

Empirical Analysis of Shipper Requirements for E-logistics : The Case of International Shipping

E-logistics에 있어서 화주의 평가체계에 관한 실증적 연구 :
국제 해운분야를 중심으로

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Key Words: e-logistics, international shipping, information technology

Abstract

Information technology has been transforming the relationship between shippers and carriers, but an unresolved question remains: what is the relative importance to shippers of service versus cost benefits of e-logistics solutions? This research develops and empirically tests a model to determine how Internet-based logistical operations in international shipping impact on the relative importance of cost versus service benefits to shippers. Contrary to expectations, results show that shippers perceived cost benefits from well-designed web sites, undoubtedly a consequence of perceptions that multi-function portals with ease of access contributed to savings in time and money. Another result was the confirmation of the positive effects of cargo tracing and bill of lading issuance on service-related factors. Finally, this study draws attention to the need for improvements in on-line booking capabilities and development of a comprehensive common portal; issues that must be addressed for shipping lines to succeed in an increasingly competitive e-logistics market.

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I . Introduction

In recent years, the relationship between shippers and carriers has been radically transformed by the advent of the Internet, the development of information technology (IT), the enhancement of supply chain management and information strategies, and the intensification of competition among shipping lines. Better methods of information management are now available to shippers, including real-time scheduling confirmation, tracking and tracing, and tariff confirmation through the exploitation of cyberspace. Most shipping lines today offer shippers a variety of services through the Internet, which are altering the customs and practices of maritime transport transactions, as well as the attitudes of shippers.

As the use of cyber logistics rapidly expands and electronic commerce, or e-commerce, transport becomes increasingly complicated, greater understanding of how those services and information are used to manage international transportation systems is sorely needed.

However, there have been relatively few attempts to thoroughly investigate the importance of e-logistics among shippers, especially in the area of international shipping. Ocean carriers can more effectively and efficiently implement a broad range of business strategies if they have a better understanding of what shippers perceive to be the most important elements of e-commerce.

The objectives of this research are wide-ranging, to include cultivating a better understanding of the e-logistics needs of users and the services offered by providers. Furthermore, this research attempts to evaluate how different kinds of services provided within e-logistics solutions contribute to service- or cost-related benefits accruing to users; more specifically, in what ways do the services offered on e-logistics web sites managed by shipping companies meet the service or cost needs of shippers.

II. Literature Review

1. IT and Logistics Service

IT has become a key issue of interest to logistics specialists, from shippers to

transport managers to logistics companies.¹⁾ In response to the expanding use of IT in the field of logistics, there have been various studies of the impact of IT on logistics performance, both in Korea and abroad. Kim and Kim used survey research to confirm the widespread adoption among Korean shippers of information technologies as internal resources for customer-oriented logistics, and how those information technologies led to a significant reduction of the level of risk in the shipping industry.²⁾ Their research also yielded insights into the motivating factors behind the evolution of e-logistics technologies in Korea's transportation industry.

The potential benefits of information sharing to logistics activities is indeed enormous.³⁾ Recent developments in e-logistics have focused on adopting IT systems to improve the visibility of actual goods during the shipping process, with information sharing providing a mechanism to deal with many of the hard-to-recognize problems associated with reducing total inventory levels of different groups along the supply chain. IT systems foster a so-called "transparency" effect for goods being transported, and information and communication technologies are helping to make the flow of goods from origin to final destination more transparent, allowing for increased coordination and cooperation among the physically separate organizations in the supply chain. Harvard University Professor Michael Porter, the leading authority on competitive strategy, has asserted that "competitive advantage is increasingly a function of how well a company can manage the entire system."⁴⁾ Transportation is an integral part of managing the supply chain system and a major factor in every company's competitiveness.

One of the most persistent management problems companies face today is the "bullwhip effect," which results from the upstream impact on the supply chain of demand variability. This effect can be moderated or prevented by using information and electronic business solutions.⁵⁾ Information management is the key to

1) Williams, Lisa and Kant Rao, "Information Technology Adoption: Using Classical Adoption Models to Predict AEI Software Implementation," *Journal of Business Logistics*, Vol. 19, No. 1, 1988, pp. 5-16.

2) Kim Seog-soo and Kim Sang-yeol, "The Interaction Effects of Logistics Internal Assets on Firm Performance," *Shipping and Logistics Studies*, The Korean Association of Shipping and Logistics, December 2003, pp. 51-75.

3) Williams Walton, Lisa, "Electronic Data Interchange(EDI): A Study of its Usage and Adoption Within Marketing and Logistics Channels," *Transportation Journal*, Vol. 34, No. 2, Winter 1994, pp. 37-45.

