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Delta Nu Alpha Transportation Fraternity

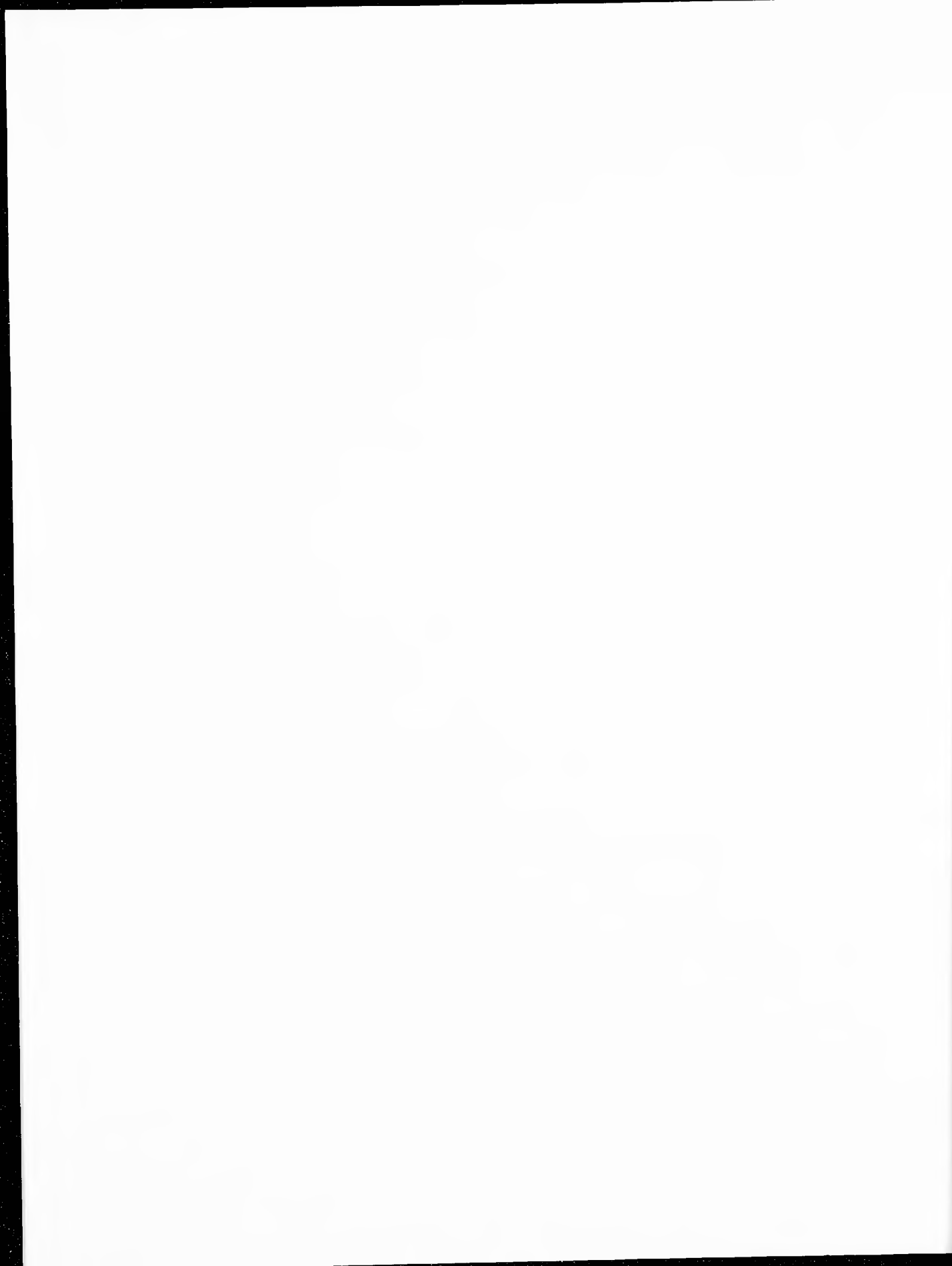


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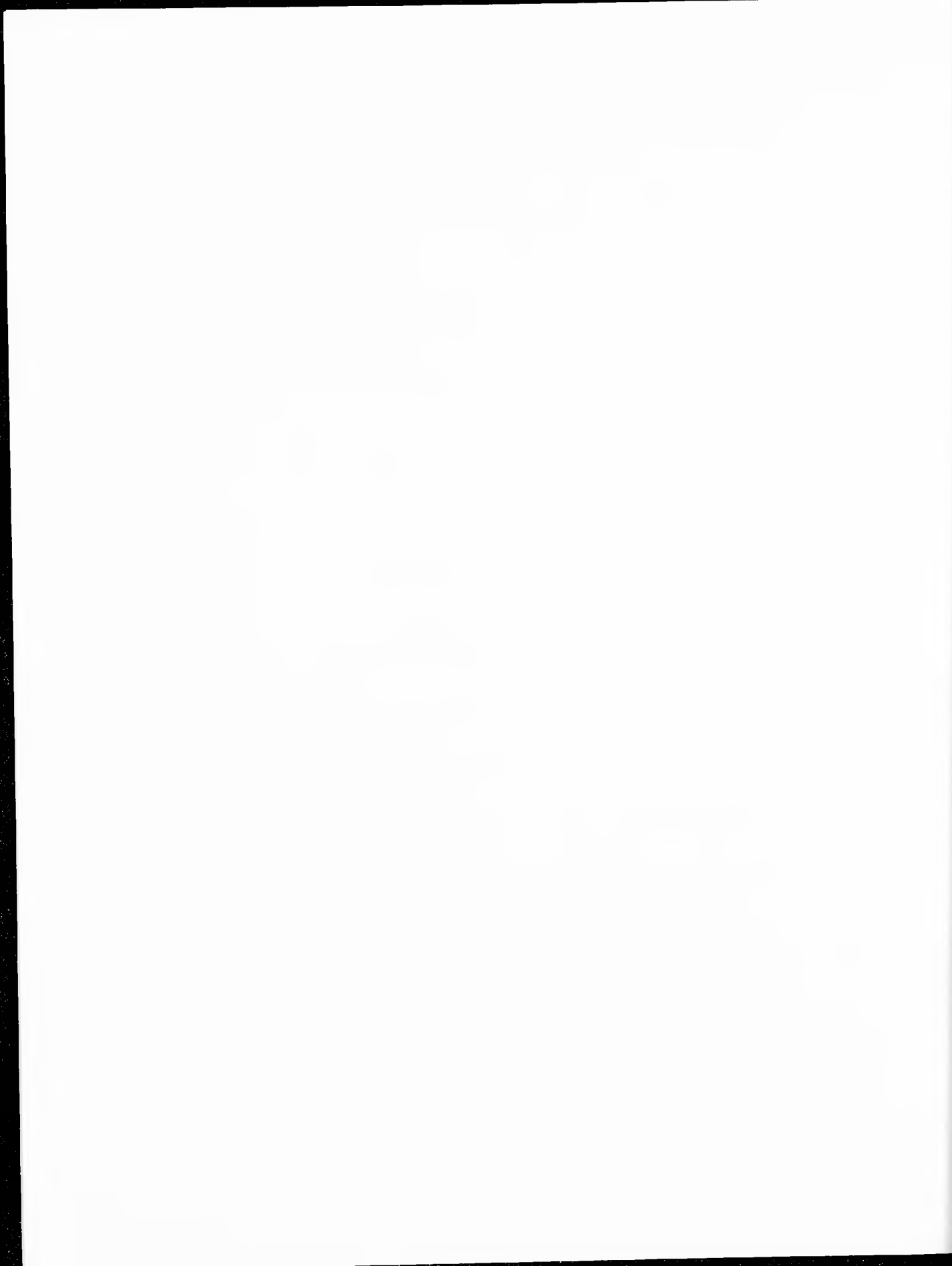
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Journal of Transportation Management

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 in 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. Additional manuscript information can be obtained by contacting the editor.

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.



From the Editor...

This issue of the *JTM* is the first under my total editorial control. I can say with complete candor that, had I known the extent of the labor involved, my enthusiasm in seeking the editor's position would have been greatly reduced! My respect for the previous editor, Mike Crum, has grown substantially in the past few months from an already high level. I thank Mike again for making the transition as smooth as possible and for mentoring me as I learn the true meaning of the title, "editor." Thanks also to Brian Gibson and Steve Rutner, my able associate editors, for their unflagging efforts and dedication. Without them, this issue would have made it to press—but next year!

This is the Spring, 1997 issue of the *Journal* and I am disappointed that you are receiving it this late in the year. However, there will be two issues this year with high quality articles and we are edging closer to a more timely production schedule.

In this issue, the subjects range from the impact of downsizing on performance and employees to the characteristics of international airfreight movement. The diversity of topics is not accidental. It is my intention to focus on subjects with broad appeal that have relevance to a diverse audience. Every reader should find value in every issue of the *Journal*.

Now on to the really exciting news. If you have not yet noticed, take a moment to look at the back cover of this issue. This is more than a reminder to attend the 15th annual International Intermodal EXPO in Dallas, May 6-8 of next year. The appearance of the EXPO logo on the cover signals the beginning of what I hope to be a very long-term relationship. Mr. John M. Youngbeck, Chief Executive Officer of the International Intermodal EXPO, recently announced that the EXPO will become a financial sponsor for the *Journal of Transportation Management* for a period of at least two years. The *JTM* will continue to be a publication of Delta Nu Alpha, under the sponsorship of the EXPO.

Just in case you are not aware of what a great value you're getting as a subscriber, the total cost of publishing the *Journal* far exceeds subscription revenue. Delta Nu Alpha has, since the first issue, heavily subsidized the publication of the *JTM*. With the new sponsorship agreement, the financial health of the publication is assured and future plans for expanding the publication to four issues can proceed. This type of support from industry, and from one of the largest industry trade organizations of its kind in the world,

underscores both the need for the *Journal* and the value of the *JTM* to this industry. Delta Nu Alpha is proud to welcome the International Intermodal EXPO as a financial sponsor and hopes for a long and mutually beneficial relationship. As the editor, I add my personal thank you to John Youngbeck for his vision, his dedication to logistics and transportation education, and for personally supporting this agreement. For all of you readers and DNA members, I ask you to support both the *JTM* and the EXPO by subscribing to the *Journal* and attending the 15th annual EXPO in Dallas at the Dallas Convention Center, May 6-8, 1998.

As I stated in my comments preceding the last issue, I am committed to the continued improvement of the *Journal* and to its recognition as an outstanding publication in the logistics and transportation industry. You can help me by subscribing, by sharing each issue with colleagues, by submitting quality articles dealing with timely topics, and by supporting both DNA and the EXPO.

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Edwin "Pete" Patton

Professor of Transportation and Logistics
The University of Tennessee

This issue of the *Journal of Transportation Management* is dedicated to the memory of Pete Patton, a leader in the field of logistics and transportation education for many years.

Pete's accomplishments are numerous. Anyone who had the pleasure of knowing him will attest to his love for teaching and for the industry he served. He could always find time to spend with someone eager to learn more about transportation. It is especially fitting that this issue of the *JTM* be dedicated to him, since he was a long-time member of Delta Nu Alpha and a past president of the fraternity. He was also very active in the AST&L and numerous railroad organizations.

As impressive as his industry accomplishments were, his real strength was as a teacher and mentor. He received the prestigious "Teacher of the year Award" given by the College of Business at the University of Tennessee. Over the years, he chaired and served on many Ph.D. committees. Pete's students will tell you that he always had the time to answer their questions and to listen to their views, regardless of the subject.

Pete was one of those rare professors that commanded respect not only for his knowledge and experience, but also for his studied opinion, passion, and genuine concern for his students. He set a high standard for all educators to emulate.

We extend our sympathies to the Patton family.



THE IMPACT OF DOWNSIZING ON LOGISTICS PERFORMANCE AND EMPLOYEES IN SHIPPER FIRMS

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Firms that downsize hope to achieve improvements in performance and to avoid adverse impacts on employees. This article compares the changes in logistics performance and logistics employee fulfillment for shippers that have downsized with those that have not. Two major conclusions of this research are: (1) Respondent firms that have downsized perceive that they have substantially improved their logistics performance, but no more so than respondent firms that have not downsized; and (2) Stress, morale, and loyalty have worsened for logistics employees in downsized respondent firms, both in an absolute sense and relative to respondent firms that have not downsized.

INTRODUCTION

The importance of downsizing on American life is evident from the coverage it has received of late in both the trade and popular business press (Blohowiak 1996; Bernstein 1997; Heller 1997). Downsizing is often the result or by-product of the application of total quality management (TQM) techniques, particularly process reengineering efforts. The primary objective of downsizing is to improve productivity through cost reduction (Chitwood 1997). The downside risk is the negative effect

it may have on the morale and loyalty of those employees who remain with the firm because it requires major changes for the firm's employees (Kets de Vries and Balasz 1997; Shaw and Power-Barrett 1997). For instance, downsizing may change the relationship between employees and their employers, the nature of the employees' work (e.g., job scope and design), and the expectations of the employees by their corporations (Dreilinger 1994). Thus, firms that downsize hope to achieve favorable changes in performance and to avoid the adverse impacts on their employees.

The purpose of this article is to provide an empirical investigation of the impact of downsizing on the logistics performance and logistics employees of shipper firms. It is organized in the following manner: first, background on downsizing in the logistics area is provided; second, research propositions are delineated; third, the research design is specified; fourth, the results are presented; and lastly, conclusions and implications are discussed.

