**EVALUATING SKILL REQUIREMENT FOR LOGISTICS OPERATION INDUSTRY BETWEEN LOGISTICS SERVICE PROVIDERS AND ACADEMICS**

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**Introduction**

With the global fierce competitive business environment, international logistics capacity is becoming an inevitable countermeasure for international enterprises to meet the challenges of managing globe spanning supply chains successfully. International logistics emphasizes the establishment of core competitive advantage of international enterprises from the aspect of minimizing operating costs, inventory pressure and risk, as well as reducing production lead-time in the supply chain process. To achieve this goal, logistics operations require implementing and fulfilling accurately by skilled staff. Thus, to enhance their own logistics capacity, international enterprises need to strengthen the hardware and software facilities as well as the need to focus on staffs’ skill training. Based on the knowledge-based theory, the elements of knowledge include information, technology, know how, and skill. The acquisition of knowledge can increase the value of the enterprise’s production and gain a competitive advantage.

However, reports indicated that international enterprises are always facing the shortage of qualified staff for fulfilling a variety of logistics operational requirements (Arvis et al., 2016) and heavily burdened logistic expense (David, 2013). The international logistics service providers (LSPs) thus assist dealing with those logistics operations for the international enterprises. This phenomenon reveals that first line employees from LSPs are required to accept more practical skill training for coping with various situation in the global supply chain context.

The other emerged problem is that the skills required by the LSPs and the training given by the academics to first line logistics employees are different. Numerous studies have attempted to explore logistic operation related skill attributes (e.g., general business knowledge, managerial knowledge and logistics knowledge, etc.) and emphasized the importance on the selection of those attributes required by LSPs in logistics operation (Murphy and Poist, 1991, 2007; Gibson et al., 1998; Wu et al., 2013). The LSPs argue that skills such as foreign language, customer relationship and software application are most important, while those in academics contend that skills such as planning and communication ability should take as the first priority to be educated.

A discrepancy of perceived skills requirement of international logistics between these two roles may result in the inefficiency of using current human resources and the misuse of training resources. Under the consideration of such cognitive differences, the identification of necessary skills that logistic practitioners should equip is becoming a worth exploring issue.

There are several researches focused on the comparison of required skills between industry and academics. For example, Aasheim and Williams (2009) addressed information technology skills; Snoke and Underwood (2001) addressed information system skills. However, few of them addressed the difference of skill requirement between international LSPs and academics. In order to fill this research gap, this study empirically evaluates the crucial logistics skill requirements between LSPs’ and logistics academics’ perspectives.

The rest sections of this study are described as below. Section 2 reviews previous research on logistics skill requirements. The research methodology is then presented in Section 3, followed by discussion of the results in Section 4. Section 5 outlines the implications of the research findings and proposes recommendations for future research.

**Literature review**

Major international market trend, involving supply chain management, transportation, and information technology, are changing the way logistics is practiced and taught (Murphy and Poist, 2006, Thai et al., 2011; Thai, 2012). These trends are also changing the critical skill requirements needed by international LSPs. International logistics is the process of planning, implementing, and controlling the flow and storage of goods, services, and related information from a point of origin to a point of consumption located in a different country. It includes providing logistic support (major end items, material, and/or services) to, or receiving logistic support from other firms. A majority of research provided a list of skill requirement of international logistics required by international logistics service providers (Murphy and Poist, 1991, 2006, 2007; Gammelgaard and Larson, 2001, Poist et al., 2001; Kovács and Tatham, 2010; We et al., 2013).

Murphy and Poist (1991) proposed a framework entitled BLM model with 83 required skills in logistics industry (33 business skills, 18 logistics skills, and 32 management skills). They also defined business skill as the knowledge that logisticians must equip both directly and indirectly relates to business. Logistics skill refers to the skills that a logistician needs to be educated or equipped in various fields of logistics. Management skill means the managers need the skills relating to planning, organizing, and personal attributes to lead to companies survive in the complex business environment.

Although the BLM model has been used as a common tool to measure logisticians’ required skills, it has been validated mostly in the American context (Thai et al., 2012). In addition, considering the target sample would include new coming employees, management skill is not involved in this study, as it should have a comprehensive experience on “real” management jobs, which is rare in new coming employees. Therefore, this study removes management skills and modifies business and logistics skills to those are more relevant to the aim of this study.

