

**An Analysis of Logistics Pedagogical Literature: Past and Future Trends in Curriculum,
Content, and Pedagogy**

Michael J. Gravier
Assistant Professor
Department of Marketing
Bryant University
1150 Douglas Pike
Smithfield, RI 02917-1218
(401) 232-6950
mgravier@bryant.edu

M. Theodore Farris II
Associate Professor
Department of Marketing and Logistics
University of North Texas
2008 Austrian-American Fulbright Scholar
PO Box 31396
Denton, TX 76203-1396
(940) 565-4368
farris@unt.edu

Abstract

Purpose – There presently is no comprehensive review which systematizes and summarizes the burgeoning body of logistics educational literature. The purpose of this paper is to provide a guide for both educators and practitioners to assess the history, current status, and future trends in logistics education in order to nurture advancement in logistics education.

Design/methodology/approach – This paper draws its conclusions based upon a literature review and categorizes the evolution of logistics education into three areas: defining curriculum, developing content and skills taught, and refining teaching methods.

Findings – Logistics education continues to benefit from strong ties to industry. Additionally, four principle macro-environmental factors were discovered that impact the current status of logistics education: an increase in the number of logistics educational programs, limited supply of logistics-trained faculty, changes to content requirements, and a changing teaching environment. Future research directions from the published literature are summarized.

Research limitations/implications – As current logistics programs continue to evolve and the number of logistics and supply chain management programs continue to increase in response to industry demand, this comprehensive review of the logistics literature may help serve as a benchmark for past and current practices in logistics education.

Practical implications -- The early partnership between industry and education set the stage to help guide educators to evolve logistics education to address practitioner needs. Increased interest in logistics education and changing environmental factors suggest the need for continued collaboration to further logistics education.

Originality/value -- The literature demonstrates successful dynamic behavior in response to dynamic industries. It highlights factors which may drive further evolution of logistics education and proposes areas impacted.

Keywords Logistics education, curriculum, teaching methods, pedagogy

Paper type Literature review

An Analysis of Logistics Pedagogical Literature: Past and Future Trends in Curriculum, Content, and Pedagogy

Introduction

Logistics has traditionally maintained a close relationship between academics and business professionals through organizations such as the American Society of Transportation and Logistics (AST&L)¹ and the Council of Supply Chain Management Professionals (CSCMP)². Founded in 1963, the CSCMP has since its origin promoted education rather than acted as a lobby group as many professional organizations have (Kent and Flint, 1997). Indeed, the three sides of CSCMP's triangle-shaped logo represent the respective communities of the professionals, the academe, and research (Blasgen, 2007). The field's emphasis on education was reflected early in the publication history of the first logistics journal, *Transportation Journal* (started in 1961 by AST&T), with a guest editorial addressing transportation education appearing in the first issue (Scheleen, 1961). Since then, articles related to education and educational concerns have continued appearing in many of the leading logistics journals such as *International Journal of Logistics Management*, *Journal of Business Logistics*, *International Journal of Physical Distribution and Logistics Management*, and *Transportation Journal*.

The evolution of logistics education has implications for pedagogy, curriculum, and industry. Pedagogy describes the principles and methods of instruction³, encompassing the use of appropriate instructional methods helps to produce higher quality graduates. Curriculum encompasses the proper course composition for degree programs in order to graduate an

¹ Founded in 1946, the American Society of Transportation and Logistics was originally named the American Society of Traffic and Transportation (AST&T) and is now closely affiliated with the National Industrial Transportation League (NITL)

² Originally named the National Council of Physical Distribution Management, renamed in 1985 to the Council of Logistics Management, finally adopting its current designation, CSCMP, in 2005

³ As defined by both Webster's online dictionary (<http://www.webster-dictionary.org/definition/pedagogy>, March 17, 2008) and the *Compact Oxford English Dictionary* (http://www.askoxford.com/concise_oed/pedagogy?view=uk, March 17, 2008)

effective workforce. From industry's perspective, educational institutions must also produce an adequate supply of college graduates to fulfill workforce needs.