DOWNSIZING IN LOGISTICS

The logistics functional area of business has experienced TQM and downsizing on a large-scale basis (Schott and Degnan 1996; Rheem 1997). Three fundamental reasons for this trend in logistics come to mind. First, the logistics area of business was a logical candidate for TQM and downsizing because of the economic deregulation of freight transportation. The highly regulated transportation environment was akin to full employment in these industries and provided for a very stabilized, relatively high paying, and steady work environment. Shippers also needed to employ a large number of workers to manage the transportation process. The freedoms granted by deregulation allowed both shippers and carriers to change their operations. When deregulation first occurred, there were indications of the forthcoming downsizing. One earlier study showed that responding transportation and logistics practitioners were experiencing downsizing and increased stress in their job environment. However, the survivors also thought that deregulation had improved the status and role of a career in transportation and distribution management (Jerman and Anderson 1989).

Second, the strong customer-orientation of quality programs in conjunction with logistics' key role in customer service makes the reengineering aspect of TQM a very good candidate for application to logistics. The logistics process is what connects customer expectations to the products or services they receive. It ensures, or fails to ensure, that

services meet or exceed customer expectations. Dependability, speed and accuracy are the major customer service dimensions of logistics. Reengineering, also known as process redesign, is a type of continuous improvement with the potential to dramatically improve the quality and speed of work and to reduce its costs by fundamentally changing the process by which work gets done. Redesigning the process usually entails changes in job design and work force requirements.

Finally, logistics is a very information-intensive set of activities or functions. The dramatic changes in information technology and the relative decrease in the cost of information (vis a vis inventory, transportation, storage, etc.) over the last decade or so have led many organizations to reengineer their logistics process to capitalize on the new information capabilities. Furthermore, these changes in information technology have greatly altered the nature of logistics employees' work and affected staffing requirements by making individual employees more productive.

In summary, changing the logistics process usually means an organizational restructuring of the logistics area with the movement being toward structural organizational compression. That is, logistics operations are being structured so they can perform required work better while using fewer human resources. The motivation for logistical structural compression starts with the changing role of the logistics functions and its key executives. In an environment characterized by restricted head count and intense asset control, logistics is emerging as an integral part of a firm's struggle to gain and maintain customer loyalty (Bowersox and Closs 1996).

RESEARCH PROPOSITIONS

As noted earlier, the primary purpose of this article is to investigate the effect of downsizing on logistics performance and logistics employees' fulfillment. Additionally, the effect of downsizing on logistics achievement outcomes is examined. The logistics performance factors considered are speed,

reliability, special services, and cost. They represent outcome measures of the internal logistics process. The components of employee fulfillment are stress, morale, company loyalty, and economic rewards. Logistics achievement outcomes reflect measures of logistics output and include logistics quality, customer satisfaction, and the financial contribution of logistics to the firm.

Three research propositions concerning logistics performance, employee fulfillment, and overall logistics achievement are evaluated. The first proposition is that the logistics performance factors will be perceived to have improved in the past five years in firms with downsized logistics personnel. A corollary proposition involves a comparison of downsized firms with those that have not downsized. We postulate that firms with downsized logistics will perceive a greater improvement in their performance factors than both firms with no change in logistics personnel and firms with increased logistics personnel (i.e., they will report greater increases or lesser decreases).

The second proposition is that logistics employee fulfillment will be perceived to have declined in the past five years in firms with downsized logistics personnel. Additionally, we postulate that employee fulfillment in the downsize group will have declined relative to that in both firms with no change in logistics personnel and firms with increased logistics personnel.

Lastly, we expect that overall logistics achievement will be perceived to have improved in the past five years in firms with downsized logistics personnel. Furthermore, we postulate that firms with downsized logistics will perceive greater improvements in overall logistics achievement than both firms with no change in logistics personnel and firms with increased logistics personnel.

RESEARCH DESIGN

The approach utilized in this study is to analyze the results of those firms that have downsized their logistics personnel and compare these results

with the results of those firms that have not downsized. Because logistics performance and employment fulfillment data (as well as data on size of logistics workforce) are not publicly available, a survey instrument was developed to generate the necessary data. The questionnaire was distributed to logistics managers to obtain their perceptions of their firms' performance and outcomes in the areas of interest. Sample selection, measures for the logistics performance and employee fulfillment factors, and method of analysis are discussed below.

The Sample

The directory of the American Society of Transportation and Logistics (AST&L) was used to generate the sample for this study. While both carriers and shippers have undergone downsizing, the focus of this study is on shipper firms. The main reason for not including both types of organizations in the study is that they have very different operating processes and, thus, utilize different performance measures. This makes it difficult to make meaningful comparisons on performance across the two groups. Consequently, only shipper members of AST&L were selected (i.e., carrier, consultant, and educator members were not included). The logistics personnel selected for the sample had job titles reflecting middle and senior management level responsibilities. All potential respondents were employees in separate firms. The questionnaire was a mailed computer disk, which provided computer-assisted interviewing, and eliminated potential questionnaire to data coding errors.

A total of 340 questionnaires were mailed, 100 were returned, and 88 were usable for a 26% effective response rate. The most frequent indicated job titles were Traffic Managers (29%), Director of Transportation (13%), and Vice-President (12%). In terms of level of job responsibility, the categories of senior, middle, and operations management were indicated by 25, 51 and 24 percent, respectively. Ninety-one percent of the respondents were male, the modal age category was 45 to 49 (31%), and ninety percent had at least one college degree.

Measures and Analysis

Three categories of change in logistics size were created from responses concerning changes in the number of non-supervisors and the number of managers in the logistics area in the past five years. In aggregate, 42 firms were found to have reduced logistics personnel, 19 firms had no net change, and 27 firms increased logistics personnel.

Performance changes were measured in the speed, reliability, special services, and cost performance factors over the past five years. Each factor included multiple measures. The logistics speed measurements were order processing time, order fill rate, transit time, and throughput time. Transit time dependability and shipment accuracy were the measured components of logistics reliability. The special services measured were the ability to meet unique needs and the ability to expedite orders. Inventory cost per SKU, storage and handling costs per SKU, and transportation costs per SKU were the measured elements of logistics cost. Overall logistics achievement was indicated by changes in the quality of logistics work, customer satisfaction with logistics, and the financial contribution of logistics to the firm. Employee fulfillment was measured from reported changes in stress, morale, company loyalty, and salary level for non-supervisory and managerial personnel.

Each of the performance, employee fulfillment, and overall achievement indicators were measured in reference to change in the past five years, using the response set of 1 = greatly decreased, 2 = decreased, 3 = no change, 4 = increased, and 5 = greatly increased. The propositions were evaluated by descriptive and statistical analysis. One-way analysis of variance (ANOVA) was employed in the pairwise statistical comparisons of mean scores on the performance, employee fulfillment, and overall achievement indicators. Separate variance estimate t-ratios were used if the test for variance homogeneity was rejected.

Pairwise statistical comparisons of average differences were made for the downsized firms with the stable and increase firms. (Though not related to the research propositions, comparisons between firms with stable employment and firms with increased employment are also provided for completeness of reporting.) The magnitude of the mean scores was also used in the assessments of the research propositions.

RESULTS

In general, the data suggest that reduction in logistics employees is related to the adoption of TQM and re-engineering programs. As Table 1 reports, TQM programs had been implemented in almost 80 percent of the downsize firms, and almost 70 percent of the downsize group reported implementation of a re-engineering program. Only 40 percent of the stable and increase firms reported TQM implementation, and just slightly more than one in five of these firms indicated that they had re-engineering programs. The remainder of this section addresses the research propositions. In discussing the results of the comparisons among groups, a p-value of 0.10 or less (i.e., the probability that the mean scores are different is 90 percent or greater) will be used to identify those variables for which the group averages are different.

Table 2 summarizes the reported averages for the 11 measured logistics performance variables and provides paired-comparisons of the mean responses among the three groups. The proposition that downsize firms will have experienced an increase in logistics performance over the last five years is generally supported. The mean scores for all 11 variables are above the scale midpoint. The ability to provide special logistics services and logistics reliability, in particular, increased substantially. Downsize firms, on average, also report a fairly strong improvement in three of the four speed factors.

TABLE 1
Percentage of Respondents with TQM Programs and
Re-Engineering Programs by Change in Logistics Personnel Performance

Change in Personnel	TQM Program	Re-Engineering Program
Downsize	78.6	69.1
Stable	36.8	21.1
Increase	40.7	22.2

Similarly, all but two of the 22 mean scores on the performance variables for the stable and increase firms are above the scale midpoint. These results reveal the perception of respondents that most aspects of their logistics performance are better today than five years ago.

The corollary propositions that downsize firms will report a greater increase in logistics performance than stable and increase firms is generally not supported. In the comparison with stable firms the

only performance factors with statistically significant different means are the two reliability measures and one special services measure, the ability to meet unique needs. For each of these factors the downsize group reports a larger improvement over the last five years. In the comparison with increase firms the only differences occur in the cost factor. The downsize firms indicate greater improvement than increase firms on all three cost measures (and the p-values are all less than 0.05).

TABLE 2
Change in Performance Factors over the Past Five Years

Performance Factors	<u>Personnel Change¹</u>			<u>p-value²</u>		
	Downsize	Stable	Increase	Downsize versus Stable	Downsize versus Increase	Stable versus Increase
Speed:						
Order Processing	3.67	3.74	3.52	8.37	.631	.594
Order Fill Rate	3.10	3.11	3.30	.972	.433	.539
Transit Time	3.95	3.74	3.96	.350	.959	.365
Throughput Time	3.69	3.26	3.41	.148	.281	.650
Reliability:						
Transit Time Dependability	3.88	3.37	3.51	.078	.161	.630
Shipment Accuracy	3.83	3.16	3.59	.014	.320	.140
Special Services:						
Ability to Meet Unique Needs	4.14	3.58	3.93	0.38	.366	.235
Ability to Expedite Orders	4.07	3.79	3.85	.294	.360	.830
Cost Per SKU:						
Inventory	3.57	3.31	3.00	.319	.014	.256
Storage & Handling	3.38	3.26	2.89	.645	.033	.179
Transportation	3.55	3.53	2.96	.938	.019	.062

¹Mean or average values on five-point scale where 1 = greatly decreased, 3 = no change, and 5 = greatly increased.

²p-value represents the probability that means are equal.

Employee Fulfillment

The second proposition stated that logistics employee fulfillment will be perceived to have declined in firms with downsized logistics. Table 3 includes the respondents' perceptions of changes in stress, morale, loyalty, and salary level over the last five years for two employee groups: managers and non-supervisors. The data generally suggest that employment fulfillment has declined over the last five years for both employee groups in the downsize firms. Stress levels are substantially higher for both groups and loyalty to the company has decreased somewhat for both.

The mean scores for the morale variable are near the scale midpoint, indicating no apparent change. The only positive change for employees is the increased salary level.

It should be noted that only the four mean scores on the stress variable (for both managers and non-supervisors) show a decrease in employee fulfillment for the stable and increase firms. The other eight mean scores are above the scale midpoint. Conversely, five of the eight mean scores for the downsize firms are on the "unfavorable" side of the scale midpoint.

TABLE 3
Change in Employee Fulfillment Factors over the Past Five Years

Employee Fulfillment Factors	<u>Personnel Change</u> ¹			Downsize versus Stable	<u>p-value</u> ²	
	Downsize	Stable	Increase		Downsize versus Increase	Stable versus Increase
Managers:						
Stress	4.43	4.05	4.30	0.76	.481	.286
Morale	3.07	3.26	3.48	.500	.108	.479
Loyalty	2.79	3.11	3.33	.209	.017	.407
Salary	3.52	3.79	3.89	.113	.022	.552
Non-Supervisors:						
Stress	4.05	3.58	3.81	.041	.251	.337
Morale	2.88	3.26	3.44	.199	.035	.572
Loyalty	2.79	3.37	3.07	.012	.158	.235
Salary	3.57	3.89	3.74	.037	.313	.354

¹Mean or average values on five-point scale where 1 = greatly decreased, 3 = no change, and 5 = greatly increased.

²p-value represents the probability that means are equal.

TABLE 4
Change in Logistics Achievement Factors over the Past Five Years

Logistics Achievement Factors	<u>Personnel Change</u> ¹			<u>p-value</u> ²		
	Downsize	Stable	Increase	Downsize versus Stable	Downsize versus Increase	Stable versus Increase
Logistics Quality	3.93	3.89	4.15	.883	.284	.286
Customer Satisfaction	3.90	3.58	3.96	.182	.788	.147
Financial Contribution	4.21	3.84	4.33	.088	.537	.038

¹Mean or average values on five-point scale where 1 = greatly decreased, 3 = no change, and 5 = greatly increased.

²p-value represents the probability that means are equal.

The corollary proposition that employee fulfillment in the downsize group will have declined relative to that in the two comparison groups is generally supported. The comparison of the downsize and stable groups indicates that the fulfillment of non-supervisory employees in downsize firms is perceived to have worsened significantly for three of the four factors. That is, stress increased more in the downsize group; loyalty decreased for downsize non-supervisory employees but increased for their counterparts in the stable group; and salaries increased more for the stable group. Interestingly, there are far fewer perceived differences in fulfillment for managers between the two groups. The only statistically significant difference is in the change in stress, with managers in the downsize group reporting a larger increase.

The comparison of the downsize and increase groups also supports the second proposition, but, unlike the previous comparison, most of the significant differences are for the managers rather than the non-supervisory employees.

Managers in the increase group perceive a greater increase in morale and salary level, and they perceive an increase in loyalty versus the decrease reported by the downsize respondents. The only statistically significant difference for non-

supervisory employees is on the morale variable—the downsize group indicates a slight decrease and the increase group perceives an increase.

Overall Achievement

The third proposition stated that overall logistics achievement will be perceived to have improved in firms with downsized logistics. The mean scores for the customer satisfaction, logistics quality, and financial contribution to the firm variables are given in Table 4. The magnitude of the scores provide support for the proposition of improved overall logistics achievement by downsize firms. Indeed, overall logistics achievement improved substantially on all measures for each of the three comparison groups.