4) Porter, Michael E., *The Competitive Advantage of Nations* (New York: The Free Press), 1990, p. 3.

coordination among members along the supply chain, and allows for more efficient adjustments to respond to demand variability.

The relevance of information exchange in avoiding bullwhip effects has been well documented. Lee, et al., found that bullwhip effects decrease as information sharing increases, although it has a limited effect on short-term disruptions in the flow of goods along the supply chain. All units in the supply chain are concerned with how best to convey information to other partners in increasingly fast-paced and ever-changing business environments. In response to this need, using IT to cultivate the free flow of information has been a major focus of current strategies to improve business competitiveness.

Developments in IT may also reduce shippers' logistics transaction costs and promote better efficiency throughout the entire supply chain. The newest information technologies provide better support for decision-making processes and business restructuring. Information gathering and sharing technologies related to order processing and the overall transaction pattern, as well as the continued and expanded use of such communication tools as phones and fax machines, are strengthening all aspects of logistics activities. IT related to e-commerce provides shippers and other logistics providers with more cost-effective and labor-saving weapons that can give companies an advantage over other supply channels.⁶⁾ Those technologies not only reduce paper-related booking and invoicing errors, but also help to streamline operations and increase overall efficiency.

Since customers ascertain information on the relevance of e-commerce solutions to their operations through research, the effective provision of e-logistics functions is critical if logistics companies wish to enhance and differentiate their service potentials. Well-designed IT solutions for e-logistics have the capability of accomplishing this by increasing the accessibility of logistics services to meet shippers' needs for more effective communication in the area of transportation management.⁷⁾

The literature also suggests that adopting technology to meet the need for more efficient control of information often creates strategic and competitive advantages for all parties involved in the supply chain. Nowadays, IT is so advanced in the area of

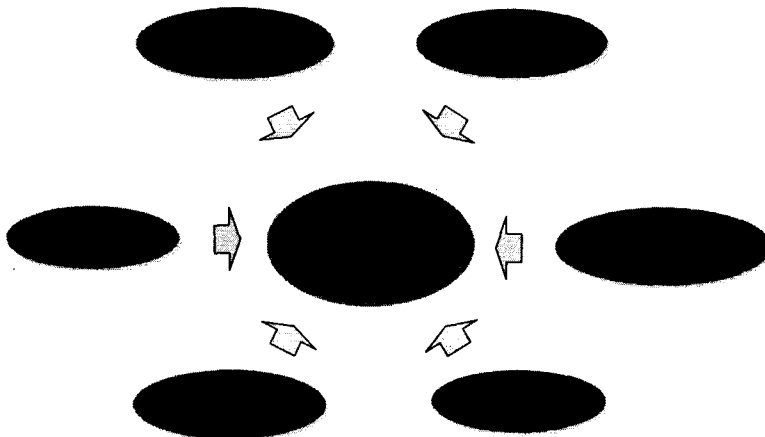
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- 5) Lee, H. L., V. Padmanabhan and S. Whang, "Information Distortion in a Supply Chain: the Bullwhip Effect," *Management Science*, Vol. 43, No. 4, 1997, pp. 546-58.
 - 6) Bowersox D. J. and P. J. Daugherty, "Logistics Paradigm: the Impact of Information Technology," *Journal of Business Logistics*, Vol. 16, No. 1, 1995, pp. 65-80.
 - 7) Bell, Lou Ann, "U.S. Liners in High-Tech Race to Implement AEI Tracking Systems," *Traffic World Magazine*, March 12, 1990, pp. 36-37.

logistics that it can alter business tactics and the framework of organizations. Well-defined and easily accessible information services from logistics companies can have substantial influence on the organizational structure and working practices of shippers.

2. The Case of International Shipping

Both shippers and shipping lines believe that IT is increasingly important to the international movement of ocean cargo.⁸⁾ The application of these technologies is helping shippers and carriers reach higher standards of service at lower costs. For example, Internet use is replacing the old practice of making numerous phone calls between shippers and carriers. Better communications through web site contacts and controls are becoming important keys to improved productivity for both shippers and carriers.⁹⁾

<Fig-1> Establishing successful e-services through service factors



8) Han, Jong-Kil, "A Study on the present situation and operation strategies of Shipping B2B e-commerce," *Shipping Studies: Theory and Practice*, The Korean Association of Shipping and Logistics, Spring 2001, pp. 35-54.

9) Mruphy, Paul R. and James M. Daley, "International Freight Forwarder Perspectives on Electronic Data Interchange and Information Management Issues," *Journal of Business Logistics*, Vol. 17, No. 1, 1996, pp. 63-84.