Recently, practitioner concern has focused on how logistics job growth has outpaced the number of graduates, with a Council of Logistics Management study finding that only 139 out of 1000 schools surveyed offered logistics-related courses (Biederman, 2001). Another concern of practitioners has been the preparation of graduates (Murphy and Poist, 1998; Myers *et al.*, 2004; van Hoek *et al.*, 2002)—all too often new graduates have arrived at the workplace less than adequately prepared for careers as logistics managers.

In response to the concerns of academe and practitioners, logistics researchers have published numerous research articles that address concerns specific to logistics educators and managers. There presently is no comprehensive review which systematizes and summarizes the burgeoning body of logistics educational literature. Consequently, it is unclear what has been learned about logistics education and what issues remain to be addressed. Currently there has been no attempt to integrate the body of logistics education knowledge; as a result, this important stream of research remains underutilized despite 20 years of rapid growth in logistics university programs.

With the number of educational articles published in logistics research journals over the past 40 years, the time seems right to assess trends and gaps. The purpose is to present a summary of the primary trends and status of logistics university education thought and not a comprehensive review of the literature. By offering such a guide, we hope to make the history, current status, and future trends in logistics education more accessible to subsequent research in the advancement in logistics education.

This paper begins by identifying historical trends in the extant body of logistics education literature. The description includes a qualitative review of the concerns that have dominated logistics university education. Then a brief description is presented of the predominant streams of extant published research taken from the educator's perspective with a focus on curriculum, content and skills, and teaching method. Next a summary is presented of macro-environmental factors identified in the extant literature that are affecting current logistics university education. Finally, an assessment is made of future research needs in logistics education. This literature review categorizes 81 journal articles published in academic journals over the past 40 years to help provide the evolution of logistics education while also provoking debate and higher quality research in this area.

Definition of Logistics

Logistics has evolved through several stages (Coyle *et al.*, 2008; Kent and Flint, 1997). The 1950s and 1960s witnessed the appearance of the systems concept that integrated various outbound logistics functions into physical distribution. Physical distribution seeks the lowest total systems costs via functional cost tradeoffs (c.f., Brewer and Rosenzweig, 1961; Lekashman and Stolle, 1965; Magee, 1962). The integrated logistics management concept of the 1980s added inbound logistics to physical distribution in response to transportation deregulation and increasing globalization (Coyle *et al.*, 2008). The influence of Porter's value chain model (Porter, 1985) extended logistics management to envision efficiency and effectiveness of the total system of interrelated companies from original vendors to final consumers, a concept that became known in the 1990s as supply chain management.

This paper follows several leading logistics texts in treating supply chain management as the extension of logistics management to the interfirm context (Bowersox *et al.*, 2007; Christopher, 2005; Coyle *et al.*, 2008; Stock and Lambert, 2001; Webster, 2008). Specifically, logistics management is defined as creating economic time and place value by procuring, moving and positioning inventory for a business (Bowersox *et al.*, 2007; Christopher, 2005). For the purposes of this study, supply chain management is defined as the extension of logistics management to coordinate and integrate activities across two or more firms (Christopher, 2005; Webster, 2008).

Method

Since there are no journals dedicated to logistics education, this study limited itself to the inclusion of logistics research journal articles in order to develop an initial starting point for future research. Using the search terms presented in Table I, the online databases *ABI/ProQuest* and *EBSCO* were used to find the majority of articles in this study. Using the same search terms, Google Scholar netted additional articles. As a last step to ensure the fullest representation of research conducted by logistics academe, a manual search was conducted of what are recognized as the top traditional academic journals listed in Table II that were available electronically. The journals were selected based upon their potential to represent logistics academia's involvement in educational concerns (c.f., Gibson *et al.*, 2004; Gibson and Hanna, 2003). General purpose educational journals were not manually searched since the purpose of this research effort was to

evaluate the status of the logistics literature; however, these journals were not excluded from the earlier searches that netted most of the sample⁴.

Sample development included articles that expounded on pedagogy or curriculum for logistics-related programs or courses, or assessed trends in educating college or university students. Specifically excluded for the purposes of this literature review were any articles dealing with non-college training, rankings of journals or programs, reviews of theory, and reviews of current research themes since they failed to address logistics university education.