The only significant difference between downsize firms and either of the other two comparison groups was the difference with stable-size firms on the financial contribution measure. The downsize firms perceive a greater improvement in the financial contribution of logistics to the firm than do the stable firms. Thus, the proposition that firms with downsized logistics will have higher overall logistics achievement than firms with no change in logistics personnel is generally not supported.

CONCLUSIONS AND IMPLICATIONS

This study utilized the perceptions of surveyed logistics managers about changes in logistics performance and employee fulfillment to test for statistically significant differences in outcomes between firms that had downsized their logistics workforce over the last five years and firms that had not downsized. Before drawing conclusions and implications from the study, a few caveats and limitations of the study should be noted.

Limitations of the Study

As is true with nearly all research on logistics performance, this study relies on self-reported, perceptual changes in performance over time and not on actual performance data. Logistics data are generally not provided in separate accounts in the financial and operating documents released by publicly held firms. A survey instrument that solicits actual performance data for a five year period would be very lengthy and time-consuming for potential respondents (i.e., likely to produce a low response rate).

In a similar vein, this study relies on the perceptions of managers about the stress, morale, and loyalty levels of their colleagues and subordinates. The ideal approach of surveying the employees in each respondent firm is not practical from a time or resource perspective. Thus, most research relies on the judgment and knowledge of representatives of the firm though there is potential for bias in their responses. Furthermore, due to the size of the sample, the respondents were not disaggregated on the basis of title or managerial position. That is, each respondent regardless of her or his position within the logistics management structure is assumed to perceive accurately the logistics performance and employee attitudes of her or his firm.

A final caveat pertains to the firms targeted by the study. The sample firms are not necessarily representative of all shippers. Indeed, it is often argued that firms belonging to leading professional organizations tend to be more progressive or advanced. Regardless, the experiences and

perceptions of these firms provide useful insights for those working in the logistics field.

Conclusions and Implications

The two major conclusions of this research are:

(1) Respondent firms that have downsized their logistics workforce perceive that they have substantially improved their logistics performance, but no more so than respondent firms that have not downsized; and

(2) Stress, morale, and loyalty have worsened for logistics employees over the last five years in respondent firms that have downsized, both in an absolute sense and relative to employees in respondent firms that have not downsized.

It appears, thus, that respondent firms have not been able to avoid the adverse effects of downsizing, and their performance improvements, particularly in the key outcome areas of quality, customer satisfaction, and financial contribution, have not exceeded those of non-downsizing respondent firms. Surprisingly, given that cost savings are often cited as a major reason for downsizing, stable-size respondents perceived similar cost improvements over the past five years as did downsize respondents. It should be noted, however, that downsize respondents do perceive better cost performance changes than do increase-size respondents while there are no differences in their perceptions of changes in any of the eight other performance factors or the three overall achievement factors.

The decrease in logistics employee morale and loyalty poses a daunting but important challenge for the downsize firms. The increasing role of logistics in customer service has already been noted. Employee involvement is critical to the successful creation of customer satisfaction. Indeed, TQM stresses internal customers, i.e., employees, as much as external customers. Many TQM practices are intended to enhance the feeling of employee "ownership" of the process and outcomes, particularly with respect to outcomes affecting the external customers. Two recent

empirical studies of how logistics creates customer satisfaction provide further evidence of the vital role of employees.

A comprehensive study of the logistics improvement process was conducted by the consulting firm A.T. Kearney in 1991. Based on a survey of more than 400 U.S. companies and 57 interviews with leading companies in quality and productivity improvement, the study identified four major characteristics shared by successful firms in the creation of customer value. One of these was employee ownership of improvement. Suggested practices to facilitate employee ownership included training, team approaches, reward and recognition (Byrne and Markham 1991).

A more recent project involved a survey of nearly 3700 firms from 11 countries in North America, Europe, and the Pacific Basin and interviews with 111 firms to identify world class logistical practices. The researchers proposed a Logistics

Competency Model comprised of four competencies: Positioning, Integration, Agility, and Measurement. Positioning encompassed several employee components including empowerment, learning, and teaming (The Global Logistics Research Team at Michigan State University 1995).

The failure to involve employees in the decision making process, to share the pain between top management and the employees, and to carry out downsizing activities in the context of a careful and far-reaching strategic review are part of the reason why downsizing so often fails to yield the returns expected from it (Evans, Gunz and Jalland 1996). Though their logistics performance appears not to have suffered to date, the downsize respondent firms can ill afford to ignore the adverse effects downsizing has had on their employees. It is very difficult for any firm with unhappy and unsatisfied logistics employees to maintain or improve its customer service over the long term.

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THE JONES ACT: IT IS TIME FOR REFORM

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The Jones Act was passed in 1920 as an amendment to the Merchant Marine Act. Its initial purpose was to protect a rail monopoly operating between the state of Washington and the territory of Alaska. It restricted transportation between U.S. ports to U.S. built, owned, registered and crewed vessels. Over the past 77 years it has become very controversial. This paper examines its costs and benefits and concludes that the Jones Act is indeed in need of major reform.

INTRODUCTION

The Jones Act of 1920 set aside domestic trade for US-built, US-flagged and U.S. crewed ships. The primary purpose of the Jones Act was to ensure the United States would have an adequate merchant marine fleet available during national emergencies. Over the past 77 years there have been many significant changes affecting U.S. defense sealift needs and capabilities.

Today, there is serious debate in Washington as well as several state capitals regarding the current benefits and costs of the Jones Act. The two primary debate topics focus on the increased costs of goods in Hawaii, Alaska, Guam and Puerto Rico and the current national defense benefits of the Jones Act. The purpose of this paper is to examine these two primary issues to determine if it is time to reform or eliminate the Jones Act. To address this central question the paper reviews the background of the Jones Act, then analyses the impact the Jones Act has had on military sealift capability and finally examines the economic effects of the Jones Act.

HISTORICAL BACKGROUND

According to Wood and Johnson (1996) cabotage is a set of laws which restrict commerce between a nation's port to carriers of that nation. It is one of the primary ways in which a nation can protect domestic transportation industries.

Cabotage was officially established in the United States under the Jones Act of the Merchant Marine Act of 1920. Its beginning, however, can be traced back to the eighteenth century.

In the late 1700's, the government of the United States began protecting US coastal trade indirectly. Acts passed in 1789 and 1790 levied discriminatory duties and port tonnage taxes on foreign-built ships engaged in U.S. coastal trades. In 1817, these acts were replaced by legislation that preserved US coastal shipping for domestically-flagged ships only. As new trade routes were developed to U.S. possessions and territories such as Puerto Rico, Hawaii, Alaska, and the Philippines, they were included under this rule. During World War II, U.S. cabotage restrictions were temporarily lifted as

the merchant marine became fully engaged in wartime missions.

The major piece of legislation that formally stated the U.S. position on coastal trade protection was the Jones Act of the Merchant Marine Act of 1920. It stated in part:

That no merchandise shall be transported by water, or by land and water on penalty of forfeiture thereof, between points in the United States, included Districts, Territories, and possessions thereof embraced within the coastwise laws, either directly or via a foreign port, or for any part of the transportation, in any other vessel than a vessel *built in and documented under the laws of the United States* (Whitehurst, 1985).

Over the years, there have been some exceptions to the Jones Act. The Philippines and the Virgin Islands were both given exemptions. This became irrelevant for the Philippines when they gained independence in 1946. However, the Virgin Islands exemption still stands today. The original exemptions allowed goods to be transported by foreign-flagged ships if that was necessary to ensure adequate shipping service. In 1936, an amendment to the Jones Act was passed which granted the U.S. Virgin Islands complete exemption from U.S. cabotage laws unless decided otherwise by the President of the United States.

Section 27 of the Jones Act provides for other exemptions. The primary one is that, "vessels of foreign registry may transport between US ports empty cargo vans, shipping tanks, or barges designed for carriage aboard ship and associated equipment used in the vessel's foreign trade" (Whitehurst, 1985). Section 27 also provides for the transfer of goods from one non-self-propelled barge to another, in the contiguous states. In addition, ships built with construction differential subsidies are not allowed to compete in the coastal trades. Occasionally, waivers

have been granted when no Jones Act ship was available. These waivers have almost entirely been for the transport of crude oil from Alaska to the lower forty-eight states.

Although some argue that the Jones Act has been effective and continues to be necessary for our national defense, not everyone agrees. A coalition for Jones Act Reform has been formed in Washington, DC. This reform group proposes significant changes to this long-standing law. The next section reviews the impact of the Jones Act on American labor, ships, and shipbuilding relative to defense needs and economic soundness.

LABOR

Over the years, the protection provided by the Jones Act and earlier laws allowed the wages of the American sailors to rise much more rapidly than those of foreign crews. The effect of these high labor costs on jobs is one area under fire in the debate over Jones Act reform.

The Jones Act, according to industry analyst Alan Abrams, has helped save jobs for American workers in the shipping industry (1991). In 1983, there were approximately 160,000 workers in private US shipyards. Of those, 10,000 workers could directly attribute their jobs to the protectionism provided by the Jones Act. Unfortunately, the jobs saved by the Jones Act may have cost others their jobs in the U.S. shipping industry. By the end of 1995 more than 60 US shipyards had been shut down eliminating an estimated 200,000 U.S. jobs. In addition, 40,000 merchant marines and 40,000 U.S. longshoremen have lost their jobs, despite Jones Act "protection" (Collins, 1996). Today, there is a notable lack of US-flag, US-crewed vessels engaged in carrying U.S. trade. A large part of this is due to the enormous discrepancies in wages and working conditions between US ships and foreign-flag vessels registered in countries with fewer regulations. Vessels from countries like Bangladesh, the Philippines, and Eastern Europe have comparatively lower crew costs because they pay much lower wages and few, if any, benefits. A 1983 study conducted by

the U.S. Congressional Budget Office found that U.S. crew costs were on average, 2.5 times higher than those of European crews and over six times higher than those of Third World Countries (Whitehurst, 1985). Primarily because of these very high crew costs, U.S. ship owners have increasingly registered their ships in so called flag of convenience nations like Panama, Liberia, Honduras and the Marshall Islands so they can use much cheaper foreign crews. In addition, the U.S. International Trade Commission recently concluded that the Jones Act has cost thousands of jobs across agriculture, metals, forestry, manufacturing and petroleum sectors of the U.S. economy (Collins, 1996).

In testimony to the House subcommittee on Transportation and Infrastructure in June 1996, the President of the U.S. Steel Manufacturers Association, James Collins, argued for reform of the Jones Act. According to his testimony, the Jones Act restrictions are putting U.S. steel makers at a distinct disadvantage with respect to their foreign competitors who are free to use the full range of transportation options. Included in his testimony are the following specific examples:

- ◆ it's more expensive to ship scrap metal from the Port of New York-New Jersey (NYNJ) to the U.S. Gulf Coast than it is to ship it from NY-NJ to any Asian port.
- ◆ Venezuela has become the leading supplier of steel products in Puerto Rico because of the excessively high cost of shipping steel under the Jones Act.
- ◆ Some U.S. steel producers can not ship to potential domestic markets at any price because the Jones Act ships are not available (1996).

SHIPS

The preamble to the Merchant Marine Act of 1920 states in part:

That it is necessary for the national defense and for the proper growth of its foreign and domestic commerce that the United States shall have a merchant marine of the best equipped and most suitable types of vessels sufficient to carry the greater portion of its commerce and serve as a naval or military auxiliary in time of war or national emergency, ultimately to be owned and operated by citizens of the United States (Whitehurst, 1985)

The question that has been raised is whether or not the Jones Act has been effective in its goal of sustaining such a fleet.

Long-time maritime journalist Robert Quartel claims the Jones Act is actually responsible for driving most U.S. ships out of business. Although the U.S. has an extensive system of deep water and inland ports, it has almost no ships. While not a single coastal freighter operates on its nearly 2,000 mile-long East-Coast, thousands of coastal freighters ply the waters of Europe and the Pacific Rim (Quartel, 1991). In 1830, American vessels carried 90 percent of the nation's trade; by 1980, they carried less than 10 percent and this number continues to decrease (Whitehurst, 1985). After World War II, there were approximately 2,500 privately owned vessels of more than 100 tons displacement. According to the trade journal *Feedstuffs*, currently there are only 128 and of those, only 33 carry dry bulk cargo (1995). The rest are liquid carriers. There are no US-flag bulkers at all operating on the Great Lakes. The number of US-flag ships are declining and the military usefulness of the ones that remain are questionable.

In 1984, the Jones Act fleet included 198 active merchant vessels. However, according to Whitehurst, a senior transportation research fellow at the Strom Thurmond Institute,

In 1985 the US-flag merchant marine was only marginally capable of supporting US forces in Europe if war

should come to that continent and could not simultaneously support a NATO effort and one or more contingencies in other parts of the world (1985).

This was evidenced in the Persian Gulf War in 1991 where only 10 percent of the ships specifically subsidized for the national defense actually entered the war zone (Shorrock, 1993). In fact, the Jones Act had to be temporarily suspended during the Persian Gulf war because it was impeding the transportation of fuel products to the Gulf.

SHIPBUILDING

The preamble to the Merchant Marine Act of 1920 also states that it is the policy of the United States to do whatever may be necessary to develop and ensure the maintenance of citizen-owned and operated merchant marine. It is debatable whether the Jones Act has achieved its goal of being able to maintain this fleet and if this objective is being pursued in the most effective manner.

