

Global logistics management curriculum: perspective from practitioners in Taiwan

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Abstract

Purpose – This study attempts to list and rank the necessary skills required of a global logistics professional based on objective evaluations from industry.

Design/methodology/approach – This paper adopts a novel mixed-methods approach using elements of concept mapping (brainstorming, multi-dimensional scaling, cluster analysis), and link analysis. Concept mapping through repeated brainstorming by industry practitioners helps to summarize the key skill required of an effective global logistician. The multidimensional scaling method and cluster analysis support the classification and weighting of the capabilities into nine clusters. Link analysis helps to evaluate the significance of the results and addresses the gap between industry and academic perceptions of the existing global logistics curriculum in Taiwan.

Findings – In dealing with globalization, a logistician needs to be able to integrate, communicate, and analyze from an international perspective, perform financial analysis, maintain good industry and customer relations, exhibit strong people skills, stay healthy, and understand laws and regulations. Significant differences exist between industry practitioners and educators. The former believe that cross-functional marketing skills are critical and emphasize the importance of risk and financial management. In contrast, logistics educators consider the traditional logistics management skills, such as demand forecasting, sourcing, planning, and system integration, as key priorities.

Research limitations/implications – There is room for research and theory on how to narrow the mismatch between the current logistics curricula in academia and practical requirements. Different pedagogical strategies and techniques can be further investigated to orchestrate an effective and balanced global logistics management course. One research limitation arises from the sample which is confined to Taiwan. Thus, the authors' findings may be constrained by local and cultural influences. Future research could extend to a large-scale multi-country data collection and analysis to reduce the possibility of cultural and context bias.

Practical implications – Arming students with such important but diverse global logistics skills presents a challenge for logistics educators who need to find the right balance between breadth and depth of the modules. Educators and practitioners need to work closely together to co-design and adapt the logistics curricula for a rapidly changing global environment. This will help to shorten the last stage from the classroom to the workplace by keeping abreast of the changes in industry and produce relevant logisticians without compromising on rigour.

Originality/value – The results provide a reference for educators keen on blending logistics education course design with practitioner inputs, to better develop global logistics capabilities. It also provides a reference to help prioritize what skills are important to be taught jointly in a module.

Keywords Skill requirements, Global logistics, Curriculum design, Management education, Taiwan, Managers, Distribution management

Paper type Research paper

Introduction

As globalization fosters more cross-border trade and connectivity, global logistics concepts and practices have assumed greater roles to foster efficient and seamless

international transactions. An efficient logistics and supply chain system can reduce transaction cost while adding value to the overall economy and fostering business development

The current issue and full text archive of this journal is available at www.emeraldinsight.com/1359-8546.htm

The authors would like to extend their sincere appreciation to National Science Council of Taiwan for the financial support (NSC 99-2410-H-110-053-MY3 & NSC 100-2628-S-110-006-MY4). Their deepest thanks also go to the referees for their constructive comments.



Supply Chain Management: An International Journal
18/4 (2013) 376–388
© Emerald Group Publishing Limited [ISSN 1359-8546]
[DOI 10.1108/SCM-04-2012-0145]

Received April 2012
Revised August 2012
October 2012
December 2012
February 2013
Accepted February 2013

(Mangan *et al.*, 2008). However, the level of logistics complexity increases with the frequency of international transactions. A logistician must now also possess a richer skill set to cope with new job demands (Wu, 2006). Further, as logistics operations become increasingly complex, industry increasingly questions if universities are imparting the requisite logistics skill set to students. Educators, on the other hand, have trouble grasping exactly which global logistics skills are required (Gravier and Farris, 2008). Some suggest that there is already a divergence as academe has moved from a strong focus on practical content so as to garner credibility from the traditional disciplines. Mangan and Christopher (2005) mention that logistics education should be more practical, with less emphasis on the theoretical content, thus suggesting a “T” approach to training logisticians. This debate between academe and practica goes a long way in explaining and achieving success for the global logistics industry in producing graduates who are both relevant to industry and sufficiently grounded in theory (Pohlen, 2011).

However, the mismatch between the supply and demand for logistics graduates persists (Defee *et al.*, 2010; Gravier and Farris, 2008). Thus, educators need to pay greater heed to the widening gap between their global logistics course content and the skills needed by industry (Dubey and Singh, 2009). While Burcher *et al.* (2005), in a study of cross-national logistics managers, assert that most managers possess the skills to satisfy their current job requirements, the overall logistics career development requires additional international and cross-functional skills, especially on improving business competitiveness and strategy formulation. In fiercely competitive settings, global logistics managers must be competent in a diverse set of skills and have a clear sense of their own strengths and weaknesses to stay competitive (Pohlen, 2011; van Hoek *et al.*, 2002). Nevertheless, the question remains i.e. what skills does a logistician need to stay relevant in today’s competitive business environment without compromising on academic rigor as demanded by the traditional disciplines? Is there a mismatch between the current logistics curricula in university and practice? Do educators have a clear sense of what is needed for a global logistics curriculum? This dyadic concern can also be addressed as follows. Is industry happy to accept the university career preparation mode of training?

This study, based on a sample from Taiwan, explores the level of disconnect between existing curricula designs and industry needs. It presents the essential skills for a global logistician, according to the evaluations provided by industry. The inclusion of insights from educators allows for an exploration of the differences and commonalities between these two groups. The ranking of the skills can aid in global logistics curricula design.

The rest of the paper is organized as follows. Section 2 presents the background literature to this study. Section 3 details the research method used in this study. In particular, we provide an overview of the two novel research methods used in this study. The research results are found in Section 4. This is followed by a discussion and some implications for theory and practice in Section 5. Section 6 concludes with some suggestions for future research.