<Figure 1> is a graphical representation of the different logistics functions that have been improved by e-commerce solutions. Together, the six areas form the basis of a strong e-logistics culture among companies involved in the movement of goods and services along the supply chain. These days, every aspect of shipping can be managed through e-logistics: from rate inquiries, booking, scheduling, and conveying shipping instructions during the pre-shipment stage, to processing bills of lading and tracking shipments during the transport of goods.

<Figure 2> is an example of a shipping line web page managed by the carrier NYK Logistics & MegacARRIER. This particular page provides information to shippers on container tracking. The page has basic information related to identification, to include a container number, the bill of lading (B/L) number for that container, and the container size or type. The page also provides detailed descriptions of actions taken during the course of shipment, to include loading dates and locations, carriers involved in shipment, positioning information, and reminders to shippers.

<Fig-2> Container tracking example provided by NYK Logistics

Container Tracking

NYK LOGISTICS & MEGACARRIER

Container Movement Details

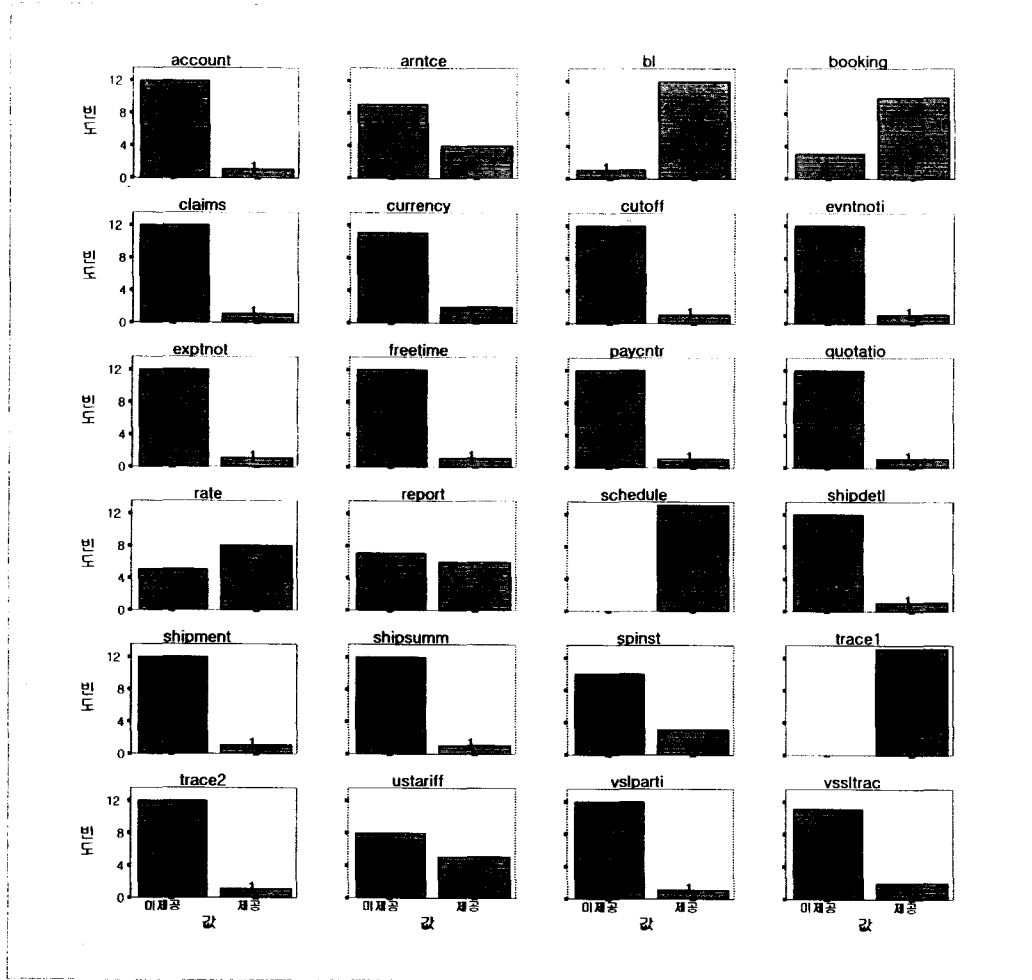
Container for B/L Number: NYK5002679571 Current date: Dec-11-2003

Container: NYKU2307762 Container Size/Type: 20xREF

Status As Of	Description	Carrier
Nov-11-2002 09:00	Container positioned to CFS for devanning at Southampton, GBR	GBPENTAL
Nov-11-2002 08:00	Import Container Received At Southampton, GBR	GBSCT
Nov-09-2002 18:00	Import container positioned from Southampton, GBR	GBSCT
Nov-08-2002 14:45	Container discharged from vessel at Southampton, GBR	NYK Antares 034
Oct-18-2002 21:50	Container loaded on vessel at Tokyo, JPN	NYK Antares 034
Oct-16-2002 11:08	Container received for export at Tokyo, JPN	
Oct-11-2002 14:30	Empty container positioned to shipper from Yokohama, JPN	

Tracking information for CFS cargo should be reconfirmed with your local NYK office.