Insert Table I: List of Search Terms
Insert Table II: Traditional Academic Logistics Journals

For this literature review, emerging themes (or categories) were developed by repeatedly studying the articles and assessing possible commonalities and how these fitted with developing themes (Leedy and Ormrod, 2005). A rigorous and systematic reading and coding of the articles allowed major themes to emerge. Diagrams were used to focus on what was emerging and to link educational research topics with possible themes. Articles were then grouped “horizontally,” being read and assessed by theme to identify differences. This process was repeated until new themes no longer emerged, suggesting that major themes had been identified.

Sample and Classification Development

A total of 81 articles were included in this study’s assessment from the journals listed in Table III. In reviewing the articles, three primary themes stood out. The first theme was

⁴ Research presented in educational journals included in the sample were two articles from *Journal of Education for Business*, one from *International Journal of Learning and Change*, and one from *The International Journal of Educational Management*.

curriculum—which courses should constitute a program of study. These articles either attempted to match educational program offerings to perceived practitioner needs or develop a prescription based upon the historical development of the logistics concept.

Insert Table III: Journals Containing Logistics Education Articles
Insert Figure 1: Total Number of Articles by Decade
Insert Table IV: Number of Articles Published by Decade and Category

The second theme that became salient was extension of individual logistics courses or content and skills in a program of study. By far the most common extension was the application of decision support software, typically in response to the introduction of the personal computer into the workplace. Other areas such as international logistics have also been published since the establishment of the Canada-US Free Trade Agreement of 1988 (which was broadened to become the North American Free Trade Agreement in 1994).

The third theme considered various methods for delivering classroom instruction of logistics-related topics. The most common method discussed was use of computer-based simulation followed by integrating computer-based management tools such as forecasting and spreadsheet modeling. Next these three categories—curriculum, content and skills, and teaching methods—are discussed in more detail.

Historical Trends in the Literature

Logistics education literature evolved in tandem with logistics as a field. As depicted in Figure 1 and Table IV, interest in educational research has evolved from curriculum focused to encompass discussion expanding content and skills and then teaching methods. The 1960s reflect

a strong interest in curriculum with 13 articles published. The 1990s and early 2000s saw a strong increase in the number of logistics-education articles with 19 and 32 articles respectively.

Figures 2 and 3 reveal insights regarding trends in the logistics educational literature. These trends reflect the evolution of the logistics academic discipline. The era of logistics as a serious discipline, both academically and professionally, began with the application of the total systems concept to physical distribution in the 1960s (Langley, 1986). The first two decades of logistics education publications were dominated by concerns defining what should constitute logistics curricula. All 13 articles published in the 1960s and all 8 in the 1970s addressed curriculum concerns, asking the question, “What should logistics be?” Transportation was the predominant logistics degree; the first articles questioned whether transportation belonged in a university curriculum as practitioners tended not to appreciate graduates with transportation degrees (Brewer, 1963; Farmer, 1963; Henderson Jr, 1963; Norton, 1963; Rose, 1967; Sampson, 1963; Scheleen, 1961; Wilson Jr., 1961). During this early era several assessments of educational needs were published (Cherington and Schneider, 1967; Christner *et al.*, 1966; Farris *et al.*, 1972)

Insert Figures 2 & 3 about here

As the discipline became more established, its focus shifted from existential in nature to a more pragmatic, “Are we meeting industry’s needs?” The 1970s marked an era of growing support of logistics education as the fledgling university programs were succeeding at producing graduates valuable to industry (Ballou and Piercy, 1974; Jaski and Moody Jr., 1977; Mundy *et*

al., 1977; Piercy *et al.*, 1977). These studies offered valuable feedback to improve the quality of the nascent logistics programs.

In the 1980s logistics education development expanded to consider content and skills and then teaching methods. The acceptance of college logistics programs led to the next obvious question: what should be taught in the individual courses? A total of 29% of the articles published in the 1980s addressed the content of logistics courses. The 1980s focused on computer literacy needs in response to the advance of affordable computing in the office (Cook, 1989; Sherwood and Rice, 1985)—a theme that has continued to present day. It was not until the 1990s that additional course topics appeared, led by international logistics (Morgan and Arnold, 1990), perhaps partly in response to previously published concern regarding the beginnings of globalization and its impact on logistics curricula (Bess and Collison, 1987; Sailer, 1980).

