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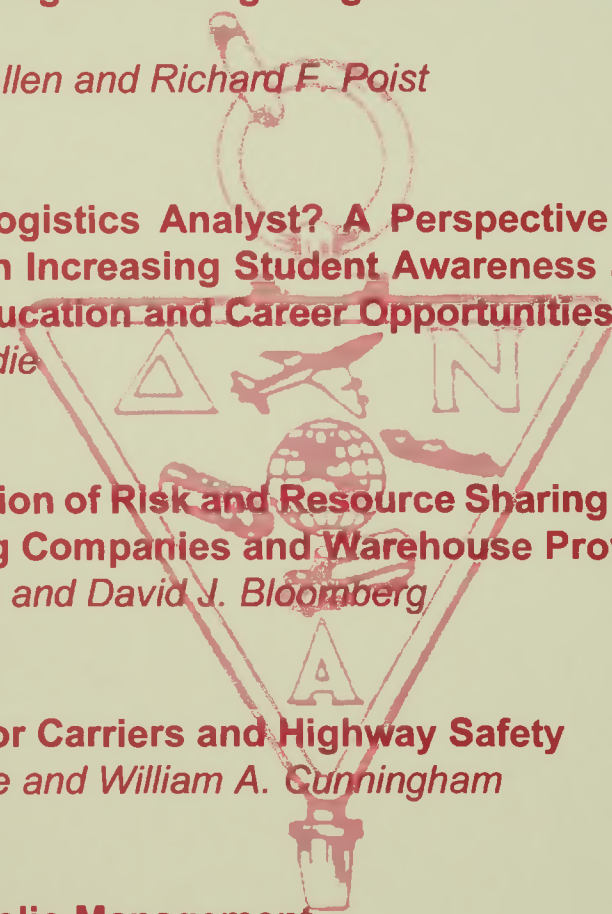
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Delta Nu Alpha Transportation Fraternity



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From the Editor...

As an author of numerous publications, I never fully understood the lengthy time period required to review articles for refereed journals. As a journal editor, I am painfully aware of the reasons for long delays in evaluating manuscripts. The cycle of initial review-revision and resubmit-second review-accept/reject can easily take six months or more. Due to this lengthy cycle, it has been extremely difficult, up to this point in my editorship, to closely match the issue date with the date of printing and mailing. We have made a great deal of progress in this area and hope to continue narrowing this gap with the next issue. I again praise my associate editors, Brian Gibson and Steve Rutner, for their dedication and time commitment. They have been instrumental in helping me to close the time gap. Also, please take a moment to read the list of members of the Editorial Review Board. Each of these experienced professionals serves Delta Nu Alpha and the *Journal* as volunteers and receives no recognition, remuneration, or reward for their efforts. The *Journal* would cease to exist without these dedicated few. I extend my personal thanks to each of you for continuing to serve in this capacity.

Within this issue, you will find a very diverse set of topics. The lead article, by Ben Allen and Richard Poist, examines some of the more important challenges facing logistics and transportation educators in the near future. The second article, by John Dinwoodie, presents an approach he and colleagues have used at the University of Plymouth to increase student awareness and knowledge of logistics occupations and career opportunities. Joe Hanna and David Bloomberg, in the third article, discuss the results of their research into carrier attitudes toward the sharing of risk and resources in alliance relationships with warehouse providers. Kathryn Dobie and William Cunningham review some of the more important problems with expanding NAFTA-related trans-border (between the United States and Mexico) motor freight traffic in the fourth article. In the final article of this issue, Ted Farris discusses carrier consolidation and presents a model for graphically analyzing various carrier performance variables. As promised, the editorial staff is determined to provide articles that cover a broad spectrum of topics and that deal with issues of interest to readers in all aspects of the logistics and transportation industry.

This issue of the *Journal* is the first under the financial sponsorship of the International Intermodal EXPO—the world's largest logistics and transportation related trade show. If you missed the 15th annual EXPO in May in Dallas, Texas, then plan to attend the 16th annual EXPO April 20-22, 1999 in Atlanta, Georgia. I again thank John Youngbeck, CEO of the EXPO, and his board of directors for their commitment to the future of the *Journal of Transportation Management*.

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

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

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

PUBLISHING DATA

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

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



SOME CHALLENGES FACING LOGISTICS EDUCATION AT THE NEW MILLENNIUM

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Although the future of logistics looks bright as the new millennium approaches, logistics programs in higher education face significant changes and challenges. This article examines six challenges—three challenges facing business education in general and three challenges directly and uniquely facing logistics education. Five propositions about the future of logistics education are developed. For logistics education, particularly the traditional logistics programs, the years after the new millennium will be both the best of times and the worst of times.

The future for the logistics discipline looks very bright as the new millennium approaches. An increasing amount of anecdotal evidence exists indicating that logistics has moved from an operational to a strategic importance in many firms. More firms appear to see logistics as a critically important area to remain competitive in the new global economy. In addition, the business press appears to have an increasing awareness of logistics as more journals such as the *Wall Street Journal*, *Fortune*, and *Business Week* provide more coverage of logistics. Possibly the most concrete evidence is that logistics majors in business schools appear to be, along with information systems majors, in most demand for permanent positions and internships.

Unlike most areas in business, however, significant logistics programs are offered in very few business schools and in even fewer engineering schools. Although it has been estimated that roughly 500 universities and colleges offer logistics courses, the logistics major or concentration is available at relatively few schools (Saccomano 1996). With growing demand and limited supply of logistics graduates, existing significant programs in business

schools would appear to be positioned for future growth. In addition, the current and projected demand for logistics graduates would suggest that smaller programs are likely to expand and new programs would be developed. The purpose of this paper is to examine some of the major changes and challenges facing logistics programs in higher education and project how these forces will influence the nature and viability of logistics programs as we enter the 21st century. In the next section, three challenges and changes facing business education in general are reviewed with their likely implications on logistics highlighted. Next, three challenges more directly and uniquely facing logistics education are examined. In the next section, several propositions are presented which suggest a view as to the future of logistics education at colleges and universities in the United States. Finally, implications and conclusions are presented.

EXOGENOUS CHALLENGES

A number of the more important challenges facing logistics education in higher education arose from changes and threats facing business education in

general (Moore and Diamond 1995; Porter 1997). In other words, these challenges are generally external to and not unique to logistics programs. Included in these challenges are: (1) changes in the accrediting procedures and criteria of the International Association for Management Education (AACSB), (2) criticism that the "silo" orientation of business schools is no longer appropriate for solving today's business problems, and (3) claims that business research is too theoretical and without relevance.

Changes in AACSB Accreditation Policy

The AACSB is the premier accrediting agency for bachelor's, master's and doctoral degree programs in business administration and accounting. Standards for business administration were instituted by the AACSB in 1919. More than 300 of the business programs in the United States are accredited. The AACSB accreditation process is designed to promote excellence and continuous improvement in business programs (AACSB 1996-97).

In April 1991, AACSB members adopted new "mission-linked" accreditation standards and procedures for business administration and accounting that support institutional diversity in management education. The change in standards followed a study by the AACSB which found existing management curriculum too standardized and inflexible (Frankel and Lewis 1992). Porter (1997) recently observed that more diversity appears to be developing across business schools. Porter attributes, in large part, this move toward increased individuality among business schools and away from the herd mentality to the new accreditation standards of the AACSB.

Before the 1991 changes, accreditation was based on standards and procedures that emphasized compliance with a set of numerical input indicators and adherence to a curricular structure composed of a specified common body of knowledge. Faculty and administrators in traditional areas such as marketing and accounting could use AACSB standards to inhibit, if not prohibit, the introduction of new programs such as logistics. If one viewed the AACSB as a cartel manager, it was simply attempting to restrict, through "regulation," competition among its cartel members in many different areas, including innovation.

The new AACSB accreditation approach, which involves both self-evaluation and peer review

processes, places the focus on a school's clear articulation of its specific mission, and on its justification of the allocation of resources, processes, curriculum and programs to implement the mission. This change in the accreditation approach by the AACSB provides a great opportunity for some logistics programs to become a more significant component of their business school curricula, if not central components. In addition, it increases the probability of establishment of new logistics programs. The new accreditation process is characterized by the AACSB as a process which supports diversity in management education (AACSB 1994-95).

The main challenge to logistics educators is to ensure that all of the appropriate logistics stakeholders are involved in any strategic planning that takes place in business schools. Today, accreditation evaluation for a school is linked to its mission which is derived through a strategic planning process. The mission must be consistent with the mission of the university. Professional organizations, such as the Council of Logistics Management and the American Society of Transportation and Logistics, must be prepared to serve as resources and be involved in the strategic planning processes of universities and business schools. Strong external support is essential given that the internal support will likely not be as strong as needed because most business faculty earned their doctorates at universities which do not have logistics or transportation programs.

Industry Criticism of Discipline-Based ("Silo") Structures of Business Schools

Business schools and their faculty continue to be criticized for their disciplinary focus and their insulation from other parts of campus. The environment produced by the continuing strong influence of individual disciplines has been noted to produce little interaction between functional units either within the business school or with units outside of business school (AACSB 1996). Employers are wanting more of an interdisciplinary educational background for business school graduates. While universities have departments based upon disciplines, the real world has problems and processes involving multiple disciplines.

This challenge to business education has both positive and negative implications for logistics education. On the one hand, logistics is highly interdisciplinary in nature. One need only look at an

earlier definition of logistics by the Council of Logistics Management (1976) to realize this. Included in the definition are such functions as customer service, demand forecasting, distribution communications, inventory control, materials handling, order processing, parts and service support, plant and warehouse site selection, procurement, packaging, return goods handling, salvage and scrap disposal, traffic and transportation, and warehousing and storage. In fact, some might consider logistics to be so broad as not to be a discipline at all. Logistics is well positioned to thrive in an academic environment in which the focus is not on disciplines. Because of its interdisciplinary nature, logistics matches up better with normal business problems and processes than most other areas in business colleges.

On the other hand, anecdotal evidence exists which suggest practitioners and others perceive students educated in logistics as having too narrow of an educational experience (Armstrong 1996; Richardson 1997). Given that most logistics programs require their students to take all of the core business courses, capstone management courses, plus non-logistics courses in their major, this perception is wrong. It also creates a paradox of sorts. Logistics is considered to be too narrow by industry but too broad by many in the academic community to be considered a legitimate area of scholarship.

Industry Demand for Relevancy of Business Research

Research conducted by business faculty has been criticized for being too theoretical and without sufficient relevance to the "Real World" business environment. On the other hand, some research is highly relevant but lacks strong theory and fails to meet promotion and tenure standards. The ideal research meets both theoretical and applied standards. Industry is looking for the type of research which improves the practice of management and which can be converted into the core body of knowledge so students can improve the practice of business. Industry members are essentially asking about the impact, or lack of impact, of research conducted by business faculty (AACSB 1996).

On balance, this challenge to business education should have a positive impact on logistics programs. Logistics and transportation research tends to be more applied than research conducted in most other areas of business schools. A cursory review of the

top journals in the transportation and logistics area clearly indicates the emphasis on relevant and applied research. In fact, the journals in the logistics area are often discounted by faculty from other business disciplines because of this focus.

The quality and impact of the research in the transportation and logistics area can be strengthened, however. There is some degree of truth to the criticisms from faculty of other business areas that the research in the logistics area tends to lack adequate theoretical underpinnings and that the empirical constructs and empirical work lag the work in other disciplines. In addition, much of the research in the logistics area is a study of what is or what has taken place instead of focusing on what should be. An important question to address is how much influence has transportation and logistics research had on industry management practices.