In the past, Jones Act ships have been responsible for keeping a number of U.S. shipyards from going out of business (Feedstuffs, 1995). In the 30 years from 1953 to 1983, over 300 vessels were constructed for the Jones Act trades (Whitehurst, 1985). From 1970 through 1985, Jones Act ships accounted for 100% of the commercial ships built in American shipyards. This represents a notable investment in American shipping. The major justification for the extensive federal investment in U.S. shipyards has been to provide the construction and maintenance capability necessary to build, modify and maintain both naval warships and U.S. flag cargo ships. There's little doubt this capability is essential to the foreign policy of the U.S. In 1984 and 1985, this investment totaled almost one billion dollars (Whitehurst, 1985). In the past, the Jones Act had a significant influence on keeping American shipyards alive and able to serve national defense needs. Military shipbuilding alone could not have accomplished this. However, as pointed out in the previous section, the Jones Act has not been

effective at stopping the significant decline in U.S. shipyard jobs or U.S. merchant seamen jobs. More recently, the Maritime Security Act of 1996 has eliminated an old requirement (dating from 1936) that ships receiving operating subsidies must be US-built.

While it is clear that shipyards must be maintained for the national defense, how many shipyards are actually needed and whether a sufficient defense base could be maintained without the Jones Act are questions now being debated. While Section 27 of the Jones Act granted a monopoly to the shipyards on construction of ships for domestic trade, it left construction for the international trade open to foreign competition. Since the cost of building a merchant ship in the U.S. is about three times that of building in Japan or Korea, domestic construction for foreign-trade merchant fleets has been virtually non-existent for the past 30 years. However, the Alabama Shipyard (a subsidiary of Atlantic Marine Corporation) recently announced it will build four 1,432-TEU containerships in the U.S. for the China Ocean Shipping Co. It should be noted this exception was based on a 1994 rule change making Title XI loan guarantees from the U.S. Marine Administration available to non-U.S. companies (COSCO, 1997). Title XI of the Merchant Marine Act of 1936 established government-backed loans to encourage U.S. companies to build their ships in U.S. shipyards just prior to the outbreak of WWII. This provision while initially very effective has not stimulated ship operators to build foreign-trade ships in U.S. shipyards for several years.

According to a report in the March issue of the *American Shipper* (1997), this \$157 million deal was financed by a \$138 million Title XI loan guarantee backed by the U.S. government. Whether this signals a long-term commitment to promote U.S. shipyards or a one-time political decision remains to be seen. The question remains then, if U.S. shipyards are unable to compete on the international market, are we taking the most effective or efficient route to maintaining our shipyards for national defense?

THE COST OF THE JONES ACT TO AMERICAN CONSUMERS

The US Built Requirement

Since 1920, the Jones Act has greatly affected millions of American consumers and hundreds of American businesses. In 1990, the International Trade Commission studied the costs of the Jones Act to American consumers and found that the Act costs consumers an additional \$10.4 billion per year (Quartel, 1991). This cost estimate is derived from the high prices that must be paid to transport goods on U.S. ships relative to the average prices paid for foreign-flag shipping. The Jones Act requires that the ships used in domestic trade be crewed by US citizens and be built in US shipyards. Many feel that the Jones Act is a barrier to competition and that U.S. Flag domestic carriers pay too much for vessels, because they must operate in a restricted market with restricted resale capacity.

Today, the U.S. is 26th in the world in merchant shipbuilding, with a mere 0.2% of the world's gross tonnage. Between 1980 and 1987, despite the Jones Act's so called protection, 60 US shipyards closed! The last order for a major Jones Act vessel was in 1987 for the *R.J. Pfeiffer*, built for Matson Navigation. The ship was estimated to cost over \$150 million, or nearly 2.5 times the world price. (The Jones Act, 1996).

Supporter's Views

There are some people who feel very differently about the Jones Act. An article entitled, "Dismantle the Jones Act", by Joey Farrell (1991), President of American Waterway Operators, argues that the Jones Act provides the U.S. with working shipyards and crews to man their ships. The author believes the Jones Act's survival is crucial to the survival of the U.S. economy. However, Farrell overlooks the cost issue and says that U.S. shipyard jobs are more important than the high consumer prices. He is not the only supporter of the Jones Act.

The maritime unions that man the ships and supply labor to the shipyards are also strong supporters of the act. Farrell feels that The Jones Act is the only U.S. maritime promotional statute that has worked. He feels that if we didn't have the Act we would have foreign vessels crewed by foreign nationals taking over the domestic trade of the United States. However, opponents to the Act have proposed reforms that would help to preserve U.S. jobs and shipyards.

National Defense

Following the Persian Gulf War, the Clinton Administration studied the effectiveness of the Jones Act in providing ships for national defense. A commission headed by Vice-President Gore found that only 10% of the US-flag ships "specifically subsidized for the purposes of national defense" entered the war zone during the Persian Gulf war (Shorrock, 1995). Quartel maintains that only one Jones Act ship was part of the Persian Gulf deployment, and it was a roll-on, roll-off vessel. He and many other respected maritime observers believe that the Jones Act fleet was simply not of the right type for use in the rapid sealift deployment required in Operation Desert Storm (Quartel, 1991). It seems clear that the main objective of the Jones Act is not being achieved. This certainly supports the view that the Jones Act is outdated and should be reformed.

Alaska and Hawaii

Alaska's and Hawaii's consumers must bear significantly higher costs for goods than their mainland counterparts as a result of the Jones Act.

Studies have estimated the cost of the Jones Act to Alaskans to range from \$269 million to as high as \$674 million per year. This equates to an annual penalty on every Alaskan household of between \$1921 and \$4821 (The Jones Act, 1996).

These are very high costs that captive consumers must bear. Alaska and Hawaii have been fighting the Jones Act reform battle for years by trying to get a waiver to the Jones Act. The costs imposed on consumers in Alaska may be even higher than the above figures show. The Governor of Alaska reported that independent consultants have estimated the costs to Alaskans imposed by the Act to be as high as \$800 million annually. It is evident that Alaska and Hawaii must pay higher costs because of the Jones Act. There is little doubt that consumer goods of all kinds would be cheaper in these states if shippers were free to use foreign-flag as well as US-flag vessels. This reason has led supporters of the Jones Act reform to form a special interest group called the Jones Act Reform coalition.

THE JONES ACT REFORM COALITION AND THE COASTAL SHIPPING COMPETITION ACT

The Jones Act Reform Coalition, according to its Internet web site (www.lexitech.com/jarc), is an 860,000 member group of diverse private and public sector organizations. These organizations include chemical fertilizer and steel manufacturers, agriculture, livestock, and forestry companies, ports, independent vessel owners and operators as well as consumer and other advocacy groups. The president is the former maritime journalist, Robert Quartel.

The Coalition, founded in 1995, has been successful in lobbying Congress to introduce Jones Act reform legislation. The Bill, known as the Coastal Shipping Competition Act, would remove (among other things) the Jones Act restriction that U.S. deepwater domestic shipping (U.S. domestic coastal trade would be redefined to include all waters accessible by ocean-going vessels, including the Great Lakes and the St. Lawrence Seaway) be limited to U.S.-built, owned, flagged and crewed vessels (Martell, 1997).

Passage of this bill would significantly change the regulatory controls enacted 77 years ago and undoubtedly change the transportation industry.

It's difficult to say what specific changes might occur, but there's a strong chance U.S. coastal shipping would reemerge as a transportation industry segment and a competitor of rail transportation.

The Jones Act Reform Coalition predicts that this new legislation would improve U.S. national security by increasing the number of vessels and deepwater-qualified seamen available to the Department of Defense in time of national emergencies. The bill is currently being discussed in both the Senate and the House of Representatives.

CONCLUSION

Based on the foregoing analysis, it appears that the Jones Act has outlived its purpose. Its contribution to military sealift is now minimal and it artificially inflates the cost of goods for millions of American consumers. The 77-year-old law protects very few U.S. flag carriers from foreign-flag competition while distorting domestic waterborne transportation markets. It has also undermined the world-wide competitiveness of some important U.S. industries, most notably the steel industry. In short, the overall negative impact the Jones Act continues to make on the U.S. economy appears to be much greater than the small benefits it may still provide. It is time to reform the Jones Act as Congress is currently considering.

For years, the U.S. Steel Manufacturers Association, Alaska, Hawaii, the Jones Act Reform Coalition, and many independent organizations have been fighting to gain enough support to reform the Act. There have been many concrete reform proposals. The proposed Coastal Shipping Competition Act would eliminate the U.S. ownership requirements in exchange for a requirement that foreign-flag ships conform with U.S. environmental regulations, immigration laws, and work force health and safety regulations. The Bill also would require foreign-flagged ships to be registered as U.S. corporations, and pay U.S. taxes.

Supporters of the reform movement claim with reform would come more jobs for American merchant seamen because the amount of intracoastal shipping would increase if cheaper foreign-built ships were permitted to compete. They believe ships would start competing with trucking and rail and this would in turn reduce shipment costs and bolster the U.S. sealift mobility base. This assessment is based on a reform bill provision which requires domestic trade ships to be manned by Americans or green card holders. Of course, not everyone agrees with this scenario.

Several key congressmen, including Senate majority leader Lott, and Admiral Herberger, chief of the U.S. Maritime Administration,

believe U.S. national defense would be weakened if the Jones Act were reformed. While they don't dispute the view that shipment costs would decrease, Senator Lott and Admiral Herberger believe U.S. seafaring jobs would be lost to foreign-flag shipping.

The debate now being waged in Congress seems to focus on the issue of the value of the Jones Act to U.S. national defense. While it is understandable that military officials would rather have complete control of all resources that might be needed in a national emergency, the facts suggest there is a more cost effective way to accomplish this purpose. It is time to reform the Jones Act by enacting the Coastal Shipping Competition Bill.

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EXAMINING INTERNATIONAL FREIGHT FORWARDER SERVICES: THE PERSPECTIVES OF CURRENT PROVIDERS AND USERS

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The service quality literature indicates a variety of gaps between expected and perceived quality, and that service quality is a key determinant of customer satisfaction. As such, the present paper examines international freight forwarders (IFFs) and IFF customers with respect to various services which might be provided by IFFs; the paper also reports on user satisfaction with their IFFs. The study results identified several mismatches between what the forwarders are currently providing and what services the users view as important. In addition, the satisfaction ratings suggest that forwarders' performance has room for improvement.

INTRODUCTION

International freight forwarders (IFFs) are key specialists in cross-border trade. They can provide a variety of services, and are used by the great majority of companies engaged in international commerce (Johnson and Wood, 1996). Despite the important role of IFFs in efficient cross-border trade, there is relatively limited empirical information about them.

The literature has suggested (Pope and Thomchick, 1985; Murphy, Daley, and Dalenberg, 1992a) that IFFs are small companies, often employing fewer than 10 people. IFFs are becoming more diversified in their customer offerings; many contemporary IFFs provide forwarding services for both air and water shipments, and a number also

provide such multiple intermediary services as non-vessel operating common carrier service and customhouse brokerage (Murphy and Daley, 1995).

Moreover, the rapidly changing global business environment has had important implications for the forwarding industry. More specifically, the forwarding industry has been characterized by tremendous volatility over the past decade (Ozsomer, Mitri and Cavusgil, 1993), as manifested in various acquisitions, consolidations, and bankruptcies. This volatility has led some to question the continued viability of smaller forwarders. Consider the following statement from the president of a smaller IFF (Gillis, 1996): "I'm a firm believer that the smaller forwarder and broker will be extinct by 2000."

One of the key aspects in the future viability of individual IFFs is how well they can meet the needs and wants of current and future customers. While this philosophy essentially represents the **marketing concept**, providers of logistics services have not always embraced the notion of satisfying customer needs and wants, in part because logistics service providers have sometimes used a very narrow definition of "customer". As an example, international water ports (Murphy, Daley, and Dalenberg, 1992b) have appeared to understand the requirements of water carriers—traditionally considered to be the ports' primary customers—with respect to key factors in water port selection, but are not so well aligned with other customer groups such as shippers and international freight forwarders.

Furthermore, although the marketing concept stresses that service providers should satisfy customer needs and wants, the service quality research has identified a variety of gaps (Parasuraman, Zeithaml, and Berry 1985) between expected and perceived service quality, and that service quality is a key determinant of customer satisfaction. With this in mind, the present paper will examine IFFs and current users of IFFs with respect to various services which might be provided by IFFs. In so doing, the paper seeks to identify possible gaps between the services actually provided by IFFs and the services IFF users would like provided. In addition, because customer satisfaction is a desired output of service quality, the paper will report on IFF users perceived satisfaction with the general performance of the IFFs used by their respective companies.

METHODOLOGY AND PARTICIPANT PROFILES

The IFF information comes from a mail survey sent to IFFs identified in *The Official Directory of Transportation Middlemen* (now, *The Official Intermodal Guide*). Of 336 eligible IFFs, usable responses were received from 98, for an effective response rate of 29.2%. Nearly two thirds of the responding IFFs reported annual revenues of less than \$10 million, a finding consistent with

previous IFF research (Pope and Thomchick, 1985; Murphy, Daley, and Dalenberg, 1992a). Approximately 75% of the respondents classified themselves as a Vice President, President, CEO, or Owner. These senior-level managers should be quite familiar with the services provided by their companies.

The user information is drawn from a mail survey of 370 randomly selected members of the Council of Logistics Management (CLM). The CLM membership was sampled because the study objectives called for respondents who used IFFs and were likely to be knowledgeable about the variety of services IFFs can offer. Operationally, these requirements meant that responding organizations must be current users of IFFs, and would ideally be "heavy" users of IFFs. CLM members tend to be large firms, which is important because previous research by Murphy, Dalenberg, and Daley (1991) established that 1) most large firms engage in international trade, 2) most large firms use IFFs for their international shipments, and 3) about 70% of the cross-border shipments of large firms are arranged by IFFs. In short, we believed that sampling CLM members could provide a group of organizations who were not only current users of IFFs but heavy users as well.