<Fig-3> Current Status of 13 Largest Shipping Lines' E-logistics services¹⁰⁾



10) The abbreviations for e-logistics services evaluated are as follows: *account*: shipping line web site provided account reporting for the past transaction; *arntce*: provided cargo's expected arrival time; *bl*: print bill of lading through web site; *booking*: on-line booking function/check booking status; *claims*: submit claim-related matters through homepage; *currency*: provided exchange rate information by vessel; *cut off*: check cut off time for shipment at loading port; *evntnoti*: event notification; *exptnot*: exception notification; *freetime*: check free time for detention at the terminal; *paycntr*: payment center; *quotatio*: provide estimated price quotation; *rate*: request rate or tariff; *report*: create shipment report and download it; *schedule*: check real-time schedule for upcoming three months; *shipdettl*: shipping details; *shipment*: provided shipment data; *shipsumm*: shipping summary; *spinst*: shipping instructions; *trace 1*: track and trace with cargo; *trace 2*: track and trace (some shipping lines provide two trace functions; one for general cargo, the other for containers); *ustariff*: tariff from/to USA; *vslparti*: vessel, particular; *vssltrac*: vessel trace.

<Figure-3> shows the results of an inspection of the e-logistics services offered on Internet web sites by the world's 13 largest shipping lines.¹¹⁾ The survey of these web sites was conducted in August 2004, and the information was compiled manually and classified using statistical software. There were 24 possible e-logistics services offered by shipping lines through their web sites, ranging from account information to vessel tracing. <Figure 3> represents the graphical results of that visual inspection of the web sites of the 13 largest shipping lines. The value on the right of each individual graph is the total number of shipping lines providing that specific e-logistics service, and the left-hand result is the number of those not providing the service. No attempt was made to list all of the services offered by each individual shipping line.

While the use of e-logistics solutions between shippers and ocean carriers is now pervasive, these results of the latest offerings posted on the web sites of those shipping lines clearly show that the range of e-services individual shipping lines offered varies widely.

Perhaps the most interesting finding among the data is that all 13 shipping lines had incorporated "shipping schedule" and "trace functions" into their web sites. A logical conclusion is that most of the carriers now regard these functions as the most important and standard operating procedure among the many e-logistics services that could potentially be offered via a web site. Surprisingly, only a single carrier for each provided the web service to manage claims, keep track of 'free time' designation period for stacking containers in the terminal, and review shipment details. No single company provided a complete list of e-logistics services. Either these secondary functions were seen as being of less importance, or they were still underdeveloped because of the information management practices of shippers.

At this point, several comments can be made about the status of web site information on shipping lines available to shippers:

- a) Most carriers offer "shipping schedule" and "cargo trace functions"; thus, these functions are more efficiently accessed.

11) The web sites evaluated were from these 13 largest shipping lines: Hanjin, Hyundai, NYK Logistics, Maersk-Sealand, OOCL, Evergreen, Yangming, COSCON, CMA-CGM, APL, K-Line, Mediterranean Shipping Co., P&O.

- b) Lack of uniformity in webpage contents among different shipping lines might make evaluating their e-logistics services more difficult for shippers.
- c) Although the web sites of some shipping alliances provide partial lists of rates and services for comparisons, currently there is no independent and comprehensive shipping portal on the Internet for service and cost comparisons among the different shipping lines.

International shipping is a proper area for examining the "e-logistics and shipper-carrier communication" because of the importance of value-added services to users, as well as the increasing interest in supply chain management, generally. Unlike research evaluating the effects of general concepts of IT, few specific studies of the ocean transport field exist.¹²⁾ While it is natural to expect that there might be a lot of research geared toward a better understanding of consumer demand to generate information about the types and quality of services available, the extent to which shippers use different services is not known. As a starting point in filling this gap, this research explores the use of e-logistics in international shipping.¹³⁾ The underlying rationale for this research is that the e-logistics services offered over the Internet by shipping lines in some sense reflects the consumer preferences for those services. It is a supply-side approach to evaluating the demand for e-logistics services.

