacity constraints of the supplier. A long-term contract has long-term consequences by definition. Frequent sharing of demand information with a supplier may eventually entail investment in EDI technology. The criteria that are used to select suppliers will have consequences for as long as those suppliers are used. Finally, moving toward more frequent deliveries may involve a change in the mode of transportation, additional investment in materials handling equipment, and changes in the receiving and inventory procedures—collectively implying long-term decisions.

These five decisions are discussed in the literature within the context of two general purchasing strategies: just-in-time purchasing (JITP) using cooperative buyer-supplier partnerships, and traditional purchasing (TP) in an open bargaining environment (Waller 1993). With respect to the five strategic purchasing decision variables, JITP vis-à-vis TP involves: using fewer suppliers for a given component (Ansari and Modarress 1988), longer term contracts with suppliers (Perry 1988), frequent

sharing of production schedule information (Treleven and Schweikhart 1988), using many criteria—not just price—for selecting suppliers (Ansari and Modarress 1988), and taking frequent deliveries of components (Perry 1988).

Crosby (1984), Russell (1985), and Stundza (1984) suggested that U.S. manufacturing firms were moving away from open market supplier transactions toward closer buyer-supplier relations. Spekman (1988) described these emerging relationships as “alliances,” Johnston and Lawrence (1988) as “partnerships,” while Heide and John (1990) contrasted them with the more traditional “arm's length” type of interaction. A strategic partnership between a purchasing firm and a supplier has been defined as “a mutual, ongoing relationship involving a commitment over an extended period of time, and a sharing of information and the risks and rewards of the relationship” (Ellram 1990). More recently, Hendrick and Ellram (1993) indicated that strategic supplier partnerships have become an enduring purchasing initiative that may be necessary for competitive leadership and survival in the future.

While the use of supplier partnerships is no doubt growing in popularity, there appears to be a consensus in the literature that supplier partnerships develop over time, rather than being constructed overnight (Ellram 1991). Furthermore, although several characteristics have been identified as common among strategic partnerships when viewed as a whole, there is also evidence that firms engage in partnership relations for a variety of reasons and desired outcomes (Hendrick and Ellram 1993). Based on the long-term nature of partnership development and the lack of a single underlying strategic direction common to partnership relations, it seems logical to assume that many organizations do not adhere to a single pure strategy of JITP or TP, but rather some type that falls in between the two ends of the spectrum. Therefore, a primary objective of this research is to assess the use of pure JITP and TP strategies relative to other hybrid types of strategies.

BUYER-SUPPLIER PARTNERSHIPS

The purpose of this section of the paper is to present an overview of the buyer-supplier partnership concept and its relationship to JIT purchasing. First, various definitions of partnerships and recurring themes within those definitions are identified. The second part of this section provides the linkage between the buyer-supplier partnership concept and a JIT environment.

Buyer-Supplier Strategic Partnership Definitions

The concept of the buyer-supplier strategic partnership has numerous definitions and synonyms in the literature. Although each definition is unique, there are common "dimensions" of these relationships that can be identified by a careful review of the literature. Several recurring themes are suggested in the numerous definitions of buyer-supplier strategic partnerships, including (1) the presence of long-term commitments; (2) information sharing and open communications; (3) cooperative continuous improvements on cost reductions and increased quality; and, (4) the sharing of risks and rewards of the relationship (Gentry 1994).

Strategic partnerships require a long-term focus and relations with a limited number of suppliers (Shapiro 1985). Ohmae (1989) also points out that coalitions must be long-term, strategic relationships which must be carefully defined, developed, and understood to prevent unreasonable expectations.

A second partnership theme identified in the review of the buyer-supplier literature is information sharing and open communications. More casual and open lines of communication between the firms allows for increased flexibility and adaptability (Bevan 1989). Sharing of information is also essential to accelerating the product development cycle and speeding the introduction of new or altered products to the marketplace.

A third recurring theme found in numerous definitions of buyer-supplier strategic partnerships is a cooperative and continuous emphasis on cost reductions and quality improvements. Dwyer et al. (1987) suggest that a buyer's anticipation of high switching costs increases the buyer's interest in maintaining a quality relationship. Both buying and selling firms can enjoy a reduction in administrative costs since purchase orders, receiving reports, inspection duties, payment transactions, and sales calls are decreased (Landeros and Monczka 1989).

A fourth recurring theme found in the literature on buyer-supplier partnerships is the sharing of risks and rewards of the relationship. Companies seek to minimize their degree of technical or financial exposure, especially when entering new product markets or expanding the geographical coverage of an existing market (Williamson 1975). Technology and asset sharing are frequently cited as benefits in forming strategic partnerships (Landeros and Monczka 1989). Partnerships allow firms to share capital investment costs and the substantial learning costs of introducing new products or making technological advancements (Cavinato 1991). Maintaining close buyer-supplier relationships and sharing superior skills and resources increases the likelihood of successful product innovations (Landeros and Monczka 1989).

Use of Partnerships in a Just-in-Time Environment

The JIT concept has been adopted widely by purchasing management. To summarize the concept, its objective is to eliminate waste of all kinds from the delivery and production systems, using a method of drawing materials through the system on an "as needed" basis as opposed to a "push" system (Hall 1983). The benefits of JIT implementation include reduced inventory levels, higher product quality, increased flexibility, and higher productivity. To achieve the coordination necessary for effective JIT processes, buyer-

supplier cooperation must replace open market competition. Toyota's card control system, Kanban, is a prime example of this concept. In essence, the whole plant and suppliers act as progressive work centers where inventory is staged for production. The system relies on a set of cards, move and production cards, utilized to authorize the movement of parts between work centers and the production of new parts to replace those used. The card circulation is placed in motion by requiring the using work centers to request or retrieve needed parts from the supplying centers. Master Lock, a Milwaukee based manufacturer of padlocks, also utilizes the JIT concept in their pull system. Color-coded containers are placed in bins. Each color represents a lock type and each container holds a standard lot size of twenty units. Production needs are withdrawn from the containers and as a container drops below the lot size the units are combined with another container of identical parts and the empty is returned to the supplying area for replenishment.

Given the critical nature of suppliers in a JIT environment, Bagchi (1988), Bookbinder and Dilts (1989), and O'Neal (1987) indicate that buyer-supplier partnerships are necessary for effective operations. It has been suggested that JIT relationships are the most cooperative buyer-supplier relations, due to the level of interdependence and long-term orientation that are required. In a comparison of market and JIT exchange relationships, JIT relations (1) have a longer term orientation; (2) necessitate frequent communication between firms; (3) involve moderate to high levels of specialized investments; (4) require a reduction in number of suppliers (with sole-sourcing optimal); (5) involve a high level of risk; and, (6) necessitate a high frequency of shipments (Frazier, Spekman and O'Neal 1988).

The purpose of this discussion is not to advocate the use of JIT relations, but rather to support the linkage between the buyer-supplier partnership and JIT concepts. Although it has been found that a JIT environment is not

necessary for a successful buyer-supplier partnership (Hendrick and Ellram 1993), it can be posited that buyer-supplier partnerships are necessary for a successful JIT system.

METHODOLOGY

Literature indicates two widely accepted pure purchasing strategies; traditional purchasing and just-in-time purchasing with supplier partners. Among the many distinctions, adopting one strategy over the other has been shown to dictate how purchasing dollars will be spent and how firms strategically influence their long-term direction. Research by Bagchi (1988), Bookbinder and Dilts (1989), O'Neal (1987), and others indicates that organizations are moving away from traditional purchasing and rapidly adopting the "win-win" philosophy commonly associated with strategic partnerships. The following research questions were identified in an effort to further establish the utility and consequences of the various strategic purchasing decisions made by firms:

1. Do firms tend to use either the pure JITP strategy or the pure TP strategy?
2. Are other identifiable strategies being used?
3. What decisions have firms made about the often-cited strategic purchasing variables, namely, length of commitments, information sharing, cooperative continuous improvements, and the sharing of risks and rewards?

Survey Instrument and Data Collection

To answer these questions, a mail survey was sent to 1,035 manufacturing firms in the fabricated metal products industry (SIC 34). While all of the firms in this study were involved in metal fabrication of some sort, a broad range of firm sizes and process technologies—ranging from job shops to assembly lines—were represented. For example, represented firms may include manufacturers of metal cans, hardware, metal forgings, cutlery, and other manufacturers of metal and wire products.

Consequently, having selected only one industry (SIC 34), industry specific variations are reduced, improving the internal validity of the study. Since a wide variety of process technologies are represented, external validity is enhanced, improving the general applicability of the findings.

Questionnaires were sent only to those firms with 100 or more employees and a purchasing manager in the manufacturing plant. The letters were addressed to the mid-level purchasing managers. After the first mailing, a reminder letter was sent to non-respondents. Then a third letter with a copy of the questionnaire was sent to the remaining non-respondents. After all three mailings, 248 questionnaires were returned, resulting in a 24 percent response rate. To rule out possible response bias, a difference of means test (T-test) between early and late respondents was conducted on various relevant variables and no significant differences were found.

JIT was not mentioned in the cover letter or questionnaire to help avoid biases in the answers to the items on the questionnaire. Neither were firms asked whether they use buyer-supplier partnerships; they were simply asked questions about the five strategic purchasing variables identified above. The respondents were asked to answer the questionnaires in reference to one critical component they purchase for a primary product since most firms using supplier partnerships only use it with components that are critical to quality (Freeland 1991). It was explained that "critical component" meant a component having a significant impact on the quality of the final product and that "primary product" meant one of the company's leading products in terms of sales revenue. Although we were interested in having some firms in the sample that use JITP, we wanted to have firms employing many strategies.

RESULTS

The next section deals with the results of the exploratory empirical investigation. This section is divided into five subsections, each dealing with a different strategic purchasing variable. These include (1) the number of suppliers, (2) the length of the contract, (3) the sharing of information, (4) the criteria used for supplier selection, and (5) the frequency of delivery. The data include all firms in the sample—not just those that might be classified as JITP.

Number of Suppliers

Advocates of JITP and supplier partnerships encourage firms to use fewer suppliers for critical components, sometimes even suggesting single sourcing (Deming 1982). It is easier to manage, for example, two suppliers than it is twenty; more resources can be expended per supplier for supplier development when fewer suppliers are used. Furthermore, when fewer suppliers are used it is easier to develop closer relationships with the suppliers, resulting in better buyer-supplier communication, enhancing the supplier's ability to meet the demands of the buyer more accurately. Also, a firm using fewer suppliers needs each supplier to provide a higher volume of production of the component that is being procured than would otherwise be the case. This facilitates the supplier's path down the learning curve in terms of cost and quality.

In this survey, respondents were asked how many suppliers they used over the past year for the critical component they selected for answering the questionnaire; Figure 1 shows the results. As can be seen, 58 percent used five or more suppliers and 19 percent used only one supplier. Only 4 percent used dual sourcing, an often-cited approach to reaping the benefits of JITP while reducing the possibilities of the negative outcomes such as disruption of supply

(Juran and Gryna 1980). Even using a broad definition of JITP, which allows for the use of dual sourcing, only 23 percent of the firms used this strategy—the majority of the firms used five or more suppliers over the past twelve months.

Length of Contract

The requirements of a strategic partnership include the need to view the relationship as a series of exchanges without an endpoint, and the need to establish various mechanisms to monitor and execute the operations of the partnership (Henderson 1990). Perry (1988) found that companies successful with JITP used long-term contracts. In a recent study, Helper (1991) found that the average length of a contract between a parts supplier and an automotive manufacturer almost doubled between 1984 and 1989.

This research addresses two primary areas: the use of contracts and their duration. Figure 2 summarizes the results. Over half of the respondents indicated they used contracts of less than one year, with only 14 percent indicating the use of contracts for a period beyond two years.

Sharing Information

Another characteristic of JITP and strategic partnerships is the sharing of production scheduling or forecasting information with supplier partners. The sharing of scheduling information allows the supplier to better plan production, allowing higher productivity and quality levels. If a company shared scheduling information on a weekly basis but it was for a 13 week planning horizon, for example, then that would be counted as weekly sharing of production scheduling information. In a JITP supplier partnership environment, having fewer suppliers makes it easier to share information and have more open lines of communication. Intuitively, if a buyer is willing to reduce its supplier base, it seems likely that it would attempt to fully exploit the potential benefits by sharing scheduling and forecasting information.

As can be seen from Figure 3, almost half of the companies never share production scheduling or

forecasting information with their suppliers. Firms are not taking full advantage of a reduced supplier base.

Criteria for Selecting Suppliers

When utilizing a TP strategy, price is the predominant supplier selection criterion for evaluation. In this traditional open market bargaining environment, price-driven tactics such as competitive bidding, positional negotiations, and value analysis are used. Most of these tactics force suppliers to base their supplier selection decisions on short-term considerations. Often the result of this operating environment is, ironically, lower quality products and ultimately higher product costs to the buyers (Hahn, Kim and Kim 1986).

Typical supplier selection criteria include price, delivery performance, and quality considerations. Since supplier partnerships are more strategic in nature and require a longer-term planning horizon, the argument has been made that these relationships require the consideration of additional factors for selecting suppliers (Ellram 1990). These include (but are not limited to) organizational issues such as cooperation, availability of technology and financial resources, and other unique factors that may include safety, location, and a supplier's existing customer base.

In this study, the respondents were given a sample list of criteria that might be used for selecting suppliers: quality, price, delivery performance, financial resources, cooperation, geography (location), and engineering capability. They were asked to check each one that they used in selecting the supplier(s) of their critical component. Figure 4 summarizes the findings, showing what percentage of firms used various numbers of the criteria in selecting suppliers. Only 4 percent of the firms used two or fewer of the criteria, and 21 percent used all seven criteria.

Frequency of Deliveries

To realize the full benefits of JIT, a firm must receive frequent and reliable deliveries of high quality parts in small sizes and exact quantities (Schonberger 1982). This requires efficient, reliable communications and information sharing, which was emphasized in the earlier section defining the common themes of buyer-supplier partnerships. Similarly, another theme found in partnering relations is a cooperative and continuous emphasis on cost reductions. The

underlying goal of small, frequent deliveries is an overall reduction of inventory and associated costs.

In this study, firms were asked how often they received deliveries from suppliers of their critical component. Figure 5 summarizes the findings. Only two of the 248 companies took delivery of critical components on an hourly basis. However, 74 of the 248 companies (30 percent) took deliveries daily, while 75 percent indicated that their firms took deliveries monthly or less frequently.

FIGURE 1
NUMBER OF SUPPLIERS OF CRITICAL COMPONENTS

FIGURE 2
LENGTH OF CONTRACT USED WITH SUPPLIER OF CRITICAL COMPONENT

FIGURE 3
FREQUENCY OF SHARING PRODUCTION SCHEDULING OR FORECASTING
INFORMATION WITH SUPPLIERS OF CRITICAL COMPONENTS

FIGURE 4
NUMBER OF THE FOLLOWING CRITERIA USED IN
SELECTING SUPPLIERS OF CRITICAL COMPONENT:
QUALITY, PRICE, DELIVERY PERFORMANCE, FINANCIAL RESOURCES,
COOPERATION, GEOGRAPHY, AND ENGINEERING CAPABILITY

FIGURE 5
FREQUENCY OF DELIVERIES OF CRITICAL COMPONENTS

CONCLUSIONS AND MANAGERIAL IMPLICATIONS

The survey results indicate that most firms are not using either a pure TP or JITP strategy. Rather, firms appear to employ different purchasing strategies for different components. Based on the significant correlations from data shown in Table 1, four alternative strategies seem present: the frequent sharing of information (X3) with long term contracts (X2) indicates a commitment strategy; selectivity in choosing suppliers (X4) with frequent sharing of information (X3) suggests an information strategy; frequent deliveries (X5) with selectivity in choosing suppliers (X4) implies an interaction strategy; and, few suppliers (X1) with infrequent deliveries (X5) suggests an efficiency strategy. Each resultant strategy has different managerial and strategic implications for firms employing them as discussed in the following sections.