In the 1990s the number of articles published about content and skills equaled curricula concerns. This came as the result of increasing diversity in the types of logistics education articles being. While content and skills and curriculum each accounted for 37% of the logistics education publications in the 1990s, teaching methods mark their first appearance during this time period, constituting 26% of the total number of articles. Articles about logistics education had progressed from asking, “Who are we?” in the 1960s and 1970s to asking “What are we teaching?” in the 1980s, then the 1990s saw logisticians begin to ask, “How are we teaching it?”

Discussion of Themes

Curriculum

By far the most common theme, the development of a logistics curriculum seeking to meet industry needs dominated the logistics’ pedagogical literature. Out of the 81 articles

researched for this paper, 49 (or 60%) addressed curriculum. Practical applicability comprises the heart of the issue in the curriculum-related articles. Most—21 out of 49—surveyed universities and colleges to determine issues related to meeting business’s demand for logistics graduates with the proper skills (c.f., Ballou and Piercy, 1974; c.f., Lancioni *et al.*, 2001a; Lancioni *et al.*, 2001b). Most of these survey articles were published in the 1960s (9 articles) or 1970s (4 articles), although four have appeared since the turn of the millennium. Other studies focused on the subject matter of curricula course content or the specialties of university logistics faculty (Ballou and Piercy, 1974; Gilmour, 1978). Some offered descriptions or maps of university departments (Lancioni *et al.*, 2001a; Lancioni *et al.*, 2001b) or community college programs (Farris and Cunningham, 1989).

The next largest group ($n=17$) of curriculum-related articles consisted of articles focusing on the marketability of logistics graduates (Dadzie, 1998; Myers *et al.*, 2004; van Hoek, 2001) or meeting the burgeoning demand for logistics graduates (Lancioni *et al.*, 2001a). These articles presented surveys of practitioner-managers’ or recruiters’ perspectives on the desirable capabilities of recent college graduates (c.f., Cherington and Schneider, 1967; Dadzie and Johnston, 1984; Dadzie, 1998; Ferrin *et al.*, 2001; Murphy and Poist, 1998). One study compared perceptions of American vs. European logistics managers regarding the skills and background most appropriate for operating in the contemporary European Union environment (Poist *et al.*, 2001). Intriguingly, American and European perceptions differed significantly with regard to required skills, but the study found no significant difference with regard to perceptions of required background.

Attempts at matching logistics graduate qualities with job market requirements have mostly appeared within the past two decades, with 11 published articles since 1990. This comes

as no surprise given the mismatch between supply and demand for logistics and supply chain college graduates has characterized the past two decades (Biederman, 2001).

The balance of articles addressing curriculum can be divided into two groups. The mostly older group from the 1960s and 1970s explicated the historical perspective on what should constitute a logistics program (Beier, 1972; Brewer, 1963; Farmer, 1963; Harper, 1965), although a couple of more recent attempts have appeared (Ballou, 2007; Farris, 1997). Besides justifying the roots of logistics curricula, these articles attempt to use the past to predict the future of logistics education. The balance of papers addressing logistics curricula explicate specific programs as examples (Christopher *et al.*, 1998; Closs and Stank, 1999; Ferrin *et al.*, 2001) or advocate enhancing international logistics in extant curricula (e.g., Bess and Collison, 1987; Sailer, 1980; Wu, 2007). These latter articles were included under curricula rather than content and skills since they specifically address college curriculum and do not describe the content of international logistics courses.

Interestingly, most recent studies have not emphasized projecting curricula requirements into the future. Indeed, at least one seems to espouse focusing entirely on present needs of industry, to the point of nearly allowing businesses to determine the curriculum (Ferrin *et al.*, 2001). This is at odds with several early studies that drew upon researchers' knowledge of trends in logistics to conjecture the future importance of such important areas as internationalization and computers (Harper, 1965; Lekashman and Stolle, 1965; Plowman, 1964; Sampson, 1963) or the possibility that logistics programs may have stages of evolution (Beier, 1972). Indeed, a frequently cited early work on logistics curriculum specifically addressed the fact that "...industry's *demand* may not necessarily reflect its actual *needs*, as viewed from outside the industry (Cherington and Schneider, 1967: p. 20)."