A total of 71 responses from current IFF users were received, representing a 19.2% response rate. Significantly, a majority of these respondents utilize IFFs for at least 75% of their international shipments, and 75% have used IFFs for at least 10 years. Because a majority of the responding organizations are heavy users of IFFs and have a history of using IFFs, they should be familiar with the various services offered by IFFs.

The IFF respondents ("providers") and the CLM respondents ("users") do not represent a "matched pairs" sample, i.e., the users are not necessarily actual customers of the providers, nor are the providers necessarily being utilized by the user group. Ideally, an examination of "providers" and "users" would involve matched pairs, because their presence allows researchers to unequivocally identify agreements and

disagreements between the two parties, thus increasing the content validity of the study.

From a practical perspective, however, matched pairs research is extremely difficult to conduct, in part because of the difficulty of generating a matched pairs sample. Service providers, for example, are often reluctant to identify their customers; similarly, users of service providers are often reluctant to identify their suppliers.

Thus, while matched pairs would be desirable, studies involving non-matched pairs of service providers and users of service providers are common in logistics journals. In the carrier selection literature, for instance, there are at least six studies (Murphy, Daley, and Hall 1997) which compare both shipper and carrier perceptions of key factors in carrier selection. Significantly, *none* of these studies appear to have used matched pairs of shippers and carriers. As a result, the present's study's use of a non-matched pairs sample of service providers

and users of service providers is consistent with the logistics literature.

RESULTS

Services Offered

The IFF services to be evaluated, presented in Table 1, were drawn from numerous sources including textbooks, academic and practitioner articles, and interviews with both IFFs and IFF customers. The IFF respondents evaluated the various functions according to whether they "currently provide", "plan to provide", or "do not plan to provide" them. The results, presented in Table 2, indicate that the payment of freight charges, tracing and expediting shipments, and making routing recommendations are the most commonly provided services by IFFs. On the other hand, legal counseling, obtaining export licenses, and export packing are the least commonly provided services.

TABLE 1
SERVICES TO BE EVALUATED

Quote steamship rates
Obtain vessel space
Prepare commercial invoices
Obtain export licenses
Issue export declarations
Prepare certificates of origin
Obtain & prepare consular invoices
Compile ocean bills of lading
Compile air waybills
Obtain insurance
Pay freight charges
Obtain dock receipts
Present documents to the bank
Obtain port warehouse space
Trace and expedite shipments
Collect & submit money for shipments
Act as export consultant
Help shippers select terms of sale
Legal counseling
Export packing
Shipment consolidation
Make routing recommendations
Break bulk

Explanation for how ties were ranked: We summed the ranking positions of the tied items, and divided by the number of tied items. For example, "pay freight charges", "trace and expedite shipments", "make routing recommendations" emerge with a ranking of "2" = $[(1 + 2 + 3) = 6]$. $[6 / 3] = 2$.

Users of international freight forwarders were asked to indicate the importance of the various services along a scale from "very unimportant" to "very important". Their results, presented in Table 3, reveal four services rated either "important" or "very important" by at least 75% of the users--compiling air waybills; obtaining

vessel space; tracing and expediting shipments; compiling ocean bills of lading. On the other hand, legal counseling, export packing, and helping shippers to select terms of sale emerge as the least important IFF services.

Note that the IFFs provided information along a nominal measurement scale, while the IFF users information involved an ordinal scale. Furthermore, the IFFs offered information as to the actual provision of select functions, while the IFF users were asked to indicate the relative importance of the services. Because of these differences in measurement, care must be taken when comparing the two groups.

TABLE 2
SERVICES PROVIDED BY IFFS

Service	Percentage who currently provide	Rank
Pay freight charges	100.0	2
Trace and expedite shipments	100.0	2
Make routing recommendations	100.0	2
Issue export declarations	99.0	4.5
Prepare certificates of origin	99.0	4.5
Quote steamship rates	97.9	6.5
Obtain insurance	97.9	6.5
Obtain dock receipts	96.9	8.5
Compile ocean bills of lading	96.9	8.5
Obtain vessel space	94.9	10.5
Present documents to the bank	94.9	10.5
Act as export consultant	94.8	13
Obtain and prepare consular invoices	94.8	13
Compile air waybills	94.8	13
Collect and submit money for shipments	93.5	15
Break bulk	91.8	16
Help shippers select terms of sale	91.6	17
Shipment consolidation	89.6	18
Prepare commercial invoices	89.4	19
Obtain port warehouse space	88.4	20
Export packing	78.7	21
Obtain export licenses	70.5	22
Legal counseling	35.6	23

TABLE 3
USER IMPORTANCE OF IFF SERVICES

Service	Percentage indicating either "important" or "very important"	Rank
Compile air waybills	80.9	1
Obtain vessel space	80.0	2
Trace and expedite shipments	78.6	3
Compile ocean bills of lading	75.7	4
Obtain dock receipts	69.0	5
Act as export consultant	66.2	7
Act as export consultant	66.2	7
Make routing recommendations	66.2	7
Obtain and prepare consular invoices	64.8	9
Quote steamship rates	64.3	10
Shipment consolidation	59.2	11
Present documents to the bank	58.6	12
Pay freight charges	55.0	13
Prepare certificates of origin	50.1	14
Prepare commercial invoices	48.6	15
Collect and submit money for shipments	42.9	16.5
Break bulk	42.9	16.5
Obtain export licenses	39.4	18
Obtain port warehouse space	31.0	19
Obtain insurance	30.0	20
Help shippers select terms of sale	24.3	21
Export packing	22.5	22
Legal counseling	19.7	23

As a result, relative comparisons, using within-group rankings, were used to compare IFFs and IFF users. More specifically, the Spearman coefficient of rank correlation was used to compare the IFFs' within-group rankings to those of IFF users. The use of the *nonparametric* Spearman test is appropriate (Siegel 1956) when using nominal and/or ordinal data.

The within-group rankings for both groups of respondents are presented in Table 4; the

Spearman coefficient of .5853 is statistically significant at the .01 level. In other words, this finding rejects the hypothesis of independence between the IFF and IFF user rankings, and indicates a fairly high degree of similarity in the rankings. Indeed, Table 4's information suggests that there is a tendency for the IFFs' larger values (i.e., lower ranked items) to be paired with the IFF users' larger values (i.e., lower ranked items). For example, legal counseling is the 23rd (lowest) ranked service by both the IFFs and IFF users. Similarly, export

packing is ranked 21st by IFFs and 22nd by IFF users.

Despite the general ranking similarity between the two groups, Table 4's results indicate that there are several services with substantial (i.e., seven positions or more) ranking differences between the two groups of respondents. Three

of these services are ranked higher by IFFs, which suggests that they are providing services which are deemed as less important by IFF users. Alternatively, three of the services with the largest ranking discrepancies are ranked higher by IFF users, suggesting that IFFs are paying less attention to some services which appear to be important to their customers.

TABLE 4
COMPARISON OF IFFS AND USERS

Within group rankings

Service	IFFs	Users
Pay freight charges	2	13
Trace and expedite shipments	2	3
Make routing recommendations	2	7
Issue export declarations	4.5	7
Prepare certificates of origin	4.5	14
Quote steamship rates	6.5	10
Obtain insurance	6.5	20
Obtain dock receipts	8.5	5
Compile ocean bills of lading	8.5	2
Compile ocean bills of lading	10.5	4
Present documents to the bank	10.5	12
Act as export consultant	13	7
Obtain and prepare consular invoices	13	9
Compile air waybills	13	1
Collect and submit money for shipments	15	16.5
Break bulk	16	16.5
Help shippers select terms of sale	17	21
Shipment consolidation	18	11
Prepare commercial invoices	19	15
Obtain port warehouse space	20	19
Export packing	21	22
Obtain export licenses	22	18
Legal counseling	23	23

Spearman coefficient of rank correlation = .5853, significant at .01

Further analysis of several of the "substantial" ranking differences appearing in Table 4 reveals that **obtain insurance** tied for sixth among IFFs while ranking 20th among IFF users. This

service is provided by nearly 98% of the responding IFFs; it is regarded as either "important" or "very important" by only 30% of the IFF users, which suggests that many users

are not looking for IFFs to obtain insurance for them. Alternatively, the **compilation of air waybills** ranked first among IFF users, while only tying for the 13th most commonly provided service among IFFs--despite being provided by nearly 95% of them. These findings suggest that while IFFs, on a relative basis, are falling short of user desires with respect to air waybills, IFFs perform much stronger in absolute terms.

User Satisfaction

Because the dichotomies highlighted in the previous paragraph raise important questions about the *practical* (as opposed to *statistical*) significance of the information appearing in Tables 2-4, IFF users were asked to indicate their satisfaction with the general performance of their IFF providers. Part of the rationale for investigating user satisfaction is that service *performance* is not necessarily positively correlated with service *satisfaction*. With respect to the present study, if the IFF users express satisfaction with general IFF performance, then the observed service dichotomies may have minimal practical significance. If, on the other hand, the IFF users tend not to be satisfied, could one explanation be mismatches between the services which forwarders are providing and the services which users would like to be provided?

Thus, using a 0 (total dissatisfaction) to 100 (total satisfaction) scale, the IFF users provided information on the performance of their IFFs. The results are presented in Table 5, and indicate that the average satisfaction rating was nearly 78. Although no respondents assigned their forwarders a "0" rating, none assigned a rating of "100", either. Moreover, over 35% of the respondents assigned satisfaction ratings of less than 80; on the other hand, almost 30% of the users assigned satisfaction ratings of between 90 and 99.

The findings in Table 5 suggest that forwarders' performance has room for improvement, in part because customer expectations continue to increase through time; what was viewed as

acceptable performance five years ago might be totally unacceptable today. Consider, for example, the service expectations of 3M Corporation, where in the early 1980s, an acceptable service performance level (Schulz 1997) was 80%. Today, by contrast, their acceptable performance level is 99%!

TABLE 5
USERS' SATISFACTION WITH IFFS

Rating	Percent of respondents
0	0.0
1 - 9	4.2
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	4.2
60 - 69	6.2
70 - 79	20.8
80 - 89	35.4
90 - 99	29.2
100	0.0

0 = total dissatisfaction
100 = total satisfaction
Average rating = 77.94

Note: Approximately 1/3 of survey participants did not respond to this question.

With respect to the present study, the information in Table 2 indicates that 17 of the 23 possible services are currently provided by at least 90% of the IFFs; furthermore, 14 of the services are currently provided by 95% of the IFFs. Nevertheless, as pointed out above, none of the IFF users are completely satisfied with the forwarders used by their respective companies. In short, the satisfaction results suggest that *service performance does not equate to service satisfaction*, and that IFFs are failing to do some things which are desired by IFF users.

CONCLUSIONS AND IMPLICATIONS

The payment of freight charges, tracing and expediting shipments, and making routing recommendations are the services most commonly provided by international freight forwarders. IFF users view the compilation of air waybills, obtaining vessel space, tracing and expediting shipments, and the compilation of ocean bills of lading as the most services which can be provided by IFFs. A comparison of IFFs and IFF users suggests no statistically significant difference between the two groups' rankings on various services which can be provided by forwarders.

From a practical perspective, however, the present study discovered several mismatches between the services currently being provided by IFFs and the services that users desire. For example, nearly all the forwarders will **obtain insurance** for their customers; however, only 30% of IFF users view this service as either "important" or "very important". Such gaps in service quality may offer a partial explanation for the fact that none of the IFF users are totally satisfied with the performance of their forwarders, as well as why over 30% of the users assigned satisfaction ratings of less than 80.

These findings appear to have several managerial implications for the various parties. For one, the study highlights the potential value of examining service quality. Importantly, studies of service quality must include input from both service providers and users of service providers. Ideally, this input would be from a "matched pairs" sample, i.e., the users would be actual customers of the providers.

The study findings also suggest that managers must understand the difference between service

performance and service satisfaction. For example, even though most IFFs provide a great number of possible services, the average user satisfaction was less than 80 (out of a possible 100). And, since service satisfaction involved the degree to which services providers can meet or exceed customer expectations, IFFs would be well advised to learn about the needs and wants of their customers (rather than focusing on items which the forwarders believe to be important).

Moreover, the study's satisfaction ratings (0 = total dissatisfaction; 100 = total satisfaction) might be used as a diagnostic tool in evaluating the performance of individual forwarders. Forwarders achieving "unsatisfactory" ratings (the definition of "unsatisfactory" will be company-specific) could be encouraged to improve their performance; failure to do so within a specified time period could be cause for replacement.

Furthermore, customers are encouraged to prioritize the key services they expect their IFFs to provide--and to **clearly communicate** these expectations to their IFFs. Forwarders cannot be expected to automatically know their customers' preferences; if customers fail to communicate with their forwarders, then the forwarders are likely to provide services with which they are most comfortable, and/or most knowledgeable. As pointed out earlier, if service companies provide what their customers want/need, there is likely to be much less dissatisfaction from the customer. While this suggestion appears to be very basic, the basics, unfortunately, are frequently overlooked in many business situations. The failure of forwarders--small or large--to accomplish these basics could result in their being "extinct by 2000!"

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CHARACTERISTICS OF THE MARKET FOR INTERNATIONAL AIRFREIGHT IN INTERMODAL LOGISTICS

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Shipper insights and opinions regarding the characteristics of the market for international airfreight in intermodal logistics were explored in this study. The methodology utilized was focus group research. The findings suggest that shippers' intermodal airfreight decisions are driven by weight and time sensitivity; that the strength of an organization's information system, especially in relation to tracking and tracing capabilities, is *the* most important category of service; that shippers respond very positively to personalized service; and that shipper selection of integrators and/or freight forwarders is destination specific. The research confirms the increasing competitiveness of the intermodal logistics market and suggests that personalized customer service can be a major factor in achieving a competitive advantage.