2. Literature review

2.1 Global logistics

Effective global logistics management enhances a firm’s capability to serve its customers worldwide. In turn, an effective global logistics manager would need to possess at least six capabilities, so that he or she can build an effective logistics hub, consolidate delivery operational channels, satisfy customer requirements at various levels, construct a speedy and efficient logistics system, coordinate internal functions, and develop a competitive strategy for the entire supply chain (Capacino and Britt, 1991). However, the complexity of global operations also requires managers to devote attention to matters such as cultural diversity and economic development (Youngdahl *et al.*, 2010). Abrahamsson and Aronsson (1999) have observed a tendency for firms to internationalize supply chains to allow them to leverage their regional and global systems to facilitate marketing, delivery, and product services. In addition to developing information and financial systems, firms must be able to execute logistics and delivery effectively to sustain a competitive advantage (Carneiro, 2007). Therefore, in the rapidly changing logistics environment, it is imperative for firms to address three main areas: supply chain management, facility development, and delivery processes (Harrison and van Hoek, 2011). As logistics complexity increases as firms move their operations globally, the ability to manage these disparities across nations has become an imperative necessity.

Beyond these internal logistics, firms must provide consolidated global logistics services, such as transportation, storage, stock management, and order processing, to partners with which they have long-term contracts, with the objective of increasing customer satisfaction through consolidated logistics services ((Knemeyer and Murphy, 2004; Lieb *et al.*, 1993; Lieb and Randall, 1996). Wilson (2007) has noted the transformation in logistics services in the US, from simple means to reduce transportation costs to one-stop solution services that encompass transportation, storage, consultation, and information management. In a global age, the ability to respond to customer requirements quickly is critical so as to sustain their competitive advantage (Talluri and Yoon, 2000). Further, the consolidation of all departments under a single framework can maximize the strategic potential of logistics services. Cost and service levels in turn have become the main determinants for selecting logistics services (Lieb, 1992; Lieb *et al.*, 1993; Lieb and Randall, 1996).

2.2 Logistics skills

Christopher (2005) outlines how logistics management has evolved with industry complexity, from “push” to “pull” and from supplier centric to customer driven, with increasing emphasis on market size. In addition to its economic developments, other features of the market in Asia also affect the growth of logistics. For example, few Asian countries host professional logistics firms that can provide efficient services (Wu and Cheng, 2008). van Hoek *et al.* (2002) suggest that the industry lacks sufficient human resources, so much so that cultivating supply chain managers has become a critical challenge. Giunipero *et al.* (2006) also argue that supply managers need to assume strategic roles, especially for building strategic relationships, focusing on cost, and collaborating with suppliers.

Myers *et al.* (2004) report that despite the vast improvement in information and communication technology (ICT), substantial numbers of entry- and mid-level employees are still needed to maintain efficient supply chain operations. This finding suggests that specific job related skills are more important than an employee's overall educational history. Such tacit skills include social, decision-making, problem-solving, and time management capabilities. Practitioners assert that priority should be obtaining operational and supply chain management, ICT, legal, interpersonal, change management, and then project management skills. However, Mangan and Christopher (2005) show that educators believe that the essential skills should focus on finance, ICT, general management, and operations and supply chain management, together with analytical, interpersonal, leadership, and change management skills. Indeed, students, educators, and practitioners have different perceptions on what is to be considered as essential skills for logistics (Keller and Ozment, 2009).

Gammelgaard and Larson (2001) assert that the ability to communicate with others is critical for practitioners, a claim supported by Myers *et al.* (2004) and Belmiro *et al.* (2000). Logistics content and skills have changed from the more technical or information technology-based skills to having less technical content (Gravier and Farris, 2008). Logisticians must be able to communicate across departments to promote and coordinate supply chain management. However, the logistics education perspective focuses more on enhancing the analytic ability of students. Mangan *et al.* (2001), in considering the educational and training needs of logistics managers working in manufacturing firms in Ireland, reveal that logisticians need more communication, negotiation, ICT, general experience, logistics/supply chain management, and people management skills.

From a practitioner's perspective then, relevance rather than academic rigor is crucial to skill development (Basnet, 2000). In their comparison of logistics management careers between Australia and Britain, Burcher *et al.* (2005) reveal that Australians focused more on computer studies, whereas British managers prefer more language training. Overall, logistics managers needed to take a more strategic approach to their work, which could benefit from an international, interdisciplinary background. According to the US and European logistics managers, it is important to be a manager first and a functional/technical specialist second (Poist *et al.*, 2001). Such results illustrate the primary importance of general management skills (communication, leadership, interpersonal relations, planning and control), with functional skills (logistics and marketing) perceived as secondary. However, this may not be a requisite in a global business environment. In Asia, for instance, competency in at least one relevant foreign language and international work or management exchange experience also appear highly desirable from the perspective of large global organizations.

Finally, corporate social responsibility (CSR) offers an increasingly interesting asset. Harrison and van Hoek (2011) define CSR in a supply chain as the effort to deal with both the social and environmental consequences of supply chain operations. Companies are starting to grapple with CSR and global logistics where regulations in Asia are not always transparent and universal.

Though the literature review has uncovered some key factors that are influencing the state of logistics education for

global logisticians, the present challenge is to be able to craft a responsive, innovative logistics curricula to meet the needs of a dynamic and growing industry, with critical inputs from practice. The existing literature does not speak to this however especially from an Asian perspective and hence the need for this paper.

3. Methodology

We conducted a mixed methods research approach using concept mapping (which involved repeated brainstorming, multi-dimensional scaling, and cluster analysis), and then link analysis (which involved skills linkage visualization). The fieldwork was conducted over a two year period targeting at senior executives based in Taiwan who were attending EMBA classes in global logistics/supply chain management. The duration of the sampling was taken to enhance the validity of the variables and justify the choice of the research method used. For completeness, we now provide readers with a brief of the two novel research approaches.