Commitment Strategy

The commitment strategy involves firms that frequently share information and engage in long-term contracts with suppliers (refer to Table 1, X3

and X2 respectively). Both elements of this strategy involve a commitment on the part of the buyer. The long-term contract reduces the buyer's flexibility to some extent, although this is dependent on the details of the specific contract. The buyer's demonstrated commitment can facilitate the development of a potentially successful relationship. The supplier will be more willing to invest in machines and labor to enhance its ability to meet or exceed the buyer's expectations.

Sharing information results in commitment in two ways: it develops human asset specificity and physical asset specificity. Human asset specificity arises due to "learning by doing." This occurs on both sides of the dyad, since good communication takes time to develop. Physical asset specificity can develop as a result of the implementation of EDI. Additionally, frequent sharing of information can be both time consuming and expensive.

Both elements of the commitment strategy—frequent sharing of information and long-term contracts—are consistent with one another in that they both represent a commitment on the part of the buyer to the supplier.

TABLE 1
CORRELATION COEFFICIENTS

	Fewer Suppliers (X1)	Length of Contract (X2)	Frequency of Sharing Scheduling Information (X3)	Number of Criteria Used (X4)	Frequency of Deliveries (X5)
Fewer Suppliers ^a (X1)					
Length of Contract (X2)	-0.03				
Frequency of Sharing Scheduling Information (X3)	0.11	0.27*			
Number of Criteria Used (X4)	0.04	0.09	0.16*		
Frequency of Deliveries (X5)	-0.27*	0.04	0.11	0.22*	

* Statistically significant at $p < .01$.

^a The number of suppliers reported was reverse coded; higher levels of X1 implies fewer suppliers

Therefore, this strategy is most appropriate in situations where such a commitment is important for the successful procurement of the component. This would be the case, for example, when it is necessary for a supplier to buy specialized assets or develop specialized skills in order to manufacture the component. Another example would be a situation where a component's specifications are frequently changed, making close communications imperative. A buyer's commitment to a supplier can enhance a supplier's willingness to cooperate with such frequent changes.

Purchasing managers must assess their critical component manufacturing needs and the capabilities of suppliers with respect to fulfilling such requirements. Those firms requiring very specialized inputs that may not be easily reproduced, for example, must protect their sourcing interests by fostering long-term relationships with willing suppliers. Buyers must assure that suppliers possess the strategic and structural ability and willingness to make the modifications necessary for providing exact component specifications. Commitment strengthens as parties become secure in exchanges based on long-term

contracts. Trust is manifest by investment in the tools necessary to completely fill the expectations of the buyer. Procurement officers must see that partnering firms' information systems are adequately integrated so as to ensure the sharing of important, sensitive, and timely exchanges.

Information Strategy

The information strategy is composed of two facets: (1) selectivity in choosing suppliers, and (2) frequent sharing of information (refer to Table 1, X4 and X3 respectively). The buyer may collect information about a potential supplier's product quality, pricing, delivery performance, financial stability, willingness to cooperate, location, and engineering capability. Based on that information, the buyer decides whether to use that supplier. After supplier selection, the buyer begins a regime involving sharing information with the supplier on a regular and frequent basis.

When uncertainty about suppliers' abilities to deliver quality products on-time pervades the sourcing decision, the information strategy is most likely to be used. If a company were

purchasing high frequency ultrasonic transducers for flaw detection, then the information strategy would be appropriate. These products are not particularly complex, but they are typically assembled to order because of slightly different specifications in orders. The quality of these components can vary significantly from one company to the next, and due to technical reasons, firms require different quality standards. Consequently, it pays for companies to be highly selective in choosing suppliers of these components. After that, the components often require on-going adjustments to properly meet the demands of the buyer. This requires continual and frequent sharing of information.

Manufacturers of products highly sensitive to quality specifications must be particularly critical in supplier selection. Suppliers must have proven demonstration of adherence to all performance criteria prior to the business exchange. Procurement managers must develop acceptable criteria ratings and ensure that the information technology is in place to effectively disseminate quality specification updates.

Interaction Strategy

The interaction strategy entails frequent deliveries of the critical components and high selectivity in choosing suppliers, both of which require a great deal of interaction between the buyer and supplier (refer to Table 1, X5 and X4 respectively). The strategy yields a highly coupled buyer-supplier dyad where the feedback loop is minimal and where there is an appropriate congruency of the buyer's needs and the supplier's capabilities.

Congruency between the buyer's needs and the supplier's capabilities is achieved by the buyer analyzing numerous performance measures in the supplier selection process. Once the supplier is selected, the company using this strategy maintains a high level of interaction by taking frequent deliveries of components. The interaction resulting from the frequent

deliveries is likely to be successful with this strategy since the congruency of the two companies is assured by the up-front investment of time in the detailed analysis of the supplier.

Procurement officers are encouraged to identify their strategy with respect to managing inventory. Firms requiring minimal inventory levels will look for suppliers who can accommodate frequent deliveries. Due to holding low levels of inventory, selection of suppliers must be critical and only those able to perform this level of delivery service need be considered.

Efficiency Strategy

The efficiency strategy contains two facets—use of fewer suppliers and less frequent deliveries (refer to Table 1, X1 and X5 respectively). The two facets together lead to various cost efficiencies in purchasing, although typically not viewed together in a single strategy. These two variables together as part of a pure JITP strategy would entail the use of fewer suppliers with **more** deliveries. However, there is a logical and cost efficient reason why companies would employ an efficiency strategy.

The use of fewer suppliers can reduce both administrative costs and component costs. Administrative costs can be reduced since there are fewer suppliers to manage and coordinate. Additionally, by reducing the number of suppliers and increasing the volume purchased from these suppliers, the component costs can be reduced by leveraging purchase volumes. Using fewer suppliers makes it easier for the buyer to take advantage of quantity discounts, and less frequent deliveries allow the buyer to gain transportation efficiencies, thus reducing total delivered cost of the components.

Consequently, manufacturers purchasing components with low inventory holding costs or those most conducive to transportation

efficiencies are encouraged to employ efficiency strategies. It is also recommended for those organizations where the purchasing department procedures are complex, slow, unstandardized, and bureaucratic, which greatly increases ordering and administrative costs. Therefore, purchasing managers must identify suppliers associated with volume discounts and strive to achieve relationships with select vendors in an effort to ensure large volume availability and improve future per unit cost savings. Ideally, the efficiency strategy should not be used to cope with such an inefficient purchasing department; instead, the company should eventually reengineer the purchasing process.

In summary, the ways in which the five strategic purchasing decision variables are used are manifestations of the purchasing strategies themselves. These purchasing variables can be used in many ways but they are most often discussed under the rubric of the JITP strategy, contrasted to the TP strategy. However, these variables can, and are, used in other combinations. While there are many benefits associated with JITP, it does not make sense to purchase all components using that strategy. The HP Greeley Division uses JITP to purchase only about 1 percent of their parts (Ansari and Modarress 1988).

This research identified four purchasing strategies that do not clearly fit into any previous category such as TP or JITP. Firms are likely to implement one of these four strategies while moving from a traditional purchasing strategy into long-term strategic supplier partnerships and JITP.

LIMITATIONS AND FUTURE RESEARCH

More empirical research in this area is needed to facilitate a better understanding of these strategies and their effect on overall firm performance. Such research should focus on various components, using a typology of the components (e.g., critical versus not critical, cost, quality). While the firms in this study represented various process technologies, due to the scope of the sample the results may only be applicable to the fabricated metal products industry. Future research should look at how different categories of purchases should be managed and investigate cross-industry and industry-specific patterns of behavior among firms. Lastly, the effect of buyer supply chain positioning (channel position) should be assessed to reveal evidence, if any, that buyers with greater channel power (i.e., in the extreme, monopolistic) have a greater propensity to pursue traditional purchasing strategies or perhaps natural market forces lead firms to greater levels of cooperation.

REFERENCES

- Ansari, A. and Modarress, B. (1988), "JIT Purchasing as a Quality and Productivity Centre," *Journal of Operations Management*, Vol. 7 No. 4, pp. 30-35.
- Bagchi, P.K. (1988), "Management of Materials Under Just-in-Time Inventory Systems: A New Look," *Journal of Business Logistics*, Vol. 9 No. 2, pp. 89-101.
- Bevan, J. (1989), "Co-Makership," *Management Decision*, Vol. 27 No. 3, pp. 50-54.
- Bookbinder, J.H. and Dilts, D.M. (1989), "Logistics Information Systems in a Just-in-Time Environment," *Journal of Business Logistics*, Vol. 10 No. 1, pp. 50-67.
- Cavinato, J.L. (1991), "Identifying Interfirm Total Cost Advantages for Supply Chain Competitiveness," *International Journal of Purchasing and Materials Management*, Vol. 27 No. 4, pp. 10-15.

- Crosby, P.B. (1984), "Supplier Audits Shouldn't Be Used as Material Inspection Parties," *Purchasing*, June 7, p. 100A27.
- Deming, W.E. (1982), *Quality, Productivity, and Competitive Position*, Massachusetts Institute of Technology's Center for Advanced Engineering Study.
- Dwyer, R.F., Schurr, P.H., and Oh, S. (1987), "Developing Buyer-Seller Relationships," *Journal of Marketing*, April, Vol. 51, pp. 11-27.
- Ellram, L.M. (1990), "The Supplier Selection Decision in Strategic Partnerships," *Journal of Purchasing and Materials Management*, Vol. 26 No. 4, pp. 8-14.
- _____ (1991), "A Managerial Guideline for the Development and Implementation of Purchasing Partnerships," *International Journal of Purchasing and Materials Management*, Vol. 27 No. 3, pp. 2-8.
- Fearon, H.E. (1988), *Purchasing Organizational Relationships*, Center for Advanced Purchasing Studies/National Association of Purchasing Management, Inc., Tempe, AZ.
- Frazier, G.L., Spekman, R.E., and O'Neal, C.R. (1988), "Just-In-Time Exchange Relationships in Industrial Markets," *Journal of Marketing*, October, Vol. 52, pp. 52-67.
- Freeland, J.R. (1991), "A Survey of Just-In-Time Purchasing Practices in the United States," *Production and Inventory Management Journal*, Vol. 32 No. 2, pp. 43-49.
- Gentry, J.J. (1994), *The Role of Carriers in Buyer-Supplier Strategic Partnerships: A Supply Chain Management Approach*, Doctoral Dissertation, Arizona State University.
- Hahn, C.K., Kim, K.H., and Kim, J.S. (1986), "Cost Competition: Implications for Purchasing Strategy," *Journal of Purchasing and Materials Management*, Vol. 22 No. 3, pp. 2-7.
- Hall, R.W. (1983), *Zero Inventories*, Dow-Jones-Irwin, Homewood, IL.
- Heide, J.B. and John, G. (1990), "Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships," *Journal of Marketing Research*, February, Vol. 27, pp. 24-36.
- Helper, S. (1991), "How Much Has Really Changed Between U.S. Automakers and Their Suppliers?" *Sloan Management Review*, Summer, pp. 15-28.
- Henderson, J.C. (1990), "Plugging into Strategic Partnerships: The Critical IS Connection," *Sloan Management Review*, Spring, pp. 7-18.
- Hendrick, T.E. and Ellram, L.M. (1993), *Strategic Supplier Partnering: An International Study*, Tempe, AZ: Center for Advanced Purchasing Studies/National Association of Purchasing Management, Inc.
- Johnston, R. and Lawrence P.R. (1988), "Beyond Vertical Integration—The Rise of the Value-Adding Partnership," *Harvard Business Review*, Vol. 66 No. 4, pp. 94-101.
- Juran, J.M. and Gryna, F.M. (1980), *Quality Planning and Analysis*, McGraw-Hill Book Company, New York, NY.
- Landeros, R. and Monczka, R.M. (1989), "Cooperative Buyer/Seller Relationships and a Firm's Competitive Posture," *Journal of Purchasing and Materials Management*, Vol. 25 No. 4, pp. 9-18.

- Leenders, M.R., Fearon, H.E. (1993), *Purchasing and Materials Management*, 10th ed., Irwin Publishing, Homewood, IL.
- Ohmae, K. (1989), "The Global Logic of Strategic Alliances," *Harvard Business Review*, Vol. 67 No. 2, pp. 143-154.
- O'Neal, C. (1987), "The Buyer-Seller Linkage in a Just-In-Time Environment," *Journal of Purchasing and Materials Management*, Vol. 23 No. 1, pp. 7-13.
- Perry, J.H. (1988), "Firm Behavior and Operating Performance in Just-In-Time Logistics Channels," *Journal of Business Logistics*, Vol. 9 No. 1, pp. 19-33.
- Reck, R.F. and Long, B.G. (1988), "Purchasing: A Competitive Weapon," *Journal of Purchasing and Materials Management*, Vol. 24 No. 3, pp. 2-8.
- Russell, J.R (1985), "Small Staff Brings Lots of Savvy to Electronics Buying," *Purchasing*, November 7, pp. 74A12-74A17.
- Schonberger, R.J. (1982), *Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity*, The Free Press, New York, NY.
- Shapiro, R.D. (1985), "Towards Effective Supplier Management: International Comparisons," Harvard Business School Working Paper 85-062.
- Spekman, R.E. (1988), "Strategic Supplier Selection: Understanding Long-Term Buyer Relationships," *Business Horizons*, Vol. 31 No. 4, pp. 75-81.
- Stundza, T. (1984), "Now's the Time to Shed the 'We Buy, You Supply' Attitude," *Purchasing*, May 24, p. 34.
- Treleven, M. and Schweikhart, S.B. (1988), "A Risk/Benefit Analysis of Sourcing Strategies: Single vs. Multiple Sourcing," *Journal of Operations Management*, Vol. 7 No. 4, pp. 93-114.
- U.S. Bureau of Census, (1989), *Annual Survey of Manufacturers*, Washington D.C.: U.S. Government Printing Office, Statistics for Industry Groups and Industries, M85(AS)-1, pp. 1-5, 1-10, and Appendix.
- Waller, M.A. (1993), *The Effects of Supply Management Strategies on Manufacturing Quality: A Covariance Structure Model*, Doctoral Dissertation, The Pennsylvania State University.
- Williamson, O.E. (1975), *Markets and Hierarchies: Analysis and Antitrust Implications*, The Free Press, New York, NY.

AUTHOR BIOGRAPHY

Julie J. Gentry is an associate professor of business logistics at the University of Arkansas. She received her Ph.D. from Arizona State University. Her research interests include purchasing and logistics partnerships, inbound transportation planning, and international logistics.

AUTHOR BIOGRAPHY

Matthew A. Waller is an associate professor of business logistics at the University of Arkansas. He received his Ph.D. from The Pennsylvania State University. His research interests include supply chain optimization, logistics strategy, and order fulfillment reengineering.

AUTHOR BIOGRAPHY

Scott B. Keller is an assistant professor of marketing and supply chain management at Michigan State University. He received his Ph.D. from the University of Arkansas. His research interests include assessing the impact on performance of internal and external marketing, carrier and shipper relationships, and assessing the dispatcher/driver interface.

MARITIME UNIONS AND THE U.S. MERCHANT MARINE

Richard L. Clarke
Clemson University

U.S. maritime unions have played a vital historical role in both the defense and the economic development of the United States. The economic and the political forces that helped shape and promote the growth of U.S. seafaring labor unions changed dramatically in the 1990s. Maritime union membership in the United States has fallen by more than 80 per cent since 1950. Inflexible union work rules and high union wage scales have contributed to this decline. Recent regulatory and industry changes require a new union approach if U. S. maritime unions are to survive the next decade.

INTRODUCTION

In 1994, America's two largest ocean carriers, Sea-Land and American President Line (APL) applied to the Maritime Administration (MARAD) for permission to change the country of registry of several of their largest and newest container ships from the United States to foreign, so-called flag of convenience countries. The CEOs of these two companies joined forces to argue that unless the federal government took immediate action to create significant new operating subsidies, their companies would be unable to continue to compete with foreign-flag carriers whose crew costs per month are about one-third that of U.S. flag carriers.