ENDOGENOUS CHALLENGES

On balance, the previously mentioned exogenous challenges to business education suggest an opportunity for logistics curricula to assume a more prominent role in business programs. Involvement by the business or professional community will be required. On the other hand, some of the changes and challenges facing logistics are more internally oriented and unique to logistics programs. The three highlighted below are: (1) the rapidly changing and expanding expectations for graduates of logistics programs, (2) the implications of the small number of logistics faculty in business schools, and (3) the problem of recruiting students to logistics programs.

Rapidly Changing and Expanding Expectations for Graduates

The expanding and rapidly changing expectations for graduates of business programs are well chronicled. More challenging is what appears to be paradoxical demands for specialized technical preparation and, at the same time, for the skills and breadth of academic experiences required to survive and thrive in a continuously changing business environment (Moore and Diamon 1995). Designing a curriculum to prepare students with the right skill sets to be able to add value immediately to the firm and to succeed over the long run is a challenging and never ending task.

This challenge is even more difficult for faculty in logistics programs due to the greater emphasis on

information technology, more breadth in terms of functions, the somewhat undefined nature of the area, and the variety of educational backgrounds possessed by logistics practitioners¹. Furthermore, logistics is a rapidly changing area with demands and conflicting expectations not as prevalently found in more mature areas of business such as accounting or marketing. For example, as noted above, the logistics task in many firms has undergone an evolution from an operational to tactical to strategic orientation. Preparing students to meet the changing educational requirements suggested by this evolution, along with the curricular implications of development of the supply chain management concept, is very challenging to logistics educators (Murphy and Poist 1994; Aron 1997; La Londe 1990).

Risks Associated with Small Faculties

Although the logistics program at Penn State is the largest program in the nation, its faculty group is one of the smallest faculty groups in the Smeal College of Business at Penn State. The group of faculty associated with business logistics at Penn State also is absolutely small with about 10 faculty members. Most faculty groups at Penn State have double this number of faculty or more. Similar numerical relationships can be found at Michigan State University, Ohio State University, University of Tennessee, University of Maryland, University of Arkansas, Arizona State University, Iowa State University, and other universities that have significant programs in logistics. The relative and absolute small size of the logistics faculty produces several challenges for logistics programs.

The relative size of faculty in the logistics area creates political challenges which are constantly manifested in a variety of ways. Strong logistics programs can be and are attacked by faculty in weaker, traditional programs because of the sheer differences in the number of faculty. Curricular issues are decided by the faculty and these decisions usually reflect the relative political power of the faculty groups which is based upon the relative number of faculty. As the curricular programming becomes more customer driven, the importance of political power based upon faculty size will diminish.

The small absolute size of typical logistics faculty creates a different type of problem. In programs with a small faculty, the departure of one faculty member, particularly a senior faculty member, can have a substantial impact on the program. Many

senior faculty have, in addition to building a national academic reputation and relationships with key employers seeking logistics graduates, have strong political ties with college and university decision makers. It is no accident that numerous logistics faculty members eventually become college or university administrators. The exposure that a logistics program has because of its size requires that logistics faculty become politically skilled and more entrepreneurial than faculty in other areas. In addition, the logistics area emphasizes systems optimization and the ability to think in terms of the "Broad Picture" rather than a single function.

Problem of Recruiting Students to Logistics Programs

Despite the higher corporate profile of the logistics profession during the past 5-10 years, it remains largely unknown among students when they first enter college. This is quite in contrast to more traditional business disciplines such as accounting and marketing which are typically more well known.

In essence this means that the great majority of logistics students initially begin with another major and, only after taking an introductory course or having part-time job exposure in logistics, decide to switch majors. Other students find out about and become interested in logistics too late in their college programs (e.g., as seniors) to make it practical to change majors.

Adding to the recruitment problem is the fact that logistics is still portrayed by some in the business community in less than favorable terms. A good example is major business publications such as *Fortune* and the *Wall Street Journal*. While these publications have demonstrated an increasing awareness and coverage of logistics, they nevertheless describe the discipline as a "sinuous, gritty and cumbersome process," that "It is as dry as toast..." and that "It may not be cool. But it is flush with potential." (Henkoff 1994; Bigness 1995)

Certainly these views do not enhance the career image of logistics, nor are they likely to attract students to the field. Even more importantly, these perceptions ignore the fact that logistics has a strategic focus and not simply an operational one. Much needs to be done in this area to educate others as to the true potential of logistics in terms of its strategic and operational importance at both the micro and macro levels of the economy.

An important objective of any recruitment effort should be to increase the number of women and minorities coming into the profession. According to George Gecowets, executive vice president of the Council of Logistics Management, there has been a marked increase in the number of women entering logistics while minorities have been less visible (Saccomano 1996). This increase in women is reflected in the graduate and undergraduate enrollment levels of university logistics programs. For example, it has been reported that 45% of the 75 logistics graduate students at the University of Nevada-Reno are female, compared with none six years ago. Likewise, the undergraduate logistics program at the University of Maryland is reportedly approaching a 50-50 gender mix (Aron 1997).

Perhaps the real challenge regarding recruitment is how best to disseminate information about logistics career opportunities to potential students. By most accounts, the demand for college educated logisticians appears to far exceed the supply resulting in an availability of well-paying jobs and excellent career advancement opportunities (Richardson 1996). This demand/supply disparity is not a recent phenomenon, but rather one that has existed since the mid-1980s and is likely to continue well into the 21st century (Zinzer 1985). A highly promising approach to disseminating this "good news" is to target students as early as possible in their educational careers. Essentially this means no later than their freshman or sophomore year in college or junior college and possibly as early as high school.

PROPOSITIONS FOR THE FUTURE

On balance, the exogenous and endogenous challenges to logistics education suggest that logistics courses and programs should become increasingly important at the college and university level. These challenges should be viewed as opportunities for innovation and improvement, and ultimately must be addressed if logistics education is to reach its full potential as a major field of study. Although not analyzed in this paper, there is clear evidence that industry will have an increasing demand for graduates with interest and skill sets needed for the logistics profession (Zinzer 1985; Richardson 1996). A number of writers have stressed the fact that contemporary logisticians need a variety of skills to be successful. For example, Herron (1985) maintains that successful managers must be able to integrate interfacing, managerial,

and functional skills. Likewise, Murphy and Poist (1991) have empirically tested a "Business Logistics Management Model" which suggests that modern logistics executives must possess a combination of business, logistics, and management skills.

The changes and challenges addressed in this paper suggest that business programs now have greater flexibility to accommodate different programs and courses, such as logistics, under the new AACSB standards, and that industry criticisms of business education (e.g., research is too theoretical and the structure of business schools is based on disciplines) should favor logistics programs now in higher education. On the other hand, the relatively and absolutely small logistics faculties create real political problems for even the most successful and largest logistics programs. Likewise, attracting students to logistics and designing logistics curricula which provide students with the appropriate skill sets will remain a very challenging and never ending task.

The review of these challenges and changes suggests a number of propositions about the future of logistics education. These propositions tend to be supported by current trends and available evidence. The most important are discussed below.

Proposition #1: In general, logistics programs will become more customer driven.

Existing logistics programs, like all business programs, will become more responsive to industry needs. Several logistics programs have just completed a curricular and program restructuring in which industry was deeply involved. One example is the Supply Chain Management program recently initiated at Michigan State University. The AACSB's new accreditation requirements suggest that all business programs must be more responsive to the needs of the customer. Given the lack of internal political support for most logistics programs, this increasing awareness of the importance of the customer is a positive development.

Proposition #2: The scope of logistics will include a wider participation of disciplines.

The ever changing demands and broadening scope of logistics calls for wider participation of disciplines in logistics curricula. Logistics will likely become a

"virtual major" depending upon the types of skill sets being requested by the firms recruiting at a particular university. The logistics major will put together courses from cognate programs in a time frame and manner requested by corporations. Given the increasing technical underpinning of logistics, it is likely that more logistics programs will be jointly offered by business and engineering schools. This approach provides an alternative to an approach suggested recently as possibly the most effective way for a student to prepare for the logistics profession—an undergraduate degree in engineering in conjunction with a MBA degree (Cooke 1992).

Proposition #3: Increasing demand will be met primarily by more business schools offering more courses, and only secondarily by establishing new programs.

As the demand for logistics grows, universities will respond by adding a course in logistics for the first time or adding a course or two to existing courses. Developing new logistics programs, particularly in business schools, will be difficult given the political and budgetary environment for most business schools. The major exception to this rule occurs when the business or professional community intervenes by providing resources to restore courses or initiate programs. Students interested in a logistics major in these "new" programs most likely will have the option of taking courses in cognate areas but will have limited options within the traditional logistics curriculum. The efficacy of this approach to meet the expanding industry demands in the logistics area will depend upon the degree to which an administrative and faculty commitment is made to logistics education. Requiring a reluctant marketing faculty member or an operations management faculty member to teach a new course in logistics is not likely to develop a nurturing environment to grow an interest in logistics.

Proposition #4: Traditional disciplines and departments will attempt to adopt logistics as their own as demand for logistics increases.

The growth in industry demand for students interested in logistics will gain the attention of traditional areas in business schools, particularly areas of declining enrollments and excess faculty. As

logistics grows, it will become more attractive to the mainstream programs in business and their attempts to adopt logistics will likely increase. Although the customers will have more influence over the curriculum than in the past, it is less clear who will control the provision of the major. The logistics programs will move from an environment of being the unwanted stepchildren of business education to being prime candidates for acquisition by the traditional majors.

Proposition #5: The business community will play an increased role in the future of logistics education.

The corporate need for logistics talent has created a strong pull on universities to revise and upgrade existing programs and course offerings. This industry influence has been referred to as the "consumer pull theory of academic change." (Aron 1997) Many, if not most, of the curricular revisions and upgrades involve placing greater emphasis on supply chain management. In an even more dramatic fashion, the business community has stepped in to help restore courses or initiate logistics programs at the University of North Texas, Long Island University, the University of Northern Colorado, and the University of Nevada-Reno (Aron 1998). More will be said regarding potential business efforts to enhance logistics programs and curricula in the Implications and Conclusion section of the paper.

IMPLICATIONS AND CONCLUSIONS

The challenges and propositions presented in the paper have a number of implications for the academic and business communities. For those in the academic community (e.g., educators and administrators), the implications can be enumerated as follows:

1. Take advantage of the opportunities offered by the new AACSB accreditation standards to establish new logistics programs as well as strengthen existing programs and courses.
2. Stress the interdisciplinary nature of logistics as well as emphasizing problems and processes involving multiple disciplines.
3. Stress greater relevancy in logistics research as well as strengthening methodological and

theoretical underpinnings associated with this research.

4. Take an active and continuing role in preparing students to meet the changing educational requirements and skill sets desired by industry.
5. Foster relationships within the academic and business communities that will assist in creating, enhancing, and ensuring strong logistics programs and curricula.
6. Take a proactive role in recruiting students to logistics programs and attempt to target/inform students about job and career opportunities as early as possible in their educational endeavors.

This paper also has implications for those in the business community including employers, practitioners, and professional associations. Their efforts are particularly important in terms of providing activities and resources which strengthen logistics programs and curricula. For example, the business community adds "real world" relevance to

logistics programs by sponsoring speaker bureaus, scholarships, internships and co-ops, career days, job fairs, field trips, web site development devoted to career opportunities, and holding local meetings/annual conferences and subsidizing student fees for these events. Last, but certainly not least, the business community must continue to seek out and hire majors/graduates from logistics programs as well as making known their needs regarding curriculum design and course content.