Because e-logistics services can be used to gauge the needs and satisfaction levels of the shippers, several research hypotheses were formulated to learn about selected e-logistics services and their relationship to overall shipper satisfaction. In this research design, the relative importance of service elements versus cost elements represent the dependent variable of the regression model discussed in the next section. Six independent variables ranging from the superiority of web site design to the regularity of web site improvements were selected to gauge the dependent variable. Six hypotheses were developed to evaluate the effects of these six independent variables on the dichotomous dependent variable. The hypotheses are as follows:

12) Murphy, Paul R., James M. Daley, and Patricia K. Hall, "EDI Issues in Logistics: A User and Carrier Perspective," *Journal of Business Logistics*, Vol. 19, No. 2, 1998, pp. 89-102.

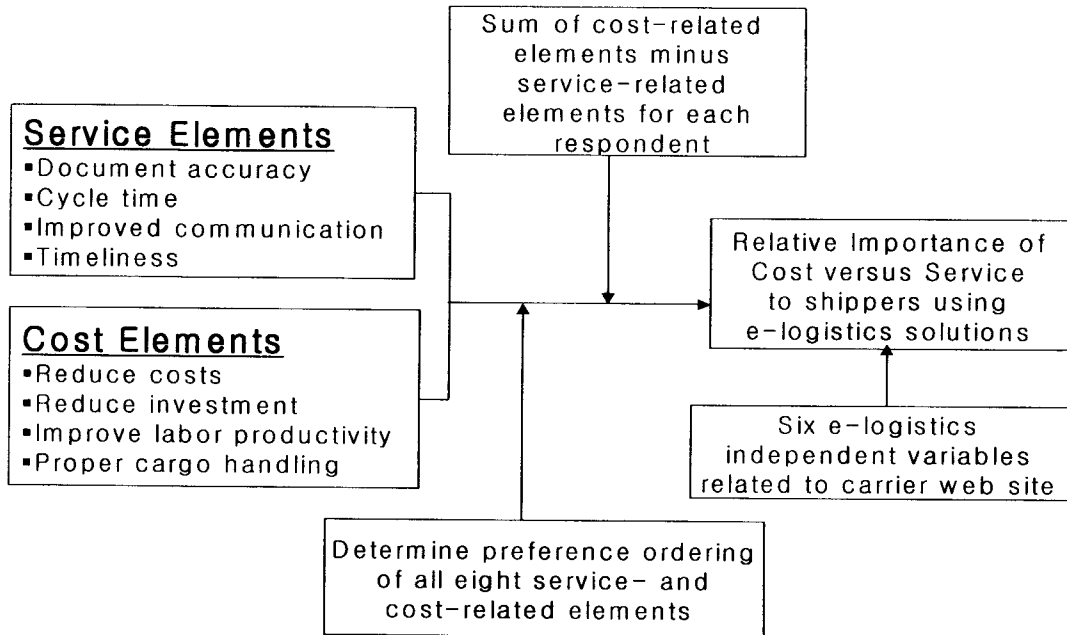
13) Han, Jong-Kil, "A Study on the e-Business Strategies of Shipping industry," *The Journal of Korean Association of Shipping Studies*, Vol. 33, December 2001, pp. 1-19.

- H1: Web site design is more positively related to service effects than to cost-saving effects.
- H2: Container tracking and document functions are more positively related to service effects than to cost saving effects.
- H3: Rate and schedule functions are more positively related to service effects than to cost-saving effects.
- H4: Web site dynamism (user-friendliness) is more positively related to service effects than to cost-saving effects.
- H5: Web site superiority with regard to visual effect is more positively related to service effects than to cost-saving effects.
- H6: Process dynamism (regular improvements made to the web site) is more positively related to service effects than to cost-saving effects.

<Figure 3> is a graphical representation of the research agenda of this paper. This research design draws from previous work by Emerson and Grimm.¹⁴⁾ The first stage of the research employs factor analysis to reduce the eight benefits that shippers get through the use of e-logistics services offered by carriers. The second stage involves the deduction of the sum of the service-related elements from the sum of the cost-related elements in order to determine the relative importance of those service versus cost elements. Friedman Tests were conducted in the third stage to find the preference ordering of shippers for benefits derived from the e-logistics services offered by carriers. The final stage uses a regression model to determine the relationship between the six e-logistics functions provided by carriers to the relative importance of service- versus cost-related elements.

14) Emerson, Carol J. and Curtis M. Grimm, "The Relative Importance of logistics and Marketing Customer Service: A Strategic Perspective," *Journal of Business Logistics*, Vol. 19, No. 1, 1998, pp. 17-32.