Organized maritime labor vigorously opposed the reflagging proposal because it would have eliminated several hundred union jobs. Since passage of the Merchant Marine Act of 1936, ship owners registering their ships in the United States have been required to crew their ships with U.S. citizens who are union members. U.S.

maritime labor is organized and controlled by 12 major AFL-CIO chartered unions and 18 company-sponsored unions. Over the past 60 years, maritime unions have in large part controlled crew size and crew costs on vessels of U.S. registry. The gauntlet laid down by APL and Sea-Land posed a serious threat to U.S. maritime labor unions, whose membership has shrunk significantly from post-WWII levels. Fortunately for organized labor, the situation was resolved in their favor when the Clinton Administration persuaded Sea-Land and APL to maintain U.S. registry for the ships at issue by offering a new operating subsidy bill.

In 1996, after years of intensive lobbying by several different maritime interest groups, Congress passed the Maritime Security Act of 1996. Under this plan, Sea-Land and APL as well as smaller operators of U.S.-registered deep-sea vessels (U.S. flagships) will receive significant subsidy payments for designated ships. In exchange, the carriers must pledge to provide the subsidized ships to the Department

of Defense upon request to support emergency military sealift needs. The primary beneficiaries of this law, Sea-Land and APL, subsequently dropped their request to change the country of registry for their ships to foreign countries where ship operating costs are much lower (called reflagging or flagging out). Sea-land and APLs' response to the passage of this new maritime subsidy program preserves what remains of the U.S. flag deep-sea fleet. The real underlying issue that motivated their request for reflagging was not addressed. The real issue is the continuing high cost of unionized U.S. maritime labor relative to the rest of the global shipping industry.

The purpose of this paper is to analyze the impact maritime unions have had on the growth and development of the U.S. Merchant Marine through their strikes, lobbying efforts and more recent cooperation with carrier management. The development and influence of maritime unions is traced from the Maritime Security Act of 1915 to the present. The paper briefly reviews the history of maritime unions then examines the impact maritime unions have had on the formation of national policy regarding the U.S. Merchant Marine. The paper concludes by considering the implications of the Ocean Shipping Reform Act of 1998 (OSRA) and recent ocean carrier mergers.

HISTORY OF U.S. MARITIME UNIONS

To understand the impact that maritime unions have had on the U.S. flag shipping industry, it is necessary to understand the pervasive nature of U.S. maritime unions in the industry. U.S. maritime unions include both licensed and unlicensed seamen on U.S. flag oceangoing vessels, Great Lakes ships and inland waterway tugs and barges. There are two longshoremen's unions, five unions for shipyard workers, twelve primary seagoing unions and nineteen independent labor unions who do business with individual oil companies (Heine, 1976). Over the years these unions became very powerful because they have had the legal right to

determine crew size and composition for different classes of ships. More importantly, U.S. maritime unions are empowered to assign only union members to crew U.S. flag vessels, determine what they will be paid and how long they may be at sea. These powers have enabled the unions to control the variable cost of oceangoing labor for U.S. flag shipping.

The Strengthening of Maritime Unions

The genesis of U.S. maritime unions can be traced back to the Seamen's Act of 1915. This act established the legal right of maritime workers to form unions and create standard work rules for all their members. This act also ended imprisonment for deserting one's ship and established standards for food and quarters aboard U.S.-flag ships. There is little doubt the Seamen's Act of 1915 was vitally needed to protect crew members from human rights abuses by powerful shipping companies and shipmasters.

The rights of maritime workers were further strengthened by the Merchant Marine Act of 1936. This law, best known for its creation of operating (ODS) and construction differential (CDS) subsidies, improved living and working conditions for maritime labor. It also empowered labor unions to select only select union members for crew duty. A year later in 1937, a federal commission completed a comprehensive review of the operation practices of U.S.-flag carriers and maritime labor union management.

This commission found several problems. The main problems identified by the commission included interunion friction, union-shipper conflict, crew inefficiencies and a general lack of discipline and order aboard ship (Quartel, 1992). The commission attempted to solve these problems through a program that included subsidies to improve onboard living conditions, a minimum wage for each rating and manning scales. Federal guidelines were also enacted to cover overtime pay, maximum time at sea and vacation time for union members.

During the 1930s, maritime unions played a significant role in improving safety, living conditions, training, pay and compensation of labor and made the U.S. maritime industry a much more desirable place to work. As a result, there was constant supply of skilled seamen available to operate an increasing number of U.S. flag vessels and make the U.S. Merchant Marine a powerful force as the United States prepared to enter World War II. Following the conclusion of World War II, the U.S. Merchant Marine began a long and steady decline in its size and strength. As shown from U.S. Maritime Administration data in Table 1, the number of U.S. seamen sailing aboard U.S. deep-sea vessels declined more than 80 per cent from 1950 to 1999 (Marad, 1999). This steep decline closely paralleled the decline in the size of the U. S. Deep Sea Fleet from 1100 vessels in 1950 to 283 at the beginning of 1999.

TABLE 1
UNION WORKFORCE, 1950-1999

Source: *Maritime Administration, Office of Maritime Labor, Training, and Safety*

This decline can be attributed to several external factors including (1) intense competition from state-owned and state subsidized foreign carriers, (2) lack of consistent U.S. maritime promotion policy, (3) growth of container

shipping and container handling technology and (4) large seasonal and annual swings in the demand for ocean transportation. These and other factors have led U.S. shipowners to reflag more and more of their ships to reduce operating cost and be more competitive with low cost shipping offered by foreign lines. These factors have combined to put increasing pressure on the already strained relationship between organized maritime labor and U.S. carriers. The unions have consistently strived to raise labor rates and maintain crew sizes while the owners have continued to eliminate high-cost union jobs by registering more vessels in foreign countries like Panama, Liberia, Honduras, and more recently the Marshall Islands. In 1970, the Nixon Administration tried to resolve some of these nagging union-management disputes and revitalize the U.S. maritime industry.

Cooperation for Revitalization

The serious deterioration of the United States Merchant Marine between 1946 and 1969 caused in part by union-management disputes led to the passage of the Merchant Marine Act of 1970. The goal of this act was to revitalize the U.S. merchant marine by promoting the construction and use of American flag ships.

To accomplish this goal, the Act attempted to control the high cost of operating U.S. flag ships. Sea-going wages were indexed and crew size was to be decided in the ship design phase rather than negotiated by maritime unions. The act envisioned 300 new U.S. flag ships would be built in U.S. shipyards by 1980. Unfortunately, only 63 new U.S. merchant cargo ships were built and the Act fell far short of revitalizing the deteriorating U.S. maritime industry (Whitehurst, 1983).

In 1972, several maritime unions agreed to new rules aimed at increasing cooperation with U.S. ship owners. Six seagoing and shoreside unions agreed to rules aimed at increasing maritime labor stability and improving the image of the merchant marine. Irwin Heine (1976) lists the five major provisions of the agreement:

- No strike during the period of contract negotiations.
- Three to five year contracts to provide assurance with respect to continuity of operations.
- Uniform contract expiration dates.
- Provision for automatic wage adjustments annually.
- Establishment of mechanism or procedure for the resolution of disputes without stoppages.

These new cooperative policies were formulated by maritime union leadership to foster a spirit of cooperation with carrier management; however, the critical issues of crew sizes and ocean going pay rates were not addressed.

MARITIME UNIONS AND MERCHANT MARINE POLICY

Maritime unions have been consistent in their position on merchant marine policy. Their main goal has always been to protect the American maritime labor from foreign competition by supporting policies and programs that promote the competitiveness of U.S. flag and U.S. manned vessel operations. These include support of the Jones Act and other policies and reform proposals, which would make it easier for U.S. operators to acquire new vessels and operate them under the U.S. flag.

Maritime unions tend to support policies which would level out the playing field of international shipping and reduce the need or desire for American vessel operators to expand their foreign flag operations. However, U.S. maritime unions have often been criticized for supporting protectionist trade policies. In addition, their lobbying efforts have raised some concern. The Seafarers International Union and International

Organization of Masters, Mates, and Pilots are represented by lobbying groups on Capital Hill—the Transportation Institute and the Maritime Institute for Research and Industry Development, respectively. While these “institutes” may appear to be research oriented organizations, they are primarily lobbying groups. The Transportation Department’s Maritime Administration reimburses subsidized ship companies for the dues, which are paid to these “institutes.” In essence, the lobbying efforts of these big groups are being supported by taxpayer’s money. Such reimbursement has been estimated at approximately \$2 million per year (Quartel, 1992).

Lobbying Activities of Maritime Unions

Maritime unions also influence legislation by making PAC (Political Action Committee) contributions to members of Congress who have authority over maritime policy. In 1992, for example, maritime unions contributed nearly \$500,000 to members of the Merchant Marine and Fisheries Committee. In the same year, the Seafarers International Union and the National Marine Engineers Beneficial Association contributed roughly two million dollars to members of Congress (Quartel, 1992). Maritime labor unions lobbied hard to get the Maritime Policy Reform Act of 1992 passed and signed into law.

Union leaders laid the foundation for maritime reform with their support of HR1126 in 1991. The purpose of this legislation was to require foreign ships to comply with the National Labor Relations Act and Fair Labor Standards Act. The unions supported this proposal because they felt the extension of U.S. labor laws to foreign flag ships operating in the U.S. would benefit their interests. The proposal would help by keeping foreign flag operators from having the competitive advantage, which they gained, by not having to adhere to minimum wage levels and working conditions. U.S. maritime unions lost this battle when the bill was defeated in Congress.

Erosion of Maritime Unions in the Early 1990's

In 1994, the union representing seagoing engineers, the Maritime Engineers Benefit Association (MEBA), agreed to a new labor contract that reduced union compensation in exchange for better job security. Under these new contracts most MEBA members starting receiving reduced benefits, including lower overtime pay rates. In 1995, there were several events that weakened organized maritime labor.

During 1995 several more U.S. owned ships were flagged out, old U.S. flag freighters were retired and the movement to repeal the Jones Act gained wider support. The unions also had their share of serious internal problems. Perhaps the most significant was the conviction of five officers of District I/MEBA for conspiracy mail fraud, extortion, racketeering, and the theft of \$6 million from union members (Shrock, 1995). This conviction gave the FBI and the Department of Labor the impetus to intensify investigations of maritime union activities and financing throughout the U.S.

Other maritime unions were also affected by internal problems and external economic pressures in 1995-1997. The National Maritime Union of America lost some of its member U.S. flag bulk carriers because of severe union-management conflicts. It is likely that union problems in the nineties are a result of the poor financial condition of many U.S. flag operators. As smaller U.S. flag carriers quit the shipping business, union membership further declined. Further problems arose when several union members under federal investigation filed charges against their own union president (Shrock, 1995).

The nagging problem of what to do about low cost foreign flag competition was not resolved during this period. The differential between U.S. union sea-going wages and those paid by competing foreign lines remained a major union-management issue as the decade came to a close.

SEAGOING WAGES

The issue of U.S. Merchant Marine seagoing wages versus European, Asian, and flag-of-convenience crews has been hotly debated for several years. U.S. labor leaders claim U.S. seamen are not paid significantly higher wages than foreign seamen. As evidence they cite higher rates per ton paid by the Defense Department during the Persian Gulf war to move military freight on foreign ships versus the same cargo on U.S. flag ships (Boggs, 1999).

On the other hand, U.S. ships owners assert that U.S. crew costs are much higher for the same class and size ship. They claim U.S. crew costs average as much as 2.5 times more than flag-of-convenience crew costs making it economically infeasible to use U.S. registry without federal operating differential subsidies (Whitehurst, 1996). Two recent pay studies offer new evidence to support the agreement raised by U.S. ship owners.

Published sources from the U.S. Maritime Administration and the International Transport Workers Federation reported comparative average crew costs associated with operating an equivalent size container ship for one month (Whitehurst, 1996). These costs in U.S. dollars are compared in Table 2.

TABLE 2
COMPARATIVE CREW COST FOR A
CONTAINERSHIP BY REGISTRY
(U.S. \$)

European	Asian	United States
\$80,000	\$95,000	\$340,000

Source: Whitehurst (1996). Original source cited in the article was the Maritime Administration, "Competitive Manning of U.S.-Flag Vessels," *Annual Report of the Maritime Administration*, 1995.

A recent breakdown by crew position done by Whitehurst also shows U.S. crew costs are significantly higher than European, Asian, or flag-of-convenience crew costs (1996) (See Table 3).

It should be noted that the International Transport Federation (ITF) wage scales apply to the highest paid 20 percent of flag-of-convenience vessels. Reliable data on the lowest paid foreign crews is unavailable, but it is widely believed that non-ITF crews are paid significantly less than ITF crews. U.S. maritime unions have dealt with the pay disparity by lobbying Congress to enact protectionist legislation that mandates the use of U.S. ships and U.S. seamen. The most recent such legislation is the Merchant Marine Act of 1996.

IMPACT OF THE MARITIME SECURITY ACT OF 1996

As the need to deploy a very large U.S. military force to the Persian Gulf started to grow in early 1990, maritime labor found a strong ally in the Defense Department. When President Bush decided to send military forces to the Persian Gulf in August of 1990, the U.S. Merchant Marine was not capable of supplying enough ships or crewmen to get the job done. The administration was forced to request merchant shipping support from its NATO allies. Fortunately, several allies that

supported the policy of military intervention in the Persian Gulf had sufficient sealift capability to help and the will to do so. Foreign carriers like Maersk of Denmark made their ships available to the U.S. Defense Department. By the time the deployment (Operation DESERT SHIELD) was completed, more than 60% of the merchant sealift of U.S. military supplies and equipment to the Persian Gulf had been provided by foreign-flag ships (Pagonis, 1992). Operation DESERT SHIELD highlighted the shortage of U.S. cargo ships and U.S. civilian crewmen and greatly helped the unions put pressure on Congress to provide new operating subsidies to guarantee the future availability of U.S.-flag ships. Five years after Iraqi forces were removed from Kuwait, Congress passed the Maritime Security Act of 1996.

Eight major unions that fought hard for this new subsidy bill were the International Longshoremen's and Warehousemen's Union, International Organization of Masters, Mates and Pilots, Maritime Firemen's Union, Sailors' Union, Sailors' Union of Pacific, National Marine Engineers Beneficial Association, Seafarers International Union, and American Maritime Officers. Union leaders emphasized the benefits of this act on the U.S. economy, employment rate, and national defense capabilities.

**TABLE 3
MONTHLY SEAGOING WAGES (U.S. \$)**

Position	U.S. Flag	European	Asian	ITF
Master	\$32,653	\$9,697	\$4,331	\$2,884
2nd Officer	18,727	7,036	1,979	1,491
Radio Officer	15,142	5,475	2,874	1,491
1st Engineer	23,229	8,425	2,796	1,862
2nd Engineer	18,848	7,845	1,979	1,491
Chief Steward	9,053	7,619	2,118	1,491
Able Seaman	6,022	4,510	1,610	856

Source: Whitehurst (1996). Original source cited in the article was the Maritime Administration, "Competitive Manning of U.S.-Flag Vessels," Annual Report of the Maritime Administration, 1995.

The new law answers the challenge laid down by Sea-land and American President Lines, at least for the near-term. It established the Maritime Security Program (MSP) with new operating subsidies for 47 militarily-useful U.S. flag ships over a 10-year period (1996-2005). The owners of each ship will receive approximately \$2.1 million per ship per year. In return the owners pledge to maintain U.S. registry and, of course, U.S. crews on these designated ships. The Maritime Security Act of 1996 provides the ship owners and the labor unions with the first significant maritime subsidy program since the Merchant Marine Act of 1970. This Act is designed to protect U.S. merchant marine jobs, improve national defense sealift capability and insure a U.S. flag presence in international shipping through 2005. However, recent U.S. ocean shipping regulatory reform and industry consolidation may have already diluted the beneficial impact unions hoped for.