In conclusion, the challenges and changes outlined in this paper suggest that the existing logistics programs are entering a time period which can best be portrayed by paraphrasing Charles Dickens' first sentence in the *Tale of Two Cities*. For logistics education, particularly the traditional logistics programs, the years after the new millennium will be both the best of times and the worst of times. In a positive sense, the growth in the demand for logistics education will likely continue for some time. In contrast, the degree to which traditional logistics programs will control provision of the logistics major and courses is much less clear and more subject to speculation.

ENDNOTE

¹George A. Gecowets, executive vice president of the Council of Logistics Management, noted that nine out of ten people who work in logistics today did not major in the field. See the article by Ann Saccomano "Higher Profile Needed," *Traffic World*, December 16, 1996, p. 42.

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WHAT IS A LOGISTICS ANALYST? A PERSPECTIVE FROM ONE BRITISH UNIVERSITY ON INCREASING STUDENT AWARENESS AND KNOWLEDGE OF LOGISTICS EDUCATION AND CAREER OPPORTUNITIES

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Many sophomore Transport students at a British university were unfamiliar with the role of the logistics analyst. This paper discusses the current extent of student knowledge of some employment roles within intermodal distribution and the processes by which students acquire an understanding of it, providing new information for logistics teachers and career advisors. Qualitative analysis of student descriptions of relevant roles revealed a schema whereby concepts evolved, enabling a teaching package to be devised which accelerated the learning process. The assistance of practitioners, and similar studies by other academics are needed in attempting to raise the awareness of future students.

INTRODUCTION: HOW IS LOGISTICS KNOWLEDGE ACQUIRED?

"For a career in logistics, you must be able to learn and contribute quickly" (Bragdon and Berkowitz 1996, 28).

One aim of the work reported here was to investigate whether the rate at which students at one British university develop their understanding of career openings in intermodal distribution could be raised, following concerns that the concept of "logistics" or the role of an "analyst" were not well established even in sophomores. The demand for such employment roles is relatively well researched (Bragdon and Berkowitz 1996), and there have been useful attempts to define particular roles (Murphy and Daley, 1997), but the ways in which student

knowledge of these roles is acquired have not been widely reported. Before existing teaching regimes could be changed to make learning more effective, it was necessary to establish the existing levels of student knowledge at various stages in courses, given that some of the "softer" aspects of logistics, such as ethical education, may be difficult to teach or involve longitudinal teaching spread over several semesters (Daley, 1994). This approach is consistent with the ideas of educators who identify a learning process which may involve learning through a series of steps, commencing with "raw experience, ...energy flowing through the skin...upon which we erect our perceptions, knowledge and epistemological systems" (Bogoun 1983, 173). Two levels of schema may exist, initially acting as pattern recognition devices, including cortical schemas which transform raw experience, in its entirety, into knowledge, and

further schemas, which organize and retain knowledge. Because an experience is complete, this implies that if we see a pattern, it is associated with a concept, so that if a name tag attached to a face or melody is experienced, this tags a concept, in turn tagging a pattern represented by an abstract, imageless and wordless element of thought.

By asking how a student develops his/her understanding of employment roles in intermodal distribution, we are attempting to reconstruct and explore their concept structure. This assumes that words can tag the concepts in the structure, so that a cognitive map is defined where the territory of verbal concepts have been recorded on paper. Nonverbal concepts only become expressible when a socializing experience results in labels understood by at least one other person to be attached to them, and meaning requires at least two sensations to be mapped.

METHODOLOGY

Any student of intermodal distribution and transport should eventually increase awareness and understanding of relevant occupations, to the point that empirical research might reveal some form of underlying schema development. In an attempt to trace the extent and nature of student knowledge at various stages of the existing study program in Transport at Plymouth, enabling areas in which changes in understanding were needed to be identified and prioritized, a questionnaire was devised to reveal the concepts which students were using to describe their understanding of these occupations. The questionnaires were administered to whole classes ensuring simultaneous replies by students in each group, overcoming some of the problems of conducting interviews, which demand longer time frames. As such, if responses were colored by more recent experiences such as lectures or field visits, they would probably have affected whole groups, with less random tainting of individual replies by such unstable influences. The nature of any schemas which emerged from this research were designed to be of interest to logistics teachers, rather than diagnostic tools for use by vocational guidance professionals. The latter are less interested in the levels of knowledge of students about particular employment roles, but more in skills competence for career management in "exploring resources, reflecting on past and present, planning, monitoring and evaluating self and situation and developing autonomy" (Kidd and Killeen 1992).

In order to focus their attention, students had already been asked to answer questions relating to their own preferred employment within the transport industry, reasons for their choices, sources of information they had used, and details of their previous industrial experience (see Appendix 1). Their reasons for choosing to study Transport at university, and in particular at Plymouth, were also explored (Dinwoodie 1996). At this point, students were asked to provide one line descriptions of the work involved in various occupations in international distribution selected to include several modes and distribution functions with a bias towards logistics. Logistics was a subject of interest to some students sampled in a control group, all of whom had chosen not to major in Transport, and indeed not to study any specialist Transport at all.

In designing sampling procedures, a comparative study of university students at the same stage in their careers was attempted, between those studying Transport as freshmen or sophomores and non-transport freshmen, acting as a control group. All Transport students present in relevant classes were surveyed in the first week of term to prevent any bias from current teaching. 100% sampling rates, of questionnaires administered to groups without warning and collected immediately with no exchange of ideas between students, provided unpremeditated first impressions from the following groups:

- a control group including Geographers and Maritime Business students, who had chosen not to major in Transport, but who might reasonably have done so.
- 38 sophomore Transport specialists, including some international exchange students new to Plymouth but with prior Transport education and work experience, and "single honors" or "major" students from the Plymouth freshmen program.
- 30 freshmen Transport students, including some who may opt for major or full degrees in Transport, and some who may select related Maritime Business or other programs.

The research used open-ended questions, designed to reveal concepts considered significant to those answering, and content analysis of replies (Breakwell, Hammond and Fife-Schaw 1995) which allowed sufficient commonalities for some statistical

comparison, although this was not a high priority in the empirical approach adopted. Null hypotheses of no significant difference between the proportions stating a given attribute among different groups were tested against a one-tailed alternative hypothesis of a greater (or lesser) proportion (p), using Z tests of pooled proportions. Where small samples (n) denied its use (where $np < 5$), tests were not attempted, as the inferential power of binomial enumeration is low.

Non Response

Where students failed to reply, this represents a lack of awareness in terms of schema development (Boreham and Arthur 1993). Response rates to questions for freshmen and sophomores are shown in Table 1, with sophomores recording lower non-response rates for all jobs, indicating increasing awareness after one year of study. The control group of freshmen displayed high non-response rates in relation to the roles of distribution manager and logistics analyst, but fared better for freight forwarder, and similarly to Transport freshmen for other roles. The distribution manager's job was the best known role among Transport students, with rail and logistics analyst jobs least well known. Analyst roles and freight forwarder were not described by a majority of Transport freshmen, but 20% more sophomores were aware of these, with 15% more for shipbroker and 1% for distribution manager. In terms of schema development, awareness of managerial functions developed ahead of planning, with technical concepts such as "logistics," "marketing analyst" and "broker" developing later.

A LOGISTICS CAREERS TEACHING PACKAGE

In order to increase their awareness of key functions in intermodal logistics, Transport freshmen were

presented with a package of ad hoc learning activities. In an introductory lecture, they were asked to discuss official statistics showing recent trends in employment in the industry by mode of transport, and detailed occupational and industrial categories. Next, support staff from the Careers Advisory Service introduced students to the concept of self-awareness, and possible types of relevant employment and sources of information available for exploring employment opportunities. In the main exercise students were requested to work in groups of three, to research sources of information for several employment roles. For each role, they were asked to write job descriptions of about 100 words, show the addresses of five relevant organizations, and list and briefly describe five other jobs which a person in each role might come into contact with during the working day. They were then requested to list the educational requirements needed to perform each of the roles shown, record fully all information sources used during the exercise, and present a one page report on each role which could be duplicated and shared with the rest of the class, either orally or in writing. Assistance in finding relevant sources of information, and in evaluating them was provided by specialist careers staff. Finally a "value-added" survey was conducted, which involved repeating parts of the original questionnaire, to highlight any changes in responses.

Non-response following teaching fell to 3% for distribution manager, freight forwarder and rail marketing analyst, roles, 6% for shipbroker and 9% for the logistics analyst, reflecting a substantial increase in knowledge following relevant teaching. Statistical comparisons between group proportions of non-response suggested that we could be 95% certain that proportions following teaching were drawn from different populations compared with those before teaching.

TABLE 1
PERCENTAGE NON-RESPONSE BY SUB-GROUP AND EMPLOYMENT ROLE

Role	Group		
	Freshmen	Sophomores	Control
Distribution manager	30	29	64
Logistics analyst	57	37	68
Freight forwarder	50	29	40
Rail marketing analyst	60	39	52
Shipbroker	47	32	48

ELEMENTS OF EMPLOYMENT ROLES IDENTIFIED BY STUDENTS

A content analysis of the one line job descriptions indicated elements of the action, function and content, associated with some roles, but fewer elements in other roles. The job function and content elements identified were specific to each role, but the action elements of some roles were more general. Detailed findings for each role are presented below. The "action" element of job descriptions revealed categories of:

Responsible/make sure that...

Manage/oversee/coordinate

Contact with customers

Control

Plan

Decides

Study/find/investigate

Optimize/advise

Responsibility implies a board level function, but management a lower level, and control or customer contact could be at either level. Planning, deciding, studying or advising imply a horizontal staff function within the organization.

The Distribution Manager

In terms of their actions, there was some confusion initially between the planning and executive management actions of the distribution manager among freshmen students, which appeared to clarify by the sophomore stage. In particular, some 10% of Transport freshmen wrongly perceived the distribution manager as "planning" or "deciding," compared with all of the Transport sophomores who responded, who identified him correctly as solely "managing" or "being responsible." After the teaching package, the proportion of freshmen stating "manage/oversee/coordinate" actions rose from 23 to 74%, a statistically significant shift. This contrasted with only 24% of the freshmen control group who were aware of the functions of the distribution manager, where most failed to reply.

The function of the distribution manager was described initially as "organizing operations, routing/scheduling" or "handling," by 37% of Transport freshmen, but by only a couple of sophomore students. More sophisticated concepts of "distributing," "how to transport," "inflows and outflows" and "movement and storage" were reported by sophomores, and a few of the control group who did reply. The content of the distribution manager's job was identified as "areas/ places" (13% of both Transport freshmen and sophomores), but the "firm" or "distribution firm" (freshmen) and "products/goods or processes" (sophomores) were also noted. This reveals a greater generality of understanding in sophomores, but was also the case for those in the control group who did reply. After the teaching package, freshmen students perceived the function as "organizing operations" or "distributing/delivering," and the content as a "distribution firm" or "products/ goods."

Typically freshmen Transport students defined the distribution manager as somebody who "manages (distribution) operations for a firm," sophomore Transport students thought that he "manages distribution of products," but the control group failed to reply. Even in this one example teaching was highly effective, by emphasizing differences in roles within a group, hierarchies within organizations, and groups in organizations.

Logistics Analyst

This was the least well-known role, with only 43% of Transport freshmen responding initially, but rising to 90% following the teaching package. The median initial response of an "investigative" role (23% of freshmen, 26% of sophomores) rose to a statistically significantly different proportion of 65%, following teaching of freshmen. The high proportion (14% of freshmen) who incorrectly attributed a "managerial" or "responsibility" role fell slightly by year two (8%), and the correct action was identified by 50% of Transport sophomores but only 29% of freshmen. This indicates that the concept of planning developed for many students during their freshman year.

