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CUSTOMER SATISFACTION IN INTERNATIONAL DISTRIBUTION: DO WATER PORTS KNOW WHAT SHIPPERS REALLY WANT?

by

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Introduction

International trade has grown substantially in the past two decades⁸, rising from 12.8% of U.S. GNP in 1970 to 23.3% in 1988. Although the primary method of transportation for international shipments is water transportation⁵, international trade participants have seen tremendous growth in their transportation choices over the past decade. As a result, some water ports have become more aggressive marketers; for example, the Port of Los Angeles has implemented a customer service center⁶ to answer questions concerning port storage facilities and steamship service.

Given the competitive pressures that currently exist in international distribution, international water ports might consider adopting a strategic marketing approach. According to Assael², this approach focuses on determining and satisfying customer needs, while also maintaining advantages over competing firms in terms of costs and product offerings. Failure to adopt this customer and competitor orientation could have important economic consequences for individual ports, as illustrated by recent experiences at the Port of Baltimore. Between 1985 and 1989, general cargo volumes at Baltimore declined by over one million short tons; Hampton Roads

(Virginia), a major competitor, saw an increase of almost 2.5 million tons over the same time period.³ According to experts³, a primary reason for Baltimore's slippage has been uncompetitive labor practices relative to neighboring ports.

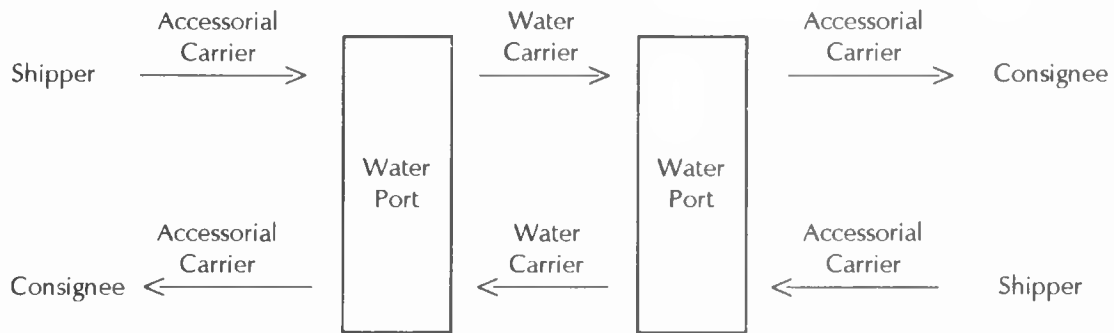
Water ports have historically considered ocean-going water carriers to be their primary customers⁴, to the virtual exclusion of other customer groups. In fact, the authors are aware of a situation⁴ in which a consultant had been called in to help a U.S. port with its marketing efforts. The consultant listed a well-known U.S. freight railroad as one of the port's major customers; the Port Director disagreed, saying that the railroad was not a customer, but rather a railroad.

The ports' emphasis on water carriers is partially attributable to the fact that without the water carriers, there would be no services for ports to provide; for instance, a lack of inbound carriers will strongly influence outbound operations. While water carriers are undeniably key port customers, this paper will argue that water ports can be viewed as "middlemen" in international distribution (see Figure 1). Figure 1 shows that ports have actually several different groups of potential customers, including ocean carriers, accessorial carriers, shippers and other ports. Each of these groups has distinct needs and wants, and for ports to structure much of their operations to satisfy ocean carriers could cause discontent among other key customer groups. Erik Stromberg, President and Chief Executive Officer of the American Association of Port Authorities has recognized that¹¹:

Port managers and their governing boards have had to significantly rethink the port's role in maritime commerce. For example, no longer can efficient port operations be defined based on shipside cargo handling. It must encompass sea lanes to interior rail and highway linehaul routes. As a result, strategic planning and marketing have become the twin imperatives of successful port management.

FIGURE 1

WATER PORTS' AS A MIDDLEMAN IN INTERNATIONAL TRADE



This research will focus on the shipper-water port interface, and will demonstrate that many large U.S. industrial corporations feel that they play a strong role in 1) evaluating port features and 2) selecting the water ports used in international distribution. One part of this paper will compare shippers and water ports in terms of the factors used to evaluate international water ports. In addition, there will be shipper-port comparisons on operational and safety issues that can influence the efficiency of international water port operations. The use of information from both shippers and water ports is valuable because customer assessments of a particular situation often differ from the seller's appraisal of the same situation⁹.