Content and skills

Content and skills constituted 15 of the 81 articles (19% of the total) included in this literature review. Generally, the strategy involves describing one area or skill identified by managers or academicians as important to be included in the education of the young new logistics graduates. All but one of these articles appeared since 1985, coinciding with the era of logistics as a key differentiator in business strategy (Kent and Flint, 1997).

Information technology-related skills represented the most common theme in this category, with half of the articles addressing enabling computer abilities and modern information systems. Four articles addressed how to include computer-oriented tools and techniques in coursework with topics that included basic computer proficiency (Rao *et al.*, 1998; Sherwood and Rice, 1985), statistics (Parker *et al.*, 2001), and modeling (Tyworth and Grenoble, 1991). Another three articles addressed courses in decision support systems (Boyken and Martz, 2004; Cook, 1989; Smith *et al.*, 1998).

Less technical aspects have also appeared in the literature. Examples are the inclusion of multiculturalism as a component of international logistics (Canen and Canen, 2001; Morgan and Arnold, 1990) and innovation management in multinational organizations (Canen and Canen, 2002). One study espoused bolstering managerial “ability to influence” in course content (van Hoek *et al.*, 2002).

Another less technical aspect that received some study was executive education. Despite the increasing popularity of university short courses for executives, and the potential to tout the benefits of logistics education and programs, only two studies (Cowell, 1998; Vollmann *et al.*, 2000) indicated that such courses offer fertile ground for the exchange of ideas and have a

positive impact on subsequent job performance. The current status of executive education as a specialized program in a few institutions with the resources and manpower (e.g., Georgia State University, University of Wisconsin, Cranfield University) probably explains the dearth of literature for this topic. The remaining two articles in this category date from the last decade and addressed inclusion of quality (Novack *et al.*, 1993) and service response (Davis Jr. and Manrodt, 1992) in coursework.

Teaching Methods

Teaching methods constituted 17 out of the 81 extant studies (21% of total). Sharing knowledge on logistics teaching methods has only begun to appear in the last 16 years, starting with an article that focused on generating more interest in logistics among undergraduate students (Theise, 1991). Six of the teaching methods articles were found in a special issue of *Production and Operations Management* that focused on supply chain education. Reflecting on this journal's focus on information technology as an enabler, five of these articles focused on computer simulations such as the "beer game" simulation (Anderson Jr. and Morrice, 2000; Campbell *et al.*, 2000; Chen and Samroengraja, 2000; Jacobs, 2000; Mehring, 2000).

The sixth *POM* article dealt with the "soft" side of supply chain management, explicating an interactive method for teaching multiculturalism in global project teams (Kopczak and Fransoo, 2000). The interactive learning theme appeared in several other articles elucidating the use of group projects to provide students experience at solving realistic problems by integrating tools and techniques (Alvarstein and Johannesen, 2001; Gudmundsson and Nijhuis, 2001; Kellar *et al.*, 1995; Thomchick, 1997; van Donselaar and Sharman, 1998). Two more articles addressed

the theme of providing practical work experience via partnering with industry (Ziarati *et al.*, 1995) and internships in industry (Knemeyer and Murphy, 2001).

Of the remaining three articles in this category, two addressed methods for generating interest or how to “recruit” students into logistics programs (Knemeyer and Murphy, 2004; Theise, 1991) while the third studied the benefits of using a block rather than a regular semester or quarterly teaching term (Grant, 2001).

Macro-environmental Factors

This literature review discovered four principle macro-environmental factors that are influencing the current status of logistics education: an increase in the number of logistics educational programs, limited supply of logistics-trained faculty, changes to content requirements, and a changing teaching environment.

Increase in the number of logistics educational programs

During the past decade the number of collegiate logistics programs has grown to address increased demand for educated logisticians and have filled a variety of niches. Some programs have developed which embrace supply chain management while others emphasize basic coursework such as transportation. In addition, there has been an increased growth in the number of community college programs as well. The result is an increased variety of curricula spawning increased discussion about logistics education.