In terms of the function of the logistics analyst, 58% of sophomores correctly identified "routing/scheduling" or "how to transport goods," compared with 36% of Transport freshmen before the teaching package and 65% afterwards. Gratifyingly, no Transport sophomores, but 7% of Transport freshmen initially quoted the executive function of

"distribute/deliver," and 8% of the control group "organizing operations."

Initially 34% of Transport sophomores identified "products/ services" as the content of the role, but only 16% of the control group and 10% of Transport freshmen identified the same categories, with 80% initially not referring to any content context. After the teaching package, there was an increase in awareness, with role contents including "the whole firm" (23%), or "service, processes or systems" (26%), or a "distribution firm," "industry" or "products" (10% each).

Typical definitions for both groups of freshmen involved no reply, changing to "studies routing/scheduling of products" for Transport sophomores or "studies routing/scheduling in the whole firm" following freshmen teaching.

Freight Forwarder

More complex descriptions of the freight forwarder were offered by students, including combined elements of action, function and contents of the role. For example, 40% of Transport sophomores identified the concept of a "middleman for cargo exchange," but none of the Transport freshmen did so. Instead, they referred to such concepts as "generally seeking freight for a company." "Handling and planning of freight" were identified by 25% in both groups, but 64% of the control group failed to reply, and a majority of those who did so, confused the role with that of the distribution manager. The "middleman" concept discriminated clearly between freshmen and sophomore Transport students initially, but after the teaching package, 62% of freshmen identified this concept, although the idea of "planning the movement of freight" still required refinement, as the next most frequent response.

Rail Marketing Analyst

The marketing analyst's role is an interesting one, including both a relatively familiar marketing function, and a less familiar analyst's action in the job title. Perhaps not surprisingly, a majority of Transport freshmen initially failed to respond to this role, but with concepts of "market research" or "product promotion" predominating for those who did. A few sophomores (13%) introduced more sophisticated concepts of "statistical analysis" or "modal competition," although some freshmen Transport students (14%) commented on the more

concrete "timetable" functions. The freshmen control group highlighted "promotion" and "statistical analysis."

Typically, responses before the teaching package involved no reply for both freshmen Transport and control groups, but "researches/promotes/advertises knowledge of customer wants" for sophomore Transport students. Following the teaching package for the Transport freshmen group, a statistically significant proportion of responses shifted to "researches trends in the market" with "knowledge of customer wants" the second major element. This is a gratifying shift, as it provides evidence of deeper understanding of other applied areas of the course, such as transport marketing studies.

Shipbroker

Descriptions of the role of the shipbroker included the action and functional elements, but few references to any context. Functions were split equally between those of a "middleman" and "finding the best deal for a customer," but a majority of both freshmen and sophomore Transport groups identified no function. Many Transport sophomores (47%) correctly identified "chartering ships/ ship space" as the prime action, but fewer Transport freshmen (30%) did so, some of whom referred to the "control of shipping," but with "buying and selling of ships" also highlighted. Among the freshmen control group, only part replies were offered including "middleman" and "buying and selling ships" most frequently. Typical initial responses for both freshmen and sophomore Transport groups were "a middleman who charters ship space." After the teaching package, statistically significant changes in the proportions noting the function of the shipbroker as a "middleman, dealer, agent" and "one who charters ships or ship space" were recorded, replacing those who previously did not know.

CONCLUSION

This paper has reported how students at one British university began to acquire a knowledge and understanding of key employment roles and functions within intermodal distribution and transportation. While no claim is made to extend the currency of these findings beyond the time and place in which this work was undertaken, teachers and assessors at other institutions need to raise their own awareness of how schemas such as those identified in students at Plymouth evolve in students

at their own institutions. Having acquired this knowledge, they will be better placed to identify and prioritize shortcomings in their own student understanding, and devise new approaches to teaching which can accelerate the relevant learning processes.

At Plymouth, one schema was found to evolve from an initial understanding of simple executive line management actions, as performed by the distribution manager, into an understanding of planning or middlemen roles. In another area, student use of technical concepts such as logistics or marketing, and relational concepts such as competition, were indicators of a more advanced stage of awareness. In terms of the perceived content of jobs, there was evidence of a shift from "the firm" initially, through "product" and "place," and eventually to "service," and the knowledge of techniques including routing, scheduling and statistics increased in more advanced students. In the light of these findings, the freshman program at Plymouth was amended to emphasize planning, analyst and freight forwarding or agency functions in logistics, rather than the traditional line functions in transport. The scope for earlier exposure to basic marketing concepts, case studies and teaching of particular techniques is also being explored. Lecturers at other universities could usefully repeat the diagnostic testing of student knowledge reported

above at their own institutions, in order to assess the need for raising the profile of studies relating to vocational and employment issues among freshmen, but there is insufficient evidence at this stage to conclude that this single measure in isolation will raise student recruitment into Transport and Logistics programs.

The assistance of practitioners in encouraging measures such as visits into their workplaces by high school students or work experience placements, and raising the public profile of their business activities is essential if talented young people are to be attracted into careers in transport and logistics. High levels of non-response in the freshmen control group at Plymouth implied that only those students who are already planning careers in transport and intermodal distribution, or those with friends or relatives involved in such work had any real awareness of these occupations at present. The most effective method of raising the knowledge and awareness of a wider range of young people in relation to these occupations, involves placing them in situations where they must confront their future occupational selves. Practitioner assistance in providing specialist lectures, library materials, or realistic groupwork exercises in which students could explore their self-awareness is essential, but the most effective context is likely to involve hands-on industrial work experience for young people.

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APPENDIX 1

Survey of How Transport Courses and Careers Are Perceived

Have you ever considered a career in the transport industry? Please list which careers you have considered.

How might you find out more about courses or careers in the transport industry?

List the features of work in the transport industry in the order that they are most likely to attract you to want to work in it.

Please describe any work experience you have had to date.

Who/what made you want to study Transport at university ?

What makes studying Transport at Plymouth attractive ?

Please describe the work involved in the following jobs (in no more than one line).

Distribution manager Logistics analyst Freight forwarder Rail marketing analyst Shipbroker

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AN EXAMINATION OF RISK AND RESOURCE SHARING BEHAVIOR BETWEEN LTL TRUCKING COMPANIES AND WAREHOUSE PROVIDERS

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Increased demand for third-party logistics providers who can offer multiple services to their customers has encouraged many entities to explore innovative ways to expand service offerings. The current research examines Class I LTL motor carriers who have expanded their services to include warehousing. While there are several ways to achieve a service expansion into warehousing, the current research focuses on firms who have elected to expand by creating a strategic alliance type relationship with an external warehouse provider. The research examines carriers attitudes about risk and resource sharing in the alliance relationship. The results indicate that carriers are moderately receptive to sharing resources with their warehouse partner and relatively less interested in sharing risks with the warehouse partner.

INTRODUCTION

Over the last fifteen years the use of third-party logistics services in a supply chain has experienced many changes. Logistics outsourcing, also known as using third-party providers, is:

...the decision to use independent, external organizations as the means of accomplishing some, or all of the logistics related functions within the firm (Sheffi 1990).

Several changes including rising customer service expectations, deregulation of the transportation industry and new trends in the supply of logistics services have helped to bring about continual innovation and growth in the market for external logistics providers (Cooke 1988, Anderson 1988, and Scribbins 1988). Many current third-party logistics providers began operating as providers of one

logistics function (i.e., transportation) and subsequently started expanding service offerings in response to customer demands (McGinnis 1990). Some of these providers are now beginning to realize they cannot provide their customers with the vast array of specialized services desired. Therefore, they have started building relationships or strategic alliances with other logistics providers to offer a more attractive and all-inclusive package to potential customers.

A popular view of strategic alliance type relationships is the establishment of, and commitment to, an interactive relationship where both parties benefit by sharing risks and resources (Ellram 1991, Landeros and Monczka 1989). What is still somewhat unclear about alliance behavior is: 1) to what extent an entity involved in a strategic alliance type relationship is willing to share the risks and resources necessary for a successful relationship,

and 2) what types of risks and resources a partner is more (or less) likely to share. The current research hopes to provide insight into both issues by examining Class I LTL motor carriers who have elected to expand service offerings to include warehousing. The research also hopes to ascertain if the carriers in the sample are pleased with the risk and resource sharing behavior of their warehouse partner. Therefore, the results of the research will focus specifically on motor carriers' perceptions of risk and resource sharing. The sample used for this research consists of Class I LTL carriers who approached warehouse providers with the idea of establishing a strategic alliance.

BACKGROUND

By entering into strategic alliances, many external logistics providers are practicing a form of relationship marketing. The goal of these relationships is to establish, develop, and maintain exchanges by the use of long-term relationship building (Morgan and Hunt 1994). Practicing relationship marketing can be done by establishing long-term strategic alliances (Morgan and Hunt 1994) or partnerships (Anderson and Narus 1990) with other logistics providers. This type of relationship involves moving away from treating businesses as adversaries and moving toward a relationship where both entities benefit. The popularity of implementing strategic alliance type relationships with other practitioners appears to be rising as firms realize the high level of achievement available by pooling resources with other companies and employing networking techniques (Morgan and Hunt 1994).

Building relationships and pooling resources with other logistics providers not only provides companies with a better resource base but also allows for risk reduction through diversification. Furthermore, building an alliance with other logistics practitioners allows the provider of each logistics function to concentrate on their core competency while still allowing customers to purchase multiple logistics functions through a cohesive entity. However, for the relationship to work all entities must be willing to dedicate resources to, and share the risk of the relationship.

Recently many motor carriers have begun to expand service offerings, making logistics outsourcing more attractive to potential customers (Crum and Allen 1991). In some cases customers can receive not only

a large number of logistics services from one cohesive entity but they can actually obtain multiple services integrated together. While there are many service expansion opportunities available to carriers including logistics information systems, fleet management, and order fulfillment, the current research has elected to examine two logistics services (transportation and warehousing) consistently identified as frequently outsourced (Lieb 1992).

Transportation is consistently outsourced by many firms not wishing to invest capital resources on private carriage. Many firms using external transportation providers also require warehousing services but are reluctant to invest in warehousing assets because they do not directly generate profit for the company. In today's market, customers outsourcing both transportation and warehousing services look to their external provider to create a seamless logistics system. In order to satisfy most customers, the third-party provider must integrate the two logistics services together while providing the customer one contact person within the organization who can handle all logistics concerns. The new emphasis on integrated offerings and one-stop shopping (Lieb and Randall 1996) plus the desire to remain competitive has encouraged many Class I LTL motor carriers to expand service offerings to customers.

Once a carrier discovers they have a customer interested in obtaining warehouse space, they can expand their services to accommodate the customer in a variety of ways. For example, a carrier can elect to purchase necessary warehousing services on the open market from a firm dedicated to providing warehouse services. This type of arrangement is typically identified by some form of short-term documentation that reads like an "arms-length" agreement between the buyer (LTL carrier) and the seller (warehouse provider). Documentation of an agreement between the carrier and warehouse provider can take a variety of forms including a contract or similar formal business agreement.

Conversely, other carriers will choose to form strategic alliances with firms supplying necessary services like warehousing facilities and experience (Gentry 1996). The carrier still purchases warehousing services in this type of relationship. However, a collaborative effort between the carrier and warehouse provider is usually evident. An alliance type arrangement is typically identified by some form of long-term documentation. The document is often a contract, structured such that

the provisions show a teamwork type approach to offering services. With many traditional "arms-length" agreements the contract specifies "penalties" and attempts to "assess blame" for errors that might occur. With the long-term collaborative alliance type relationship the contract identifies ways in which the two entities can work together to prevent past errors from reoccurring. While most would agree the long-term collaborative relationship created by alliances is different from short-term "arms-length" agreements to purchase a service, several issues remain unclear about alliance behavior. These issues are detailed in the following research questions.