3.1 Concept mapping

Most studies on logistics education skill requirements use surveys, interviews, and case studies (Gammelgaard and Larson, 2001; Mangan and Christopher, 2005; Mangan *et al.*, 2001; Poist *et al.*, 2001; van Hoek *et al.*, 2002). These methodologies tend to reflect subjective, individual perspectives though they offer insightful, qualitative, and in-depth analyses. Our paper adopts concept mapping to overcome the inherent bias associated with such methods.

Concept mapping, as originally proposed by Trochim (1989), can be combined with other methods to reinforce analytical validity, and the tool has been applied in various fields. Bigne *et al.* (2002), who use it to explore customer loyalty to travel agencies in Spain, call it an effective technique that generates important construct dimensions. Nabitz *et al.* (2005) also demonstrate how concept mapping can generate meaningful, internally valid indicator frameworks, such as for addiction treatment centers. Trochim *et al.* (2004) apply concept mapping to plan a statewide health improvement initiative and find that the tool is effective for:

- engaging geographically dispersed stakeholders, including local constituents and subject area experts across the country;
- generating valid findings that are comprehensible for non-scientists with clear implications for policy and practice; and
- delivering useful results in a short time at a relatively low cost.

In education research, Wopereis *et al.* (2005) have used concept mapping to explore the outcomes of stimulating the creative use of ICT in higher education. Clayton (2006) also documents the positive effects of applying concept mapping on the academic performance of students and their critical thinking abilities.

Wu (2006) has constructed a logistics licensing framework in Taiwan and provided a practical training and recruiting reference list for logistics-related firms using concept mapping. However, other studies applying concept mapping to examine the essential skills for the logistics industry are rare, even though logistics managers need a wide variety of skills to remain relevant. It thus remains unclear exactly which types of skills are needed in an actual industry setting.

Besides, the application of concept mapping occasionally has been questioned, on the grounds that the samples are not representative, questionnaires are neither clear nor well-structured, and the results are not standardized, agreed on, or reliable (Bigne *et al.*, 2002). Clayton (2006) argues that existing research on concept mapping is too limited to draw generalizations. Nevertheless, according to Trochim (1989), concept mapping offers significant advantages, including the ability to represent major concepts and their relationships. By combining concept mapping with other techniques such as link analysis, the results arising from group dynamics gain objective confirmation. Thus, through content mapping and link analysis, we can identify what skills ought to be taught jointly in a certain module. In what follows, we outline the steps used in a typical concept mapping procedure: preparation, statement generation, statement structuring, and statement representation.

Preparation

Conceptualization gains accuracy when it includes a wide circle of relevant individuals (Trochim, 1989). However, some situations demand the use of relatively small, homogenous groups for conceptualization. As mentioned, the sampling frame used for this study are the Executive Masters of Business Administration (EMBA) students enrolled in the global logistics/supply chain management classes at one of the top 50 global EMBA programs in Taiwan and is accredited by the Association to Advance Collegiate Schools of Business (AACSB). The respondents have a fair idea of the courses offered at the other undergraduate and graduate programs in Taiwan. The sample comprises 26 participants in the first round and 65 participants in the second round, representing diverse industry backgrounds (Table I). In this study, the research process targeted senior supply chain executives but requested data /information on entry- and mid-level logistics managers, which the respondents were able to provide richly given their wealth of work experience.

To ensure the face validity of the opinions expressed by the participants, the skill listing generation process was done twice. The first group comprised 26 logistics experts and yielded 29 skill items that the experts regarded as important for global logistics.

The skill items are:

- 1 Properties of materials.
- 2 Relationship in industrial chains.
- 3 Global perspective.
- 4 Negotiation.
- 5 Laws.
- 6 Application of IT.
- 7 Integration.

Table I Industry background: two groups

	First group	Second group
High-tech	5	10
Logistics	1	2
Traditional manufacturing	6	20
Construction	1	2
Medical	4	10
Service	9	21
Total	26	65

- 8 Interpersonal relationships.
- 9 Communication.
- 10 Consumer-oriented perspectives.
- 11 Industry trends.
- 12 Cultural difference.
- 13 Knowledge of international transport distribution.
- 14 Crisis management.
- 15 Financial analysis.
- 16 Corporate social responsibility.
- 17 Ethics.
- 18 Health.
- 19 Family.
- 20 Knowledge of exchange rates.
- 21 Leadership.
- 22 Independent operation.
- 23 Loyalty.
- 24 Foreign language.
- 25 International etiquette.
- 26 Political sensitivity.
- 27 Ability to think independently.
- 28 Teamwork.
- 29 Cost control.

Note: Items 18 and 19 are examples of soft skills desired by organizations, e.g. the ability to maintain a healthy lifestyle to cope with the demands of tight timelines and to maintain a good work life balance.

The skills relevant to global logistics are both hard and soft. Some of the soft skills deemed desirable by organizations actually pertain to the individual. These include the ability to connect with customers and suppliers (treating people with warmth), and able to work under tight timelines and long hours without falling sick all the time (have good health/stay healthy). This list was then evaluated by the second group of 65 participants through open discussions, without the presence of the first group. To strengthen the sample reliability, a set of clusters, through concept mapping, was identified from the two groups and comparisons were made between the two groups. As no significant differences emerged, sample reliability was satisfied. The same set of clusters was later used for further analysis.

Generation of statements

The actual concept mapping process begins with the generation of a set of statements through brainstorming by qualified participants, prompted by focus statements. In the validation process, the second group used the items generated by the first group to resume the discussion, which resulted in an expansion of the original 29 skills to 50 skills, as shown in Table II. After further discussion and refinement, the EMBA participants divided the personnel traits into several areas, defined by their relative importance.