INTRODUCTION

Reviews of the literature of transportation and logistics indicate clearly that efficiency in international intermodal logistics has become increasingly defined by the speed in which components and finished products are moved through the supply, fabrication, and distribution processes. Globalization, increased inventory carrying costs, just-in-time manufacturing, and corporate emphasis on supply chain and channel management have all contributed to a focus on *total* logistics/distribution costs and an to the emergence of air as a preferred mode of shipment for international dutiables. However, the characteristics of the market for international airfreight in intermodal logistics, as perceived by shippers, remain largely undefined in the professional literature. This article reports on the results of exploratory research seeking to define some of these characteristics.

Purpose of the Study

This study was an investigation of shipper insights and opinions regarding the characteristics of the market for international airfreight in intermodal logistics in the Western United States. The following questions were asked of participating shippers:

1. What shipment attributes or characteristics do you use most frequently to classify international shipments for movement by air?
2. What do you think are the most important services provided by integrated carriers and/or freight forwarders.
3. How are integrated carriers and freight forwarders meeting your service expectations?

4. What factors most influence your choice of a specific integrated carrier or freight forwarder?

Methodology

The primary methodology used in this study was the focus group interview. The preliminary interview guide was developed in a series of interviews with shippers, freight forwarders, and integrated carrier managers. The interview guide was pre-tested in San Jose, California in February, 1996. These pre-tests consisted of three one-on-one interviews of approximately 45 minutes each. The three participants in the test interviews met all criteria established for the recruiting of the focus group participants. The results of the test interviews were used in the finalization of the interview guide. The three test interviews were conducted by the author of this paper.

Four focus group sessions were held, two in Seattle (February, 1996) and two in Los Angeles (March, 1996). Five to seven participants were recruited for each session. The author was the focus group moderator for all the sessions. All focus group participants met the following criteria:

1. Were traffic managers or shipping managers that control U.S. outbound freight decision making;
2. Considered themselves "knowledgeable" about international intermodal logistics;
3. Were experienced with a mix of international dutiable shipments of various weights;
4. Had made a minimum of five international dutiable shipments per month of 1-20 pounds, five of 20-100 pounds, and at least five shipments over 100 pounds;
5. Were employed by companies that spent a minimum of \$2,000 per month for international dutiable shipments;

6. Had not participated in a shipping related focus group in the past year.

RESULTS, SEATTLE FOCUS GROUPS

Market Classifications

In Seattle, participants were asked how they classify dutiable international air shipments. The categories that emerged in the discussions included weight, size, value, destinations, and time sensitivity. The two variables that shippers utilize most frequently in classifying shipments for international airfreight were identified as: (1) weight and (2) time sensitivity.

Participants quickly classified shipments into small, medium, and large weight categories. For these participants, small shipments were those that weighed less than 16 pounds, medium shipments were those that had an average weight of approximately 70 pounds, and large shipments were considered to be anything over 100 pounds (113 pound average). Almost 46% of all shipments made by the participants were in the small category, 32% were in the medium category, and about 22% were large shipments weighing over 100 pounds.

Emergency shipments were those that reflected intense time sensitivity. These shipments frequently reflected customer emergencies or deadlines imposed by higher management. Words like "fire", "crisis," or "red alert" were used to describe the conditions of these shipments. Non-emergency shipments were the participants' routine air shipments. Here time remained an important factor, but there was more flexibility in delivery deadlines and there was no crisis atmosphere surrounding the shipment.

Participants noted that approximately 30% of their shipments moved under an emergency status and 70% were non-emergency shipments. The percentage of emergency shipments ranged from a low of 5% to a high of almost 70%

Six shipment segments were identified and a preliminary market share estimate was computed by multiplying the percentage of total

shipments in corresponding weight and time sensitivity classifications. Table 1 (below) presents the results of these conclusions.

TABLE 1
Mid-Share Estimates by Weight and Time
Seattle

<u>Market Classification</u>	<u>Pct. of Total by Weight</u>	<u>Pct. of Total by Time</u>	<u>Estimated Market Share</u>
#1 Small Emergency Shipments	46%	30%	.138*
#2 Small Non-Emergency Shipments		70%	.322**
#3 Medium Emergency Shipments	32%	30%	.096
#4 Medium Non-Emergency Shipments		70%	.224
#5 Large Emergency Shipments	22%	30%	.066
#6 Large Non-Emergency Shipments		70%	.154

* $0.46 \times 0.30 = 0.138$

** $0.46 \times 0.70 = 0.322$

Most Important Services

Participants were asked to consider the six market classifications and to list the three carrier/logistics services most important to them in each of the segments. To these participants, shipment information/tracking was the most important service that is offered by an integrated carrier or freight forwarder. It was among the top three services identified in every one of the six segments.

Door to door transit time was also a very important service characteristic, included in all but the large non-emergency segment category. Assistance in customs clearance at destination

was identified as a very important service category for all emergency shipments.

The importance of individualized customer service was interwoven throughout the discussions of most important services. Shippers stated that they wanted a person who is "competent", "concerned", "accessible", and "knowledgeable about their business" assigned to their account on a "permanent" basis to provide support and assistance.

Service quality, especially service with a "personal touch", tended to be more important than price in decisions regarding the selection of a carrier or freight forwarder. However, price

was seen as defining the "value" element in competitor evaluations.

RESULTS, LOS ANGELES FOCUS GROUPS

Market Classifications

In the Los Angeles focus groups, weight and time sensitivity were also identified as the two most important classifications of shipments. Discussions with participants in Los Angeles, however, suggested that the two time sensitivity divisions of "emergency" and "non-emergency" could, perhaps, be more precisely classified into *three* categories: emergency, express, and deferred.

Almost 25% of all shipments made by the participants were in the small category, 41% were in the medium category, and about 34%

were large shipments weighing over 100 pounds. Participants stated that about 18% of their international air shipments were emergencies. Approximately 50% of their shipments moved under an express status and 32% were moved under a less time sensitive deferred status. Emergencies were defined as "red flag", high pressure, "we need it yesterday" shipments. Express shipments constituted normal airfreight movements.

Deferred were described as shipments that required movement by air but that had considerable delivery time flexibility.

Nine shipment segments were identified and a preliminary market share estimate was computed by multiplying the percentage of total shipments in corresponding weight and time sensitivity classifications. The results of these calculations are presented in Table 2.

TABLE 2
Market Share Estimates by Weight and Time
Los Angeles

<u>Market Classification</u>	<u>Pct. of Total by Weight</u>	<u>Pct. of Total by Time</u>	<u>Estimated Market Share</u>
#1 Small Emergency Shipments	25%	18%	.045
#2 Small Express Shipments		50%	.125
#3 Small Deferred Shipments		<u>32%</u>	.080
#4 Medium Emergency Shipments	41%	18%	.074
#5 Medium Express Shipments		50%	.205
#6 Medium Deferred Shipments		<u>32%</u>	.131
#7 Large Emergency Shipments	34%	18%	.061
#8 Large Express Shipments		50%	.170
#9 Large Deferred Shipments		<u>32%</u>	.109

Most Important Services

Participants were asked to consider the nine market classifications and to list the three carrier/logistics services most important to them in each of the segments. Consistent on-time delivery was listed among the top three carrier services in every one of the nine segments.

Shippers, however, *expected* consistent on-time delivery from an integrated carrier or freight forwarder. Failure to perform in this category would cause these shippers to shift their business to a competitor.

In both the Seattle and the Los Angeles focus groups, the strength of an organization's

information system, especially in relation to tracking and tracing capabilities, was identified as *the* most important category of service that is offered (beyond the expected consistent on-time delivery). Tracking/tracing was among the top three carrier services identified by participants in every one of the market segments identified in this research.

Assistance in customs clearance was important in all emergency shipments and for small express packages. The critical importance of individualized customer service, expressed by shippers in Seattle, was confirmed by the Los Angeles participants.

Service quality, especially service with a "personal touch", was generally seen to be more important than price in decisions regarding the selection of a carrier or freight forwarder. However, price emerged as being important for larger express shipments and the determining factor for deferred shipments.

MEETING SHIPPER EXPECTATIONS: INTEGRATED CARRIERS VS. FREIGHT FORWARDERS

Even though the participants in both the Seattle and the Los Angeles focus group sessions agreed that integrators are their overwhelming choice for small shipments, they praised the individualized service provided by freight forwarders. Freight forwarders are a major competitive force for all but small shipment segments because of the perceived value (high quality and low prices) of their services.

Freight forwarders dominate the large shipment market. The participants perceived that the integrators are not equipped to handle heavier loads. They were especially concerned about shipment pickup. Their image of an integrator was a company operating single driver vans designed for document or small package pickup and delivery.

The participants thought that about 75 pounds is the upper limit of a shipment that can be handled by an integrated carrier. They were

worried that a single driver could not handle even 75 pound shipments either at pickup or delivery. Shippers assumed that outside trucking firms would have to be sub-contracted on larger shipments and this would negate one of the major competitive advantages that integrators have over freight forwarders.

Value was another major reason freight forwarders were preferred for larger shipments. As the shipment becomes larger, participants believed the price advantage of the forwarders increases. Price was a key factor in the movement of larger express shipments and for all shipments in the deferred classification.

In addition to price, participants believed that freight forwarders offer superior customer service. Forwarder service quality has its roots in the *personalized* service that shippers perceived that they can get from forwarders but not from integrators.

The shippers in both the Seattle and Los Angeles focus groups repeatedly noted that they know their freight forwarder, that they are important to their freight forwarder, and that their freight forwarder understands their business. A majority of the participants agreed that freight forwarders tend to see their customers' problems as their problems too.

When participants discussed problem shipments they tended to praise the performance of their freight forwarders. These forwarders generally have provided pro-active notification, they have furnished thorough explanations of the cause of problems, and (very importantly) they have suggested solutions. Rapport with shippers and industry and/or geographic expertise seemed to be the primary reasons for the perceived superiority of freight forwarders in providing personalized customer service.

All of the integrators were seen as being too large to offer the personal "touch" these shippers expect for complex international movements. They used the expression "lost in the maize" to describe their interface with large integrators. The impersonal "telephone only" customer

service of the integrators was compared unfavorably to the individualized service received from freight forwarders.

Participants particularly complained about the lack of expertise and the lack of concern of the integrator customer service personnel they reach by telephone. Turnover, lack of training, and indifference were all cited as problems they had encountered with integrator customer service personnel. Only rarely was one individual assigned to their account on a "permanent" basis to provide support and assistance. All of the integrators seemed to lack the "personal touch". None of the integrated carriers was seen as being competitive with freight forwarders in the area of individualized customer service.

In addition to price and personal service advantages, freight forwarders were also seen as frequently offering quicker delivery of international shipments than the integrators. The participating shippers believed that forwarders either know or will search for the most direct routing of a shipment. Integrators, on the other hand, are expected to consolidate shipments in a hub location that may require extra miles and will require extra time.

Since freight forwarders consolidate primarily at the point of origin while integrators consolidate in-route, the participants tended to believe that the chance for loss or damage was greater when integrators were used. They cited specific concerns about the loss of one or more pieces from a multi-piece shipment.

Participants also felt that the forwarders gave them better control over their shipments and

access to these shipments in-route. They thought that integrated carriers generally do not palletize shipments, which they believe increases the probability of loss or damage. Their experience has been that if pallets are required, shippers must make advance arrangements with integrators but this is not necessary when they use freight forwarders.

The fundamental issue that underlies the differences in shipper perceptions of forwarders and integrators seemed to be that forwarders are seen as *specialists* while integrators are seen as *generalists*. Integrators were seen as mass merchandisers that specialize in the movement of large quantities of undifferentiated shipments that do not require any special attention.

As specialists, freight forwarders were believed to have substantially more industry and geographic specific expertise than integrators. Further, forwarders are seen as being set up to handle shipments "out of the norm" while integrators are not. Finally, freight forwarders were seen as being able to handle special documentation requirements in a manner superior to integrators.

CONCLUSIONS

1. The participants in this focus group research tend to classify their international intermodal logistics markets by two variables: time sensitivity and shipment weight. In the Seattle focus groups, six distinct market segments emerged (ranked here by estimated market share):

TABLE 3
Ranked Market share Estimates
Seattle

<u>Ranked Segments</u>	<u>Estimated Market Share</u>
Segment #2: Small Non-Emergency Shipments	.322
Segment #4: Medium Non-Emergency Shipments	.224
Segment #6: Large Non-Emergency Shipments	.154
Segment #1: Small Emergency Shipments	.138
Segment #3: Medium Emergency Shipments	.096
Segment #5: Large Emergency Shipments	.066

In the Los Angeles focus groups, nine market segments were identified by the focus group participants:

TABLE 4
Ranked Market Share Estimate
Los Angeles

<u>Ranked Segments</u>	<u>Estimated Market Share</u>
Segment #5: Medium Express Shipments	.205
Segment #8: Large Express Shipments	.170
Segment #6: Medium Deferred Shipments	.131
Segment #2: Small Express Shipments	.125
Segment #9: Large Deferred Shipments	.109
Segment #3: Small Deferred Shipments	.080
Segment #5: Medium Emergency Shipments	.074
Segment #7: Large Emergency Shipments	.061
Segment #1: Small Emergency Shipments	.045

2. The strength of an organization's information system, especially in relation to tracking/tracing capabilities was identified as *the* most important service category that is offered by a carrier (beyond the expected consistent on-time delivery). Tracking and tracing was among the top three carrier services in every one of the market segments identified in this study.
3. Door to door transit time was also a very important service characteristic, included in all but the large non-emergency segment category. Assistance in customs clearance at destination was identified as a very important service category for all emergency shipments.