Research Question #1

Do LTL carriers and warehouseurs who elect to participate in an alliance share risks and resources more than LTL carriers and warehouseurs who are engaged in traditional "arms-length" business relationships?

Research Question #2

Once an alliance type relationship is formed, are there certain types of risk and resources that LTL carriers and warehouseurs are more or less likely to share?

STUDY

The current research focuses on the potential relationship between Class I LTL motor carriers and the external warehouse provider. This examination will focus specifically on the carrier side of the relationship. The current study attempts to differentiate between firms achieving a service expansion by participating in a strategic alliance and those electing to expand by purchasing the additional service. Furthermore, the researchers will attempt to determine if these two categories of firms (strategic alliance vs. purchase) differ in their risk and resource sharing behavior. The research will also attempt to gain insight into the types of risk and resources business partners are more (or less) likely to share. Specifically the current research will focus on the following:

Class I LTL (general commodity) motor carrier based logistics service providers in business at the end of 1994 who offer both motor carriage and warehousing services.

For purposes of this study third-party warehousing will include both contract and public warehousing and will be defined as:

A business entity with space and services available to serve customers in the receiving, storage and shipping of the customer's goods (Speh and Blomquist 1988).

DATA COLLECTION

Success of the research project required contacting an individual within the trucking company who had sufficient knowledge about the relationship between the company they represent and the external warehouse provider. As a result a telephone survey was employed. This method was chosen for three primary reasons: 1) to increase the chances of talking with the proper contact person within the firm, 2) to increase the response rate, and 3) to obtain better narrative information from each respondent. There is no assurance that the "best" contact person was reached. Use of a phone survey gave the interviewer the opportunity to briefly discuss the carrier-warehouseur relationship with the trucking company representative. In cases where the initial contact person was qualified, the survey instrument was administered. If the initial contact person could identify a more qualified individual, the more qualified representative was contacted and the survey administered.

The initial list used to derive the sample consisted of 78 carriers. Of the seventy-eight carriers two refused to participate and fifteen others had subsequently been combined with other carriers through a merger, acquisition or takeover arrangement. Therefore a total of 61 carriers participated in the actual survey administration. Of the sixty-one firms contacted, 19 indicated they had not expanded service offerings to include warehousing. Therefore, the final sample for this research consisted of forty-two (42) subjects (Class I LTL carriers) who indicated they did participate in some form of a relationship or agreement with another entity to expand service offerings to provide their customers warehousing services.

Since the focus of the research was to examine behaviors of the carrier-warehouseur relationship, the nineteen carriers not expanding service offerings to include warehousing were dropped from further analysis. Each of the remaining 42 subjects were contacted and asked the following specific survey

question in an attempt to determine the type of carrier-warehouse relationship: "When your company expands services to include warehousing, how is the expansion usually achieved, through a partnership or alliance with a warehouse provider or through an "arms-length" purchase of services on the open market?" In cases where the answer was ambiguous (e.g., it depends on different variables like the \$ amount, volume, and length of the agreement) additional survey questions were asked to help obtain a better understanding for the actual carrier-warehouse interface.

In cases where responses to the above question did not allow the researchers to clearly conclude the type of carrier-warehouse relationship, additional questions were asked to better understand the relationship. Additional questions included: 1) "Does your trucking company have a co-affiliate company that you work with to provide warehousing services?" 2) "Would you characterize the way your company provides warehousing services to be most similar to a public, private, or contract warehousing situation?" 3) "Do you bill separately for each service?" and, 4) "Are your truck and warehouse facilities in the same terminal or on the same property?"

In most cases the determination of how a carrier expanded services was fairly clear. In rare cases the researchers had to use responses to the above questions plus narrative information to make a well-informed judgement about how the company was actually expanding service offerings. Specifically the researchers classified seventeen of the forty-two subjects as providing warehousing to their customers by an "arms-length" agreement with an external provider. The other twenty-five firms were classified by the researchers as participating in a strategic alliance type relationship with an external warehouse provider.

RESULTS

The survey instrument used to collect data for the research used multiple measures to collect data on two attributes: risk sharing and resource sharing. The survey instrument was developed by the researchers with the assistance of a thorough literature review examining previously used risk and resource sharing attributes. A survey pretest was used in the development process to refine the

instrument. Multiple measures were used to assess both the risk and resource attributes because of the many varieties of risk and resources that can be shared between business partners. For instance, a carrier and warehouse may decide to share information technology resources but elect not to share labor resources.

The researchers started with seven items measuring resource sharing and six items measuring risk sharing. The reliability of the multi-item measure was appropriately assessed by following accepted research procedures. The researchers examined a Cronbach Alpha measure which helps to determine the reliability of the overall survey instrument (Peter 1979). In addition, the researchers used principal component factor analysis to determine if each item measuring a risk or resource sharing attribute belonged in the survey. Initial analysis determined two of the items measuring risk sharing and one of the items measuring resource sharing were not reliable. These items were subsequently dropped from the multi-item measurement instrument.

The Cronbach Alpha value for the six items measuring resource sharing and the four items measuring risk sharing were above .65 (See Tables 1 and 2) which is considered acceptable for exploratory research (DeVellis 1991). Once a determination was made that the Cronbach Alpha measure was sufficient, principal component factor analysis was again used and the results of the analysis were satisfactory. Therefore, the results presented here are based on using six (6) questions to measure the resource sharing attribute (Table 1) and four (4) questions to measure the risk sharing attribute (Table 2). The three questions excluded from the multi-item measure produced some interesting questions about the types of risk and resources carriers and warehouse are more (or less) likely to share. The issues raised by each of the three questions will be specifically examined later in the results section.

Satisfied with the reliability of the multi-item measurement instrument the researchers proceeded with the analysis of the results. The researchers tried to determine if significant differences in the levels of resource sharing and risk sharing existed between firms participating in strategic alliances and those using "arms-length" agreements to obtain warehousing services.

TABLE 1
TYPES OF RESOURCES USED TO MEASURE THE *RESOURCE* SHARING ATTRIBUTE

Carrier willingness to share the following resource Cronbach Alpha measure= .8600	Examples used in survey to illustrate types of sharing <i>How willing would you be to sharing any of the following examples with a partner?</i>
Q1: Asset acquisition	<ul style="list-style-type: none"> * Share cost of acquiring new receiving and shipping equipment * Share cost of acquiring new communication and information equipment
Q2: Personnel	<ul style="list-style-type: none"> * Share cost of hiring a specialist * Share internal personnel (e.g., dock workers)
Q3: Information	<ul style="list-style-type: none"> * Share financial information * Share customer information
Q4: Commitment	<ul style="list-style-type: none"> * Share costs of entering into a long-term agreement * Share initial costs of obtaining a customer
Q5: Communication	<ul style="list-style-type: none"> * Share information about daily schedules/route changes * Share daily operating information with partners
Q6: Price reductions	<ul style="list-style-type: none"> * Share consequences of price reductions * Share profit margin decreases with partner

TABLE 2
TYPES OF RISK USED TO MEASURE THE *RISK* SHARING ATTRIBUTE

Carrier willingness to share the following risk Cronbach Alpha = .6674	Examples used in survey to illustrate types of sharing <i>How willing would you be to sharing any of the following examples with a partner?</i>
Q7: Contract termination	<ul style="list-style-type: none"> * Share the financial risk of a lost contract * Share the risk of negative publicity from a lost contract
Q8: Lost personnel	<ul style="list-style-type: none"> * Share the risk of an employee leaving your firm for the partner * Share the risk of an employee leaving your firm for the customer
Q9: Poor performance	<ul style="list-style-type: none"> * Share the risks associated with a late shipment * Share the risks associated with a damaged shipment
Q10: Inability to handle the volume	<ul style="list-style-type: none"> * Share the risk for lack of ability to handle peak demand * Share the risk of penalty for failure to transport and store the volume required by the customer

In the sample of firms contacted in the current research there was a significant difference in the level of risk and resource sharing between firms participating in strategic alliances and firms using traditional "arms-length" agreements to obtain warehousing services (Table 3). Based on a 7-point Likert scale, firms participating in strategic alliances appear to show moderate interest in sharing

resources (mean score = 4.526) and less interest in sharing risk (mean score= 2.588). Firms using "arms-length" agreements to achieve a service expansion are also relatively more likely to share resources (mean score= 2.709) than risk (mean score= 1.907). When examining all of the firms in the current sample they are more likely to share resources than they are to share risk.

TABLE 3
ANALYSIS OF MULTI-ITEM MEASURES FOR THE RISK AND RESOURCE SHARING
ATTRIBUTES

<u>Sharing Possibilities:</u>	<u>N</u>	<u>Strategic Alliance¹</u>	<u>Arms Length¹</u>	<u>Significance</u>
Resource sharing	42	4.526	2.588	Yes (.05 level)
Risk sharing	42	2.709	1.907	Yes (.05 level)

¹1 = low willingness to share and 7 = high willingness to share

When compared to firms participating in strategic alliances, firms expanding service offerings by negotiating an "arms-length" agreement with a warehouse provider are much less likely to share resources (mean score = 4.526 vs. 2.588) or risk (mean score = 2.709 vs. 1.907). Both risk and resource sharing behavior are significantly different (.05 level) when comparing strategic alliance participants to providers using an "arms-length" agreement to expand service offerings (Table 3).

Additionally, it is interesting to note that, regardless of how the carrier achieved the expansion into warehousing, the mean score for risk sharing is below 3 on a 7-point scale. This indicates that, while carriers engaged in a partnership are more likely to share risk than their "arms-length" counterparts, there seems to be a general lack of willingness to share business risk. The willingness of a carrier to share resources with a partner who provides warehousing is probably best described as moderate since the mean score is slightly above 4.5 on a 7-point scale. The mean resource sharing score for carriers using "arms-length" agreements to share resources is relatively low (below 3 on a 7-point scale). Overall there appears to be a general lack of desire to share risks or resources with warehouse providers.

As previously mentioned one of the seven items measuring resource sharing was dropped from the analysis. The item addressed the likelihood of a carrier to share profits with their warehouse provider. While motor carriers participating in alliances appear to be somewhat receptive to sharing many resources (i.e., asset acquisition, personnel, information, commitment, communication, and price reductions), the results indicate they may not be interested in sharing profits with their warehouse provider. This item was identified during the

principal component factor analysis phase of the research as the only item not measuring the same attribute (*resource*) as the other items. Further investigation revealed that the responses to sharing profits were consistently low regardless of how the motor carrier expanded service offerings. This indicates a general reluctance on the part of the motor carriers in the current sample to share any profits regardless of the relationship with the warehouse provider.

Two risk sharing items were also dropped from the multi-item measure. Carriers appear to be willing to share certain types of risk (i.e., contract termination, lost personnel, poor performance, and inability to handle the volume) with their warehouse partner. However, carriers appear reluctant to sharing the risk of poor customer service and the risk of future lost business with their partner. Further investigation of the results of these two items indicates the responses for these questions are low regardless of how the motor carrier expanded their service offerings. While further investigation is needed, it appears that carriers are more reluctant to share these specific types of risk with their warehouse provider. The researchers can not conclude that these types of risk (poor customer service and future lost business) and/or resources (profits) are never shared by motor carriers and warehouse providers. However, it appears these types of risks and resources are potential problem areas when attempting to structure a collaborative alliance type agreement with a warehouse provider.

MANAGERIAL IMPLICATIONS

Outsourcing has managerial implications for both the buyer (customer) and supplier (third-party provider) of logistics services. In the past a large portion of the research into the third-party logistics

market has been from the perspective of the customer or buyer. In contrast, the current research examines the logistics outsourcing decision process from the providers' point of view. Therefore the managerial implications will focus specifically on implications for the suppliers of logistics services.