<Fig-3> Framework of Research



III. Empirical Analysis

1. Research Methodology

This research focuses on evaluating the relative importance of the major elements of e-logistics and the impact of shipper satisfaction with various e-logistics services on international ocean shipping. A reasonable starting point to gain insights into e-logistics practices is to analyze the responses of users. In this study, the connection between web site information and shipper satisfaction levels related to both cost and service were investigated from the shipper perspective.¹⁵⁾

In order to assess how well e-logistics programs are performing, interviews of managers from several transport departments of large trading firms located in Seoul

15) Anderson, James C., "A Measurement Model to Assess Measure-Specific Factors in Multiple-Informant Research," *Journal of Marketing Research*, Vol. 22, February 1985, pp. 86-92.

were conducted to enable the researcher to gain a better understanding of what e-logistics issues were most important to shippers. These interviews provided the basis for an extraction of relevant measures of performance outcomes related to e-logistics.

The respondents (shippers) were provided with a questionnaire designed to evaluate the relative importance of different e-logistics solutions discussed in <Fig-3> according to cost and service functions.¹⁶⁾ The questionnaire was developed to uncover the perceptions of logistics managers concerning how their firms evaluated the effect of e-logistics on company performance. Questionnaires were hand delivered to 500 trading firms located in Seoul. Three university students employed by the researchers conducted the delivery and subsequent collection of questionnaires. Of the 142 questionnaires (28.4% response rate) collected, 126 were useable. The regression model for testing the hypotheses is:

$$\text{SERCOS} = \beta_0 + \beta_1 \text{Design} + \beta_2 \text{Tracebl} + \beta_3 \text{Ratesch} + \beta_4 \text{User} + \beta_5 \text{Visual} + \beta_6 \text{Improv}$$

Where the independent variables are:

DESIGN: Web site Design

TRACEBL: Cargo tracing and On-line B/L

RATESCH: Rate and Schedule Search

USER: User-friendliness

VISUAL: Visual Effects

UPDATE: Regular Improvement of the Web Site

The independent variables used in the regression model represent the individual responses of shippers to six separate questions related to each aspect of the web page characteristic under scrutiny. The web site design question asked respondents to gauge the importance of web sites providing more services and information in an easily accessible format. The cargo tracing and on-line B/L question asked respondents how important it was for web sites to provide up-to-date information on the movement of shipments and instant issuance of bills of lading. The rate and schedule search dealt with the importance of the availability of rate information and

16) Matear, Sheelash and Richard Gray, "Factors Influencing Freight Service Choice for Shippers and Freight Suppliers," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 2, 1993, pp. 25-35.

scheduling of vessels. User-friendliness asked about the importance of simple directions for navigating throughout the web page. The visual effects question addressed the importance of cosmetic issues related to the look of the web page, and the regular improvements question asked respondents whether constant upgrades to the web page impacted on their business needs.

The dimensionality of the benefits of e-logistics solutions to shippers were evaluated by using factor analysis to analyze the variables. The objective of the analysis was to reduce the eight variables into a smaller number of independent constructs using the specific factor analysis technique of principal components with orthogonal rotation. Factors with an eigenvalue greater than one were rotated and were reduced to two factors: service element and cost element. The two factors accounted for 58.2 percent of the variance in the eight questions. The factors were interpreted by examining the factor loadings of the individual variables.

The variables were loaded along the following two dimensions: service-related elements (document accuracy, cycle time reduction, improved communication, timely operation) and cost-related elements (cost-saving effects such as lower investment in information management, improvements in labor productivity, and proper cargo treatment). The factor analysis results in <Table 1> confirm our classification into the two dimensions of service element and cost element.

<Tab-1> Results of Factor Analysis

	Factor	
	Cost Effectiveness	Service Effectiveness
Reduce costs	.826	.101
Reduce investment	.826	.190
Improve labor productivity	.558	.358
Proper cargo treatment	.669	.205
Document accuracy	.361	.643
Cycle time Reduction	.503	.506
Improved communication	-4.556E-03	.842
Timeliness	.294	.684