4. The importance of individualized customer service was interwoven throughout the discussions of most important services. Shippers stated that they wanted a person who is "competent", "concerned", "accessible", and "knowledgeable about their business" assigned to their account on a "permanent" basis to provide support and assistance. Service quality, especially service with a "personal touch", was seen to be more important than price in decisions regarding the selection of a carrier or freight forwarder. However, price was seen as defining the "value" element in competitor evaluations.
5. Participants reported that integrators dominate the small shipment market. Integrators compete with freight forwarders for medium shipments. Freight forwarders dominate the large shipment market.
6. Freight forwarders were seen by the participants as *specialists* while integrators were seen as *generalists*. Integrators were perceived as mass merchandisers that can effectively move large quantities of undifferentiated shipments. As specialists, freight forwarders were believed to have substantially more industry and geographic specific expertise than integrators. Further, forwarders are seen as being set up to handle shipments "out of the norm" while integrators are not. Finally, freight forwarders were seen as being able to handle special documentation requirements in a manner superior to integrators.
7. In general, all of the major integrators were seen by the participants as providing satisfactory service in the movement of undifferentiated small shipments. No integrator was perceived as having a distinct competitive advantage over the others. The difference in performance was between integrators and freight forwarders. In the medium and large shipment categories, freight forwarders were perceived as having a competitive advantage over integrators in both price and service.

8. In an era characterized by "high tech" automated customer service, the "high touch" of individualized service has become dramatically more important to the participants in this focus group research. The personalized customer service offered by typically smaller freight forwarders has given them a distinct competitive advantage over the major integrated carriers in all but the small shipment categories.

MANAGERIAL IMPLICATIONS

Competition and preferences for specific integrators or forwarders were discussed by the participants in these focus group sessions. The factors that participants stated influenced their decisions in the purchase of intermodal services would seem to have important implications for carrier and forwarder management.

Competition among integrators is especially intense in the small shipment market. Participants expected integrators to compete among themselves *and* with freight forwarders for their medium sized shipments. Most participants did not consider integrators when making decisions regarding the movement of large shipments. The competition for large shipments is among freight forwarders.

Although no integrated carrier seemed to have a distinct *service* advantage over the others, perceived geographic specialization or expertise did emerge as an important criteria influencing preferences for specific integrators and/or freight forwarders. Destination emerged as an important shipment classification, surpassed only by time sensitivity and weight. Several participants noted that "destination expertise drives their decisions" when selecting an integrator or a forwarder.

Integrator and freight forwarder reputations for a given country or geographic region were based on the participating shippers' personal perceptions of delivery speed and consistency, tracking and tracing capabilities, customs clearance performance, knowledge and

familiarity with a given country or region, and perceptions of lift capacity to a given location. Participants seemed quite knowledgeable in their discussions of country-by-country reputations of major integrators and freight forwarders in their geographic regions.

The salesforces of airfreight and logistics organizations, especially the integrated carriers, would seem to have potential as a major strategic but underutilized marketing resource. Because shippers see salesreps as a source of personalized customer service, sales people have the

potential of becoming important advisors or consultants to their clients. To do so, however, shippers will insist that salesreps become familiar with the shipping needs of their companies and that they develop expertise as global logistics problem solvers.

In all, this focus group research suggests to management that shippers intermodal airfreight

decisions are driven by weight and time sensitivity; that the strength of an organization's information system, especially in relation to tracking and tracing capabilities, is *the* most important category of service; that the shippers respond very positively to personalized service; and that shipper selection of integrators and/or freight forwarders is destination specific. This research would seem to confirm the increasing competitiveness of the intermodal logistics market and it suggests that personalized customer service can be a major factor in achieving a competitive advantage.

The shippers participating in these focus groups were very service and information sensitive. Their advice to integrated carriers and freight forwarders was that the future of those providing airfreight services in international intermodal logistics will be influenced by the depth of their global expertise, by their ability to deliver personalized customer service, and by the strength of their information systems.

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THE INVESTMENT AND MARKETING OF TRANSLOAD FACILITIES: A STATISTICAL EVALUATION

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This paper examines the basic relationships which shippers, carriers, and facility operators have developed in the design and operation of bulk intermodal facilities, or transload terminals. The analysis is based on 349 truck-served transload facilities throughout the United States. The facilities are examined for commodity types being handled and the types of handling equipment being used. The results demonstrate a strong relationship between certain handling procedures and commodity types. Additionally, the size and volume of the facilities are related by commodity types and the number of rail spots. Finally, the specialization or dedication of a large number of facilities to individual commodities is addressed, as well as the basic thoughts on their investment needs to attract suitable customers. The information provided demonstrates that the market is very segmented on the basis of materials being handled, and that many facilities are commodity, and initially customer driven. These findings are important to transload providers in increasing their asset utilization, and also to users that seek efficient and effective transportation alternatives to meet their logistical needs.

IMPORTANCE OF THE ISSUE

Intermodal and multimodal have long involved the combining of ideas already in existence. For example, the container concept dates back to early Roman days. Jack White of the Smithsonian has thoroughly researched the roots of containerization, probing back as far as Circus Maximus in Roman times. His conclusion is that the barrel is the oldest form of containerization, a type of container which is still in use today (White 1988). Early interest in the use of containers - as documented by the Liverpool & Manchester Railroad in 1830 - came

about because of the large amount of labor involved with moving bulk materials such as coal and grains. Containerization of commodities enabled the effective movement of freight, and quickly led to further innovations in combining modes to move products. The need for effective transportation still exists today as the marketplace becomes increasingly global. Furthermore, many shippers and carriers are finding that responsive, cost efficient, door-to-door service often involves multimodalism.

The ability to provide different means of transporting a product from origin to destination

has never been more important to industry. The role and nature of transportation is changing as shippers become more sophisticated and involved in the modal choice process. Trends in supply chain management are forcing warehouse managers to rethink their operations in order to find ways to "flow" inventory more efficiently and effectively. Transportation options, such as intermodalism, are an increasingly important component of supply chain strategy (Osswald 1985). While piggyback, trailer-on-flatcar (TOFC), and container-on-flatcar (COFC) have become the predominant way in which intermodalism is operationalized, logistically-linked transportation can involve multiple-modal partners in a movement without a container or other device to define the practice. Transloading involves both the modal change as well as the container change.

As a growing portion of intermodalism, transloading is playing a vital role due to its inherent advantages and characteristics. Previous research examined the operations of a number of southeast transload centers and included interviews with a number of the customers (Jennings 1994). The research findings indicated that transload:

- ◆ Provides more economical transportation under certain conditions,
- ◆ Allows access to different modes of transportation,
- ◆ Creates the ability to attract new or increased volumes of business or new suppliers,
- ◆ Provides service flexibility,
- ◆ Acts as a temporary warehouse for the product,
- ◆ Increases the feasibility and viability for various distribution activities to be contracted out,

- ◆ Enables the consolidation of shipments for at least part of the delivery movement, and
- ◆ Promotes larger volume movement in some lanes as needed.

TRANSLOAD MARKETING CONCEPTS

Much like the first 50 years of consumer goods manufacturing, the basic strategy of selling transportation in the past involved market aggregation. Using this principle, carriers attempted to appeal to as many potential customers as possible and relied upon high levels of traffic to maintain relatively low prices. Market aggregation is a suitable and appropriate practice only where the total market has few differences in customer needs or desires. The technique is also appropriate where it is operationally difficult to develop distinct products or marketing actions to reach different customer segments. However, few markets, and customers, are actually suitable for such treatment. In theory and concept, the practice of transload is no different.

Many of the companies which provide transload services readily admit that they entered the market almost by accident. A number started as a contractor for a single company and then expanded their services along similar product lines to attract and serve additional customers. As noted by Chris Lofgren, Chief Technology Officer for Schneider National Inc.: "We're more customer-oriented than market oriented, so we tend to get pulled into new markets by our customers. They'll take us to new places and then we build new customers once we're there (Saccomano 1996, p. 40)."

This example demonstrates one of several methods upon which segmentation is based. The categories include:

- ◆ Customer needs such as reliability, performance, convenience, and economy;
- ◆ Product- or service-related behavior such as amount of usage, purchase predisposition and experience, and purchase influence;

- ◆ Person- or firm-related behavior such as being an innovator, early adopter, early majority, late majority, or laggard in their practices; and
- ◆ Demographic descriptors such as location and access.

The marketing and investment activities of the transload industry seem to follow these same patterns which are used for "traditional" products and services. Many of the centers examined started as either a "one commodity" or a "one handling device" operation. However, as business matured, many have customized their operations for individual materials and customers, or have decided to only serve a small segment of the market via specialization.

From a shipper's viewpoint, transloading is often used to obtain lower transportation costs through consolidation practices, reaching new carriers or modes, or a combination of both. Additionally, many shippers report that they use transload to avoid asset investment. Therefore, the value in "marketing" transload would be the improvement in return on assets through: (1) increased sales, (2) reduced transportation expenses, and (3) reduction in the level of assets employed.

Many transload facility operators invest based upon a single customer's need, and then try to attract new customers with similar products and handling needs. This practice is an appropriate managerial technique in that investment has already been made in equipment. It is far less expensive to attract the portion of the market which can use the same facilities and equipment as opposed to marketing to customers with different needs, and which would entail additional investments to serve them. In today's business environment of increased competition

and value-added service, this alternative for market segmentation appears to be the most logical for a facility operator. The extent to which the transload marketplace models this concept is examined in the following section.

STATISTICAL ANALYSIS OF FACILITIES

The facilities used in this analysis encompass 349 operations located throughout the United States during 1995/1996. These data represent a secondary data source in that the commercial listings for the facilities are published by *Modern Bulk Transporter*. The annual data collection relies on a self-reporting technique through direct advertising and phone solicitation as the primary means for motivating participation. The research staff of the journal uses an active search method to identify as comprehensively as possible the entities that comprise the facility population. The reported information includes items such as address and phone number, the number of rail spots at the facility, types of commodities handled, and the general types of handling equipment and services provided.

The general commodity types include acids, asphalts, dry and liquid chemicals, dry and liquid food products, petroleum products, and plastics. These general types cover a large share of the commodities previously found to be moving via transload, with only raw materials such as ores, stones, and coal; and finished industrial products such as steel shapes and brick not being represented. Of the commodities handled, plastics, dry and liquid chemicals, and dry foods were handled by more than half of the facilities. Asphalt was handled by less than ten percent of the facilities analyzed for this study. Table 1 presents an itemized product breakdown for the reporting facilities.

TABLE 1
Number of Listed Facilities Handling the Various Product Types

PRODUCT TYPE	NUMBER OF FACILITIES REPORTED AS HANDLING	PERCENTAGE OF FAILURES
Acids	121	34.7%
Asphalt	29	8.3
Chemicals (Dry)	236	67.6
Chemicals (Liquid)	200	57.3
Foods (Dry)	183	52.4
Foods (Liquid)	136	39.0
Petroleum Products	137	39.3
Plastics	242	69.3

Equipment and Services

The number of facilities reporting that they handle a product is considered to be representative of the ease of moving each commodity type, as well as the general volumes of each type moving in the industry. For example, the four types reported as handled by more than half of the facilities are heavily dependent upon nationwide consumer and industrial demand, and can be transloaded at many locations with minimal equipment. Several such sites examined in an earlier study indicated that not much more than modal access was necessary as the carrying highway and rail vehicles are often equipped with the needed handling equipment (Jennings 1994).

On the other hand, asphalt is a product seldom handled in such a manner. During a previous case study of transload facilities (Jennings 1994), two facilities were identified and studied which handled the commodity. In this case, one of the operators said that the only major benefit provided by the facility was transferring the operation and investment to another party as the same storage, handling, and other devices

were needed as at a normal industrial location. This avoidance of cost or facility development by the shipper and receiver was reported by Beier (1977). However, because of the facilities required to handle asphalt, there is a great deal of expense to the terminal operator. This in turn necessitates a large volume to justify the installation of the equipment as well as the availability of financing. Since many of the operators of transload facilities are also attempting to minimize investment, this type of facility seems to be built less often.

The general services and handling equipment listed in the *Modern Bulk Transporter* include: air compressors, scales, blending meters, sampling services, hot water heater, steam heating, tank trailer cleaning, liquid storage tanks, and liquid pumps. Several of these are clearly related to certain types of products such as liquid storage tanks and liquid pumps. Others, such as scales and sampling services, are not so clearly associated. Additionally, five transfer devices described as being for dry bulk were included. These include vacuum trailers, augers, blowers, gravity systems, and portable vacuums/air conveyors.

One of the purposes of this study is to more clearly define the relationships between the services and devices required by the shippers and handlers of the various products. Previous articles which have examined facilities where bulk commodities are transloaded have indicated that the facilities are designed specifically for a limited number of products and that the handling devices will indicate this trend (Jennings and Holcomb 1996).

The analysis presented in this paper supports that theory and finds that the commodities handled will significantly determine what handling devices are required. Furthermore, it is suggested that the devices available can indicate to those marketing the facility what commodity types are most suitable for its use. The number of handling devices which are significantly different for those facilities handling various types of products are shown in the Appendix, Tables A1 through A4.

Acids are one commodity type which clearly demonstrates how the different handling devices relate to the presence, or lack thereof, at the transload facility. Air compressors, with 91.7% of those facilities handling the product reporting its presence, is an obvious piece of equipment needed. Many acids are carried in special tanks, both by rail and highway, which require tank pressurization to completely empty the contained chemical. Liquid pumps (85.1%) are another obvious requirement for most acids. Steam heating (52.1%), hot water (33.9%), and scales (85.1%) are other requirements of which facilities handling acids have significantly higher occurrences. Even blending meters

(19.8%), an item which few facilities reported having for any reason, are found significantly more often at facilities handling acids than at those which do not.