Sharing risks and resources tends to be an indication of the commitment to the relationship (Morgan and Hunt 1994).

The narrative comments received from several representatives of carriers included in the current research also indicates the importance of risk and resource sharing behavior on relationships between third-party providers. If one partner is willing to share but the other firm is handling the relationship like an "arms-length" agreement, the relationship is likely to have difficulty. As a result, corporate attitudes towards risk and resource sharing should be specifically examined during the preliminary negotiation stage of the contract process.

Proactive managerial attention to a potential partner's risk and resource sharing behavior may help to alleviate possible future difficulties in the relationship. Attitudes about sharing risks and resources can be assessed in a variety of ways. First, significant amounts of knowledge can be gained by participating in discussions during the negotiation phase of the relationship. Second, key members of the potential partner firm can be asked to fill out a survey designed to measure attitudes towards sharing. Third, the carrier can seek information from other entities who are currently dealing with the warehouse provider. This approach can help to identify various tendencies of the potential business partner. This step should be completed before the relationship is finalized.

As competition levels throughout the industry have increased, firms do appear to have reacted by adjusting service offerings. Many logistics practitioners interviewed during the current study indicated they feel some pressure to offer multiple logistics services. Some respondents indicated they have expanded service offerings to remain competitive, maintain acceptable customer service levels, and/or maintain or increase market share.

Several respondents indicated that management in their company is highly cognizant of customer demands. If management is truly customer driven, they need to have a strategic plan in place for how to successfully expand service offerings to meet the unique needs of each customer in a manner which is

acceptable to the customer and the motor carrier. If the chosen method of expansion is through a strategic alliance, then the researchers suggest establishing a preferred partner list. A preferred partner list should include many of the standard items you might find on a preferred supplier or carrier list (e.g., financial stability, handling of loss and damage claims, customer service levels, etc.). However, a preferred partner list must be more in-depth than a conventional preferred supplier or carrier list.

Entering into a long-term collaborative relationship with one warehouse provider can increase a carrier's risk exposure if the supplier fails to perform as expected. In order for the carrier to reduce risk of performance failure, the potential partner must convince the carrier of their commitment to the success of the relationship. Several approaches can be utilized to help assess the commitment of a partner to long-term success. First, a trial period can be implemented where the carrier uses the warehouse provider on a test basis. If the warehouse provider satisfies all of the carrier's pre-established criteria for a successful partnership, they are granted partner status and placed on a preferred partner list. In cases where trial opportunities are not possible (e.g., if the initial expense of implementing a trial partnership is too large) the carrier and potential partner can enter into a short-term partnership agreement. If the results of the short-term agreement are acceptable then a long-term partnership agreement can be constructed and the warehouse provider can be placed on the preferred partner list. Regardless of the method used to examine the potential partner, they should be able to demonstrate a commitment to the relationship and a willingness to share an acceptable level of risks and resources. The specific determination of an acceptable level of sharing depends on the individual goals and objectives of each potential partner.

CONCLUSIONS

Class I LTL motor carriers appear to be responding to current market conditions and expanding service offerings to include additional services like warehousing. The sensitivity to current market trends may be an indication that third-parties are focusing on providing integrated logistics services to their customers. If third-parties remain sensitive to customers' demands in the future, perhaps external logistics providers will not only be able to provide

multiple, integrated services but provide services throughout the entire supply chain.

While many providers of logistics services appear to be responding to customer demands for multiple services, the manner in which they achieve the expansion differs between entities. The idea of sharing risks and resources with former competitors to offer multiple services requires a change in managerial attitudes and practices. In some cases firms who recently competed against each other for business are now teaming up to provide a more attractive package of logistics services to potential customers. While improvements in sharing may still be warranted, firms participating in strategic alliances to expand service offerings appear to be sharing some risks and resources with their partners.

LIMITATIONS

As with any research several limitations are associated with this study. The focus of the study is very narrow which limits the usefulness and generalizability of the information obtained. The use of one specific expanded service offering (transportation and warehousing) also limits the generalizability of the results. There are numerous logistics functions which can be offered and it is doubtful risk and resource sharing behavior is identical when different functions and entities are involved.

Focusing entirely on the carrier side of the relationship is a potential limitation because it only allows the researchers to capture one side of the

carrier-warehouse relationship. It is very possible that warehouse providers feel differently about risk and resource sharing behavior in the relationship.

Furthermore, asking the carrier to focus on one specific relationship with a particular warehouse provider may not yield results representative of the way the carrier handles other external relationships. Limitations to the current research reduces the ability of the researcher to draw inferences from the results. Nonetheless, the researchers believe the results help provide insight into current levels of risk and resource sharing between Class I LTL motor carriers and warehousing companies.

RECOMMENDATIONS FOR FUTURE RESEARCH

There are many possible extensions to the current research. The scope of research could be expanded in the future to include a larger and more diverse sample of logistics providers. For instance, third-party providers offering different expanded services (e.g., inventory control, information support) could be examined. External logistics providers who did not begin as carriers but entered the third-party market through another logistics function (e.g., warehouse expanding to also offer transportation) could also be examined. A more international approach examining third-party providers operating outside the United States could make a potentially large contribution to understanding risk and resource sharing behavior between logistics providers.

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NAFTA, MOTOR CARRIERS AND HIGHWAY SAFETY

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The signing of the NAFTA agreement signaled the beginning of increased efforts to harmonize trade between the U.S., Canada, and Mexico. Unfortunately the harmonization of transportation links is lagging far behind proposed implementation dates. This narrative describes the highway safety, and concerns expressed by highway safety advocates and Teamsters union representatives, and documented by the GAO. The authors propose a market based alternative to restricting transborder traffic to the narrow commercial zone presently in place.

INTRODUCTION

The signing of the NAFTA agreement in December 1993 marked the beginning of a new era in North American trade relations. However, the benefits of these new trade relationships hinge on free access to markets. While the intent of the NAFTA agreement was to lower and in time to virtually eliminate political and legal barriers to trade, the physical barriers to the cross-border flow of goods remain problematic. One physical barrier to the free flow of goods is the lack of adequate infrastructure. It will take a commitment and considerable financial investment to alleviate this problem. The second barrier is the unwillingness and/or inability of many Mexican transportation providers, specifically motor carriers, to meet U.S. safety and operating standards. Expressing concerns that the planned December 1995 opening of the four U.S. and six Mexican border states to the free flow of traffic would compromise the safety of American highways, Teamsters Union representatives and highway safety groups advocated that the border states not be opened until the safety issue was rectified. As a result President Clinton opted not to open the border states to the free flow of traffic as had been scheduled under the NAFTA agreement.

The purpose of this article is twofold. First, the safety concerns which have precipitated the present conflict over the advisability of opening the border states to unrestricted transportation movement or of continuing to restrict movement to the narrow commercial zone currently in place will be presented. Secondly, the short and long term economic implications of opening the border for the free movement of motor carriers for both Mexican and U.S. shippers and carriers will be discussed.

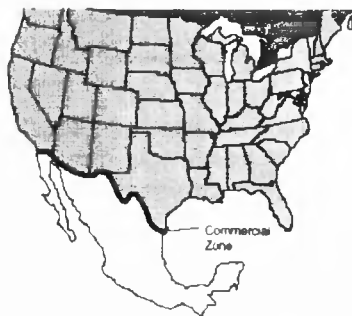
Following an overview of the progress toward opening the border, the factors which have been identified as contributing to the accident rate of motor carriers will be examined. Data regarding out-of-service violations for Mexican motor carriers will then be compared to the identified accident contribution factors. This will provide the necessary background for extending the discussion to the specific economic impact of motor carrier safety and the implementation of NAFTA provisions for the free access of motor carriers to markets in all areas of North America.

SITUATIONAL OVERVIEW

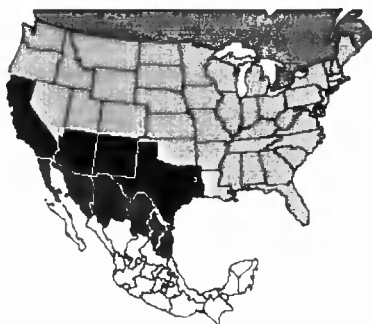
The Government Accounting Office has conducted two studies examining the state of safety inspections and safety inspection procedures at the U.S./Mexican

border crossings in California, Arizona, New Mexico, and Texas. The first report, issued February 29, 1996, focused on providing an update on the status of harmonizing safety regulations, operating and enforcement practices, and the readiness of state and federal agencies to enforce compliance with U.S. trucking regulations ("Commercial Trucking..." 1996). It was felt that these represented the greatest impediment to implementing the first phase of the NAFTA agreement which expands the free access trade zone of the U.S./Mexican border (Exhibit 1) to the total area of the ten border states (Exhibit 2). The data for this report was collected between June 1995 and Jan. 1996.

**EXHIBIT 1
CURRENT COMMERCIAL ZONE**



**EXHIBIT 2
TEN STATE ACCESS—DECEMBER 18, 1995**



At the time that this report was issued, it was determined that enough progress had not been made to justify expanding cross border traffic beyond the existing commercial zone. Specific concerns which were highlighted included the incompatibility of trucking regulations between the U.S. and Mexico (Exhibit 3), the lack of uniform enforcement practices between the U.S. and Mexico (Exhibit 4), the lack of inspection facilities on the U.S. side of the border (Exhibit 5), and the lack of inspection on the Mexican side of the border. The numbers of Mexican truckers whose vehicles have been restricted from highway service until safety violations have been remedied has ranged from 50 to 63 percent. This high rate of safety violations has been cited by political, union, and consumer groups as a major cause for concern.

**EXHIBIT 3
INCOMPATIBILITY OF TRUCKING
REGULATIONS**

Regulation	U.S.	Mexico
Driver Hours of Service	10 per day	None
Log Books	Required	Not Required
Computerized Driver Records	Required	Not Required
Vehicle		
Front Brakes	Required	Not Required
Gross Vehicle Weight	80,000 lbs.	97,000 lbs.
Single Axle Weight	20,000 lbs.	22,000 lbs.
Tandem Axle Weight	34,000 lbs.	39,600 lbs.

*GAO/RCED 96-61 Commercial Trucking Under NAFTA, p. 20.

**EXHIBIT 4
DIFFERENCES IN ENFORCEMENT
PRACTICES**

U.S.	Mexico
Federal Motor Carrier Safety Regulations	Commercial Vehicle Safety Alliance (1991)
Motor Carrier Safety Assistance Program	Educational Inspection Activity (1993)
Commercial Vehicle Safety Alliance	Little to no Enforcement
Fines for Violations	Fines for Violations Virtually Non-existent

In April 1997, the GAO issued a second report concerning the progress made toward satisfying the safety and inspection standards necessary to implement the opening of

**EXHIBIT 5
U.S. INSPECTION FACILITIES**

- California (24% of traffic)
Permanent Inspection Facilities at Otay Mesa and Calexico
- Texas (66% of traffic)
No Permanent Inspection Facilities
- Arizona (10% of traffic)
No Permanent Inspection Facilities

the border states to the free movement of truck traffic ("Commercial Trucking..." 1997). By this time, the original target date for implementation, December 18, 1995, had already been postponed for over a year. The focus was on inspection procedures and safety enforcement along the border areas and federal strategies to ensure the compliance with U.S. safety standards by Mexican truckers. The intent

was to take a more detailed look at border inspection facilities and practices in an effort to determine if progress had been made toward the goal of harmonizing and enforcing safety standards between the U.S. and Mexico. The results of the study indicated that California, with 24% of the truck traffic from Mexico, was by far the most proactive of the states in implementing inspection procedures. The inspection facilities in Texas, with 66% of the total truck traffic, and Arizona, with 10% of the total truck traffic, were woefully inadequate and in some border areas non-existent. In addition, DOT programs to train inspectors on the Mexican side of the border had not produced any measurable results.