**Business skills**

Business skills include the basic skills used in any type of industry. Murphy and Poist (1991) proposed 33 business skills and categorized them into traditional skills and non-traditional skills. The top five skills include transportation and logistics, general business administration, business ethics, information system, and strategic management. Poist et al. (2001) examined the skill requirement from logistics managers’ perspective. They proposed 13 general business related skills that new-hired logistics personnel should have and categorized them into three tiers based on their importance. The top 5 skills include communication skill, adaption ability, Multi-functional capabilities, Information system and computer skills, and foreign language. Gammelgaard and Larson (2001) analysed the difference of perception of supply chain management skills between logisticians and students who studied in the logistics related departments in the universities. They proposed nine business related skills, including business ethics, computer programming skills, database application, software knowledge, statistics analysis ability, planning management, industry background knowledge, technology knowledge and technique knowledge. Kovács and Tatham (2010) suggested that a logistician should require several general skills, including finance and accounting, information technology, change management, marketing, project management, strategic management, customer relationship management, supplier relationship management, and risk management. Wu et al. (2013) proposed 50 skills for global logistics managers in Taiwan. The results showed that the top five skills are related to general business skills, including international perspective, foreign language, communication, decision making, and risk management.

**Logistics skills**

For the logistics skills, it reflects the professional knowledge related to logistics area. Murphy and Poist (1991) found the top five logistics skills include traffic/transportation management, customer service, warehousing, inventory control, and material handling. Kovács and Tatham (2010) suggested a logistician should require some logistics skills, including legal, customs, import and export management, transportation management, inventory management, warehousing, purchasing and procurement, forecasting, reverse logistics, port/airport management, and logistics information system. The results from Wu et al. (2013) showed that the logistics related skills are less important than general business skills, but also important according to their weights. The important logistics skills they found include logistics professional knowledge, customs regulations, purchasing capability, delivery management, raw material planning, and storage management.

**Comparison by different groups**

Murphy and Poist (2006) compared the difference of skill requirements between senior and junior logistics managers. The results indicated that both senior- and entry- level logisticians emphasize on the business skills of supply chain management, transportation and logistics, and business ethics. The results also indicated that the top three logistics skills for senior-level logisticians include customer service, inventory management, and transportation and traffic management, whereas entry-level logisticians emphasize more on transportation and traffic management, logistics information management, and warehousing management. Murphy and Poist (2007) compared the skill requirement between 1990s and 2007. The results show that the business skills were getting increasing important on speech communications, production management, and international business, whereas the logistics skills were increasingly important in international logistics, forecasting, and return goods handling. Razzaque and Sirat (2001) analyzed the logistics skills equipped by mid-level and high-level logistics managers between Singapore and Malaysia. The results indicated that Singapore managers emphasized skills such as transportation management, customer service, inventory management, warehousing, and demand, whereas Malaysia managers focused on those of customer service, inventory management, warehousing, and demand prediction. This indicates that the skill requirement might be different based on the background of the respondents.

**Methodology**

**Sample**

The sample of shipping agencies was selected from Directory of the National Association of Shipping Agencies. Meanwhile, population of forwarders were drawn from members of the International Ocean Freight and Air Freight Forwarders Association. Samples of international LSPs were selected from local warehousing, transportation and customs brokers association. In addition, samples of academic fields were selected from professors and lecturers those who were lecturing at logistics and transportation related fields in Taiwan’s university and colleges.

In total, 1,447 questionnaires were posted to logistics related firms and academics. Based on the reply time period, the respondents were classified into two groups. The first group with 121 responses was collected in three weeks, and the second group with 69 responses was collected after three weeks. A total of 190 mailing were received yet the valid replies were 181 because of some missing data in the removed nine respondents. Among of these valid responses, 142 were from international LSPs and 39 were from logistics academics. The valid response rate was 12.6 %. The result presents that 1,021 questionnaires were sent to forwarders and received 87 replies (response rate: 8.3%), 46 replies from 259 shipping carriers (response rate: 17%), 8 replies from 51 third party LSPs (response rate: 15.7%), 5 replies from 10 airline carriers (response rate: 50%) and 44 replies from 106 scholars (response rate: 36.8%).