Recent Ocean Carrier Consolidation

In 1999, Denmark's A.P. Moller, the parent company of Maersk, purchased the international division of Sea-Land Services, Inc. This recent takeover of the largest U.S.-flag carrier follows the 1997 takeover of American President Line (APL) by Neptune Orient Lines (NOL) of Singapore and the 1997 CP Ships (Canadian) takeover of Lykes, the third largest U.S. ocean carrier (Beargie, 1999). These mergers have placed 31 (3 Lykes ships, 9 APL ships and 19 Sea-Land/Maersk ships) of the 47 total MSP vessels under foreign control (Damas, 1999).

For the time being these 31 vessels continue to be manned by U.S. union seamen. When the MSP comes up for renewal in 2005, the issue of foreign ownership may force Congress to find other alternatives for defense sealift. While it is too soon to identify all the likely alternatives, it seems clear the protection of U. S. seafaring jobs provided by the 1996 Maritime Security Act will cease in six years or less. Recent U.S. ocean shipping reform also appears to be having a detrimental impact on U.S. seafaring labor.

Impact of U.S. Ocean Shipping Regulatory Reform

On May 1, 1999, the U.S. Ocean Shipping Reform Act (ORSA) became effective. This new law significantly reduces regulatory control of ocean transportation by the U.S. and encourages carriers to become more competitive. A major provision of the new law allows carriers to negotiate confidential service agreements with U.S. shippers and importers. Many foreign carriers have already taken steps to reduce their operating costs so they can attract new business by offering lower rates. The general impact on most sectors of the U.S. economy should be positive since increased competition usually fosters better service and lower transportation cost, which in turn can lower the price of consumer goods. One sector, which will likely feel a negative impact, is organized maritime labor. A less regulated carrier industry will likely force U.S. ship owners to rely even more heavily on lower cost foreign crews resulting in a further decline in U.S. seagoing union labor.

CONCLUSION

Maritime unions have had significant influence on the United States Merchant Marine. From the Seamen's Act of 1915 to the Maritime Security Act of 1996, maritime unions have helped shape U.S. maritime policy and have provided high paying jobs for their members. Maritime unions have also supplied the manpower necessary for the sealift of military supplies and equipment in times of war and national emergency. Most recently, U.S. merchants ships and U.S. merchant seamen contributed significantly to the success of Operation Desert Storm / Shield. However, there is legitimate concern for the vitality of the U.S. Merchant Marine in the future.

The recent trend in the global ocean carrier industry toward consolidation and rationalization will likely continue. As large foreign carriers like Maersk and Neptune Orient Lines gain control of an increasing number of U.S. registered ships, more union jobs will be lost. Ocean shipping has become more competitive and shipowners must

operate as efficiently as possible. When the subsidies guaranteed by the Maritime Security Act of 1996 expire in 2005, ship owners will find it difficult to justify the continued use of U.S. union seamen. While Congress and the maritime special interests groups debate future political options to find another temporary fix, it seems a permanent solution may rest on what the unions do.

It is clear that owners/operators of U.S. flag ships want maritime unions to reduce wage rates, crew

sizes, and change other union work rules to lower operating cost. The renewal of operating subsidies for national defense sealift provided by the Maritime Security Act of 1996 offers U.S. flag operators and American maritime unions a small window for finding a permanent solution to operating cost issues. Perhaps, if both sides now focus on their mutual interests rather than on long-held positions over pay and crew size issues, a lasting solution can be found before the new subsidy program terminates in 2005.

REFERENCES

- Beargie, Tony, "Looking Beyond Subsidy?" *American Shipper*, September 1999, pp. 11-12.
- Boggs, Richard S. "Breach of Contract," <http://www.pacifier.com>, 8 February 1999.
- Damas, Phillip, "Maersk, Sea-Land Finalize Deal," *American Shipper*, September 1999, pp. 6-9.
- Heine, Irwin M., *The United States Merchant Marine—A National Asset*, Washington D.C.: National Maritime Council, 1976.
- Lane, Carl, *What the Citizen Should Know About the Merchant Marine*, New York: W.W Norton and Company, 1941.
- Pagonis, Lt. General William G., *Moving Mountains—Lessons in Leadership and Logistics from the Persian Gulf War*, Boston, MA: Harvard Business School Press, 1992.
- Quartel, Rob, "Reform Congress Too," *The Washington Post*, 15 December 1992, Sec A, p.23.
- "Shippers and Unions Rowing the Same Boat," *The National Journal*, 23(1991), 990.
- Shrock, Tim, "Ship Unions on the Alert for Full-Scale Investigation," *Journal of Commerce*, 405, No. 2856 (14 July), 1995, p/A.
- Whitehurst, Clinton H. Jr., *The U.S. Merchant Marine: In Search of An Enduring Maritime Policy*, U. S. Naval Institute Press, Annapolis, MD, 1983.
- Whitehurst, Clinton H. Jr., "The Last Chance for an Enduring Maritime Policy," *A Special Report of the Strom Thurmond Institute*, February 1996.

AUTHOR BIOGRAPHY

Dr. Richard (Rick) Clarke is a faculty member in the College of Business and Public Affairs at Clemson University. He is the director of logistics education programs at Clemson University and an active researcher in the field of logistics. He has published over twenty referred scholarly articles in top logistics and transportation journals including the *Transportation Journal*, the *Journal of Business Logistics*, *Journal of Transportation Management*, *Transportation Quarterly* and the *International Journal of Physical Distribution and Logistics Management*. He has also published in *Decision Sciences* and *The European Journal of Operational Research*. He received his Ph.D. in 1988 from the University of Texas at Austin, an M.S. (with distinction) from the Air Force Institute of Technology and a B.S. from Hobart College. His research interests include transportation policy and the assessment of productivity in non-profit organizations.

DEFINING DYADIC COST AND RISK IN INTERNATIONAL TRADE: A REVIEW OF INCOTERMS 2000 WITH STRATEGIC IMPLICATIONS

Drew M. Stapleton
University of Wisconsin–La Crosse

Virginie Saulnier
University of Wisconsin–La Crosse

ABSTRACT

As trade markets continue to expand due to developments in transportation and logistics technologies, distribution networks extend well beyond national frontiers. With obstacles such as distance, language, and business customs, allocation of legal responsibility between a buyer and a seller of goods becomes even more crucial in international commerce. This document is presented in three general sections. Reviewing the basics, including definition, origin, use and classifications of INCOTERMS constitutes the first section. The second section describes and analyzes the differences between each of the 13 INCOTERMS 2000. Lastly, the changes introduced by the 2000 revision are studied in more detail in section three and implications are proffered.

INTRODUCTION

INCOTERMS, an acronym for International Commercial Terms, are internationally standardized “trade terms” that describe the dyadic obligations of both buyers and sellers in international sales transactions. Moreover, INCOTERMS is a set of 13 terms that clearly allocate the costs, risks, customs, and insurance responsibilities when internationally transporting goods between the buyer and seller. Consequently, it is important to stress that

INCOTERMS deal only with the relation between sellers and buyers under a contract of sale. They do not relate directly to the contract of carriage.

INCOTERMS were first developed in 1936 by the Paris-based International Chamber of Commerce (ICC) as a set of international rules for the interpretation of trade terms (Barelrier et al. 1995). These rules, known as “INCOTERMS 1936,” have been subsequently revised. Amendments and additions were later made in

1953, 1967, 1976, 1980, 1990 and presently in 2000 in order to bring the rules in line with current international trade practices. INCOTERMS serve much the same purpose for international trade as the Uniform Commercial Code does for domestic commerce in the U.S. (*Journal of Commerce*, 1999).

It should be stressed that, when the parties intend to incorporate INCOTERMS into their contract of sale, they should always make an expressed reference to the current version of INCOTERMS. Buyers and sellers willing to use INCOTERMS 2000 should therefore clearly specify that their contract is governed by "INCOTERMS 2000." Further, the correct use of INCOTERMS implies that a named port of destination or named place of destination has to be stipulated to be valid, followed by the INCOTERMS version governing their use (e.g., EXW La Crosse, WI – INCOTERMS 2000; FAS Norfolk, VA – INCOTERMS 2000).

The trade terms have been put together in four different groups: E, F, C, and D.

Group E

Group 'E' (for "Ex" or from) represents the minimum responsibility for the seller, and maximum responsibility for the buyer. In this group, the seller is only responsible for making the goods available to the buyer at the agreed place, usually at the seller's premises.

Group F

Group 'F' continues with the seller being "free" of responsibility during the main carriage. Thus, the seller is called upon to deliver the goods to a carrier appointed by the buyer. In other words, he/she is not responsible for the main carriage, only some pre-shipment charges.

Group C

Group 'C' stands for "cost" or "carriage" and means that the seller is responsible for contracting and paying for the main carriage, but

without assuming the risk of loss of, or damage to the goods, or additional costs due to events occurring after shipment and dispatch.

Group D

Finally, group 'D' means "delivery" and rallies five "arrival" INCOTERMS where the seller is responsible for the payment and delivery of the goods to the country of destination. The seller has to bear all the costs and risks needed to bring the goods to the country of destination.

Further, INCOTERMS can be classified into two categories from a delivery perspective: 1) departure contracts; and, 2) arrival contracts. "Departure contracts" involve the seller being responsible for delivering to a named place in the country of export or departure country. The seller assumes all costs and risks before crossing a border. Departure contracts involve groups 'E', 'F', and 'C.' Note that the 'C' terms are frequently misinterpreted as "arrival contracts." However, it must be stressed that under 'C' terms, as under the 'F' terms, the seller fulfills the contract in the country of shipment. Thus, the contracts of sale under the terms 'C' falls within the category of "departure contracts."

"Arrival contracts" require the seller to bear all costs and risks involved in bringing the goods to an overseas point of delivery. In other words, the seller is responsible for the arrival of the goods at the agreed place or point of destination at the border (DAF) or within the country of destination. Hence, the seller assumes most, if not all, of the transportation responsibilities. Arrival contracts only concern 'D' trade terms.

Moreover, carriers and freight forwarders may interpret INCOTERMS according to the following alternative: "Freight Prepaid" means the seller pays the main carriage charges before the departure. Therefore, the seller is responsible for the costs of the main carriage. It rallies groups 'C' and 'D.' "Freight Collect," on the other hand, means the main carriage charges are collected, or payable, at destination, thus the buyer is paying for them. Groups 'E' and 'F' are involved here.

INCOTERMS 2000

In response to developing technology and increasing worldwide use of trade terms, INCOTERMS have been revised for the 21st century. The revisions were made by the Working Party on Trade Terms (WPTT), a group of 40 trade experts from around the world. The WPTT is a subgroup of the Committee on International Practice, which is part of the Paris-based International Chamber of Commerce (ICC).

After two years of revision of its sales terms for the new millennium, the ICC began publishing its new edition, *INCOTERMS 2000*, since September 1999. INCOTERMS 2000 are in effect with contracts beginning on the 1st of January, 2000, and should only be quoted on contracts effective from January 2000.

Standard Obligations of Each Party

INCOTERMS rely on and apply to a contract of sale, and do not relate directly to a contract for carriage. While most of the issues salient to the use of INCOTERMS relate to maritime transportation, the negotiation of contractual obligations represented by INCOTERMS is critical to the buyer-seller dyad. Next, we cover the seller's standard obligations, followed by the buyer's standard obligations.

Seller's Standard Obligations

Packaging and marking. The seller is obliged to pack the goods in such a manner as is required for the transport, but only to the extent that the circumstances relating to the transport are made known to the seller at the time the contract of sale is concluded. In addition,

marking is to be made appropriately, especially when dealing with dangerous goods.

Checking. The seller supports the costs of any required checking operations, such as checking quality, measuring, weighing, and counting, which are necessary for the purpose of placing the goods at the buyer's disposal.

Goods in conformity with the contract. The goods provided by the seller must be in conformity with the contract of sale. Moreover, the seller has to enclose the commercial invoice and any other evidence of conformity as required by the contract.

Notice to the buyer. The seller must inform the buyer when and where the goods will be placed at his/her disposal.

Buyer's Standard Obligations

Payment of the price. The buyer must pay the exact price as provided in the contract of sale.

Take delivery. The buyer must take delivery of the goods when they have been placed at his/her disposal in accordance with the designated INCOTERM.

DEFINITION OF KEY TERMS

Before going into further details for each of the 13 INCOTERMS 2000, a description of the diagram we use to clarify the 13 INCOTERMS and definitions of the terms used will help clarify the discussion and allow the reader a better understanding. Refer to Figure 1 for the location of each of these activities in the goods movement.

FIGURE 1

- **Pre-carriage:** also called “domestic pre-carriage” or “local cartage,” consists of a point-to-point carriage from the shipper’s premises or warehouse to the first carrier’s terminal or to the freight forwarder’s warehouse. Usually covered by inland carriers via road, or rail, or a combination of road-rail (for full container loads moves – FCL), symbolized in the scheme by a truck.
- **Export formalities:** include export licenses & authorizations (obtained through Chambers of Commerce), export declaration (when the value of the shipment is over U.S. \$2,000, also called Exdec for Export Declaration), certificate of origin, and more if needed.
- **Export customs clearance:** encompasses export taxes, duties and fees if required by the customs of country of exportation.
- **Terminal:** means cargo terminal, railway station, quay/wharf/port warehouse and/or airport.
- **Terminal Handling Charges (THC) at origin:** also called “FOB charges” by freight forwarders, include such charges as handling fee, storage fee, transfer charges (for transferring from the freight forwarder’s warehouse to the main carrier’s terminal at the airport or at the port terminal), file fee, air way bill or bill of lading fee (for issuing the transport document), and exceptional charges by international organizations.
- **Main carriage:** deals with the carriage from a terminal in the country of origin to a terminal in an overseas country. It can be air (from airport to airport), ocean (from seaport to seaport, more usually called “from quay to quay”), road, rail, inland waterway, or a combination of such modes.
- **Terminal Handling Charges (THC) at destination:** also called “arrival charges,” include such charges as transfer charges (for transferring from the main carrier’s terminal to the freight forwarder’s warehouse), handling fee, storage fee, and dispatch fee.

- **Import formalities:** includes import licenses and authorization.
- **Import customs clearance:** involves duties, import taxes, fees and other charges related to customs.
- **On-carriage:** also called "local cartage" or "domestic on-carriage," or simply "delivery," consists of a point-to-point carriage from the carrier's terminal to the consignee's premises (most likely the buyer's premises). Usually covered by inland carriers via road, or rail, or a combination of road-rail (for full container loads moves-FCL), symbolized in the scheme by a truck.
- **Multimodal:** several different modes of transport used successively on one single shipment.

- **Carrier:** a person or entity whom commences to perform or to procure the performance of transport by rail, road, air, ocean, inland waterway or by a combination of such modes.

COMPARING THE OLD AND THE NEW

For each of the INCOTERMS 2000, a description of the responsibilities and obligations of each party is stated. Any change between the INCOTERMS 1990 and INCOTERMS 2000 is emphasized in bold. Figure 2 provides a summary of the characteristics of each of the 13 INCOTERMS.

EXW	EX WORKS (...named place) The seller delivers by placing the goods at the disposal of the buyer at the named place of delivery, usually the seller's premises or another named place.
------------	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Make the goods available at the agreed place, usually his/her premises. 	<ul style="list-style-type: none"> • Take delivery of the goods at the agreed place when available. • Load goods on the collecting vehicle. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➔ Pre-carriage, ➔ THC at origin, <p>(continued)</p>

Seller Must	Buyer Must
	<ul style="list-style-type: none"> ➡ Main carriage, ➡ THC at destination, and ➡ On-carriage. <ul style="list-style-type: none"> • Provide import customs clearance.

FCA	FREE CARRIER (...named place) The seller delivers the goods to the carrier selected by the buyer at the named place.
------------	---

Seller must	Buyer must
<ul style="list-style-type: none"> • Deliver the goods to the named place. • Load goods on the collecting vehicle, if the delivery occurs at the seller's premises. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage if the delivery occurs at any other place but the seller's premises. 	<ul style="list-style-type: none"> • Unload goods from the collecting vehicle if delivery occurs at a place other than the seller's premises. • Contract at his/her own expense for the carriage of the goods from the named place. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ Pre-carriage, ➡ THC at origin, ➡ Main carriage, ➡ THC at destination, and ➡ On-carriage. • Provide import customs clearance.