Methodology And Respondent Characteristics

The information in this paper is drawn from mail surveys sent to international water ports (hereafter referred to as ports) and U.S. industrial corporations (hereafter referred to as shippers). For the ports, the surveys were targeted to the highest ranking employees having international trade responsibilities, while the shipper surveys were addressed to the highest ranking corporate logistics executive. A Container News directory of international transportation links and nodes was used to identify 236 international water ports, from whom 86 usable responses were received, representing a response rate of 36.4%. (Resource constraints allowed for the survey to be printed only in English, which likely depressed the response rate.)

The 1989 Fortune 500 listing of U.S. industrial corporations served as the sampling frame for the shippers, with surveys being sent to the 400 highest ranking corporations. Of the 400 surveys mailed, 17 were undeliverable, leaving an effective sample size of 383; 81 usable responses were received, for a 21.2% response rate.

The authors used a variety of sources in the development of the questionnaire items. Questions involving the respondent's roles in port evaluation and selection were drawn from the marketing literature, which suggests that there are several buying roles (e.g., influencer, purchaser) associated with purchasing decisions.⁸

The list of port selection factors was derived from previous transportation choice research such as Burdige and Daley³ and Stock and LaLonde.¹² Respondents were limited to only nine selection factors because consumers rarely use more than six evaluative criteria when making decisions.⁶ Respondents were also asked to evaluate selected international trade issues; while this listing is not comprehensive, it is representative, and was drawn from newspapers, trade publications and discussions with transportation and logistics managers.

Selected demographic characteristics of respondents and their organizations are presented in Table 1. Sixty percent of the port respondents were between 40 and 59 years of age, while a similar percentage had been with their employer for ten or more years. The responding ports have annual revenues ranging from under \$10 million (U.S. dollars) per year to over \$500 million. Thirty percent of the ports handle at least 10,000,000 short tons (i.e., 2,000 pounds = 1 ton) of freight per year. As for the shippers, approximately 65% of their respondents were between 40 and 59 years old, with 62% reporting ten or more years of company tenure. Not surprisingly, the shippers represent large organizations, with nearly two-thirds reporting annual revenues of between \$1 billion and \$4.999 billion. One-third of the shippers have annual shipment volumes of more than 1,000,000 tons.

The information in Table 2 details several aspects of the shipper's participation in international trade. The median tonnage for international shipments was 23,430 tons (low = 0, high = 200,000,000), with nearly 40% of the shippers indicating that international shipments account for at least 25% of their

outbound tonnage. In addition, the median tonnage for international water shipments is 12,500 tons (low = 0, high = 196,000,000), with an average of 62% of international shipments moving by water.

Almost 75% of the international shipments involve the use of freight forwarders, which might be an indication that the shippers are not involved in port evaluation and selection. On the contrary, as shown in Table 2, the shippers indicated that they take a very active role in negotiating with, evaluating, and selecting the water ports used in international commerce. For example, nearly 75% of the shippers indicate a high degree of responsibility for 1) determining the necessary features of a water port as well as 2) selecting international water ports.

Results

1. Port Evaluation Factors. The previous section demonstrated that the top logistics personnel at many large U.S. manufacturing companies feel that they play key roles in evaluating and selecting the water ports to be used in international trade. In order to determine whether ports recognize the evaluation factors important to shippers, the information in Table 3 presents the results of t-tests of mean equality for port and shipper responses to nine port evaluation factors.^a The mean scores were based on port and shipper importance ratings for each attribute, using a five point scale where 1 = very unimportant and 5 = very important. In addition, each group's mean ratings were ranked from highest to lowest; port and shipper rankings were then compared using the Spearman test of rank correlation.

^a*Equality of variance results indicated that t-tests were a feasible technique.*

Table 1
Respondent Characteristics

WATER PORTS	
Respondent's Age	
<u>Age</u>	<u>% of Respondents</u>
Under 30	3.6
30 - 39	23.0
40 - 49	24.0
50 - 59	37.4
Over 59	12.0
Respondent's Years with Present Organization	
<u>Years</u>	<u>% of Respondents</u>
0 - 4	23.8
5 - 9	19.1
10 - 14	20.2
15 - 19	11.9
Over 19	25.0
Company Revenues	
<u>Revenues (U.S. dollars)</u>	<u>% of Companies</u>
Under \$10 million (M)	25.0
\$10 M - \$49.99 M	38.8
\$50 M - \$99.99 M	17.5
Over \$99.99 M	18.7
Short Tons Handled	
<u>Tons (000s)</u>	<u>% of Companies</u>
Under 2,500	28.0
2,500 - 4,999	21.0
5,000 - 9,999	20.0
Over 9,999	32.0

Table 1 Con't.