As the academic field grows, with it comes an increase in the number of faculty seeking publication. New faculty tend to try and test new things in the classroom as they develop their teaching style and this may result in additional logistics education articles. With the imbalance

between supply and demand for new logistics graduates likely to continue into the foreseeable future, the number of universities developing new and innovative programs may also continue. As long as new ideas are developed and implemented, their authors may strive to share them with their peers in the academic community.

Limited Supply of Logistics-Trained Faculty

The conundrum of the growth of collegiate logistics programs is the lack of logistics faculty with terminal degrees. Subsequently, many programs may find the need to adapt teaching methods to accommodate larger course sections and utilize different and innovative pedagogical approaches. In other cases, the constraints may result in hiring adjuncts from industry or terminally qualified crossover faculty from related fields such as operations management or decision sciences. These solutions may also serve to enrich the logistics education literature with new ideas or innovative approaches.

Changing Content Requirements:

As logistics continues to grow in stature in the corporate scene, logistics education must shift its emphasis from developing specialist technicians to generalist managers who understand logistics. The majority of studies that addressed the question indicate that most logistics managers must have a mix of desirable business, logistics, and management skills, with an emphasis on the importance of having the right skills or experience over education (Keolanui and Wood, 1998; Murphy and Poist, 1994; Murphy and Poist, 1998; Myers et al., 2004; Poist et al., 2001).

With regard to the skills most beneficial to practicing logistics managers, a few skills re-appeared repeatedly. Murphy and Poist's results typify the five areas of study most frequently found to be important (though not always in this order): transportation and logistics, general business administration, human resource management, business writing, and information systems (Murphy and Poist, 1998). One could re-name these more generally as specialty skills, general business, interpersonal relations, communications, and computer systems. Most of the literature describing surveys of practitioner managers have highlighted these same areas repeatedly (Cherington and Schneider, 1967; Dadzie and Johnston, 1984; Dadzie, 1998; Keolanui and Wood, 1998; Murphy and Poist, 1994; Myers et al., 2004).

People skills appear more and more both in terms of perceived importance and in articles about specific areas of study, especially in the context of customer service (Davis Jr. and Manrodt, 1992; Murphy and Poist, 1998) and multiculturalism or globalization (Canen and Canen, 2001; Williams *et al.*, 2000). The prominence of literature about using groups for learning logistics (Gudmundsson and Nijhuis, 2001; Kellar et al., 1995; Thomchick, 1997) reveals the growing importance of the ability of logistics managers to influence people (van Hoek et al., 2002).

The logistics concept has broadened to encompass the supply chain management concept which changes or adds more content to courses. Several articles address supply chain management or group logistics with supply chain management (Ballou, 2007; Johnson and Pyke, 2000; Lancioni et al., 2001a; Okongwu, 2007). As supply chain management evolves, we expect to see articles concerning new and modified curriculum and additional content that prepare the logistics graduate to operate in the supply chain environment.

The technology skills of the student have changed as we now may teach students who grew up technologically enabled instead of teaching them about technology. No longer do we need to teach a basic spreadsheet class, rather how to advance the application of those spreadsheet skills to resolve logistics problems.

Whether by enterprise resource planning, expert systems, or some other way, information systems and computer systems serve as enablers of both skills and integrating disciplines in addition to bridging inter-firm gaps. The advent of supply chain management as a field of study best demonstrates the importance of information sharing to the contemporary business environment. For this reason if no other, computer and information systems appear frequently as the topic of articles elucidating important areas of study in logistics (Boyken and Martz, 2004; Cook, 1989; Rao et al., 1998; Smith et al., 1998; Tyworth and Grenoble, 1991).

One could call the plethora of recent studies of information systems in the context of logistics “trendy” but for the fact that since the earliest days of logistics academic studies the most respected authors have alluded to the importance of information (Brewer and Rosenzweig, 1961; Farris *et al.*, 1969; La Londe and Dawson, 1969; Lekashman and Stolle, 1965; Plowman, 1964). Information sharing, analysis, and processing represent an important aspect of the theoretical foundations for efficient and effective logistics (Bowersox, 1978; Bowersox *et al.*, 2000; Langley, 1986). Specifically, little research has explored the end market’s role as the ultimate determinant of successful supply chain configurations—the importance of end market information to supply chain configuration remains underrepresented in logistics education.