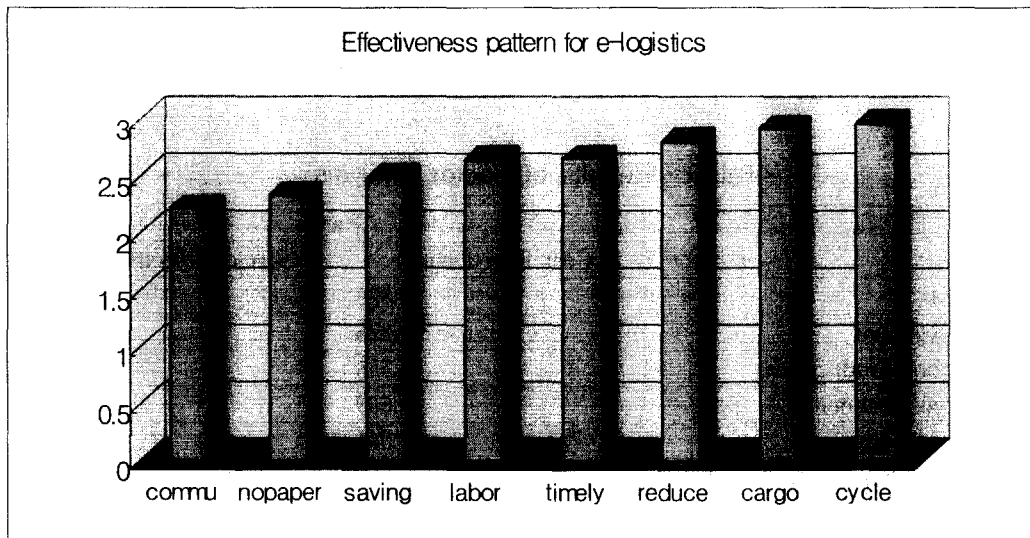
The relative importance of service and cost elements of e-logistics was extracted in the following way. Shippers were asked to rate the importance of each performance variable. The eight performance factors included above mentioned four

from service-related elements and four that were cost-related. Later, the total of the four items regarding cost-related factors were deducted from the sum of the four service factors. Therefore, if the final number was positive, cost factors were greater than service factors. If the final coefficient was negative, service factors were greater than cost-related factors to individual shippers. This final number was designated as the dependent variable in the regression analysis.

2. Results

In the questionnaire, shippers were asked to indicate the importance of each of the eight performance items to their firm. A five-point scale was utilized, with 1='Very Important', 3='Average', and 5='Very Unimportant'. Lower composite scores for individual performance items represent a greater importance of that performance item to respondents.

<Fig-5> Order of effectiveness of e-logistics perceived by shippers



<Figure 5> ranks the eight performance items by relative importance to respondents. The top three components in terms of degree of importance were improved communication (2.21) listed as COMMU, document accuracy (2.33)

represented by NOPAPER, and cost reduction (2.48) expressed as SAVING. Shipper responses evidenced a strong desire among respondents for those elements related to information management and paperless trade. The respondents also had strong preferences for improved labor productivity (2.64) expressed as LABOR, response timeliness (2.65) listed as TIMELY, and a reduction in investment in information management (2.79) represented by REDUCE. These six were substantially more important than last two services. Cycle time reduction (CYCLE) and proper cargo handling (CARGO) were significantly less important to shippers utilizing Internet services than all other services.

In order to determine whether the observed ranking orders were statistically significant, a Friedman Test was computed on the data. <Table 2> shows the results of those calculations. The difference in the importance for each of the variables is significant at the 0.05 level, thereby providing confirming evidence of the ranking differences of each of the items. All of the variables were statistically significant, confirming the order of importance ranking of those variables.

<Tab-2> Results of Friedman Test

	N	Average	St.D	Avg rank	P
SAVING	126	2.48	.94	4.16	N=126 Chi Sqr=95.106 D. freedom=7 P=.000 a Friedman Test
REDUCE	126	2.79	.87	5.00	
LABOR	126	2.64	1.04	4.56	
CARGO	126	2.91	1.02	5.15	
NOPAPER	126	2.33	.95	3.72	
CYCLE	126	2.96	1.02	5.39	
COMMU	126	2.21	.86	3.42	
TIMELY	126	2.65	.95	4.60	

Thus, of the major effects reported by shippers in evaluating the information services offered by carriers on Internet web sites, improved communication, document accuracy, and cost savings were by far the most significant. Several of the respondents said that such an emphasis was prompted largely by the ability of the Internet to provide real-time information related to transportation.

The results of the regression analysis are shown in <Table 3>. The results

indicate that web site design, cargo tracing/BL issuance, and regular improvements to the web site significantly influence the outcome of the dependent variable. The other variables were found not to have a significant effect on whether shippers believed they were accruing service- or cost-related benefits.