SHIPPERS	
Respondent's Age	
<u>Age</u>	<u>% of Respondents</u>
Under 30	2.5
30 - 39	21.3
40 - 49	38.7
50 - 59	26.3
Over 59	11.2
Respondent's Years with Present Organization	
<u>Years</u>	<u>% of Respondents</u>
0 - 4	19.8
5 - 9	18.6
10 - 14	16.0
15 - 19	13.6
Over 19	32.0
Company Revenues	
<u>Revenues</u>	<u>% of Companies</u>
Under \$1 billion (B)	11.4
\$1B - \$4.999B	63.3
\$5B - \$9.999B	13.9
Over \$9.999B	11.4
Annual Shipment Volumes	
<u>Tonnage</u>	<u>% of Companies</u>
0 - 99,999	45.9
100,000 - 999,999	19.7
1,000,000 - 9,999,999	14.4
Over 9,999,999	19.7

Table 2

SHIPPER INVOLVEMENT IN INTERNATIONAL TRADE

International Shipments

Tonnage	% of Respondents	Median
0	5.3	
1 - 999	15.8	
1,000 - 9,999	21.0	23,430
10,000 - 99,999	17.5	
100,000 - 999,999	21.1	
Over 999,999	19.3	

International Shipments

As % of Total Tonnage	% of Respondents	Mean
0 - 24.9%	60.6	
25 - 49.9%	24.2	24.9%
50 - 74.9%	6.1	
Over 74.9%	9.1	

International Water Shipments

Tonnage	% of Shipments	Median
0	7.1	
1 - 999	25.0	
1,000 - 9,999.	16.1	12,500
10,000 - 99,999	16.1	
100,000 - 999,999	16.1	
Over 999,999	19.6	

International Water Shipments

As % of International Shipments	% of Respondents	Mean
0 - 24.9%	23.4	
25 - 49.9%	11.7	61.1%
50 - 74.4%	10.4	
Over 74.9%	54.5	

Table 2 Cont.

Use of International Freight Forwarders					
<u>% of International Shipments</u>	<u>% of Respondents</u>			<u>Mean</u>	
0 - 24.9%	21.6				
25 - 49.9%	2.7			72.6%	
50 - 74.9%	5.4				
Over 74.9%	70.3				

Respondent's Roles in Port Evaluation and Selection					
<u>Statement</u>	<u>Strongly Disagree</u>	<u>Disagree</u>	<u>Neither Agree Nor Disagree</u>	<u>Agree</u>	<u>Strongly Agree</u>
I identify my firm's operational need for a water port	3.8%	7.7	9.0	55.1	24.4
I play an important role in collecting information about the features of different water ports	3.8	16.5	12.7	51.9	15.2
I do not play an important role in determining features my firm would need from a water port	23.1	51.3	7.7	11.5	6.4
I play an important role in evaluating different water ports	5.1	8.9	8.9	59.5	17.7
I play an active role in negotiating the prices and terms for the water ports my firm uses	7.6	20.3	6.3	45.6	20.3
I do not have a major influence on the final selection of a water port for my firm's operations	29.4	44.9	7.7	11.5	6.4

Note: Percentages may not sum to 100 due to rounding error.

The information in Table 3 shows that the mean ratings for the ports ranged from a low of 3.00 (neither important nor unimportant) on claims handling to 4.50 (very important) on equipment availability. The shipper range was slightly narrower, going from 3.16 (neither important nor unimportant) on odd-sized freight to 4.38 (important) on both equipment availability and loss and damage performance. With respect to the t-tests, three of the nine port evaluation factors show statistically significant differences at the .05 level. The attribute with the largest difference is large volume shipments, with a mean rating of 4.05 for ports and 3.34 for shippers. The two other attributes with statistically significant differences in importance ratings are loading and unloading facilities for large and/or odd-sized freight (port mean = 3.59; shipper mean = 3.16) and assistance in claims handling (port mean = 3.00; shipper mean = 3.35).