International supply chains continue to grow and develop, requiring curriculum and content changes to encompass outsourcing, elements of international trades, reverse logistics and recalls. Several articles have already been published which focus on increasing

internationalization in logistics and supply chain management from the perspective either of changing extant curricula (Dinwoodie, 2001; Mangan et al., 2001; Poist et al., 2001; Veenstra, 2002; Wu, 2007) or specific aspects of individual courses in international logistics (Canen and Canen, 2001; Canen and Canen, 2002). Much of the growth of logistics may occur in developing countries. The changing international marketplace may offer increased material for logistics education articles including differing learning environments to educate international managers.

Increased emphasis on business collaboration and logistics' unique place at the crossroads of many business functions has added another element that must be addressed in the teaching environment (Ferrin et al., 2001; Lancioni et al., 2001b). Logistics managers and academicians must have the ability to integrate skills from across multiple disciplines in the most desirable business mix. Ever since Brewer's indictment of the problems with transportation education (Brewer, 1963), researchers and practitioners have endorsed multi-disciplinary, integrated approaches over stove-piped or specialty courses of study (Cherington and Schneider, 1967; Christopher et al., 1998; Closs and Stank, 1999; Farris et al., 1969). The end result should be a renewed focus on relationship management, and most especially how interfirm relationships change over time in response to demand conditions.

The body of logistics literature that addresses teaching methods has emphasized cross-disciplinary approaches by recommending problem-based learning solving issues for industry (Alvarstein and Johannesen, 2001; Gammelgaard, 2001; Gudmundsson and Nijhuis, 2001; van Hoek, 2001) and, to a lesser degree, group or collaborative learning (Kellar et al., 1995; Thomchick, 1997). While offering the advantages of practical experience combining multiple disciplines and working with industry, these methods do not provide true practical work

experience since they still occur in a structured academic setting; an area of opportunity for further logistics education development.

Changing Teaching Environment:

Continued development in technology may offer additional content for research for teaching methods. For example, consider the opportunities to utilize live-meeting technology to enable joint student group projects between a Fachhochschul in Austria with a university on North Texas and how this may potentially enhance the teaching environment. In addition, the growth of on-line courses as a delivery method continues to offer publishable new pedagogy considerations.

Where should authors submit their logistics education articles advancing curriculum, content and skills, and teaching methods? Historical analysis shown in Table V identifies which journals have published articles in each category. In addition, other logistics journals, such as the *International Journal of Logistics Management*, are beginning to recognize the importance of furthering logistics education growth and development to help meet the needs of the professional field.

Insert Table V: Historical Prescription Where to Submit Articles

Future Research Directions

The process of conducting the literature review uncovered several areas of future research. A summary of these areas of future research follows. Much of logistics education

research is descriptive in nature and lacks detailed suggestions for future research. This should be addressed in future publications.

Curriculum

Surveys of university programs have appeared frequently since the turn of the millennium. More than one study found that graduates require skill sets that vary by industry, suggesting that curricula should also vary (i.e., Dadzie, 1998; Gibson and Cook, 2001; Myers et al., 2004; Poist et al., 2001). Future research needs to identify which programs of study would satisfy industry's diverse needs. Logistics and supply chain management exists as a fragmented discipline, housed in university departments as diverse as production management, marketing, supply management, industrial engineering, management science, or in its own department. The nascent status of the discipline and lack of consensus among academics results in little distinction by employers between the value of a logistics versus other business degrees (Dadzie, 1998; Gibson and Cook, 2001; Myers et al., 2004). Further exacerbating the problem is the existence of university functional silos and the mixed message sent by the co-existence of logistics and supply chain management in multiple departments at many schools (Closs and Stank, 1999).

Additionally, whereas most recent research has focused on industry's current needs, academics in recent times have seldom attempted to project the future evolution of logistics' educational needs; this is surely an area where industry expects academia to take leadership. Recent research has described current programs or advocated international logistics or the addition of foreign languages (Poist et al., 2001), but such studies are reactive rather than proactive.