Statement structuring

It was important to obtain information on how the logistics skills relate to each other. Therefore, each brainstormed skill item appeared printed on a separate 3 × 5 index card, and each participant received a complete set of cards for grouping and rating purposes. After each participant had finished the sorting task, the results were entered into a binary, symmetric similarity matrix. The relative importance of the various skills, as rated by the practitioners, was then determined using a five-point Likert scale (1 = not important, 5 = very important).

Table II Brainstormed topics by the second group for global logistics skills

Rank	Variable	Cluster	Weight	SD
1	International perspective	3	4.4923	0.7530
2	Foreign language	3	4.4769	0.7520
3	Communication	1	4.3846	0.9130
4	Decision making	1	4.3385	0.9230
5	Risk management	8	4.2615	0.7960
6	Cross-cultural sensitivity	3	4.2462	0.8670
7	Application and integration of resources	5	4.2462	0.8300
8	Negotiation	1	4.2154	0.9100
9	Ability to make profit	8	4.2000	0.9050
10	Market sensitivity	6	4.1692	0.9930
11	Analysis of industry trends	6	4.1538	0.7120
12	Integrity, honesty	1	4.1077	1.1470
13	Leadership	2	4.1077	1.0480
14	EQ management	1	4.0615	1.0290
15	Logical thinking	1	4.0615	0.9160
16	Social networks	1	4.0462	0.9910
17	Information integration	5	4.0308	1.0750
18	Courage to solve problems	1	4.0000	1.0160
19	Marketing	3	3.9231	1.0940
20	Knowledge of international trade	7	3.8308	0.9610
21	Corporate responsibility	2	3.8000	1.1070
22	Knowledge of logistics	4	3.7846	1.1520
23	Financial management	8	3.7692	0.9810
24	Assigning tasks effectively	1	3.7538	1.0610
25	Innovation	1	3.7385	1.1760
26	Integration of system and process	5	3.7231	1.0970
27	Information search	5	3.6462	1.1240
28	Quality management	5	3.6250	1.1790
29	Financial knowledge	7	3.5692	0.8830
30	Production integration	5	3.5385	1.0170
31	Health	1	3.5077	1.4370
32	Cultivating human resources	2	3.5077	1.1060
33	Enthusiasm	1	3.4769	1.1870
34	Carefulness	1	3.4615	1.1050
35	Environmental protection	9	3.4615	1.0320
36	Treating people with warmth	1	3.4000	1.1700
37	Customs laws	7	3.3846	1.2340
38	Purchasing	4	3.3231	1.1330
39	Coaching successors	2	3.2923	1.2960
40	Distribution management	4	3.2769	1.1790
41	Raw material management	4	3.2222	1.2050
42	Decision making under risk	6	3.2000	0.9870
43	Storage management	4	3.1846	1.2490
44	Adventure	1	3.1563	1.1490
45	Financial insurance	8	3.0769	1.0050
46	Patent analysis	6	3.0462	1.0960
47	Profit distribution	8	3.0308	1.1040
48	Mergers & acquisitions	7	2.9846	1.0680
49	Sense of humour	1	2.8750	1.1520
50	Appearance	1	2.8154	1.1980

Note: Again, when brainstormed with the second group of participants, many attributes of the individual deemed as soft skills were deemed as desirable by organizations, e.g. sense of humour in dealing with difficult situations involving customers / suppliers, maintaining a pleasant appearance before unpleasant clients, good relationship with other business associates. All these were grouped under personality related skills in the cluster analysis of Table III

Representation of statements

Multidimensional scaling can be applied to data that relate objects, individuals, subjects, or stimuli. The most common measure of the relationship between objects uses proximity (Cox and Cox, 2001). To represent the conceptual domain, a non-metric, multidimensional scaling analysis based on the previously obtained similarity matrix was conducted to group skill items into clusters. The final variables featured all 50 identified logistics skills, which later served as inputs for the cluster analysis.

After multidimensional scaling, we performed an agglomerative hierarchical cluster analysis on SPSS ver 17.0, using the average linkages (between groups) to differentiate each cluster (Wu, 2006). This technique sorts the observations into similar sets/groups (Ketchen and Shook, 1996) so that each participant can easily determine the skills in a cluster and describe any main area as a cluster. As a result, nine clusters that best depict the relationships among the skills were formed. To determine the internal consistency and reliability of each cluster, a reliability analysis was applied (Table III). Other than Clusters 3 and 7, the overall reliability statistics were acceptable with Cronbach's alpha values exceeding the threshold of 0.7.

3.2 Link analysis

Link analysis, drawn from graph theory, is not a specific modeling technique and can be used for both directed and undirected data mining. Widely used in many computer science and internet based applications such as webpage links and phone-call patterns, it can be used to create new derived variables for use by other modeling methodologies (Berry and Linoff, 2011). Link analysis, which capitalizes on factor relationships, is ideal for network visualization as it explores the correlations between classes of categorical variables and presents the results as interactive graphs comprising nodes and edges to represent the relationships. In our case, the nodes represent the logistics skills deemed important by the global logistics managers. The edges join the pairs of nodes connected by a relationship, as shown in Figure 1. Thus, the visual output of link analysis facilitates a better understanding of the underlying structure of investigated nodes and helps the analyzer to observe and isolate key patterns for further investigation. Link analysis then calculates the significance and correlation between the pairs of objects, such that the significance level reveals the probability of occurrence and the correlation indicates the link level, according to the following formula, $\text{Significance} = -\ln(p\text{-value})$ where the p -value indicates the correlation level of the pair on the basis of the YES (True) value and type. The p -value is derived from a cumulative hypergeometric distribution. The correlation level provides a reference for the two attributes of concern. If a given link has a significance of 30, the probability of a link between the two attributes (nodes) is explained by the statistical fluctuation of $\exp(-30)$.