The Spearman coefficient of rank correlation, .7417 (significant at the .05 level), suggests that there are similarities between the port and shipper rankings of the port evaluation factors. For example, there are minimal ranking differences between ports and shippers on equipment availability, loss and damage records, and pickup and delivery times.

The evaluation factor with the largest rating (.71) and ranking (four places) discrepancies between port and shipper participants is large volume shipments. This is an intriguing finding, in part because an important trend in contemporary international water transportation has been load centering, which involves concentrating large volume shipments at only one port in a geographic area. The shipper responses (mean = 3.34) appear to suggest that the ports (mean = 4.05) are overemphasizing the need to handle large volume shipments.

Rather than focusing so heavily on large volume shipments, the results of this study (see Table 3) indicate that port management might improve their offerings in the area of customer service. For example, the mean importance ratings for claims handling (ports = 3.00; shippers = 3.35) are significantly

different at the .05 level, while there is a ranking difference of two places (ninth for ports; seventh for shippers). Moreover, the ranking discrepancy for shipment information is two and one-half places (seventh among ports; tied for fourth among shippers).

2. International Trade Issues. Respondents were presented with statements on a number of contemporary trade issues that might influence the efficiency of international water port operations, and were asked to assess each statement using a five point scale where 1 = strongly disagree and 5 = strongly agree. As was the case in the previous section, port and shipper responses were analyzed by t-tests of mean equality^b, with the results appearing in Table 4. In addition, Table 4 provides information on whether the shippers consider the particular issue to be important. To facilitate the discussion, the issues have been divided into two groups, 1) operational and 2) safety and security.

Operational Issues. As shown in Table 4, port and shipper differences were statistically insignificant on three of the nine operational issues. Ports slightly agree (mean = 3.41) that graft/personal inducements are a minor problem in port operations, while shippers are neutral (mean = 3.16) on this issue. Both groups of respondents are essentially neutral concerning the influence of documentation complexity on port operations (port mean = 3.01; shipper mean = 3.14), while both groups agree (port mean = 3.79; shipper mean = 3.71) that cargo handlers at water ports should be fluent in the primary language of the country in which they work. Interestingly, none of these three issues was considered to be important by a majority of respondents; in fact, only about 25% feel that graft/corruption and language fluency are important. In other words, there is general agreement between the ports and the shippers on issues that are unimportant to the shippers.

^b*Equality of variance results indicated that t-tests were feasible.*

Table 3

Port Evaluation Factors			
Factor	Mean Score* Ports	(Rank) Shippers	t-value
Has equipment available	4.50 (1)	4.38 (1.5)	.81
Provides a low frequency of cargo loss or damage	4.26 (2)	4.38 (1.5)	-.72
Offers convenient pickup and delivery times	4.15 (3)	4.01 (3)	.81
Allows for large volume shipments	4.05 (4)	3.34 (8)	4.12*
Offers flexibility in meeting special handling requirements	4.00 (5)	3.76 (6)	1.49
Has low freight handling charges	3.95 (6)	3.95 (4.5)	.02
Provides information concerning shipments	3.67 (7)	3.95 (4.5)	-1.62
Has loading and unloading facilities for large and/or odd-sized freight	3.59 (8)	3.16 (9)	2.15**
Offers assistance in claims handling	3.00 (9)	3.35 (7)	-2.04**

Spearman coefficient of rank correlation = .7417, significant at
p = .05.

*1 - very unimportant; 5 - very important
**significant at .05 level
*significant at .01 level

Of the six operational issues exhibiting statistically significant differences between port and shipper responses, the one with the largest difference involves the influence of labor regulations on port operations; labor regulations also emerged as the most important (83%) of the issues presented in Table 4. Port respondents neither agree nor disagree (mean = 2.95) that labor regulations are a minor problem in port operations, while shippers definitely disagree (mean = 2.09). The importance of labor regulations on efficient port operations is illustrated by the comments¹¹ of a leading official at the U.S. Maritime Administration, who identified relations between port management and port labor to be the major impediment to efficient port operations in the coming decade.

Both pickup (PU) and delivery (D) times at ports are international trade issues that are important to a majority of the shippers, who feel that PU and D times are too lengthy, while ports do not. For both issues, the mean differences between port and shipper responses exceed .50 (on a five point scale), a strong indication that there are problems with pickup and delivery at ports. Although some causes of these delays may not be directly controllable (e.g., drayage problems, infrastructure-related congestion) by port management, marketing theory teaches that uncontrollable variables/factors/elements are nonetheless key components of a company's marketing environment. As a result, port management should determine: 1) whether PU and D times are a problem at their particular facility, and 2) the sources of PU and D time delays so that corrective action can be pursued.