FAS	FREE ALONGSIDE SHIP (...named port of shipment) The seller delivers when the goods are placed alongside the vessel selected by the buyer at the loading place named by the buyer at the named port of shipment.
------------	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> Deliver the goods to the named port of shipment alongside the selected vessel. Provide export customs clearance. Bear all costs and risks involved in bringing the goods to the place delivery, including: <ul style="list-style-type: none"> Pre-carriage THC at origin 	<ul style="list-style-type: none"> Select the carrier. Contract at his/her own expense for the carriage of the goods from the named port of shipment. Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> Loading costs: lighterage and wharfage charges Main carriage, THC at destination, and On-carriage. Provide import customs clearance.

FOB	FREE ON BOARD (...named port of Shipment) The seller delivers when the goods pass the ship's rail at the named port of shipment.
------------	--

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods on board the vessel selected by the buyer at the named port of shipment. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Loading costs: lighterage and wharfage charges to the extent that they are not included in the freight. 	<ul style="list-style-type: none"> • Select the carrier. • Contract at his/her own expense for the carriage of the goods from the named port of shipment. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ Loading costs: lighterage and wharfage charges to the extent that they are not included in the freight, ➡ Main carriage, ➡ THC at destination, and ➡ On-carriage. • Provide import customs clearance.

CFR	COST and FREIGHT (...named port of destination)
	The seller delivers when the goods pass the ship's rail in the port of shipment.

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods on board the vessel selected by the buyer at the named port of shipment. • Select the carrier. • Contract at his/her own expense for the carriage of the goods to the named port of destination. • Provide export customs clearance. • Bear all costs and risks (but only in the country of origin) involved in bringing the goods to the place delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin 	<ul style="list-style-type: none"> • Bear all risks of loss or of damage to the goods from the time they have passed the ship's rail at the port of shipment. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ Unloading costs: lighterage and wharfage charges to the extent that they are not included in the freight, ➡ THC at destination, and ➡ On-carriage. <p>(continued)</p>

Seller Must	Buyer Must
<ul style="list-style-type: none"> ➡ Main carriage ➡ Loading costs: lighterage and wharfage charges to the extent that they are not included in the freight. 	<ul style="list-style-type: none"> • Provide import customs clearance.

CIF	COST, INSURANCE, and FREIGHT (...named port of destination) The seller delivers when the goods pass the ship's rail in the port of shipment.
-----	--

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods on board the vessel selected by the buyer at the named port of shipment. • Select the carrier. • Contract at his/her own expense for the carriage of the goods to the named port of destination. • Provide export customs clearance. • Contract for the insurance of goods during the carriage and pay the insurance premium. • Bear all costs and risks, but only in the country of origin, involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Main carriage ➡ Unloading costs: lighterage and wharfage charges to the extent that they are not included in the freight. 	<ul style="list-style-type: none"> • Bear all risks of loss or of damage to the goods from the time they have passed the ship's rail at the port of shipment. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ Unloading costs: lighterage and wharfage charges to the extent that they are not included in the freight, ➡ THC at destination, and ➡ On-carriage. • Provide import customs clearance.

CPT	CARRIAGE PAID TO (...named place of destination) The seller delivers the goods to the carrier selected by him/her and pays the cost of carriage necessary to bring the goods to the named destination. The buyer bears all risks and any other costs occurring after the goods have been delivered.
------------	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods into the custody of the first carrier. • Select the carrier. • Contract at his/her own expense for the carriage of the goods to the named place of destination. • Provide export customs clearance. • Bear all costs and risks, but only in the country of origin, involved in bringing the goods to the place delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Main carriage 	<ul style="list-style-type: none"> • Bear all risks of loss or of damage to the goods from the time they are into the custody of the carrier. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ THC at destination, and ➡ On-carriage. • Provide import customs clearance.

CIP	CARRIAGE and INSURANCE PAID TO (...named place of destination) The seller delivers goods to the carrier selected by him/her and pays the cost of carriage necessary to bring the goods to the named destination. The buyer bears all risks and any other costs occurring after the goods have been delivered.
------------	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods into the custody of the first carrier. • Select the carrier. • Contract at his/her own expense for the carriage of the goods to the named place of destination. • Provide export customs clearance. • Contract for the insurance of goods during the carriage and pay the insurance premium. • Bear all costs and risks, but only in the country of origin, involved in bringing the goods to the place delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Main carriage 	<ul style="list-style-type: none"> • Bear all risks of loss or of damage to the goods from the time they are into the custody of the carrier. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ THC at destination, and ➡ On-carriage. • Provide import customs clearance.

DAF	DELIVERED AT FRONTIER (...named place) The seller delivers when the goods are placed at the disposal of the buyer on the arriving means of transport (not unloaded) before the customs border of the adjoining country.
-----	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods at the named frontier (or the named place at the frontier) but before the customers border of the adjoining country. • Contract at his/her own expense for the pre-carriage of the goods to the named point. • Provide export customs clearance. 	<ul style="list-style-type: none"> • Take delivery of the goods at the named frontier. • Unload goods from the arriving means of transport at the named place of delivery. • Contract at his/her own expense for the on-carriage of the goods to the desired destination. • Provide import customs clearance.

DES**DELIVERED EX SHIP (...named port of destination)**

The seller delivers when the goods are placed at the disposal of the buyer on board the ship at the named port of destination.

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods on board the ship at the named port of destination. • Select the carrier. • Contact at his/her own expense for the carriage of the goods to the named port of destination. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Main carriage 	<ul style="list-style-type: none"> • Take delivery of the goods from the ship at the port of destination. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ Unloading costs: lighterage and wharfage charges ➡ THC at destination ➡ On-carriage • Provide import customs clearance.

DEQ**DELIVERED EX QUAY - DUTY PAID (...named port of destination)**

The seller delivers when the goods are placed at the disposal of the buyer on the quay (wharf) at the named port of destination.

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods on the quay at the named port of destination. • Select the carrier. • Contract at his/her own expense for the carriage of the goods to the named port of destination. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage ➡ THC at origin ➡ Main carriage ➡ Unloading costs: lighterage and wharfage charges. 	<ul style="list-style-type: none"> • Take delivery of the goods from the ship at the port of destination. • Bear all costs and risks involved in bringing the goods from the place of delivery to the desired destination, including: <ul style="list-style-type: none"> ➡ THC at destination (other than costs of unloading the goods from the ship). ➡ On-carriage. • Provide import customs clearance.

DDU	DELIVERY DUTY UNPAID (...named place of destination) The seller delivers the goods to the buyer, not cleared for import, and not unloaded from any arriving means of transport at the named place of destination.
------------	---

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods at the named place of destination (usually the buyer's premises). • Contract at his/her own expense for the carriage of the goods to the named place of destination. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ➡ Pre-carriage 	<ul style="list-style-type: none"> • Take delivery of the goods at the named place of destination. • Unload the goods from any arriving means of transport. • Provide import customs clearance. <p>(continued)</p>

Seller Must	Buyer Must
<ul style="list-style-type: none"> ⇒ THC at origin ⇒ Main carriage ⇒ THC at destination ⇒ On-carriage. 	

DDP	DELIVERED DUTY PAID (...named place of destination) The seller delivers the goods to the buyer, cleared for import, and not unloaded from any arriving means of transport at the named place of destination.
------------	--

Seller Must	Buyer Must
<ul style="list-style-type: none"> • Deliver the goods at the named place of destination (usually the buyer's premises). • Contract at his/her own expense for the carriage of the goods to the named place of destination. • Provide export customs clearance. • Bear all costs and risks involved in bringing the goods to the place of delivery, including: <ul style="list-style-type: none"> ⇒ Pre-carriage ⇒ THC at origin ⇒ Main carriage ⇒ THC at destination ⇒ On-carriage. • Provide import customs clearance. 	<ul style="list-style-type: none"> • Take delivery of the goods at the named place of destination. • Unload goods from any arriving means of transport.

FIGURE 2
SUMMARY OF THE 13 INCOTERMS

	EXW	FCA	FAS	FOB	CFR	CIF	CPT	CIP	DAF	DES	DEQ	DDU	DDP
Packaging & marking	X	X	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Checking	X	X	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Loading on the collecting vehicle		X	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Pre-carriage		X ¹	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Export formalities		X	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Export customs formalities		X	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
THC at origin			<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Loading in the vessel				X ²	X	X				X	X		
Contract of main carriage					<u>X</u>	<u>X</u>	X	X	X	<u>X</u>	<u>X</u>	X	X
Main carriage costs					<u>X</u>	<u>X</u>	X	X	(X) ⁴	<u>X</u>	<u>X</u>	X	X
Main carriage risks									(X) ⁴	<u>X</u>	<u>X</u>	X	X
Insurance						<u>X</u>		X					
Unloading from the vessel					<u>X</u> ³	<u>X</u> ³					<u>X</u>		
THC at destination												X	X
On-Carriage												X	X
Import customs formalities													X
Unloading from a delivering vehicle													

X = Seller pays or is in charge of.

Italic = ocean and inland waterway terms

1. If FCA Seller's premises: Pre-carriage is to be borne by the Buyer; if FCA other named place: Pre-carriage is to be borne by the Seller.
2. If loading charges are not included in the freight, the Seller pays; if loading charges are included in the freight, the Buyer pays.
3. If unloading charges are included in the freight, the Seller pays; if unloading charges are not included in the freight, the Buyer pays.
4. The main carriage does not really exist under DAF. The carriage up to the border is just commonly called pre-carriage, and beyond the border on-carriage.

ANALYSIS OF THE 2000 CHANGES AND STRATEGIC IMPLICATIONS

The first part of this discussion identifies extrinsic changes related to the 2000 revision, whereas the second part focuses on intrinsic changes of specific terms under which the obligations and responsibilities of each party have been modified from the INCOTERMS 1990 to INCOTERMS 2000.

Extrinsic Changes

The general extrinsic changes incorporated in INCOTERMS 2000 over INCOTERMS 1990 relate to: 1) further standardization; 2) greater international participation; 3) enhanced language translation; and, 4) a reflection of increased concerns from U.S. traders. Standard sales terms fit in with the trend toward standardization in accordance with The Harmonized System, Uniform Customs and Practices for Documentary Credits in ISO Certification. In addition, the new INCOTERMS are more in line with the terms used in the United Nations Convention on Contracts for International Sales of Goods (C.I.S.G.). The latest revision of INCOTERMS is truly global in nature and process. Though the International Chamber of Commerce is based in Paris and most of the creators were from the European Community, this 21st century revision received inputs from outside Western Europe at record levels. As listed in the acknowledgements, the ICC worked with participants in Canada, China, Ecuador, Hungary, India, Islamic Republic of Iran, Israel, Japan, Mexico, Peru, Singapore, South Africa, Spain, Sweden, and the United States. Though INCOTERMS 2000 is currently available in English and French, the ICC will for the first time publish the new version in 20 languages, a deviation from the traditional French and English-only publications of the first seven decades of INCOTERMS.

Anecdotally, U.S. traders have appeared more and more concerned with the advantages INCOTERMS provide. In fact, changes in the new version better reflect U.S. business

practices. Moreover, the USCIB, the powerful ICC United States affiliate showed an unusually active interest in this INCOTERMS revision. This organization consists of many "heavyweight" members, some of them large enough to force any issue with their vendors and customers. In practice, therefore, this contingent was instrumental in the revisions completed by the ICC in 1999.

Intrinsic Changes

The changes in the new version salient to the various 13 INCOTERMS include specific changes in: 1) FCA, 2) FAS, 3) DEQ, and, 4) DAF. The biggest change in the revisions concerns INCOTERM FCA, Free Carrier. In INCOTERMS 1990, FCA referred to seven different modes of transport: air, ocean, inland waterway, container, multimodal, highway, and unnamed modes of transport. Recognizing that multimodal transport is now the norm, under INCOTERMS 2000 FCA has now a single application. If the goods have to be delivered at the seller's premises, then the delivery is contractually completed, and the seller's responsibility ends when the goods have been loaded in the collecting vehicle provided by the carrier that will deliver the goods to the buyer. If the delivery occurs at a place other than the seller's premises, the seller's responsibility ends when the goods are placed at the disposal of the carrier designated by the buyer.

In other words, if the delivery is not made at the seller's premises, then the seller is not obliged to unload the goods when the goods arrived in the collecting vehicle at the carrier's terminal or freight forwarder's warehouse. The seller just leaves the goods at the disposal of the international carrier, who will unload goods from the truck, but under the buyer's responsibility. Consequently, FCA now allocates more precisely the costs and risks for unloading operations. This change is significant because transshipments are likely to be a source of litigation due to losses and damages occurring frequently during transshipments, depending on the trade lane(s) involved.

Under INCOTERMS 1990, FAS implied that the buyer had the responsibility to provide export customs clearance. This responsibility has been transferred to the seller under INCOTERMS 2000. Consequently, EXW is now the only term under which the buyer is responsible for export clearance; under any INCOTERMS other than EXW, it is now the responsibility of the seller to clear goods for export. Similar to FAS, under INCOTERMS 1990, import clearance was the responsibility of the seller. However, with INCOTERMS 2000, it is now the buyer who has the responsibility of clearing the goods for import. These two changes significantly ease the fulfillment of such a legal obligation.

In fact, under INCOTERMS 1990, one party was forced to deal with the customs rules in the home country of the other party. Under INCOTERMS 2000, customs issues are now handled by the local party. Emmanuel Jolivet, ICC's policy manager for international commercial practice, reasons "The reason for the changes, clearly, is that it is easier for a party living in a particular country to clear goods for import or export in his/her own country" (Freudmann 1999). Reflecting the urgency the ICC working group desired on this issue, these changes were made right at the very start of the revision process. Finally, the term "DAF" now applies only to land borders, whereas under INCOTERMS 1990, it could be used for all modes of transport. Consequently, DAF is now only applicable for rail or road shipments, or a combination of both modes of transport.

IMPLICATIONS

Understanding the differences between the various INCOTERMS will allow for better negotiation, fewer misunderstandings, and reduced costs (e.g., financial and opportunity costs) of conducting trade internationally. There is strong anecdotal evidence that suggests it is extremely costly to misunderstand the critical points at which cost and responsibility legally transfer from buyer to seller.

On one account the authors are familiar with, a U.S. Midwestern firm was shipping a full container load (FCL) of pens and other items from a seller in Asia. The U.S. firm would periodically procure items from their Asian supplier and would engrave corporate logos and re-sell them to clients throughout the globe. The INCOTERM negotiated and used was usually FOB – Singapore, though the seller was willing to take on more risk and responsibility (i.e., use another INCOTERM in the C or D range) for a nominal cost. Recall, under FOB, the buyer must contract at his/her own expense for the carriage of the goods from the named port of shipment, including the procurement of marine insurance. Under the Carriage of Goods by Sea Act (COGSA), which ratified the 1937 Hague Rules in the U.S., the steamship line is only responsible for \$500 per container if the container is lost or destroyed at sea. The steamship line carrying the container load of pens hit rough waters and several containers were lost at sea. The importer, who was not insured, received \$500 for the loss from the steamship line, though the value of the cargo was worth well over \$125,000 U.S. Dollars. The firm made a costly mistake that could have been easily avoided. The implications for not understanding the strategic usage of INCOTERMS can be very detrimental to firms.