However, link analysis' strength is in identifying specific patterns that can be converted into new features of the data for reference in conjunction with other directed data mining techniques, as this paper shows. This is novel to logistics research. On the methodological background and applications of link analysis, Berry and Linoff (2011) have the details. The Megaputer data analysis software PolyAnalyst 6.0. is used to pair the related skills.

Table III Reliability statistics of cluster analysis

No.	Cluster	Variance	Alpha	F	Sig.	Grand mean	Percent
1	Personal skills	0.097	0.935	23.151	0.000	3.73	11.29
2	Leadership skills	0.065	0.762	11.293	0.000	3.68	11.13
3	Internationalization	0.089	0.526	7.634	0.000	4.28	12.95
4	Logistics-related	0.012	0.879	5.644	0.000	3.36	10.17
5	Information integration	0.060	0.789	6.957	0.000	3.79	11.47
6	Market trends	0.086	0.707	41.281	0.000	3.64	11.01
7	International finance and trade	0.104	0.569	10.028	0.000	3.44	10.41
8	Risk and profit management	0.048	0.701	36.035	0.000	3.67	11.10
9	Environmental protection	n/a	n/a	n/a	n/a	3.46	10.47

Note: n/a = data not available

4. Results

Table III shows that the resultant clusters as personal skills, leadership skills, international perspective, logistics knowledge, resource integration, market/business knowledge, international trade, risk management, and environmental awareness. In Cluster 1 (personal skills), good communication and negotiation skills are expected of a logistics expert, as they must connect with other functions or businesses, including suppliers and customers, concurring with Mangan *et al.* (2001) and Poist *et al.* (2001). Cluster 2 (leadership) also emerged as a key requirement in that logisticians must have been able to lead in a global logistics environment, concurring with Mangan and Christopher (2005). Beyond management, corporate social responsibility has been gaining in importance among the practitioners.

Clearly, a logistics expert in a global business needs expertise in the logistics field (Poist *et al.*, 2001). An effective logistician should combine global business expertise with functional/technical skills, rather than being primarily a functional/technical or a logistics specialist. Cluster 5 (information integration) reflects the demands of both suppliers and consumers for on-time, reliable information systems, which are possible only with information applications integrated throughout supply chain management. In addition, logisticians must pay attention to global markets and competition. In Cluster 7 (international finance and trade), practitioners considered the knowledge of international trade as the most important skill. Logistics experts should be familiar with international laws and trade regulations to operate efficiently and effectively in other countries. At the same time, as it is not possible to know every country's culture or management style, risk and financial management capabilities are needed to mitigate losses.

Cluster 9 (environmental protection) is noteworthy. The logistics industry has been advocating green supply chains, and environmental protection concepts has been gaining acceptance worldwide among practitioners and offered by academe (Wu *et al.*, 2010). Murphy and Poist (2003) suggest that green concerns will broaden the scope of logistics and influence the way logistics managers do their jobs. Further, firms in various countries need to establish different policies for managing environmental issues to meet the specific regulations in those markets.

The link analysis results connected quality management with information gathering; customs and regulations with raw material planning; environmental consciousness with corporate

social responsibility; cultivating human resources with coaching successors; and innovation with industry analysis (Figure 1). In particular, practitioners emphasized on internationalization, including international perspectives, culture, and foreign language and marketing capabilities, consistent with the prevailing globalization trends. Logisticians should learn another language and exhibit cross-cultural sensitivity. Method triangulation thus helped to strengthen the data reliability of the link analysis to observe the appropriateness and correlations across skills. These skills collectively suggest how educators can create modular courses that combine organizational leadership with emotional quotient (EQ) management, and corporate social responsibility with environmental consciousness. This is new and useful for tailoring relevant logistics courses without losing out on the theoretical rigor. For instance, Cluster 4 contains five skills that needed to be taught, of which two skills (storage management and raw material planning) are strongly correlated as found through link analysis (with a factor rating strength of 4). Hence, if one were to design an example module, then storage management and raw material planning as shown in Table IV must be given priority over others and be taught together.

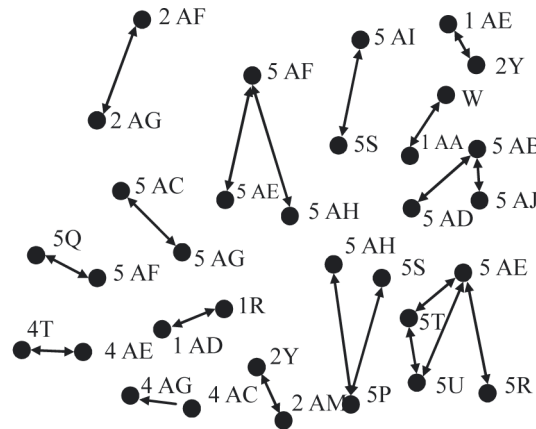
The link analysis results pertaining to the logistics industry professional skill requirements are largely consistent with the literature (e.g. Burcher *et al.* 2005). To cope with globalization, a logistician should be able to analyze, integrate, and communicate from an international perspective; perform financial analysis; maintain good industry and customer relations; exhibit good people skills; stay healthy; and understand relevant laws and regulations.

5. Discussion

We now compare the educator and practitioner viewpoints. To narrow the gap between industry demands and academic curricula, this section also proposes a logistics curriculum based on the business, logistics, and management (BLM) skills framework (Murphy and Poist, 1991).