<Tab-3> Regression results of the relationship between e-logistics and the relative importance of Cost versus Service

	Coefficient (Std. Error)		T-statistic (Sig)	
Constant	.467	.985	.474	.636
DESIGN	.738	.235	3.146	(.002)**
TRACEBL	-.735	.316	-2.326	(.022)**
RATESCH	.163	.351	.464	.643
USER	-.292	.298	-.982	.328
VISUAL	-.376	.285	-1.317	.190
UPDATE	.457	.246	1.854	(.066)*

*Significant at level shown

Interestingly, and contrary to our expectations, web site design was the most important factor to a determination of the relative importance of cost versus service benefits. Also, we hypothesized that web site design would have a greater impact on respondents' perceptions regarding service benefits, but in fact it was cost benefits that shippers felt they were gaining from better-designed web sites. Also contrary to our hypothesis, respondents placed greater emphasis on the cost benefits of web sites that had cargo tracing and B/L issuance capabilities, rather than the service benefits. Regular updating of the web site and continual improvements made to webpage contents positively related to service benefits, which did support our original hypothesis, and were significant at the 0.1 level. Therefore, there is a 90 percent degree of certainty that transport companies that regularly update their sites were likely to be more competitive in their operations.¹⁷⁾ Thus, this research confirms that web site design, cargo tracing/BL issuance, and regular improvements to the web site impacted on the perceptions of shippers as to whether service or cost benefits were being gained from the use of e-logistics solutions.

17) Global Logistics Research Team, *World Class Logistics: The Challenge of Managing Continuous Change*, Council of Logistics Management, 1995, pp. 186-215.

IV. Discussion and Conclusion

A key finding of the study was that the design and framework of the web site impacts significantly on cost-related factors, contrary to our expectation. What this finding implies is that shippers perceived cost benefits resulting from well-designed web sites, probably the result of the view that multi-function web sites with ease of access contributed to savings in time and money. Design features such as instant or automatic log-on capabilities, when included as part of the contents of the web sites of shipping companies, contribute to reducing the time shippers need to spend acquiring the information they need on the status of shipments.

Another result of this research program was the confirmation of the positive effects of the cargo tracing and BL issuance on service-related factors. It seems that these functions had a major impact on service-related factors, more so than any of the others offered by service providers. These service-related effects seems to be quite strong and confirm our interview results that cargo tracing received significant attention from shippers. During interviews, shippers often mentioned that they frequently used e-logistics services to find the exact location of shipments at a moment's notice.

Although not apparent from the regression analysis, during the interview process many shippers said carriers needed to expand and improve the booking-related capabilities of their web sites. Currently, real-time booking is not possible due to several system-related problems endemic to the operations of most shipping lines. Those shippers who called for improvements to on-line booking capabilities said that they still had to wait for an extended period of time to receive confirmation from the carrier when making on-line booking arrangements.

Finally, most of the transport officers interviewed said they were looking forward to the day when different shipping lines had a common portal service to allow for access to information on competitive pricing, scheduling, and other services offered by individual carriers. Many hoped a common Internet portal would be available in the not-too-distant future. A few of the alliances formed among shipping lines now offer limited portal service, but there currently does not exist any single site providing complete coverage and comprehensive information. The creation of such a site would also contribute to standardization of web contents among providers.

This research makes it clear that shippers view e-logistics solutions as yielding both service- and cost-related benefits. As long as that view is held, providers will work to make improvements to those solutions to better meet the needs of users.

Notes

- 1) Bowersox, D. J. and P. J. Daugherty, "Logistics Paradigm: the Impact of Information Technology," *Journal of Business Logistics*, Vol. 16, No. 1, 1995, pp.65-80.
- 2) Global Logistics Research Team, *World Class Logistics: The Challenge of Managing Continuous Change*, Council of Logistics Management, 1995, pp. 186-215.
- 3) Lee, H. L., V. Padmanabhan and S. Whang, "Information Distortion in a Supply Chain: the Bullwhip Effect," *Management Science*, Vol. 43, No. 4, 1997, pp. 546-58.
- 4) Han, Jong-Kil, "A Study on the e-Business Strategies of Shipping industry ," *The Journal of Korean Association of Shipping Studies*, Vol. 33, December 2001, pp. 1-19.
- 5) Han, Jong-Kil, "A Study on the present situation and operation strategies of Shipping B2B e-commerce," *Shipping Studies: Theory and Practice*, The Korean Association of Shipping and Logistics, Spring 2001, pp. 35-54.
- 6) Anderson, James C., "A Measurement Model to Assess Measure-Specific Factors in Multiple-Informant Research," *Journal of Marketing Research*, Vol. 22, February 1985, pp. 86-92.
- 7) Kim Seog-soo and Kim Sang-yeol, "The Interaction Effects of Logistics Internal Assets on Firm Performance," *Shipping and Logistics Studies*, The Korean Association of Shipping and Logistics, December 2003, pp. 51-75.
- 8) Williams, Lisa and Kant Rao, "Information Technology Adoption: Using Classical Adoption Models to Predict AEI Software Implementation," *Journal of Business Logistics*, Vol. 19, No. 1, 1988, pp. 5-16.
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