MOTOR CARRIER SAFETY

Attention to the issue of motor carrier safety is not a new phenomenon. The public, state highway administrators, DOT officials, shippers, and motor carriers alike have been concerned about safety issues for various reasons. Concerns have revolved around such issues as actual physical safety, the possibility of infrastructure damage, costs of operation, and the importance of the exchange of undamaged goods between shipper and customer (Brandt, 1997; "Mexico's NAFTA,..." 1997; "NAFTA Inspires NAIL,..." 1996). These same issues were raised following enactment of the Motor Carrier Act of 1980. At that time public interest advocates focused on the possibility that safety performance had changed due to the new operating environment and the number of new entrants in the industry. There was public criticism of the rate of highway accidents involving poorly maintained trucks (O'Neill, 1987). This was blamed on the lack of fines and other penalties being imposed on safety violators by the Federal Highway Administration's Office of Motor Carriers. Even with the shortage of inspectors, 30-40% of trucks that were inspected were cited for serious safety violations involving brakes, tires, and the size and weight of the load (Loos and Labich, 1987).

Academic researchers who studied this problem found that newer carriers with little experience in the motor carrier industry had significantly higher accident rates (Corsi, Fanara and Jarrell, 1988; Corsi and Grimm, 1987). They also reported a higher incidence of reported accidents involving owner-operators. This was attributed to a general lack of experience and inadequate maintenance.

While these studies identified populations in the motor carrier industry who might be more prone to accidents, they did not identify the factors which were most likely to contribute to the incidence of motor carrier accidents. Bruning specifically attempted to identify those factors most often associated with motor carrier accidents (Bruning, 1989). The factors which had the greatest positive correlation with motor carrier accidents were driver longevity and experience (.01 level of significance), equipment defects (.05 level of significance), age of the equipment (.10 level of significance), and the size and financial stability of the carrier (.01 level of significance). From this study, it could be concluded that the profile of the carrier least likely to pose a safety hazard would be larger, financially sound, with newer, well maintained equipment and experienced drivers. Interestingly, this study did not find a significant relationship between accident rates and whether or not the driver was self employed, e.g. an owner-operator.

A similar effort investigated the role that excessive speed and driver training played in the incidence of accidents (Beilock and Capelle, 1989). Two contributors to excessive speed identified in this study were thrill seeking and the over estimation of personal abilities or vehicle capabilities. Thrill seeking and the underestimation of personal abilities may be conceivably linked to the lack of experience identified by Bruning. The likelihood of overestimating vehicle performance capabilities may be linked to both driver inexperience and the condition and age of the vehicle. While these studies have focused on different factors it is plain that those factors are not mutually exclusive.

The preceding studies, conducted in an effort to determine the factors affecting highway accident rates for U.S. carriers, are as applicable as they were when they were conducted. Factors contributing to higher numbers of safety violations, e.g. driver inexperience, equipment safety violations, equipment age and the financial status of the company, apply to Mexican carriers as well as the U.S. carriers that were originally surveyed. A survey of the out-of-service data collected during the GAO investigation of border area safety violations illustrates this point.

EXAMINATION OF OUT-OF-SERVICE DATA

The average monthly out-of-service rate for U.S. trucks inspected during fiscal year 1995 was 28% while the average out-of-service rate for Mexican

trucks entering the U.S. was 45%. The difference in the rate of trucks being restricted from highway service until safety violations are corrected serves to underscore the concerns that opening the border states might lead to an increase in safety related accidents. However, these figures may overstate the difference between the numbers of U.S. carriers sidelined for safety violations and the numbers of Mexican carriers sidelined for safety violations. The Mexican sample consisted of over 25,000 inspections out of about 3 million trucks. This sample was primarily selected according to how likely the truck was to be in violation. In addition, since Mexican trucks are only allowed to travel within the narrow commercial zone, they are most likely to be drayage vehicles which make several trips across the border in a single day. In contrast, the 1.8 million trucks inspected in the U.S. sample represent a more general cross section of the motor carrier population. Safety violation data for drayage operations is not available separately from inspection data for the motor carrier population as a whole.

The GAO categorized the violations that were commonly observed during the inspection of trucks entering the U.S. from Mexico into four areas. (See Exhibit 6)

Two of these categories, equipment deficiencies and lack of driver qualifications were specifically identified in Bruning's study as being significant contributors to accidents. The third category, cargo, could conceivably affect the handling quality and performance of the vehicle. In addition, weight factors have a detrimental effect on roads and bridges which may indirectly contribute to accidents. The final category is of importance in terms of financial responsibility, but does not directly affect truck safety.

DISCUSSION

It is important for transportation managers to consider the consequences of opening the U.S./Mexican border to the free flow of motor carrier traffic. Safety is an issue that cannot be over emphasized. From the information presented by the GAO, it appears that due to inadequate inspection facilities and the continuing high rate of safety standard violations, the limited commercial zone rules should not be expanded. Using GAO figures, the Teamsters and highway safety advocates have actively lobbied for the status quo.

**EXHIBIT 6
COMMON SAFETY VIOLATIONS**

Equipment	Structural Cracks Poor Suspension Faulty Tires Non-Working Brakes Non-Working Lights Steering Problems Faulty Exhaust Systems Leaky Fuel Tanks Non-Functioning Emergency Equipment
Driver	Invalid Licenses Under Age Logbook Language Drug Testing
Cargo	Overweight Not Secured Properly Hazardous Material Not Secured Properly
Other	Insurance

However, The Commercial Vehicle Safety Alliance, an association of federal, state and province officials and industry representatives who are responsible for motor carrier safety laws in the U.S., Canada and Mexico, maintain that the truck safety enforcement community is prepared to handle the levels of cross-border traffic which would result when the commercial trade zone is increased to include the border states.

The most obvious way to deal with truck safety appears to be through inspection programs. With its aggressive enforcement program, California seems to have achieved a high degree of compliance. Thus, one could conclude that the same results could be achieved in Texas and Arizona if the same level of effort was expended. The situation on the Mexican side of the border appears to be as inadequate as that on much of the U.S. border area. Presently Mexican officials have taken the stance that any inspection activity will be directed toward carriers entering Mexico, not leaving. This would seem to be a

short-sighted view since cooperation in enforcing safety standards for motor carriers on both sides of the border should result in safer highways for both Mexico and the U.S..

On the surface, it would appear that increased inspection levels would lead to greater numbers of trucks being detained in inspection facilities. These delays translate into additional costs to carriers and shippers. However, the certainty of inspection and resulting penalties for safety violations inherent in increased inspection levels should encourage carriers and operators to conform to safety regulations. The present situation where traffic is restricted to a narrow commercial zone disrupts U.S. and Mexican firms who are unable to efficiently transport goods, and motor carriers who are unable to compete in new and potentially profitable markets. The question that must be answered is what are the probable consequences if the long-delayed opening of the ten U.S. and Mexican border states is implemented.

Immediate Consequences of Expanding the U.S./Mexican Commercial Zone

In the short term, the decision to open the U.S./Mexican border to the free flow of transportation will not necessarily change the way things are being done. Several factors support this argument. First, U.S. motor carriers have already formed alliances with those Mexican carriers who provide the best opportunities for mutually beneficial relationships. These alliances would be adversely affected if the U.S. carrier were to begin to compete directly in the same freight lanes. In addition, drivers for these U.S. carriers are ill-prepared to operate in the Mexican environment with its unique language, cultural, physical, and legal characteristics. U.S. motor carriers are already struggling with the task of maintaining a qualified driver force to meet their present service needs and might find it difficult to field the driver force necessary to expand their service areas.

A second factor which would inhibit short-term changes in cross-border transportation operations is the nature of existing truck traffic. The preponderance of trucks originating in Mexico engage in drayage operations. They are not poised to capitalize on longer distance market opportunities due to the nature of their business emphasis, the inadequacy of their equipment, and the lack of trained drivers capable of meeting U.S. licensing standards.

There are fears that if the next phase in the NAFTA agreement were to be implemented that U.S. carriers would hire large numbers of Mexican drivers to take advantage of lower wage rates. In the short term this does not seem to be feasible. Considering the differences in driver education, training, and licensing requirements, unfamiliarity with the language, conventions, and safety regulations of the U.S., and green card restrictions, it is unlikely that U.S. motor carriers will be able to hire Mexican drivers in any numbers. In fact, given the long term nature of the driver shortage in the U.S., if hiring Mexican drivers had been an acceptable option for alleviating this situation, Mexican drivers would already constitute a visible contingent of the U.S. driver force.

Looking Toward the Future

In the long term, the element which seems to have been overlooked by government officials and various proponents and opponents to opening the border for a free flow of motor carriers is the impact that the market has on carrier performance. U.S. motor carriers have found that safety plays an important part in their bottom line performance (Siegel, 1992; "Safety and Service," 1990). This is due to direct savings in driver turnover costs, insurance costs, down-time costs, and fines. In addition there are indirect benefits such as improved reputation and the ability to meet shipper price and service requirements. These same direct and indirect costs and benefits apply to Mexican carriers. As existing agreements between U.S. and Mexican carriers expire, the possibility exists that U.S. carriers will seize the opportunity for increased business if there is a shortage of Mexican carriers that meet required safety standards. Perhaps there has been insufficient effort made to emphasize the importance of safety to the bottom line performance of the carrier.

Viewing the market from the side of the shipper also illustrates the impact that market forces have on a carrier's motivation to maintain high safety standards. As Mexican shippers become more sophisticated and aware of what it takes to compete on a NAFTA-wide basis, the importance of transportation in the total logistics effort will become apparent. Shippers can not, and will not, accept the level of service that is provided by carriers that are unable to maintain the prerequisite levels of safety

performance. Trucks which are placed out-of-service are less likely to provide the damage-free, reliable, on-time service that shippers operating in time sensitive environments require. Using unreliable carriers would result in increased shipper costs due to the need to carry higher inventory levels, stock-outs and/or manufacturing interruptions. In addition, as part of an integrated logistics program, core carriers must be able to serve all of a shipper's transportation needs, including cross-border movements. In order to provide that service, the carrier must meet the most stringent reliability standards.

The realities of the market are that a carrier must be competitive and capable of meeting shipper needs. The market values high safety standards because of the effect on operating efficiencies, e.g. time and profits. The government values high safety standards because of the effect on public safety and the integrity of the national infrastructure. Carriers that do not meet these requirements will not be able to operate profitably and thus will not remain in business.

SUMMARY

The combination of stringent government enforcement of safety standards and demand from the market for damage-free shipments delivered on an on-time basis provides the most effective means of promoting carrier attention to safety. The drop in the out-of-service rate for U.S. trucks from an average of 40% to an average of 28% in the past ten years can be attributed to this effect. It may be time for motor carriers and shippers from both sides of the border to take a leadership initiative, promoting the free flow of goods throughout North America. The market can serve to enforce safety requirements in conjunction with governmental efforts. As high safety standards provide a vital component of profitable operations, carriers will be motivated to maintain those standards to satisfy both governmental regulations and shipper demands. Those carriers who cannot remain competitive, meeting shipper demands at a profit, will not be tolerated in the marketplace. An understanding of this linkage between the efforts of the government and the market may provide a new perspective on the decision of whether or not to extend the free flow of truck operations to the ten border states and eventually all of North America and beyond.