Since integrating the identified logistics skills into actual curricula requires the cooperation of frontline educators, we sent out another survey to collect the opinions of 13 supply chain and logistics professors from five universities in Taiwan, with the aim of incorporating these results into curriculum design. Table V reveals that practitioners and educators agree on the indispensability of an international perspective, language ability, and communication skills for global logistics professionals. However, in addition to these skills,

Figure 1 Link analysis



Code	Skill	Code	Skill
A	Language	B	International perspective
C	Decision making	D	Risk management
E	Organizational leadership	F	Honesty and integrity
G	Communication	H	Information integration
I	International trade	J	Good “guanxi”
K	EQ management	L	Marketing
M	Financial management	N	System & process integration
O	Logistics knowledge	P	Innovative
Q	CSR	R	Customs regulation
S	Assigning tasks effectively	T	Raw material planning
U	Delivery management	V	Adventurous
W	Good sense of humor	X	Patent analysis
Y	Profit allocation	Z	M&A
AA	Appearance	AB	Passion
AC	Cultivating human resources	AD	Treating people with warmth
AE	Storage management	AF	Environmentally conscious
AG	Coaching successors	AH	Industry trend analysis
AI	Quality management	AJ	Logical thinking
AK	Product integration	AL	Profit making
AM	Integrative decision making	AN	Problem solving
AO	Attention to details	AP	Negotiation
AQ	International trade	AR	Information gathering
AS	Market sensitivity	AT	Information integration
AU	Cross-cultural sensitivity	AV	Purchasing
AW	Insurance	AX	Finance

practitioners were rightly and more concerned with risk management and decision making under pressure. Educators instead mainly focused on information (systems and process) integration and logical thinking. To maintain sustainable operations, it is imperative to reduce cost and increase profit,

so a firm grasp of risk control may be more important than systems and process integration. From an academic perspective though, information management appeared crucial, as reflected in the curricula that focus on teaching about enterprise resource planning, just-in-time systems, and e-commerce.

Table IV Link analysis and significance ranking

First node	Second node	Significance	Support
Storage management: 4	Raw material planning: 4	22.0683	15
Cultivate human resources: 5	Coaching successors: 5	14.9551	10
Information gathering: 5	System & process integration: 5	14.7529	14
Storage management: 5	Raw material planning: 5	14.0119	8
Cultivating human resources: 4	Coaching successors: 4	12.8685	14
Storage management: 5	Delivery management: 5	12.4763	8
Treating people with warmth: 5	Passion: 5	12.4385	9
EQ management: 5	Organizational leadership: 5	12.1720	22
Raw material planning: 5	Delivery management: 5	12.0920	7
Customs regulation: 5	Storage management: 5	11.4614	9
Innovative: 5	Industry trend analysis: 5	11.4323	14
Passion: 5	Logical thinking: 5	11.1422	11
Assign tasks effectively: 5	Innovative: 5	11.0684	13
Environmentally conscious: 5	CSR: 5	10.3507	10
Information gathering: 5	Quality management: 5	10.1433	12

Note: Significance is computed as the absolute value of the logarithm of the probability that the considered link occurred by chance. Support represents the number of records in which two values were present, namely, the number of records “supporting” the relation, which is also the relation frequency. In short, support (storage management 5-raw material planning 5) = 15 refers to 15 respondents who indicated this link and its strength. Also, teaching storage management and raw material planning together is more important than the other skills in a cluster. This helps to prioritize the curricula content

Another disparity involved the ranking of raw material planning or sometimes known as logistics demand forecast planning. Practitioners rank this attribute as 41st but educators rank this as 9th. Other highly technical skills related to logistics, such as storage and delivery, did not even make it into the top 10 ranking of industry, suggesting perhaps that such skills are already a given when operating on the global stage. As Poist *et al.* (2001) point out, there are often such differences in terms of skill ranking, reflecting an emphasis on being a manager/leader first and a functional/technical specialist second.

Independent *t*-tests served to compare the evaluations of practitioners and educators further (Table VI). With $p < 0.05$ as a cut-off, the results indicated that the assessments of marketing, logistics demand planning, risk management, cross-cultural sensitivity, systems and process integration, financial management, ethics, and leadership differed significantly between groups. Practitioners believed that in addition to logistics knowledge, cross-functional marketing skills are a must, have given the nature and complexity of global logistics. Given the global turbulence and uncertainty, practitioners also emphasized the importance of risk and financial management reiterating Table V. In contrast, educators considered the traditional professional logistics skills, such as raw material planning, resource integration, and system integration, as key priorities.

Overall, educators tend to place greater focus on traditional logistics professional training than the practitioners, which explains why the logistics curricula tend to be drawn according to professional specialization. Also, practitioners focused more on risk management and financial returns. In the light of eco-friendly trends, especially as governments start to tighten environmental regulations and with more environmental awareness, practitioners have begun to pay heed to environmental training, an area where the educational community is lagging. Clearly, the current curricula need to align with the needs of industry.

Using Faherty's (1979) concept of quartile deviation, a matrix diagram supports a further comparison of the skill evaluations proposed by practitioners and educators. Both groups identified language, an international perspective, communication, and the ability to make decisions under pressure as critical skills. However, the differences also were stark. A quartile deviation (Figure 2) indicates different rankings for more than half of the 50 skills. Dividing the results according to the BLM framework revealed 12 managerial skills: organization, leadership, good guanxi (personal relation) networks, understanding cross-cultural differences, adventurous, problem solving, innovative, honesty and integrity, health, EQ management, coaching successors, appearance, and good sense of humor. The ten business skills were marketing, international trade, market sensitivity, information gathering, corporate social responsibility, patent analysis, M&A, profit allocation, finance and insurance, and profit creation. Finally, the specific logistics-related skills included system and process integration, storage management, and logistics knowledge. Practitioners tended to emphasize organizational leadership, honesty and integrity, EQ management, and marketing while educators focused more on the logistics-related professional skills. Each side thus had basically different opinions about the essential skills needed for the global logistics industry.

Implications for research

Clearly, academe is a laggard on a responsive curriculum. There is a need for practice to inform academe on innovative curriculum design to respond better to industry needs. At the same time, industry realizes and prizes the value of soft skills in a highly service based industry, the global logistics industry, and as such desires to see more students imbibed with skills that are immediately portable globally. The academic community must take serious cognizance of this need.