To detect any potential non-response bias, Armstrong and Overton (1977) recommend ensuring that the second wave of respondents’ responses which are having similar characteristics to the first part of preventing from any non-respondents’ case. The total 181 survey respondents were divided into two groups based on their response waves (first: n=121, 66.9% and second: n=69, 38.1%). t-tests were conducted on the two groups’ responses and the results indicated that, at the 5% significance level, there were no significant differences in the two groups’ responses to the various items. t-test results suggested that this study does not have non-response bias since late respondents’ responses were similar to those of first wave respondents.

**Research methods**

The research analytical steps were conducted as follows. The first step was the selection of business and logistics skill attributes respectively for LSPs and logistics academics. In determining questionnaire items, it is crucial to ensure the validity of their content, since it is an important measure of a survey instrument’s accuracy. Content validity refers to the extent to which an item measures what it is supposed to measure (Cooper and Emory, 1995). Content validity assessment typically involves an organized review of a survey’s content to ensure it includes the necessary information. The content validity of the questionnaire used in this study was tested through a literature review and interviews with interviewees. The results indicate that 29 business and 20 logistics skill attributes were appropriate and therefore selected for the questionnaire.

In the second step, after collecting the replies, analysis of variance (ANOVA) was employed to test the perceived differences of logistics skill requirements between academics and four groups of international LSPs (forwarder, maritime carrier, 3rd party, and airline carrier). In the third step, factor analysis with principal components analysis was employed to summarize a large number of skill attributes into a smaller number of underlying dimensions called critical factors. VARIMAX rotation was used to transform a set of interrelated variables into a set of unrelated linear combinations of these variables. Only variables with a factor loading than 0.5 were selected. Having eigenvalues greater than one was used as the criterion to determine the number of factors in each data set. In addition, a reliability test based on Cronbach’s α was used to test the internal consistency of questionnaire responses.

**Result of empirical analysis**

**Characteristics of respondents**

About the characteristics of respondents, the results showed that 35.2% of firm’s survey participants were vice-presidents or above, nearly 42% were managers and assistant managers, 4.2% were directors, 4.2% were sales representatives, 9.9% were clerk, and 4.9 % were others. This study attempted to investigate the importance of perceived logistics skill in all aspects of logistics dimensions, therefore the views of managers as well as general employees (e.g. sales representatives or clerks) were all considered for evaluation. In terms of work experience, results indicated that a majority of respondents (37.3%) served more than 20 years in port, whereas 16.2% of respondents had been working between 16 to 20 years, 14.1% were between 11-15 years, 17.6% were between 6-10 years, and 14.8% with work experience were less than 5 years.

As regards for age of logistics firms, results revealed more than one third of logistics firms (38.8 %) had been established for more than 20 years, followed by 6-10 years (19.7%), 11-15 years (19.0%) and 16-20 years (17.6%). Only 4.9% of logistics firms operated their business less than five years. Furthermore, the results also showed that nearly half (42.9%) of logistics firms earn annual revenue more than 101 million NT$, followed 11-50 (19.7%), 5-10 (15.5%), less than 5 million (11.3%) and 51-100 (10.6%). Further, 41.5% of sampled logistics firms had employees less than 20, whereas 26.1% of firms had employees between 21-50 personnel. 14.8% hired employee more than 250 personnel followed 9.9 % (101-250) and 7.7% (51-100).

In terms of the respondents from academics, of all the logistics academics surveyed, 46.2% were assistant professors, 20.5% and 17.9% were professors and associate professors, respectively. Only 15.4% of respondents were lecturers. Most of respondents had PhD degree (84.6%) in this survey. In addition, more than 25% of logistics academic respondents had lectured and conducted research in the related filed for more than 10 years, over 35% were between 5 and 10 years, and over 30% of respondents (33.4%) had logistics related lecturing experience for less than 5 years. This indicated that more than 66% of respondents had conducted research and lectured in the logistics fields for more than five years and consequently had sufficient knowledge to answer the questionnaire accurately and reliably.