Content and Skills

After two decades of decline, logistics costs in the US rose from 8.8% of gross domestic product in 2004 to 9.9% in 2006; increases in transportation costs and the need to increase inventory to buffer the increased uncertainty endemic to increasingly global supply chains receive most of the blame (Wilson, 2007). This suggests that the previous downward trend may have resulted from environmental factors such as deregulation and an unprecedented period of global economic prosperity rather than a better educated work force.

At least one study found education to be a poor predictor for logistics managerial performance (Myers et al., 2004). The connection between education and performance needs explored further. The same study identified “soft skills” (social, decision making, problem solving, and time management) as valued by employers—but these skills seldom appear in university curricula. Less technical content has started to gain momentum in the literature, largely due to two factors. First, globalization has increased the importance of multiculturalism to international logistics both from the perspective of business success (Canen and Canen, 2001; Morgan and Arnold, 1990) and managing innovation across multinational organizations (Canen and Canen, 2002). Second, the increased status of logistics managers in the firm has influenced the necessity of adding course content to help improve their ability to influence people (van Hoek et al., 2002).

Given the promise shown by the two examples of non-traditional studies such as executive education and non-degree coursework (Cowell, 1998; Vollmann et al., 2000), additional work needs done in this area. Both of these studies identified the highly segmented nature of non-degree coursework; since most managers do not have a logistics and supply chain

degree, they benefit greatly from such coursework. Future research should identify shortfalls in managerial education and how to leverage the relationships formed with managers during the educational process to reinforce logistics' academic-industry relationship.

Teaching Methods

Many teaching method articles focused on the use of computer simulation. Researchers have called for increasing the complexity of the simulations to make them more realistic. Only one of the articles explicating classroom use of simulation provided future research directions, including the use of dynamic demand patterns and complex global information sharing (Anderson Jr. and Morrice, 2000). Specifically, these techniques need to expose real life inter-organizational dynamism and evolution of interfirm relationships.

This area of educational research lacks longitudinal studies to assess the efficacy of the teaching methods; follow up studies are needed that assess alumni career preparedness after graduation. Although the different teaching methods presented appear to offer benefits, little or no research explores the connection between teaching methods and job performance.

Conclusion

Two-thirds of the way into the current decade, the number of published articles that address logistics education is greater than any two consecutive previous decades. By the end of this decade there may be more than double the number of articles written in any preceding decade. As logistics programs have become more established, education research articles have shifted from a focus on prescriptions for what a logistics program should look like to recommendations for improvements to existing programs either based upon success stories (c.f.,

Dinwoodie, 2001; Mangan *et al.*, 2001; Veenstra, 2002) or observations of educational gaps (Gibson and Cook, 2001; Myers *et al.*, 2004; Okongwu, 2007; van Hoek, 2001).

The economic impact of logistics justifies the implementation of more effective educational methods—at \$1.3 billion and 9.9 percent of gross domestic product, logistics constitutes a significant portion of the national economy (Wilson, 2007). Indeed, evidence suggests that the focus of logistics educational programs on practical relevance has already proven its effectiveness: between 1982 and 2006, advances in logistics theory, complemented by rapid advances in information systems, contributed to a 41 percent decrease in total logistics costs encompassing a 60 percent drop in inventory carrying costs and a 20 percent drop in transportation costs (Wilson, 2007). Despite a small increase since 2004, total logistics costs as a percent of GDP are at their lowest in twenty years.

The findings of this literature review indicate that logistics and supply chain management university education continues to redefine itself—the literature demonstrates dynamic behavior in response to a dynamic industry. It also highlights relative gaps in sharing ideas that could enable benchmarking of world-class courses. As the number of university logistics and supply chain programs continue to increase in response to industry demand for quality graduates, more detailed research about coursework and programs from existing successful institutions may facilitate the evolution of logistics education.

In terms of practical relevance, the early partnership between industry and education set the stage to help guide educators to evolve logistics education to address practitioner needs. Increased interest in logistics education and changing environmental factors suggest the need for continued collaboration to further logistics education. This important relationship between academicians and industry must continue if university logistics education is to avoid the risk of

irrelevance that has betimes afflicted other disciplines (c.f., Hansen, 1989). As current logistics programs continue to evolve and the number of logistics and supply chain management programs continue to increase in response to industry demand, this comprehensive review of the logistics literature may help serve as a benchmark for past and current practices in logistics education.

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