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CARRIER PORTFOLIO MANAGEMENT

M. Theodore Farris II
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INTRODUCTION

This article investigates the concept of carrier consolidation and how it impacts the performance measurements of the carrier for measured variables to the shipper. It recommends treating the carrier base as a portfolio of assets, with each carrier contributing unique, strategic advantages to the sum of the whole.

For the practitioner, the article offers a technique to graphically analyze and display changes in numerous performance variables. The technique utilizes data available annually from *Distribution Magazine* to quantify the effect of carrier consolidation. It concludes by applying the model to a case study in which a shipper consolidated its annual business from 14 carriers down to two key carriers; saving in excess of \$600,000 annually and reducing transportation expenses by 20% while improving service by 13.9%.

Your "Portfolio" of Carriers

Shippers seeking cost saving opportunities should consider assessing their current pool of carriers to determine their investment in transportation services. Similar to personal financial portfolios, a shipper has, intentionally or unintentionally, invested their business with a variety of carriers and the performance of these carriers may directly impact the shipper's bottom line. Unfortunately, many shippers tend to operate on a transactional basis and do not consider their on-going relationships. Manage your carriers as you would a personal financial portfolio. Make sure that each component of the carrier portfolio is resident for a

different reason and uniquely contributes to the overall portfolio. What holds for personal stock investing also holds for carrier portfolio management. "Select" carriers which offer the most value to your process without redundancy.

Efforts to determine and improve standard measurements of carrier quality are lagging approximately seven years behind the efforts of materials suppliers (Minahan, 1996). Most shippers recognize the importance of intangibles in what a carrier offers. The problem is, when intangibles play a part in the selection process, it's often a gut decision (Richardson, 1994). While no one seems to have formalized the process of incorporating intangibles into the carrier selection process, leading companies are starting to develop quantitative ways to measure intangibles (Richardson, 1994). Fifty percent of how UNISYS determines who it will do business with is not price based (Richardson, 1994). Tangible and intangible are a package. Either can cause you to lose a customer (Richardson, 1994). The best way to ensure that carriers provide consistent on-time damage-free deliveries is to take a proactive position in improving carrier quality (Minahan, 1996). The first step is proper selection, or weeding, of the carrier base.

Reducing The Number of Carriers

When a carrier portfolio is initially constructed, it is not surprising to discover redundancy in the form of replicated geographic coverage or available equipment. The argument for multiple sourcing is an age-old debate pitting single sourcing against multiple sourcing. Architect Ludwig Mies van der Rohe based his architectural designs on the concept

that "less is more." This holds in the purchase of transportation services. A key transportation concept suggests that greater volume with a single carrier results in a lower rate. Single sourcing allows a company to aggregate their volumes. It also results in improvements in areas other than price. Becton Dickinson's strategy included reducing the number of carriers and improving carrier management and control. As a result of carrier reduction actions, Becton Dickinson (Thomas, 1993):

- Has one carrier interfacing with key customers
- Reduced transit time by 15% and cost by 6%
- Has a broader geographic coverage by a single carrier
- Has less product handling damage
- Receives a steady supply of transportation equipment
- Received just-in-time loading at distribution centers

As their carrier's number one partner, Becton Dickinson receives 97% service versus 94% service for non-partner customers.

Partnering has become common in transportation. A survey by Crum and Allen (1991) of 266 Class I and Class II motor carriers indicated carriers depend on a primary shipper for a substantial portion of its total revenue and generates a large percentage of its revenue from contracted traffic. Carriers service their "core" customers by providing a different level of service, increased attention, and lower prices.

This paper will show how improved service links to the higher shipping volumes of being a "core" customer. Still, many companies continue to disaggregate their volumes in the name of multiple sourcing hoping the free market will sort out the best carrier. They never get to the point of sorting out the carriers and thus typically pay higher costs and receive poorer service.

Developing a Graphical Model

To understand the difference between carriers a graphical model may be used. The key to the model is the availability of reliable data. *Distribution Magazine* dedicates its August issue for its "Annual Quest for Quality." This annual survey provides a

consistent, unbiased source of data for comparing carriers. The "Quest for Quality" is a summary of over 4300 surveys received from *Distribution Magazine*. *Distribution Magazine* compares responder demographics to other industry lists to ensure it is a fair representation of the universe of buyers. Carriers are rated on a three point scale ("3" outstanding, "2" average and "1" poor). A "core" score reflects the scores or respondents who indicated the carriers they rated handled a large portion of their freight due to a partnership or alliance agreement (*Distribution Magazine*, 1996).

Survey respondents rated carriers in five areas:

Variable	Criteria
On-Time Performance	<ul style="list-style-type: none"> • on-time pick-up and delivery • consistent dependable schedules • transit times
Value	<ul style="list-style-type: none"> • competitiveness of rates with carriers offering similar services • relationship of price to service level provided • simplicity of tariffs and contract prices
Equipment and Operations	<ul style="list-style-type: none"> • equipment availability • condition of equipment • good attention to safety • low incidence of loss and damage
Customer Service	<ul style="list-style-type: none"> • willingness and ability to quickly answer inquiries and resolve problems • claims settled promptly and courteously • ability to provide information when needed via the most appropriate communications link
Administration and Staff	<ul style="list-style-type: none"> • knowledge of shipper needs and carrier capabilities • responsiveness to special requirements • billing accuracy • regular and effective sales calls that provide timely information on service and options

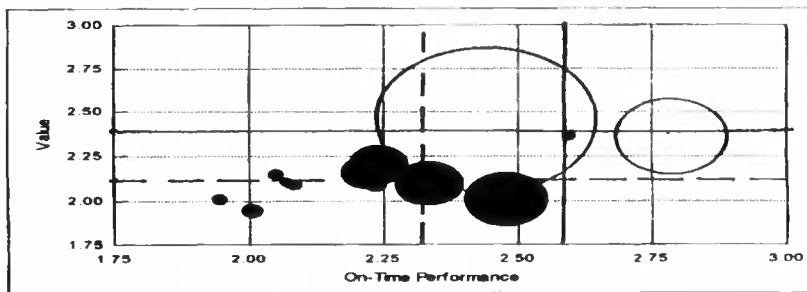
The survey data offers a basis for comparison. Key variables may be charted, for example, comparing value versus on-time performance for each carrier a shipper uses. The chart will help identify which operating measurements are the strongest for each carrier and how they compare relative to other carriers. Some carriers will focus more on a specific variable than others. The shipper should consider

what efforts are required to become a "core" customer. A third dimension can be shown on the two-dimensional plane by changing the size of each data point so it reflects the proportional amount of business each carrier represents to the shipper. Figure One compares On-Time Performance with Value. The area of the circles represents the proportion of the shipper's overall transportation budget.

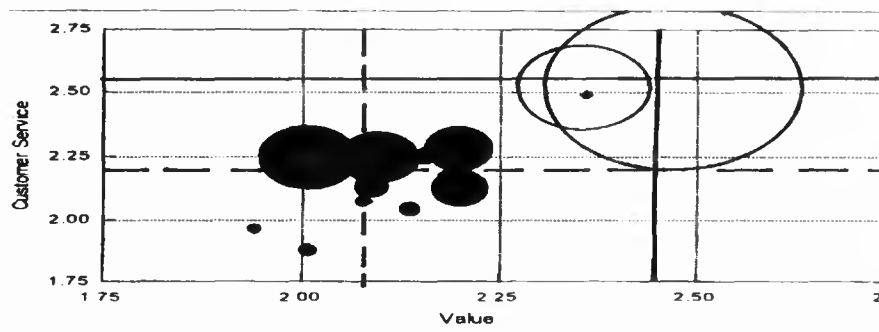
Figures One through Four show the application of the model using *Distribution Magazine* data for seven LTL carriers servicing a manufacturing

company located in Columbus, Ohio. Over the course of a year, the shipper consolidated its annual business from the twelve carriers shown down to two key carriers; saving in excess of \$600,000 annually and reducing transportation expenses by 20% while improving service by 13.9%. The solid circles reflect transportation service prior to the consolidation. The dashed line represents the weighted average score (actual numbers are shown in Table One). The unfilled circles reflect the "core" customer service for the two carriers remaining after the consolidation. The solid line reflects the new weighted average score.

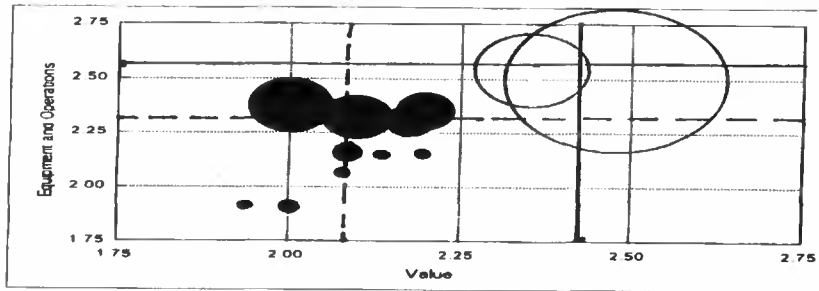
**FIGURE ONE
ON-TIME PERFORMANCE VS. VALUE**



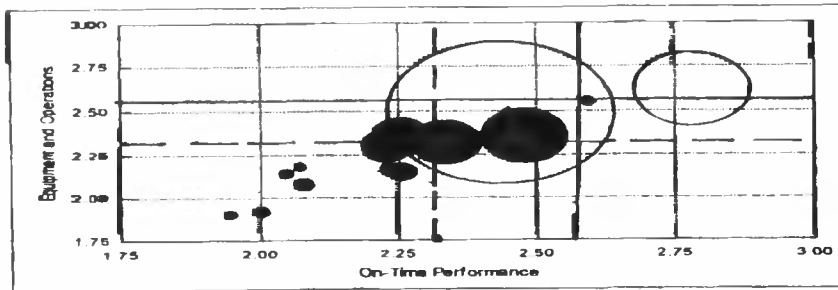
**FIGURE TWO
VALUE VS. CUSTOMER SERVICE**



**FIGURE THREE
VALUE VS. EQUIPMENT AND OPERATIONS**



**FIGURE FOUR
ON-TIME PERFORMANCE VS. EQUIPMENT AND OPERATIONS**



**TABLE ONE
Average Weighted Performance Scores—
Before and After Consolidation**

Average Weighted Score for:	Before	After	Improvement
Value	2.08	2.45	18%
Customer Service	2.23	2.54	14%
On-Time Performance	2.29	2.56	12%
Equipment and Operations	2.29	2.53	11%

Consolidation activities by the shipper likely will utilize tested carriers who already provide above "average" service to the shipper as a "traditional" or non-core customer. Charting this position offers an estimate of the potential improvement of converting from "traditional" customer status to that of "core" customer.

The Concept of Relational Transactions

The concept of relational transactions suggests a company should emphasize increasing business with current customers rather than to spending the time, effort, and money to seek new customers. The concept suggests it is more effective to build a business relationship with current customers by expanding product or service offerings in logical niches which are unfilled or unsatisfactorily handled by the competition. The benefits of entering into a relational transaction have been shown graphically in Figures One through Four.

Conclusion

The decision to consolidate a carrier base involves many variables to consider. Data is readily available through the *Distribution Magazine* "Annual Quest for Quality" which can help identify how average performance will change when a company shifts from the role of a "traditional" customer to that of a "core" customer. It is also recommended that companies develop and track their own measures of their carriers since the *Distribution Magazine* data may not accurately reflect unique circumstances and are an average of the survey responses. Charting key variables and including performance scores of all the carriers currently in the portfolio may help to identify which carriers to maintain in the portfolio and which to eliminate. It may also reflect changes in the average weighted performance. Treat your carrier base as you would a portfolio of assets, with each carrier contributing unique, strategic advantages to the sum of the whole.

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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.

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