Similarly, since May 1st, 1999, the Ocean Shipping Reform Act of 1998 (OSRA) went into effect on U.S. trade lanes. The law effectively scrapped the century-old concept of "common carriage" — the notion of equal treatment for similarly situated shippers (Stapleton and Ghosh 1999). The new law encouraged a landmark shift from common carriage to contract carriage (Beargie 1998), by disallowing the practice of a firm allowing another to undertake the costs of negotiating with steamship lines for carriage and simply claiming "similarly situated status" and demanding a "me-too" rate. OSRA deregulated the maritime environment and allowed firms to contract confidentially with steamship lines. Competitors are no longer allowed to let the industry leader garner the best possible rate

(due to volume and negotiating power) and sit back and claim "similarly situated status." Since contracts are now confidential between shippers and carriers, competing shippers can no longer figure out the critical elements of a contract, including the cost and INCOTERM specified between buyer and seller, or consignee and consignor. Therefore, a firm who strategically takes on more cost and risk (by changing to a Group C or Group D INCOTERM), though nominal, stands a good chance of increasing market share.

CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

The main reason for a new revision of INCOTERMS 1990 was the need to adapt them to contemporary commercial practice. The intent of the revision process, which has taken about two years, was not merely to review each of the 13 INCOTERMS, but to bring them in their entirety in line with contemporary global trade. Indeed, the motivation was far beyond formal or substantial changes. The ICC meant to extend the use of its trade terms by further globalizing their concept. Consequently, the ICC concentrated on simplifying and standardizing its terminology to harmonize it with international trade practices.

This goal seems to have been reached since a wide-range of world traders participated in this revision process. It appears more and more clearly that INCOTERMS now enjoy worldwide recognition.

Finally, considering that any change involves adaptation, it should be interesting to study how these changes affect international trade practices between buyers and sellers, and how carriers and freight forwarders react to them. This can be the subject for a later study in the new millennium.

As markets continue to expand due to technological developments in transportation and logistics, distribution networks will extend well beyond national frontiers. With obstacles such as distance, language and business customs, the allocation of responsibility between a buyer and a seller of goods becomes even more crucial. This is where INCOTERMS strategies will continue to remain critical in international commerce.

It is hoped that our extensive review of the 13 INCOTERMS and their revision will help practitioners in both the understanding of the terms and in realizing their strategic implications for transporting cargo in the vastly changing international context of global commerce. Further, it is our hope that this discussion will lead to better understanding among academicians in both the importance of teaching these rich concepts and in research. Future research can seek to understand the strategic implications in the usage of INCOTERMS; whether adopting one INCOTERM strategy over another will lead to competitive advantage; and whether changes in terminology impact shipping practices similarly on both sides of the buyer-seller dyad.

ACKNOWLEDGMENT

We would like to acknowledge a grant from Penn State University and the Industrial Studies of British Markets (ISBM) for their aid in this research project.

REFERENCES

Barelier, André, Jacques Duboin, Francois Duphil, Nicole Gevaudan-contal, Louis Kuhn, Claude Levy, Jacques Paveau, Jean-Marc Sarhan (1995), "Exporter: Pratique du Commerce International," Editions Foucher.	Beargie, Tony (1998) "Re-inventing Conferences," <i>American Shipper</i> , December (1998), 12-16.

- Biederman, David (1999) "Get Ready for INCOTERMS 2000," *Journal of Commerce*, October 11, 1999, 1A.
- Debattista, Charles (1995) "INCOTERMS in Practice: Advice on the Application of INCOTERMS," ICC Publication No. 505, July 1995.
- "Evolving Lessons on INCOTERMS," *Journal of Commerce*, November 3, 1999, 1A.
- Freudmann, Aviva (1999) "Traders Get a Brand-new Bible," *Journal of Commerce*, September 9, 1999, 1A.
- "Implications of INCOTERMS 2000," *Journal of Commerce*, September 15, 1999, 1A.
- INCOTERMS 1990: International Commercial TERMS*, ICC Publication No. 460, Paris: International Chamber of Commerce April 1990.
- INCOTERMS 2000 (1999) ICC Publication No. 560, Paris: International Chamber of Commerce, September 1999.
- Ramberg, Jan (1991) "Guide to INCOTERMS 1990," ICC Publication No. 461/90, May 1991
- Stapleton, Drew H.M. and Soumen N. Ghosh (1999) "The Ocean Shipping Reform Act: Practical Implications for Both Buyers and Sellers," *Journal of Transportation Law, Logistics & Policy*, Vol. 67, No. 1 (Autumn 1999), 53-68.

AUTHOR BIOGRAPHY

Drew M. Stapleton, Ph.D., is a professor of logistics and transportation at the University of Wisconsin-La Crosse. He has served in logistics and distribution management at General Motors Corporation and Xerox Corporation, and as a consultant to the maritime shipping industry. Dr. Stapleton has published articles in the *Journal of Transportation Law, Logistics, and Policy*, *Marketing News*, *Marketing Educators Review*, *ISBM Working Papers*, and several international transportation conference proceedings. His research interests include logistics management, transaction cost analysis, carrier-buyer-seller negotiations, and supply chain management in electronic commerce.

AUTHOR BIOGRAPHY

Virginie Saulnier is sales coordinator and freight forwarder at EMO Trans, Inc., International Freight Forwarders in Chicago, IL. She is also pursuing an MBA with an emphasis in logistics and transportation at the University of Wisconsin-La Crosse. Ms. Saulnier has international freight forwarding experience in both the United States and her native France. Her research interests include buyer-seller interaction for the negotiation of international transportation and the interface between marketing and logistics.

LEADING WITHOUT BLEEDING: AN INFORMATION TECHNOLOGY CASE STUDY AT UNION PACIFIC RAILROAD

Uma G. Gupta
University of Houston

Randy W. Butler
Union Pacific Railroad

Thomas D. Milner
Science Applications International Corporation

ABSTRACT

In the railroad industry, the ability to assess damages to rail units in an accurate and timely manner is critical to the success and profits of a company. Accurate damage assessment of rail units also plays a key role in dispute resolution and negotiation with key vendors and suppliers (my.uprr.com/pub/dam-prev). This paper describes and presents information about Union Pacific Railroads (UPRR) and Science Applications International Corporations (SAIC) highly successful efforts in fully automating the data collection, inspection, assessment and reporting of damage claims to rail equipment. UPRR and SAIC used an innovative and highly creative approach to develop and implement the Automated Gate System (AGS) by integrating a portfolio of leading edge high resolution imaging and optical character recognition technologies. AGS is a unique and revolutionary system in the transportation industry and has yielded significant strategic and long-term benefits to the company. The reengineering efforts that preceded the development of the system have helped the company to sustain its position as a leader in the railroad industry.

INTRODUCTION

Union Pacific Corporation is one of North America's leading transportation, computer technology and logistics companies, with operations in all 50 United States, Canada and Mexico. With headquarters in Omaha, Nebraska, Union Pacific Corporation currently has over 52,000 employees, covers more than 36,000 miles of track in 23 states and has an annual payroll in excess of \$3 billion. There are 1700 people in information technology alone with a budget of about \$250 M. The company's web site at <http://www.uprr.com> provides a comprehensive corporate profile of the company.

Science Applications International Corporation is the nation's largest employee-owned research and engineering company, providing information technology and systems integration products and services to government and commercial customers. SAIC scientists and engineers work to solve complex technical problems in telecommunications, national security, health care, transportation, energy, the environment, and financial services. With annual revenues of \$4.7 billion, SAIC and its subsidiaries have more than 38,000 employees at offices in more than 150 cities worldwide.

Intermodal units are critical for the sustained success of a railroad company and hence it is important to ensure that these units are in good working condition. As customers' demand more speedy and efficient transportation of goods, rail intermodal service — the movement of trailers or containers by rail and at least one other mode of transportation — is ideally suited to meet this demand. That is one of the reasons intermodal is the fastest growing segment of the railroad industry (my.uprr.com/pub/notes). Intermodal traffic has grown from 3 million trailers and containers in 1980 to 8.7 million in 1997 and accounts for more than 17 percent of rail revenues, second only to coal at 22 percent (www.aar.org). Intermodal transportation yields many powerful benefits (www.aar.org):

- **Fuel efficiency.** Rail intermodal service on average uses less than half as much fuel as highway transport to move the same shipment the same distance.
- **Convenience and partnerships.** Intermodal combines the door-to-door convenience of trucks with the long-haul economy of rail service. As a result, railroads, trucking companies and intermodal marketing companies are forming productive partnerships to combine the best of both modes.
- **Improved air quality.** Moving a ton of freight by rail instead of truck results in less than one-third the emissions into the air.
- **Reduced traffic congestion.** A single intermodal train can remove as many as 280 trucks from the highways.
- **Innovative technology.** Intermodal technology, such as double-stack trains (one container on top of another) permit one train with two crew members to remove up to 280 trucks from the highway, reduce pollution and save energy.

Railroad regulations require the inspection of all intermodal equipment (vans, containers, chassis) during yard entry and exit to ensure that damages to a unit are positively identified and charged to the responsible party ("Building the Systems...", 1999). This is a very critical step if the railroad is to recover damage claims assessed by equipment owners and also to win disputes regarding the timing and extent of damage.

In January of 1995, during a strategic planning exercise at the company, it became clear that there was room for improvement in the way the company managed and maintained its intermodal units. Reengineering current intermodal operational process and practices would

help the company be more responsive to customer needs while increasing its operational efficiencies and profits. Due to increased global competitiveness, customers expected their transportation companies to be agile and responsive. After considerable discussion among top and middle management, the company established the following primary goals for the reengineering effort of intermodal operations:

- Increase data accuracy
- Reduce transaction processing time
- Increase the rate of collections from damage claims
- Increase accuracy of the damage inspection
- Decrease number of yard personnel

As the reengineering team began to look closely at the intermodal operations, it became evident that two processes were big bottlenecks in achieving desired efficiencies. These were the *ingate* (arrival of an intermodal unit at a given rail yard) and *outgate* (departure of an intermodal unit from a rail yard) processes. The process of manually assessing and recording damages was slow, cumbersome, and error-prone. Since damages were manually assessed by physical inspections at the terminal gate, damages to intermodal equipment were often missed or inaccurately recorded. To make matters worse, in many cases, it was difficult, if not impossible, to retrace the steps and correct the inaccuracies. Further, since all damages were recorded on a form and filed for future reference, it was impossible to make effective business decisions involving claims. Managers often had little or no knowledge of the nature of the claims and found it difficult to be proactive based on trends in filed claims. As the volume of railroad traffic continued to increase significantly and customers became more demanding, it became clear that this slow, labor-intensive and error-prone process needed to be

changed. The company decided to completely automate the in-gate/outgate processes and thus AGS was born. Currently there are three AGS systems in place. Marion, Arkansas (outside of Memphis, TN), Mesquite, Texas, and Kansas City, Missouri. The fourth system will be installed in mid to late 2000 in Oakland, California.

HOW AGS WORKS

The basic function of the Automated Gate System (AGS) is to automate the data collection, inspection, assessment, and reporting processes at intermodal gates. This required the creative application and integration of a wide variety of information technologies. The AGS System Architecture utilizes three separate network paths to accomplish the large amount of throughput required for image transfer and image display.

Although AGS is based on leading-edge technologies, (and some even bleeding-edge for its time), great leadership, outstanding project management, exemplary team work, a rigid discipline for organization, and a keen sense for detail has made AGS a remarkable success story in the transportation industry. At a cost of more than two million dollars and four years of development work, AGS has become a strategic information system for Union Pacific Railroads. AGS is the product of a number of technologies working together in an innovative and meaningful way. Figure 1 shows the subsystems that constitute AGS. The following section explains how AGS works.

Driver Enters Terminal

When an intermodal unit first arrives at a yard, it is guided by inductive loops embedded in the pavement at strategic locations in the yard. Live digital video conferencing technology facilitates communication between the AGS operator and the intermodal driver at the gate stand. For example, each gate stand in a rail yard has a

FIGURE 1

(This diagram shows the communications links between various applications. Numbered links are TCP/IP sockets; lettered links are Win32 messages.)

color video camera that displays a live image of the driver on the AGS workstation monitor. This image is captured as a digital snapshot and attached to the transaction images. Also, mounted directly to the rear of each gate stand lane is a two-way digital audio system that facilitates communication between the driver and the AGS operator when the driver is at the rear of the unit. Each gate stand has a call button to notify the AGS operator of the need to communicate verbally and this appears as a visual display on the AGS monitor. The AGS operator uses a hands-free head set for voice communication with the truck driver and a foot pedal to activate the unit's transmission.

Instructional signs direct the driver to wait until the portal control light turns green. A portal is composed of ten digital cameras, four light curtains, and two Automatic Equipment Identification antennas. There are seven line-scan cameras that take a 1/8" slice of video as the truck drives through the portal at 10 MPH and three area scan cameras that take area pictures of the rear of the intermodal unit and its tires.

The Video Inspection System integrates image analysis, vehicle axle count and optical character recognition technologies. Optical character

recognition identifies and scans alphanumeric characters on the left side, right side and back side of a unit to produce a high-resolution digital image of the top, sides, nose, rear, tires and under carriage of all units passing through the portal. These images are stored locally for playback review to inspect damages, validate equipment identification marks and hazardous material placards. The results of this scan are then compared with data residing in the Intelligent Character Recognition (ICR) system, an integrated database of all equipment identification prefixes. The AGS operator can perform a visual inspection of the images after a single unit or multiple units (as in the case of "pups") pass through the camera portal. Using "point and click" screen icons, the operator can review the images.

Based on the images, the vehicle at the yard is then classified into one of the following:

1. A tractor (bobtail)
2. Tractor with chassis
3. Tractor with trailer or container tractor with multiple trailers or containers or non-intermodal vehicles.

FIGURE 2
GATE CONTROL SCREEN THAT UPDATES THE STATUS
OF INCOMING AND OUTGOING UNITS

Interior Inspection

The next step is to ensure the accurate inspection of the unit. Mounted directly to the rear of each gate stand lane is a color camera that views and takes live images of the inside of the unit. These images are then displayed and controlled by the AGS operator using the GATE CONTROL function to inspect empty returned units or blocking and bracing of loads to ensure that the load inside the container does not shift in transit. Refer to Figure 2.

Once the unit passes properly through the camera portal, the system creates an icon to represent the unit on the AGS operator's monitor. The icon includes the initial of the unit and its identification number, which are then displayed in the "portal queue" areas on AGS. Refer to Figure 3.

FIGURE 3
ICONS AS THEY APPEAR
ON THE GATE CONTROL SCREEN

Once the icon appears on the AGS screen, the operator begins the inspection process by viewing the images. A *gate stand* refers to an interactive monitor, a keyboard, two-way hands-free voice intercom, call button, driver image capture, printer, electronic driver identification,

and a magnetic card reader. A Gate Stand computer is installed at each inbound and outbound lane. The Gate Stand is the driver's interface and lane controller. These computers are intended to gather pertinent information from the driver and transfer that information to the System Controller for validation and further use in the process. The Gate Stand computer is also used to allow the controller at the Playback to communicate with the driver.

AGS prompts the user with screen menus for data entry in order to process the gate transaction. The driver interface is designed to be as user friendly as possible with minimum interaction from the driver yet still gather as much of the required data as possible before the AGS operator is needed (if needed) to complete the transaction. The data the driver is asked to input is relevant to the particular transaction type as identified by the system. In most cases, it is expected that the data input received from the driver will leave the AGS operator with handling only exceptions or lack of required data. If, at any time during the process, the driver is unable to complete the data entry, the AGS operator may intervene and complete any portion or all of the transaction.

AGS allows for inspection at any time, i.e., as soon as the units arrive or at a later time, as long as the images are available. This allows terminal managers at different yards to establish their own policies and guidelines as to when the inspection should be done. While viewing the images the AGS operator may inspect and report damage (if applicable) and verify equipment identification marks. The destination information is supplied and formatted on the playback display. As indicated earlier, since each gate stand has a video camera to capture a live image of the driver, a still snapshot of the driver is captured automatically and stored with the gate transaction. Each gate stand also has a magnetic card reader that allows drivers to swipe their identification cards and capture and match the driver's identification in the system.

System Output

Each gate stand also has an enclosed ticket printer that automatically feeds the gate receipt when the transaction has been processed. A gate receipt is similar to an invoice that vendors use to receive payment for delivering or picking up units. The gate receipt on a complete transaction includes information about the date, time, location, driver name, initial and number of the chassis, yard disposition instructions, and information about damages, if any.