Another operational issue considered to be important by a majority of shippers (63%) is standardized container sizes. Interestingly, the port respondents (mean = 4.31) more strongly favor standardized container sizes than do their shipper counterparts (mean = 3.75), an indication that shippers may not fully appreciate the operational complexities associated with different sized containers (e.g., increased transfers of freight, increased handling times and costs, increased opportunities for

Table 4

International Water Transportation Issues				
Issue	Mean Score ^a		t-value	Is this issue important to shippers? (% yes)
	Ports	Shippers		
Operational Issues:				
Graft/personal inducements are a minor problem in water port operations	3.41	3.16	1.54	26.6%
Complexity of documentation is the major problem in water port operations	3.01	3.14	-.78	45.5%
Cargo handlers at water ports should be fluent in the primary language of the country in which they work	3.79	3.71	.58	23.9%
International cargo losses are higher at a water port than while in transit	2.68	3.30	-4.25*	45.5%
Labor regulations are a minor problem in water port operations	2.95	2.09	4.87*	83.3%
Containers are more likely to be damaged while in transit than while at a water port	3.31	2.94	2.29**	43.8%
Carrier pickup at water ports takes too much time	2.82	3.36	-3.64*	61.5%

Table 4 cont.

International Water Transportation Issues				
Issue	Mean Score*		t-value	Is this issue important to shippers? (% yes)
	Ports	Shippers		
<u>Operational Issues:</u>				
Carrier delivery at water ports takes too much time	2.71	3.34	-4.14*	55.6%
Container sizes need to be standard worldwide	4.31	3.75	4.31*	62.7%
<u>Safety and Security Issues:</u>				
Hazardous cargoes should not be moved in international trade	1.80	1.91	-.97	58.5%
Packaging standards for hazardous cargo moving through water ports should be more strictly enforced	3.88	3.59	2.25**	63.6%
Water ports are secure from terrorist violence	2.95	2.21	4.94*	57.1%
*1 - strongly disagree; 5 - strongly agree				
**significant at .05 level				
*significant at .01 level				

loss/damage). Improved communication between ports and large shippers could sensitize the shippers to the importance of trying to put their outbound international shipments in uniform container sizes.

The final significant differences among operational variables indicate that ports and shippers do not agree about the location of loss and damage for international shipments. On the one hand, ports slightly disagree (mean = 2.68) that cargo losses are higher when goods are at water ports than while goods are in transit; shippers slightly agree (mean = 3.30) that cargo losses are more likely at ports. On the other hand, ports slightly agree (mean = 3.31) that cargo damage is more likely when goods are in transit, while shippers are neutral (mean = 2.94) on this issue.

While this information suggests that the disagreement is stronger concerning losses than concerning damage, it should be noted that neither issue was considered to be important by a majority of shippers. A possible explanation is that the shippers were asked to evaluate the importance of the various operational (as well as safety/security) issues based on the exact statements appearing in Table 4. As pointed out in Table 3, loss and damage performance is a key criteria when shippers select a water port; however, the actual location of lost or damaged goods (the issues appearing in Table 4) is of lesser importance than whether goods are lost or damaged.

Safety and Security Issues. Table 4 also provides information on port and shipper evaluations of three safety and security issues, along with shipper importance ratings on the issues. Two of the three show statistically significant differences between ports and shippers, with ports more strongly favoring (mean = 3.88) stricter packaging requirements for hazardous products than do the carriers (mean = 3.59). Moreover, packaging standards are considered an important issue by nearly two-thirds of the shippers; these standards may raise legal questions concerning the responsibility--shippers, carriers, forwarders, ports--for errors or accidents that may occur.

There is also rather strong disagreement between the ports and shippers concerning the influence of terrorist violence on port operations (an issue important to 57% of the shippers). Ports are neutral (mean = 2.95) as to whether or not their facilities are secure from terrorist violence, while the shippers disagree (mean = 2.21) that water ports are safe from such actions. Although terrorist activities are, to a large degree, uncontrollable, the magnitude of disagreement (almost .75) between ports and shippers is a clear indication that port management needs to improve at least the perception that their facilities are secure from terrorist behavior.