The relationship between commodities and the facility's handling device requirements is important to each part of the process from marketing to operations. Knowledge of the commodity leads the investor in the equipment acquisition and provides information concerning investment costs for the facility. On the other hand, knowing what equipment is available, the relationship can help marketing to direct efforts to the most appropriate commodities for growth in transloading and the facility.

Rail Spots

The number of rail spots per facility as shown in Table 2 depicts the diversity that currently exists across transload facilities. Some commodities, such as petroleum products, asphalts, and acids, seem to require rail service more often than do the other products included in this study. Many of the petroleum products moving via transload in today's market appear to be used motor oils. This low value commodity is perfect for receiving the benefit of lower transportation costs from using rail for the line haul while using a motor carrier for the local pick up. In an earlier study of a bulk transload facility it was found that several companies were using this technique with one truck and using the tank car as temporary storage until the car was full and ready for shipment to the refinery (Jennings 1994).

TABLE 2
Reported Percentage of Railcar Spots by Commodity Handled and Facility
 Number of Spots

<u>COMMODITY</u>	<u>NONE</u>	<u>1-20</u>	<u>21-40</u>	<u>41-60</u>	<u>61-80</u>	<u>81-100</u>	<u>100+</u>
Acids	19.8	19.8	18.2	10.7	10.7	9.9	10.7
Asphalt	17.2	17.2	10.3	20.7	10.3	13.8	10.3
Chemicals-Dry	25.0	21.2	16.9	10.6	9.7	7.6	8.9
Chemicals-Liquid	22.5	24.0	17.0	10.5	9.0	7.0	10.0
Foods-Dry	24.0	17.5	20.2	9.3	9.3	8.2	11.5
Foods-Liquid	24.3	19.1	16.2	7.4	11.8	8.8	12.5
Petroleum	14.6	24.1	16.8	10.9	12.4	10.9	10.2
Plastics	21.9	19.0	18.2	10.7	9.5	8.3	12.4

Likewise, asphalts very logically require rail service in most movements. This is due to the volume of materials needed to justify the expense of the specialized transload facility. Additionally, the movement of asphalt is performed in specially heated tank cars on the railroad, and is generally moved in solid blocks to avoid delay. This type of movement requires large car volumes to be practical and may further explain why asphalt transload facilities seem to have more rail car spots than facilities for other types of commodities.

Products such as foods tend to have a higher percentage of facilities without rail spots. The rationale for this seems to be that many foods are time sensitive and motor carrier to air is an alternative for these higher value commodities. For example, the airport at Seattle, Washington, specializes in moving fresh fish via air to inland markets.

Facility Investment Decisions

Plastics represent a very diverse market thus explaining the large percentage of both small and large facilities serving the product. Plastics are a universally used material, going into

everything from milk bottles to industrial piping. Previous case studies discovered that small companies go from using truckload sizes of plastics to railcar loads when a certain volume is met (Jennings 1994). However, since most companies did not base facility location solely on transportation costs, or simply did not anticipate the growth, the move to rail is often accomplished via transload using a nearby transload facility or any other available spur track. It is only at the point in time when commodity volume grows to a level where it is possible to achieve substantial transportation savings that a move to a site with direct rail access is considered.

Because of this pattern, many of the manufacturers of plastics have begun to open their own reload facilities for better control of service quality and to manage the handling of their materials. Examples of this include a bulk distribution facility where a major chemical manufacturer and processor has a dedicated operation for their own distribution needs, while immediately adjacent a separate bulk distribution facility is operated for several other plastics manufacturers.

Some companies have become very specialized in their decision as to what products to handle and what equipment and facilities are necessary. For example, Ee-Jay Motor Transports operates a plastics transload terminal in East St. Louis, Illinois. Ee-Jay has been involved with bulk intermodal work since the company's founding in 1949 when it was created to haul oil to Mississippi River barges. It became involved with the rail-to-truck transload movement of bulk commodities in 1957. By 1981, thirteen dry bulk vehicles were being used mainly to haul plastic pellets to dairy plants, soft drink bottlers, and other industrial customers. Growth of rail-to-truck transload has increased the operations to 30 dry bulk trailers and 31 tractors.

From 1981 to 1996, the volume of plastic pellets moving through the rail-to-truck transload facility in East St. Louis tripled. This has allowed Ee-Jay Motor Transports to expand and improve the transfer facility to create one of the largest rail hubs in the United States. Currently the 20-acre facility has 120 railcar spots with plans for 20 more. Ee-Jay feels that it has created a competitive advantage by offering one contact for both transfer and transportation in that it eliminates questions of process ownership and responsibility for the service.

Ee-Jay attributes their success to understanding the needs of their core customers. Jim Dougherty, president of Ee-Jay, stated in an article that: "Our objective is to listen very carefully to customer requirements so that we are a no-problem vendor. Shippers should hear from us only if there is a problem with the product, not with the delivery....This is an industry where your reputation means a lot, and we work hard to keep our good reputation ("Ee-Jay Profits from Plastic Pellets," 1996, p.52).

Listening to their customers has allowed Ee-Jay to acquire specialized equipment based upon the materials they handle. Although the company primarily owns pneumatic trailers, it is planning to add more vacuum/pneumatic trailers because of the equipment's ability to load anywhere. This is an example of value-added service to

customers in situations where removing products from railcars that are derailed or damaged in accidents is required. Other examples of specialized investments based upon the commodity shipment requirements include:

- ◆ In-line air filters to prevent contamination from the incoming air,
- ◆ Gauges to monitor air temperature of blower air,
- ◆ Heat exchangers to provide temperature protection for handling low-density polyethylene which has a lower melting point than other plastics,
- ◆ Paved loading areas to prevent contamination from the soil,
- ◆ Wash facility for cleaning trailers and transfer machines,
- ◆ Trailer-mounted white neoprene domelid gaskets based upon shipper requests, and
- ◆ Stainless steel hosing to prevent contamination.

Many of these investments are made based upon the value and characteristics of the commodity handled (e.g. plastic pellets). "Contamination is the biggest fear in this business," says Thomas Imlay, Ee-Jay company controller ("Ee-Jay Profits from Plastic Pellets," 1996, p.54). Specially trained transfer operators handle all trailer loading at the transload terminal and perform the transfer work only during daylight hours for safety reasons and to reduce the contamination threat. All loaders and drivers receive training in the company's contamination control program. This includes keeping records of products last contained in the trailer or transferred through the transfer machines used to load the pneumatic trailers. In addition, plastic samples are taken from each railcar upon delivery to double check the billing information and from the loaded trailers to ensure that the load is correct. Samples are retained for 30-60 days for audit and control purposes. The level of

service detail extends to the cleaning and drying of trailers after product transfer, and no backhauls are made.

Due to the fact that many of the product types examined in this study are fairly general in nature and include many different types of final products, use is found for them by companies of all sizes. As noted in the plastics example, many of the commodities experience an increase in their demand which can result in a change in the transportation and handling techniques as time goes by. Therefore, many of the concepts described for the plastic transload facilities are applicable to the other products reported in this analysis.

CONCLUSIONS

Previous research in the area of transload cited the ability to lower the overall transportation and handling costs in the supply chain as an important reason for utilizing the practice (Jennings 1994; Jennings and Holcomb 1996). This analysis has expanded on those findings in that it has shown that transload (or bulk load) facilities acquire and operate handling equipment for the primary purpose of meeting specific customer needs.

The basis for this conclusion can be found in the number of handling devices which are statistically significant for certain commodity types. Initially this decision allows the facility to avoid unnecessary investment costs, and ensures high utilization of handling equipment. As acknowledged by previous case studies, this in turn is reflected in a lower cost transportation option for the shipper than other modal alternatives.

It appears that many of those marketing transload facilities have realized the value of market segmentation on the basis of customer

need and respective handling equipment (i.e. service provided). However, the greater value may be that by knowing the equipment available at a site, the transload business can be increased by using the same market segmentation factors to identify prospective shippers and their commodities which can be handled with little or no additional investment expense at the existing facility. This ability to align the providers with the users can potentially increase return on investment through improved equipment productivity for the transload facility. As discussed above, this efficiency is often reflected in the cost of doing business, thereby resulting in a favorable outcome for the shipper as well.

It should be noted that while knowledge of the commodity and the initial customer needs direct the investor in the equipment acquisition phase, marketing does not begin the process of investment. That is, in the beginning the customer defines the scope of the business for the transload facility. Once the investment is made, however, the relationship changes in that economies of scale motivate those providing this transportation service to "market" their services to the most appropriate shippers/commodities for business growth. From this point forward marketing plays an important role in asset utilization through the expansion of business and value-added services.

Many of those outside of the bulk reload field consider the practice to be more primitive than containerization. However, the findings of this research have indicated that the practitioners of transload are clearly complying with the basic principles of sound business. They are providing a competitive system of product transportation which allows a company to avoid unnecessary costs and investments while providing added value to the product.

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APPENDIX

TABLE A1
Evaluation of the Use of Handling Devices for the Movement of Acids and Asphalts

<u>HANDLING DEVICE</u>	<u>PERCENTAGE REPORTED HAVING DEVICE</u>	
	Acids	Asphalts
Air Compressor	91.7*	86.2
Scale	85.1*	89.7
Blending Meters	19.8*	24.1
Sampling	71.1	86.2*
Hot Water Heater	33.9*	31.1
Steam Heating	52.1*	69.0*
Tank Cleaning	25.6	20.7
Liquid Tank Storage	19.8*	24.1
Liquid Pumps	85.1*	89.7*
Vacuum Trailer	47.1	48.3
Auger	37.2*	34.5
Blower	60.3	58.6
Gravity System	9.1	6.9
Portable Vacuum/Air	62.0	51.3

* Statistically significant device at 0.01.

TABLE A2**Evaluation of the Use of Handling Devices for the Movement of Dry and Liquid Chemicals**

<u>HANDLING DEVICE</u>	<u>PERCENTAGE REPORTED HAVING DEVICE</u>	
	Dry Chemicals	Liquid Chemicals
Air Compressor	79.2*	85.5*
Scale	80.1*	78.5
Blending Meters	11.9	16.5*
Sampling	67.4*	71.0*
Hot Water Heater	21.2	27.5*
Steam Heating	28.0	40.5*
Tank Cleaning	33.1*	28.0
Liquid Tank Storage	7.2#	17.0*
Liquid Pumps	62.7*	79.5*
Vacuum Trailer	65.7*	53.0
Auger	33.5*	30.0
Blower	69.1*	61.0
Gravity System	13.6	11.5
Portable Vacuum/Air	64.8*	59.5*

* Statistically significant device at 0.01.

Denotes statistical significance but not the largest component of reporting dry chemical facilities.

Table A3**Evaluation of the Use of Handling Devices for the Movement of Dry and Liquid Foods**

<u>HANDLING DEVICE</u>	<u>PERCENTAGE REPORTED HAVING DEVICE</u>	
	Dry Foods	Liquid Foods
Air Compressor	80.9*	88.2*
Scale	82.0*	81.6*
Blending Meters	12.6	17.6*
Sampling	73.8*	74.3*
Hot Water Heater	24.6*	36.0*
Steam Heating	32.8	50.0*
Tank Cleaning	36.1*	31.6
Liquid Tank Storage	6.0*	16.2
Liquid Pumps	65.0*	84.6*
Vacuum Trailer	69.9*	63.2
Auger	33.3*	33.1
Blower	70.5*	63.2
Gravity System	13.1	12.5
Portable Vacuum/Air	68.9*	64.7*

* Statistically significant device at 0.01.

TABLE A4
Evaluation of the Use of Handling Devices for the Movement of
Petroleum Products and Plastics

<u>HANDLING DEVICE</u>	<u>PERCENTAGE REPORTED HAVING DEVICE</u>	
	Petroleum Products	Plastics
Air Compressor	87.6*	71.9*
Scale	86.9*	79.3*
Blending Meters	20.4*	9.5
Sampling	73.7*	68.6*
Hot Water Heater	32.1*	21.1
Steam Heating	47.4*	26.9
Tank Cleaning	25.5	34.3*
Liquid Tank Storage	17.5*	5.8*
Liquid Pumps	82.5*	59.1
Vacuum Trailer	53.3	74.4*
Auger	29.9	29.3
Blower	60.6	69.4*
Gravity System	13.1	10.7
Portable Vacuum/Air	62.8*	67.8*

* Statistically significant device at 0.01.

AUTHOR BIOGRAPHY

Barton Jennings (Ph.D., University of Tennessee) is senior research associate at the University of Tennessee Transportation Center and adjunct professor of logistics and transportation. Dr. Jennings' research areas include carrier operations, intermodal transportation, and transportation regulation and policy. Dr. Jennings' career has included work in both the Class I and shortline railroad industry as well as work with state transportation departments. He has a particular interest in the use of railroads in developing countries and has traveled extensively to explore this subject. He regularly conducts workshops on regulatory compliance for the railroad industry and on many technical issues for several state highway departments. Dr. Jennings has been the author or co-author on a number of reports and journal articles in these and other fields.

AUTHOR BIOGRAPHY

Mary Collins Holcomb (Ph.D., University of Tennessee) is associate professor of logistics and transportation at the University of Tennessee. Dr. Holcomb's research interests focus on two related areas of strategic logistics management: process design for quality and customer service measurement. Dr. Holcomb's professional career involved eighteen years at the Oak Ridge National laboratory in transportation research for the U.S. Department of Energy, U.S. Department of Transportation, and the U.S. Department of Defense. Her background also consists of varied industry experience including Burlington Northern Railroad, General Motors, and two years of collaborative research with Procter & Gamble. Dr. Holcomb is the former editor of the *Transportation Energy Data Book* and author and co-author of numerous reports in the area of transportation policy.



Journal of Transportation Management

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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.

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

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.
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