The driver enters the unit initial and number or presses the NO key to identify a bobtail transaction (a transaction to indicate that the driver is in the yard to just pick up a unit. This information is compared with units in the ingate queue to identify a match. If one is found, the unit icon on the GATE CONTROL display on the AGS workstation is automatically moved to the gate stand to associate the data input with the portal images. If a match is not found, the driver is prompted to verify the input and re-enter the data. If the driver validates the information and a match is still not found, AGS notifies the AGS operator to complete the transaction.

Next, AGS checks for equipment classification (in the case of a chassis, gate control is handed over to the AGS operator to complete the transaction as there is no further input required from the driver.). AGS then generates a data packet to send to the mainframe (TCS) to check for billing information. If billing information is not found in the TCS, the system will prompt the driver to identify if the unit is loaded or empty. The goal is to collect as much required data as possible from the driver to assist in any billing inquiry activity.

The next AGS screen captures the seal numbers and contents associated with each unit. The shipping company applies a seal to each unit in order to prevent any tampering with the contents. If the seal is missing, then Union Pacific will not allow the unit to enter the rail

yard, until another seal has been supplied and the new number entered in the system. In the case of multiple units (as in the case of "pups"), the driver enters the details for each unit and the steps are repeated until details about all units are entered in the system.

Once the driver completes the input process, the AGS operator assumes responsibility for completing the transaction. The data collected is sent to TCS in the form of a van arrival for TCS processing. If the message is processed without errors, a buckslip is printed at the gate stand and the driver has the option to inquire about units in the yard for pickup. Otherwise the system is reset for the next transaction.

TECHNOLOGY BEHIND AGS

The AGS system consists of Acquisition computers, Gate Stand computers, Playback computers, Image Server computers and a System Controller Computer. Acquisition Computers reside in the Signal Cabin which is physically centered between the In and Out portals. There are three Acquisition computers for each portal: Left Acquisition, Right Acquisition and Auxiliary Acquisition. The Left Acquisition computer is responsible for capturing and transferring image data from the three line scan cameras mounted on the left side of the portal. The Right Acquisition computer is responsible for capturing and transferring image data from the three line scan cameras mounted on the right side of the portal. The Auxiliary Acquisition computer is responsible for the Top Scan, Rear Shot and Left and Right Tire Shots. The Auxiliary Acquisition computers handle the I/O from the portals as well as from the queuing lanes.

Gate Stand computers were described earlier. Playback Computers serve as the user interface to the AGS System and are located in the Operations area of the Gate House. They are used to display truck images and handle the gate process which involves getting information from

the driver and verifying that the driver can enter the yard. This process can also involve creating damage reports, registering drivers and possibly establishing a video conference with the driver at a gate stand.

The In-Portal Image Server and Out-Portal Image Server computers are located in a rack in the communications room in the Gate House.

Each Image Server handles the reception of the raw image data, creates the viewed images and handles the archiving of the image to optical disk. The System Controller computer is also located in a rack in the communications room in the Gate House and is responsible for handling all of the data packets passed between machines as well as maintaining the truck image database. The team structure for AGS is shown in Figure 4.

FIGURE 4
TEAM STRUCTURE FOR AGS

MEASURE OF SUCCESS

AGS has become one of the most successful information systems in the company's history and continues to yield significant extrinsic and intrinsic benefits to the company and to its customers. A recent cost/benefit analysis comparing hand held technology with AGS shows a 75% reduction in labor at the three existing locations. The ROI of AGS is approximately 40%. Some of the benefits of AGS include

- **Increased Customer Satisfaction.** AGS helped reduce time to process units at the gate by more than 70%. Thus customers were able to get in and get out of the yards quickly, leading to significant efficiencies for both UP and its customers. Further, customer satisfaction increased when AGS was implemented.
- **Increased Revenue.** While revenue attributable to AGS is confidential, it is safe to say that profits attributed to AGS are significant. Further, evidence points to greater throughput for drayage companies, which increases their ability to achieve higher volumes of traffic through the rail yards.
- **Reduction in Personnel.** Significant reductions were achieved in the number of personnel required at the gates. In several yards around the country, the number of internal gate operators decreased by more

than 50% while the number of outside gate operators has been completely eliminated.

- **Improved Decision-Making.** AGS continues to play an important role in enhancing the quality of decisions. There has been a significant increase in the integrity and accuracy of critical transportation data collected at the yards, leading to better decision making at the rail yards and throughout the company.
- **Reduction in damage claims.** Finally, AGS has helped Union Pacific to achieve significant reduction in damage claims paid to its customers. Since photographic documentation of all units passing through the AGS data acquisition portals is available, it is easy to settle claims, thus decreasing the number of litigious claims.
- **Leader in the field.** Union Pacific is a leader in the field and hence customers have high expectations of the company. Managers attribute the smooth flow of traffic through the rail yards to AGS. Charles Whited, Senior Manager of the Union Pacific Intermodal Terminal, Marion, AR, says, "For example, on 8/11/99 we did 1,065 arrivals and departures. It is my opinion that traffic flow and congestion is much better than with any other system we have had. Also, this is done with fewer people working the gate. With AGS we have 3 people at peak 7am to 1900pm and one person at other times. Without AGS I believe we would need 8 people at peak and 4 at other times."

REFERENCES

"Building the Systems: Why Architecture Matters," (1999). *Nation's Cities Weekly*, Vol. 22, No. 10, pp. 9-10.

<http://www.aar.org/comm/statfact.nsf/5406ac733125e6c7852564d000737b60/fdf95cfeef772fc3852568800067074d>.

http://my.uprr.com/pub/notes/INetBull/2f82_202.shtml.

<http://my.uprr.com/pub/dam-prev/loading/intguide/intguil.shtml>.

OTHER READINGS

- Awadallah, Faisal, and Habesch, Najib, (1998). "Evaluation of Video Image Processing for Traffic Management Systems," *Transportation Quarterly*, Vol. 52, No. 3, pp. 79-91.
- Berka, Stanislaw, and Lall, B. Kent, (1998). "New Perspectives for ATMS: Advanced Technologies in Traffic Detection," *Journal of Transportation Engineering*, Vol. 124, No. 1, pp. 9-16.
- Crowell, Anthony, and Hall, Rebecca, (1997). "Intelligent Vehicle Highway Systems — United States," *Public Management (US)*, Vol. 79, No. 9, pp. 3-11
- Dietz, Francis, (1998). "Intelligent Transportation Systems—One Step at a Time," *Mechanical Engineering*, Vol. 120, No. 8, pp. 36-37.
- Krapf, Eric, (1997). "New Technologies Rev Up Transportation Systems," *Business Communications Review*, Vol. 97, No. 10, pp. 55-61
- Noy, Y. Ian, (1997). "Human Factors in Modern Traffic Systems," *Ergonomics*, Vol. 40, No. 10, pp. 1016 - 1025
- Park, Dongjoo, and Rilett, Laurence R, (1999). "Spectral Basis Neural Networks for Real-Time Travel Time Forecasting," *Journal of Transportation Engineering*, Vol. 125, No. 6, pp. 515 - 524.
- Smith, Brian L., and Scherer, William T., (1999). "Developing Complex Integrated Computer Applications and Systems," *Journal of Computing in Civil Engineering*, Vol. 13, No. 4, pp. 238-246.
- Utamaphethai, Noppanunt, and Ghosh, Sumit, (1998). "Dicaf: A Distributed Architecture for Intelligent Transportation," *Computer*, Vol. 31, No. 3, pp. 78-85.
- "Vendors Back Proposed Trailer-packing Interface Standard," (1999). *Logistics Management & Distribution Report*, Vol. 38, No. 5, pp. 99-102.

AUTHOR BIOGRAPHY

Uma G. Gupta is the John and Rebecca Moore scholar and the dean of the College of Technology at the University of Houston. She holds a Ph.D. in industrial engineering, and an MBA from the University of Central Florida, and a master in mathematics from India. Dr. Gupta is the author of *Management Information Systems: A Managerial Perspective* (West Publishing) and has edited a second book on validating expert systems. She has more than 50 refereed journal articles and conference proceedings to her credit.

AUTHOR BIOGRAPHY

Randy Butler currently holds the position of systems consultant e-commerce in Omaha, Nebraska. He began his career with the Union Pacific Railroad in 1971 as a project analyst. Mr. Butler has held various positions with the Union Pacific Railroad including systems consultant intermodal systems, process engineer, manager planning & productions, superintendent of transportation, general director of development, and avp reengineering. He is currently completing a master of science in information systems and qualitative analysis at the University of Nebraska-Omaha.

AUTHOR BIOGRAPHY

Thomas Milner currently holds the position of director of marketing, intermodal systems and is the program manager for AGS with Science Applications International Corporation. Prior to joining SAIC, he held various positions during a 13 year career with Missouri Pacific/Union Pacific Railroads including TCS systems implementation and intermodal terminal operations. Mr. Milner earned a bachelor of science degree in business administration from the University of Arkansas in 1984.

TRUCKLOAD TRANSPORTATION REQUIREMENTS: IN ANTICIPATION OF Y2K WITH EPILOGUE

John L. Kent

Southwest Missouri State University

R. Stephen Parker

Southwest Missouri State University

Charles E. Pettijohn

Southwest Missouri State University

This article investigates the impact of the much-hyped Y2K phenomenon on truckload transportation requirements in the United States, as a result of year-end inventory build-ups. The article reports the results of a *Y2K Truckload Transportation Survey* of truckload shippers conducted in August of 1999. Additionally, the article takes a post-hoc look at what actually occurred in an effort to completely document the impact of the Y2K phenomenon in the dry van, temperature controlled, and flatbed segments of the truckload transportation industry.

INTRODUCTION

It is highly unlikely that many of us escaped the what-if scenarios of the Y2K phenomenon. These scenarios ranged from a non-event scenario where nothing happens and life goes on without a hitch, to the more media-hyped doomsday scenario where civilization as we know it disintegrates as humans are incapable or unprepared to exist without computer assistance. Olgeirson (1999) describes this latter scenario in a hypothetical situation where, in each case, the worst does happen, panic sets in, and society self-destructs. As businesses and governments had spent \$300 to \$600 billion

dollars world wide (Hamilton and Wong, 1999) in preparation for this event, reality was thought to fall between these two scenarios.

The transportation industry was no exception in terms of preparation for tracking carriers, shipments, and invoices. In fact, Hamilton and Wong (1999) point out that as the transportation industry is the central force in the supply chain, how this industry reacted to and prepared for the Y2K phenomenon would have far reaching effects on everyone from manufacturers to end-users. They further contend that not all reports on transportation preparedness were encouraging. In fact, by some estimates, the

transportation industry ranked near the bottom of industries addressing the Y2K problem and it was estimated that approximately 50% of these companies would experience mission-critical failures. Brandt (1999) reported that a government survey conducted by the Special Committee on the Year 2000 Technology Problem revealed only 62% of the responding transportation companies had completed Y2K preparations. Medium sized fleets were described as facing the largest challenge in preparing for the year 2000 since they typically have fewer people on their technology staffs than do the larger companies. Further, 50% reported that they anticipated being involved in some type of litigation resulting from the Y2K phenomenon. The litigation issue was compounded by contractual agreements involving just-in-time deliveries. Leffort (1999) reported that the transportation industry in general was in a very difficult position, as they rely on every member of the supply chain.

However, it was thought that the Y2K phenomenon might have provided a profit making business opportunity for the transportation industry. For example, at least one large trucking firm postponed its annual company Christmas party in anticipation of increased demands on its ability to transport the vast volume of goods being purchased by numerous businesses prior to any possible disruption in the supply chain. This expectation of increased usage was not an isolated view. Watson (1999) noted that shippers were protecting themselves from any potential Y2K associated problems by stocking increased inventories. As a result of this increase in safety stock, shippers pre-booked shipments to assure adequate equipment availability. Watson further noted that this increase in bookings might have increased margins by 2% to 4% in the motor carrier industry. A variety of other potentially positive outcomes also existed. Hamilton and Wong (1999) suggested that by being forced to deal with the Y2K problem companies improved a variety of processes and products. These improvements included areas such as better communication, standardized bar

coding and electronic manifests, and the simplification of multi-mode shipment tracking.

While it is clear that there was a range of both positive and negative aspects to the Y2K phenomenon, the lack of specific information on how firms prepared was disconcerting. Thibodeau (1998) reported that many surveys relating to year 2000 readiness were never returned, perhaps as a result of either being unprepared or concerned about their responses being used in future litigation. In the transportation industry, adequate Y2K preparation was a critical determinant of a firm's ability to satisfy their customers, maintain sales and market share, increase profits, and ultimately ensure long-term survival. Thus, from a strategic perspective, Y2K preparedness had significant repercussions. While the majority of existing research on Y2K has focused on computer issues, the primary purpose of this study was to examine the customer base of a large truckload motor carrier to determine if their customers anticipated an increase in third and fourth quarter shipping requirements in an effort to supplement inventories. Such an examination had numerous strategic implications for this carrier, as it attempted to forecast the affect Y2K might have on its market position and profitability. Secondly, this study examined what actually transpired with regard to truckload transportation requirements as we entered the new millennium.

METHODOLOGY

During August of 1999 approximately six hundred shippers utilizing temperature controlled, flatbed, and dry van truckload transportation services were mailed a one page *Y2K Truckload Transportation Survey*. Ninety-eight or 16% of the shippers returned the survey. In the context of Y2K, each of the shippers was asked four primary questions. The first question was, does your firm anticipate an increase in truckload transportation requirements for the second half of 1999? The second question asked, if your firm anticipates the need for extra trailers during the second half of 1999 would you

be willing to rent or lease the trailers? Next the shippers were asked, does your firm anticipate any other additional truckload related services during the second half of 1999? Finally, each shipper was asked to indicate the percentage increase expected for truckload transportation requirements from the first half of 1999 to the second half of 1999.

RESULTS

The overall survey results are provided in Exhibit 1. As shown in the exhibit, forty-four percent of the respondents indicated they anticipated an increase in their truckload transportation requirements in anticipation of Y2K. An examination of the table also indicates the magnitude of the anticipated increases in transportation requirements in anticipation of Y2K. The results show that refrigerated shipments were expected to experience the greatest gain, with a 34% increase forecast for the final six months of 1999 over the first six months of 1999. Dry van truckload requirement increases were also large, with an increase of 22%. Flatbed shipments were expected to increase by only 11%.

Additionally, the results were analyzed by comparing the three service types (i.e., temperature controlled, flatbed, and dry van) for each of the survey questions. Of the respondents that indicated a primary service type, 56% indicated temperature controlled, 27% indicated flatbed, and 17% indicated dry van. Pearson chi-square values were calculated for each of the three service types with cross-tabs for each of the survey questions. No statistically significant differences were found between the service types.

While 44% of the respondents indicated that they anticipated increases in their transportation requirements in anticipation of Y2K, the respondents did not anticipate a strong demand for the use of additional truckload related services during the last six months of 1999. As the exhibit shows, only 9.5% of the respondents indicated a need for additional truckload services at the end of the year. With regard to the shippers' willingness to lease trailers, the results indicate that few of the respondents expressed an interest in leasing trailers, with only three percent indicating a desire to lease.