Summary And Conclusions

A central premise of this study is that water ports have primarily concentrated their marketing efforts on ocean carriers, neglecting other relevant groups of customers. This neglect becomes evident when the responses of ports and one group of "neglected" customers are compared on a variety of international trade variables. Specifically, this study focuses on a comparison of water ports and large U.S. industrial shippers in terms of 1) important factors in water port evaluation and 2) opinions concerning issues that influence the efficiency of international trade.

With respect to port evaluation factors, the locational advantages that individual ports previously relied upon are diminishing. For example, Virginia's inland port at Front Royal is approximately 200 miles from its "parent" ports of Hampton Roads. As a result, water ports must attempt to satisfy customer needs beyond locational preference. This study found that ports tend to overemphasize the ability to handle large volume shipments, while underestimating the informational requirements of shippers, particularly in terms of claims handling and shipment tracing.

In terms of the contemporary trade issues, shippers and ports demonstrated marked disagreements concerning the influence of labor regulations on efficient port operations. The importance of this issue to shippers (83% felt it to be an important issue) also suggests that shippers view labor regulations as more than a minor problem influencing water port operation. Furthermore, the shippers suggest that carrier pickup and delivery times at water ports take too long, situations that may be exacerbated by port labor problems.

Although water ports do not generally view shippers as an important customer group, respondents from large U.S. industrial corporations indicated that they play a key role in evaluating and selecting the water ports used by their companies for international distribution. Shippers--especially large ones--are actually important water port customers.

Some ports view selected operational (e.g. port pickup and delivery times) and safety/security (e.g., terrorist violence) issues as uncontrollable factors, which therefore do not need to be addressed by port management.⁴ However, others have recognized that¹³ "uncontrollable elements...must be considered in the planning, implementation and control of the firm's international distribution network." The necessity of dealing with these uncontrollable factors comes in part from the increasingly competitive international distribution environment, which offers shippers a broad array of choices for their cross-border shipments.

International shipments that historically moved from water port to water port are today facing stiff competition from sea/air and sea/truck/air alternatives. At a minimum, these alternatives to all-water movements offer the potential for reduced business for individual ports. Consequently, water ports might adopt a more proactive approach to their customers--including a broader delineation of their customers (see Figure 1)--because lost business is extremely difficult, if not impossible, to reclaim.

References

¹Assael, Henry. Marketing. Chicago: Dryden, 1990, Chapter 1.

²Brown, Warren. "Port in a Storm." The Washington Post, 29 January 1990, Washington Business, p. 30.

³Burdg, Henry B. and James M. Daley. "Shallow-Draft Water Transportation: Marketing Implications of User and Carrier Attribute Perceptions," Transportation Journal, Spring 1985, pp. 55-67.

⁴Confidential correspondence.

⁵Coyle, John J., Edward J. Bardi and C. John Langley. The Management of Business Logistics. Fourth edition, St. Paul: West, 1988, Chapter 12.

⁶Engel, James F., Roger D. Blackwell and Paul W. Miniard. Consumer Behavior. Fourth edition, Chicago: Dryden, 1986, Chapter 5.

⁷Gish, Judy. "Ports Push Service." Container News, January 1990, pp.- 21-23-

⁸Lehmann, Donald R. and Russell S. Winer. Marketing Planning. Second edition, Homewood: Richard Irwin, 1991, Chapter 5.

⁹McCarthy, Eugene J. and William D. Perreault. Basic Marketing. Ninth edition, Homewood: Richard Irwin, 1987, p. 91.

¹⁰McConnell, Campbell R. and Stanley L. Brue. Economics:

Principles, Problems and Policies. Eleventh edition, New York: McGraw-Hill, 1990, Chapter 39.

¹¹Salzano, Carlo J. "Labor-Management Relations Seen as Ports' Top Challenge in the '90s." Traffic World, 25 December 1989, pp. 26-27.

¹²Stock, James M. and Bernard J. LaLonde. "The Transportation Mode Decision Revisited." Transportation Journal, Winter 1977, pp. 51-59.

¹³Stock, James M. and Douglas M. Lambert. Strategic Logistics Management. Second edition, Homewood: Richard Irwin, 1987, p. 646.

¹⁴Stromberg, Erik. "The Changing Role of Ports." Container News, September 1990, p. 42.