A scan of the course syllabi from other universities further suggests that topics such as knowledge of export and import procedures and information management are staples in global

Table V Ranking differences: practitioners versus educators

Rank	Skill (practitioners)	Weight	Skill (educators)	Weight	Difference
1	International perspective	4.49	Foreign language	4.62	+1
2	Foreign language	4.47	Communication	4.54	+1
3	Communication	4.38	Integration of system and process	4.54	+23
4	Decision making	4.33	International perspective	4.38	-3
5	Risk management	4.26	Information integration	4.31	+12
6	Understand cultural differences	4.24	Logical thinking	4.23	+9
7	Resource integration	4.24	Problem solving	4.15	+11
8	Negotiation skill	4.21	Decision making	4.08	-4
9	Profit making	4.20	Raw material planning	4.00	+32
10	Market sensitivity	4.16	Information gathering	4.00	+17
11	Analyzing industry trends	4.15	Resource integration and application	4.00	-4
12	Honesty and integrity	4.10	Customs regulations	3.92	+25
13	Organizational leadership	4.10	Market sensitivity	3.92	-3
14	EQ management	4.06	Logistics professional knowledge	3.92	+8
15	Logical thinking	4.06	Knowledge of international trade	3.85	+5
16	Good guanxi networks	4.04	Good guanxi networks	3.85	+0
17	Information integration	4.03	Negotiation skill	3.85	-9
18	Problem solving	4.00	Analyzing industry trends	3.77	-7
19	Marketing	3.92	Product integration	3.69	+11
20	Knowledge of international trade	3.83	Delivery management	3.69	+20
21	CSR	3.80	Risk management	3.69	-16
22	Logistics professional knowledge	3.78	Innovation	3.69	+3
23	Financial management	3.76	Health	3.69	+8
24	Assign tasks effectively	3.75	Profit making	3.69	-15
25	Innovation	3.73	Financial knowledge	3.62	+4
26	Integration of system and process	3.72	EQ management	3.62	-12
27	Information gathering	3.64	Storage management	3.54	+16
28	Quality management	3.62	Attention to detail	3.54	+6
29	Financial knowledge	3.56	Understand cultural differences	3.54	-23
30	Product integration	3.53	CSR	3.54	-9
31	Health	3.50	Purchasing capability	3.46	+7
32	Cultivate human resources	3.50	Organizational leadership	3.46	-19
33	Passion	3.47	Integrative decision making	3.38	+9
34	Attention to detail	3.46	Passion	3.38	-1
35	Environmentally conscious	3.46	Quality management	3.38	-7
36	Treating people with warmth	3.40	Treating people with warmth	3.31	+0
37	Customs regulations	3.38	Assign tasks effectively	3.31	-13
38	Purchasing capability	3.32	Marketing	3.23	-19
39	Coaching successors	3.29	Appearance	3.15	+11
40	Delivery management	3.27	Honesty and integrity	3.08	-28
41	Raw material planning	3.22	Cultivate human resources	3.08	-9
42	Integrative decision making	3.20	Financial management	3.00	-19
43	Storage management	3.18	Environmentally conscious	3.00	-8
44	Adventurous	3.15	Coaching successors	3.00	-5
45	Finance and insurance	3.07	Good sense of humor	2.92	+4
46	Patent analysis	3.04	Adventurous	2.85	-2
47	Profit allocation	3.03	Finance and insurance	2.85	-2
48	M&A	2.98	Patent analysis	2.54	-2
49	Good sense of humor	2.87	Profit allocation	2.54	-2
50	Appearance	2.81	M&A	2.46	-2

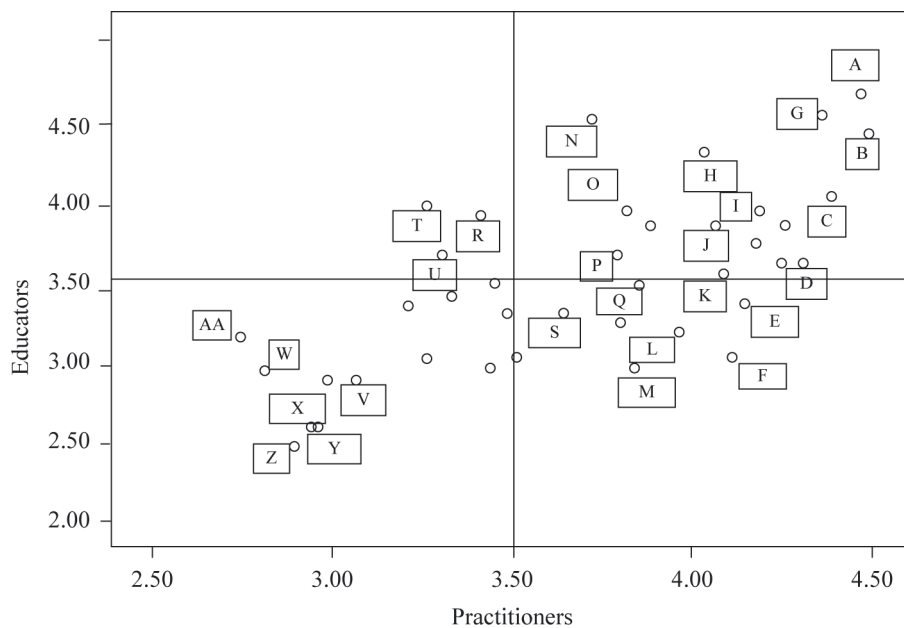
logistics education. These results are consistent with the educator responses found in our survey and reinforce the finding that the current course content is not well aligned with industry and does not provide sufficient coverage in areas (risk management, market profitability, and ethics) deemed

important by practitioners. Perhaps a realignment following the approach offered by Spady and Marshall (1991) to create a capability-oriented curriculum design is timely. Indeed, as suggested by the literature in other domains, cultivating skills demands learning guidelines for both educators and students