EXHIBIT 1 Y2K TRUCKLOAD TRANSPORTATION SURVEY RESULTS

Question	Yes	No	No Response
Does your firm anticipate an increase in truckload transportation requirements for the second half of 1999?	44%	50%	6%
If your firm anticipates the need for extra trailers during the second half of 1999, would you be willing to rent or lease the trailers?	3%	75%	22%
Does your firm anticipate any other additional truckload-related services during the second half of 1999?	9.5%	80%	11.5%
Overall percentage increase in anticipated truckload shipments from second half of 1999 over the first half of 1999	Refrigerated 34%	Flatbed 11%	Dry Van 22%

CONCLUSIONS AND MANAGERIAL IMPLICATIONS

The findings provided guidance for managers as they attempted to develop their marketing strategies in anticipation of Y2K. One implication that may be derived from the results is that most shippers did not seem to anticipate the "apocalyptic" results often discussed in the media. In fact, one might contend that the findings show that most respondents believed that Y2K would have very little impact on their shipping requirements, as fifty percent of the respondents indicated that they did not anticipate an increase in their truckload transportation requirements in the six months prior to the year 2000. Furthermore, the vast majority of respondents contended that they would not be interested in obtaining additional trailers or additional truckload related services in the second half of 1999, again supporting the perception that the impact of Y2K was expected to be minimal. The perception that Y2K would have little impact on the requirements of the majority of shippers may also be advanced by the non-respondents. It may be argued that those not responding to the survey also did not anticipate changes in their shipping requirements as they approached the new millennium. This argument may be advanced based on the premise that customers who anticipated *any* changes in their shipping requirements would be well-advised to make those changes known to facilitate their supplier's ability to meet their changing requirements. The fact that they did not respond *might* indicate that they did not anticipate changes in their shipping needs.

However, prior to dismissing the affect of Y2K on the requirements of shippers, it should be noted that forty-four percent of the respondents indicated that they anticipated an increase in their truckload transportation requirements in the second half of 1999. This forecast may have been indicative of a forecasted derived demand for their products. For example, as the media communicated the dire consequences of the Y2K, consumers could have begun acquiring an

inventory of essential products. This consumer acquisition process could have been the catalyst for additional production of these products, which in turn generates additional transportation demands for various shippers. This argument may be supported by the finding that refrigerated shipping was anticipating the greatest increase. Since refrigerated shipping may be associated with perishable items, and since one possible consequence of Y2K was a shortage of basic foodstuffs, products that require refrigerated shipping would be ones that could be expected to be in greater demand. Correspondingly, the relatively low increase in expected truckload requirements for flatbed shipping (11%) may be indicative of the fact that flatbed commodities and heavy equipment did not experience the increased demand that would result from Y2K fears. Thus, Y2K fears could have been allayed by the purchase of subsistence items such as food, generators, heaters, batteries, etc. which would likely be shipped via refrigerated or dry van shippers.

In conclusion, these findings should have provided the truckload transportation industry with guidance that should have provided assistance in developing their strategies and tactics prior to the new millennium. First, strategically the firm should have recognized that those shippers anticipating an increase in their requirements represented a target market that could be extremely profitable, both in the present and in the future. By preparing to satisfy the needs of this market, the firm may have been able to gain a stronger market position in comparison with carriers who have failed to forecast, and consequently failed to prepare for increases in demand. The stronger market position may then have been used as a means of developing a competitive advantage in future relationships with this market. However, to gain a stronger competitive position with this market, the firm may be required to maintain or enhance its normal level of service, maintain its value-oriented pricing policies, and take significant steps toward ensuring customer satisfaction in order to create a long-term gain from a short-term sales opportunity. Second, the

results also indicated that the firm's efforts in optimizing the opportunities presented by Y2K might have been well targeted to specific types of businesses. This targeting may have been facilitated by an evaluation of the "type" of shipper anticipating increases in demand. If, as argued, shippers anticipating increases in their shipping requirements were those involved with "subsistence" items, then targeting firms producing and marketing such items may have provided the catalyst for the development of a new customer base.

The majority of shippers participating in this study did not expect changes in their shipping requirements, thus arguing against any dire results from the advent of the new century. Further, even those who anticipated changes did not seem to be forecasting major changes in their requirements as indicated by the relatively few respondents who were willing to lease trailers or who expected to use any additional truckload services during the second half of 1999. Thus, the basic conclusion that was advanced is that well-targeted preparations may provide a long-term market advantage to the carriers prepared for changes in shipping requirements associated with Y2K, but that the preparations should be well-targeted and not designed for the majority of shippers.

EPILOGUE

With the exception of some of the world's most spectacular celebrations, the start of the third millennium appears to have been a non-event. The doomsday forecasts have come and gone with the Y2K bug, which, to this point in time, has been little more than a common cold. Levy (2000) reports that the United States spent around \$100 billion and the world outlay was closer to \$500 billion. Did we over spend? No one yet knows, as some "experts" predict that only about 1% of the problems would occur on the rollover date, with others appearing later in the year. However, what we do know is that very few problems have actually occurred to date and those that did are seen as being very minor in nature. Kisiel (2000) for example, reports that

the automobile industry was well prepared for the problem and has experienced little more than a few robots not working correctly and other very minor problems, such as incorrect dates, that were fixed very quickly.

The motor carrier for whom the research reported in this study was conducted was not surprised when the year ended. Just as the results of the study conducted in August of 1999 indicated, a surge in truckload shipping requirements as the result of inventory hedging by their shippers did not occur. The postponed Christmas party should have been held during December, just as in prior years. The fourth quarter results indicated no more than the normal seasonal increase in traffic and no sign of buyers hoarding raw materials or finished goods. Furthermore, demand for truckload transportation services in the first quarter of the new millennium was stable for this motor carrier. This stability indicates that inventory levels were not significantly increased in anticipation of Y2K or first quarter demand would have almost certainly declined.

Additionally, when asked if the costs associated with Y2K preparation had paid off. The firm's management responded with a definite yes. They stated, "clearly the minimal cost associated with the shipper survey, along with a little more time spent coordinating with the few shippers that were identified in the survey as potential Y2K problem shippers, paid off. We had a smooth, problem-free transition into the new millennium." In short, the bug may not have bitten, but it did force businesses to examine their communication links to supply chain members with whom computer contact is essential. As a result, many companies are probably better off than prior to the Y2K event.

In retrospect, it appears that the disasters associated with Y2K were more hype than real. The results of the hype, however, may be perceived in different ways. From a negative perspective, the hype resulted in some cases in the change of business strategies and tactics. These changes resulted in an improper

deployment of human, technical, and financial resources.

Conversely, the Y2K hype also resulted in some potentially positive activities. As stated, transportation firms not only increased communications with their markets customers, they also were "forced" to reassess their

strategies. The hype actually may have resulted in motivating many transportation companies to audit their current strategies, resources and tactics and develop contingency plans. These audits and reassessments probably created more long-term planning activity, which should in turn result in improved asset utilization in the future.

REFERENCES

- Brandt, Chris (1999), "Schneider Testifies on Y2K," *Transportation Topics*, Spring 1999.
- Hamilton, James R. and Paul H. Wong (1999), "Y2K and the Transportation Industry: Clouds and Silver Linings," *Supply Chain Management Review*, pp. 28-35.
- Kiesel, Ralph (2000), Y2K Glitches Were Few and Minor," *Automotive News*, Vol. 74 Issue 5856, p6.
- Lefort, David (1999), "Y2K and Insurance: What's Your Liability for Failed Service?" *Transportation Topics*, February 1999.
- Levy, Steven (2000), "The Bug That Didn't Bite," *Newsweek*, Vol. 135 Issue 2, p41.
- Olgeirson, Ian (1999), "The Doomsday Scenario: Could It Happen?" *Denver Business Journal*, Vol. 50, Issue 22, p.3B, 2p.
- Thibodeau, Patrick (1998), "Senate: Transportation in Y2K Trouble," *Computerworld*, Vol. 32, No. 37, Sept. 14, p8.
- Watson, Rip (1999), "Y2K Anxiety Driving Sector to Higher Pricing, Analysts Say," *Journal of Commerce*, July 14, p. 17.

AUTHOR BIOGRAPHY

John L. Kent, Ph.D., University of Tennessee, is an assistant professor of logistics and transportation at Southwest Missouri State University. His articles have appeared in *International Journal of Physical Distribution and Logistics Management*, *Journal of Business Logistics*, *Defense of Transportation Journal*, and *Journal of Marketing Management*.

AUTHOR BIOGRAPHY

R. Stephen Parker, DBA, Louisiana Tech University, is a professor of marketing at Southwest Missouri State University. His articles have appeared in *Journal of Advertising Research*, *Industrial Marketing Management*, *Logistics and Transportation Review*, *Management Accounting*, and *Marketing Education Review*.

AUTHOR BIOGRAPHY

Charles E. Pettijohn, DBA, Louisiana Tech University, is a professor of marketing at Southwest Missouri State University. His articles have appeared in *Marketing Education Review*, *Journal of Marketing Theory and Practice*, and *Psychology and Marketing*.

Journal of Transportation Management

Guidelines for Submission/Publication

FRONT MATTER

1. First Page—Title of the paper, name and position of the author(s), author(s) complete address(es) and telephone number(s), e-mail address(es), and any acknowledgment of assistance.
2. Second Page—A brief biographical sketch of each author including name, degree(s) held, title or position, organization or institution, previous publications and research interests.
3. Third Page—Title of the paper without author name(s) and a brief abstract of no more than 100 words summarizing the article. The abstract is used on the Contents page of the JTM and serves to generate reader interest in the full article.

FORMATTING

1. Manuscripts should be typed, double-spaced (body of text only), on white 8 ½ by 11 inch paper.
2. Submit four (4) paper copies of the manuscript for review. It is not necessary to send a disk for the initial review. However, to save time and effort if accepted, the article should be prepared using either:

WordPerfect **9.0 or lower**

OR

Microsoft Word **95 or lower**

3. Accepted articles, in final form, are to be submitted on disk (in WordPerfect or Microsoft Word format as described above) and in hard copy. Note: Macintosh versions of WordPerfect and Microsoft Word are NOT acceptable.
4. The entire manuscript should have 1" margins on all sides in Times 10-point font. Times New Roman or Century Schoolbook are both acceptable.
5. The entire manuscript must be typed LEFT-JUSTIFIED, with the exception of tables and figures.

TITLE PAGE AND ABSTRACT

1. The manuscript title should be printed in Times 11-point and in all capital letters and bold print.
2. Author(s) and affiliation(s) are to be printed in upper and lower case letters below the title. Author(s) is(are) to be listed with affiliation(s) only.
3. The abstract should be 100 words or less.

BODY OF MANUSCRIPT

1. Main headings are bolded and in all caps.
2. First level headings are upper/lower case and bolded.
3. Second level headings are upper/lower case.
4. The body is NOT indented, rather a full blank line is left between paragraphs.
5. A full blank line should be left between all headings and paragraphs.
6. Unnecessary hard returns should not be used at the end of each line.

TABLES AND FIGURES

1. ONLY Tables and Figures are to appear in camera-ready format!
2. All tables MUST be typed in WordPerfect table or Microsoft Word table functions. Tables should NOT be tabbed or spaced to align columns. Column headings should not be created in separate tables. Table titles should not be created as part of the table. All tables MUST be either 3 1/4 inches wide or 6 7/8 inches wide.

3. All figures MUST be saved in one of these formats: TIFF, CGM, or WPG.
4. Tables and figures are NOT to be included unless directly referred to in the body of the manuscript.
5. For accepted manuscripts, tables and figures must be included on the submitted disk and each should be printed on a separate page.
6. Placement of tables and figures in the manuscript should be indicated as follows:

Table or Figure About Here

EQUATIONS, CITATIONS, REFERENCES, ETC.

1. Equations are placed on a separate line with a blank line both above and below, and numbered in parentheses, flush right. Examples:

$$y = c + ax + bx \quad (1)$$

$$y = a + 1x + 2x + 3x + ax \quad (2)$$

2. References within the text should include the author's last name and year of publication enclosed in parentheses, e.g. (Cunningham 1993; Rakowski and Southern 1996). For more than one cite in the same location, references should be in chronological order, as above. For more than one cite in the same year, alphabetize by author name, such as (Grimm 1991; Farris 1992; Rakowski 1992; Gibson 1994). If practical, place the citation just ahead of a punctuation mark. If the author's name is used within the text sentence, just place the year of publication in parentheses, e.g., "According to Rakowski and Southern (1996)...". For multiple authors, use up to three names in the citation. With four or more authors, use the lead author and et al., (Mundy et al. 1994).
3. Footnotes may be used where necessary. Footnotes are in 8-point font and should appear at the bottom of the page using numbers (1, 2, etc.). Note: footnotes should be explanatory in nature if used, not for reference purposes.
4. All references should be in block style. Hanging indents are not to be used.
5. Appendices follow the body of the text but do not precede references.

6. The list of references cited in the manuscript should immediately follow the body of the text in alphabetized order, with the lead author's surname first and the year of publication following all author names. Work by the same author with the same year of publication should be distinguished by lower case letters after the date (e.g., 1996a). For author names that repeat, in the same order, in subsequent cites, substitute a .5 inch underline for each name that repeats. A blank line should separate each reference in the list. Do not number references.

7. All references to journals, books, etc. are *italicized*, NOT underlined. Examples are as follows:

Collison, Fredrick M. (1994), "Transpacific Air Service with Hong Kong: Characteristics and Issues," *Journal of Transportation Management*, 6(2):1-39.

Crum, Michael R. (1996), "On the Improvement of Carrier EDI Implementation Strategies," in *EDI Implementation in the Transportation Industry*, New York: Transportation Press, 387-404.

Johnson, James C. & Donald F. Wood (1996), *Contemporary Logistics*, 6th ed., Upper Saddle River, NJ: Prentice-Hall, Inc.

MANUSCRIPT SAMPLE

TEACHING LOGISTICS STUDENTS TO TAKE OWNERSHIP OF INFORMATION INFRASTRUCTURE DEVELOPMENT

Frank W. Davis, University of Tennessee
Kenneth J. Preissler, Logistics Insights Corporation

Logistics systems, developed gradually over the past decades, are undergoing necessary radical change in this era of increasing global competition. This article describes an approach taken by the authors to teach logistics students how to take ownership of designing their own information infrastructure and how to use it to make their organizations more flexible, providing more strategic options.

INTRODUCTION

Advances in information systems technology such as data base management systems, bar code scanning, telecommunications, and image processing have enabled logistics and information managers with vision to reengineer the way the firm conducts its business. The usage of mainframe computers, personal computers, and logistics information systems has been widely studied (Gustin 1989). These studies have universally concluded that there has been a rapid growth in the usage of computers and logistics information systems.

Computer Usage in the Classroom

The usage of computer applications in a logistics course has also been studied. Rao, Stenger and Wu stated that there are several approaches to integrating computers into the classroom in a business curriculum, each with its individual advantages and drawbacks (1992).

Table 1 about here

Systems Development In Practice

The study of the information systems development process of computer applications has been almost universally left up to the computer science, software engineering, and information systems educators and practitioners.

$$y = a + lx + ax \tag{1}$$

REFERENCES

- Collison, Fredrick M. (1994), "Transpacific Air Service with Hong Kong: Characteristics and Issues," *Journal of Transportation Management*, 6(2):1-39.
- Crum, Michael R. (1996), "On the Improvement of Carrier EDI Implementation Strategies," in *EDI Implementation in the Transportation Industry*, New York: Transportation Press, 387-404.
- Johnson, James C. & Donald F. Wood (1996), *Contemporary Logistics*, 6th ed., Upper Saddle River, NJ: Prentice-Hall, Inc.

Professional Certification Program in Transportation Management

Level 2 - Transportation Planning & Management

- Topics Covered in Two Three Day Blocks Include:
 - Managerial Roles
 - Trans. Partnerships/Alliances
 - Carrier Performance Measures
 - Trans. Activity Based Costing
 - Statistical Process Control
 - Trans. Value Creation
 - Trans. Data Analysis
 - Future Trans. Trends
- Faculty from multiple universities and major corporations

“The *ITRAN* course has something for everyone. It provides a comprehensive, baseline educational program focused exclusively on the transportation business. More people from our company will attend.”

- Tony Hilliard, Columbia Chemicals Corp.

The Institute of International Transportation & Logistics is endorsed by Delta Nu Alpha.
All DNA members receive a discount on admission to ITRAN sessions.

The next class is scheduled to begin *Oct. 10, 2000!*

For more information, contact the Logistics Foundation of America within the Georgia Freight Bureau:

ITRAN
229 Peachtree St. NE - Suite 401
Atlanta, Georgia 30303-1600
404-524-7777