Table VI Independent t-tests

Capability	t	t-tests for equality of means			95% Confidence Interval	
		Sig. two-tailed	Mean difference	Std. error difference	Lower	Upper
Marketing	2.061	0.043	0.692	0.336	0.023	1.361
Raw material planning	-2.260	0.026	-0.778	0.343	-1.461	-0.095
Risk management	2.237	0.028	0.569	0.254	0.062	1.076
Cross-cultural sensitivity	2.475	0.016	0.708	0.286	0.138	1.277
System and process integration	-2.580	0.012	-0.815	0.316	-1.445	-0.186
Financial management	2.726	0.008	0.769	0.282	0.207	1.331
Honesty and integrity	2.912	0.005	1.031	0.354	0.326	1.736
Organizational leadership	2.029	0.046	0.646	0.318	0.012	1.280

Figure 2 Comparison of weighted results between practitioners and educators



Code	Skill	Code	Skill
A	Language	B	International perspective
C	Decision making	D	Risk management
E	Organizational leadership	F	Honesty and integrity
G	Communication	H	Information integration
I	International trade	J	Good guanxi
K	EQ management	L	Marketing
M	Financial management	N	System & process integration
O	Logistics knowledge	P	Innovative
Q	CSR	R	Customs regulation
S	Assigning tasks effectively	T	Raw material planning
U	Delivery management	V	Adventurous
W	Good sense of humor	X	Patent analysis
Y	Profit allocation	Z	M&A
AA	Appearance		

(Connor and Shaw (2008). Doing so can help to ensure that graduates will possess the skills demanded by industry and will be more marketable globally and immediately. The

challenge for academe is on how to blend a theoretically biased curriculum with the softer practice based skills without diluting the value of the diversity of course contents.

Implications for industry

Though many universities in Asia are starting to provide programs that train global logisticians, there are still not enough of such qualified logisticians. Besides, as mentioned in the literature, the inadequacy in developing soft skills in university is prevalent (Gravier and Farris, 2008). The emphasis on soft skills such as an international perspective and cultural communications is gaining momentum over technical skills as the industry tries to grapple with globalization. Today, firms are fulfilling this need in-house through their corporate universities. However, this can sometimes strain their resources, especially for those firms that lack the financial capital to do so. Since organizations clearly want graduates who are well placed for the marketplace, industry must take a proactive rather than a passive lead and partner universities to co-develop global logistics curricula early to better address practitioner needs and response well to an uncertain environment. There is mutual benefit for doing so as effective global logistics management curricula design and improvement can now be facilitated quickly by keeping abreast of industry demands and changes through the active participation of the practitioners. Also, graduates can have the benefit of direct input from practice in terms of the prevailing focus of skills in demand on a global platform. This provides relevance to the courses taught and hence produce more appreciative graduates. In the ideal, a global logistics professional must have in depth knowledge of concepts through rigorous academic grounding and a wide breadth of understanding through exposure to an international arena of practice. In short, we can extend Mangan and Christopher's (2005) "T"-model for logistics education by engaging industry as early as possible in curriculum co-development.

6. Conclusion

Logistics has a long history of reconciling the differences between educator and practitioner perceptions in terms of career preparation while at university. This relationship between academia and industry goes a long way toward explaining the success of the industry. Consequently, it is critical for logistics stakeholders to understand the different perceptions between academe and practice. While much research has been conducted on logistics skills, the existing studies seldom explore the mismatch problem between the current logistics curricula in universities and real-world requirements.

The goal of this study is thus to identify the essential skills a global logistician should have, based on the inputs from industry and logistics educators in Taiwan so as to propose an effective content in terms of relevance and rigor, producing more marketable graduates. We find that, to operate globally, a logistician should be able to integrate, communicate, and analyze from an international perspective; perform financial analysis; maintain good industry and customer relations; exhibit good people skills; stay healthy; and understand laws and regulations. The results also suggest that a mismatch exists between the current logistics curricula in universities and real-world requirements. We find that industry believes strongly in the criticality of cross-functional marketing skills and emphasize on the importance of sound risk and financial management. There is a greater call for the necessity of adding course content to help improve the global logistician's ability to influence people. In contrast, educators view the

traditional professional logistics skills, such as raw material planning and the ability to perform demand forecasting, and system integration, as priorities.

In summary, by applying the two novel research approaches of content mapping and link analysis to logistics management, this study identifies the key skill requirements for an effective global logistician. We also evaluate the significance of the results and address the gaps in industry and academic perceptions of the global logistics curriculum. Another contribution of this paper is to provide a practical reference for educators in terms of improving the course design to meet the changing times, to better serve industry and to produce marketplace relevant future logisticians. Third, we have a reference through link analysis to help prioritize what skills to be taught jointly in a course module.

As in any research, there are limitations. First, this study does not examine the causality behind the difference in opinion between industry and academia. Next, this study is limited by the sample scope in that the sample contains industry practitioners enrolled in the EMBA classes from a single university in Taiwan. Due to participant background differences, such as education and industry type, different samples may yield different results (Dadzie, 1998). The sample sizes were small, which could limit possible instrument reliability and validity and prevented controls for extraneous variables.

Future research may consider a large-scale multi-national data collection and analysis to reduce the possibility of cultural bias. Different pedagogical strategies can also be investigated to orchestrate an effective global logistics management course. Another logical extension would attempt to learn more about how to identify and develop skills within an existing employee base. In addition, as industry will always prefer that the faster a candidate can start creating value the better, a possible research topic is to undertake a longitudinal study to investigate whether this person will also be adding value in the long term when given less emphasis on theoretical and abstract thinking in university education.

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Further reading

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