**Results of Factor analysis**

Factor analysis was used to reduce both the 29 business and the 20 logistics attributes to smaller sets of underlying factors in order to detect the presence of meaningful patterns among the original variables and to extract the main dimension factors. Only variables with a factor loading greater than 0.50 are selected (Hair et al., 2010). Two business skills (human resource management and organization psychology) and four logistics skills (electronic commerce, transportation economics, logistics law and regulation, and international logistics) were eliminated as they had two factor loading scores greater than 0.50 or very close to 0.50.

In Table 1, six identified key business skill factors accounted for approximately 65.397 per cent of the total variance. The 6 factors were labelled and categorized below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Business skill attributes | F1 | F2 | F3 | F4 | F5 | F6 |
| Regression analysis | **0.867** |  |  |  |  |  |
| Multivariate analysis | **0.839** |  |  |  |  |  |
| Operation research | **0.819** |  |  |  |  |  |
| Statistics | **0.750** |  |  |  |  |  |
| Microeconomics | **0.703** |  |  |  |  |  |
| Macroeconomics | **0.677** |  |  |  |  |  |
| Customer relationship management |  | **0.814** |  |  |  |  |
| Marketing management |  | **0.725** |  |  |  |  |
| Consumer behaviour |  | **0.696** |  |  |  |  |
| Strategic management |  | **0.579** |  |  |  |  |
| International exchange |  |  | **0.748** |  |  |  |
| International finance |  |  | **0.643** |  |  |  |
| Insurance |  |  | **0.631** |  |  |  |
| Business ethics |  |  | **0.529** |  |  |  |
| Business regulation |  |  | **0.509** |  |  |  |
| International trade |  |  | **0.500** |  |  |  |
| Software application |  |  |  | **0.720** |  |  |
| Management information system |  |  |  | **0.710** |  |  |
| Computer program language |  |  |  | **0.604** |  |  |
| Database application |  |  |  | **0.601** |  |  |
| Excel application |  |  |  | **0.595** |  |  |
| Accounting |  |  |  |  | **0.822** |  |
| Financial management |  |  |  |  | **0.806** |  |
| Business administration |  |  |  |  | **0.551** |  |
| Business writing |  |  |  |  |  | **0.761** |
| English capability |  |  |  |  |  | **0.634** |
| Business negotiation |  |  |  |  |  | **0.596** |
| Eigenvalues | 10.041 | 2.607 | 2.059 | 1.691 | 1.477 | 1.089 |
| Percentage variance | 34.626 | 8.991 | 7.098 | 5.832 | 5.094 | 3.756 |
| Cronbach Alpha | 0.9116 | 0.8187 | 0.8005 | 0.8113 | 0.7568 | 0.6310 |
| Mean | 3.265 | 3.917 | 3.688 | 3.876 | 3.771 | 4.242 |

Table 1: Factor analysis for business skill attributes

Table 2 revealed four logistics skill factors accounted for approximately 73.634% of the total variance. They were labelled and categorized below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Logistics and SCM skill attributes | F1 | F2 | F3 | F4 |
| Distribution management | **0.850** |  |  |  |
| Retailer management | **0.833** |  |  |  |
| Order management | **0.788** |  |  |  |
| Quality assurance management | **0.783** |  |  |  |
| Delivery management | **0.769** |  |  |  |
| Purchase management | **0.764** |  |  |  |
| Inventory management | **0.761** |  |  |  |
| Producing management | **0.672** |  |  |  |
| Warehousing management | **0.655** |  |  |  |
| Logistics system simulation |  | **0.841** |  |  |
| Enterprise resource planning |  | **0.692** |  |  |
| Logistics information system |  | **0.685** |  |  |
| Transportation management |  |  | **0.820** |  |
| Intermodal transportation |  |  | **0.814** |  |
| Global logistics management |  |  |  | **0.775** |
| Supply chain management |  |  |  | **0.737** |
| **Eigenvalues** | 10.342 | 2.203 | 1.162 | 1.020 |
| **Percentage variance** | 51.712 | 11.015 | 5.808 | 5.099 |
| **Cronbach Alpha** | 0.9399 | 0.8511 | 0.8613 | 0.7711 |
| **Mean** | 3.606 | 3.669 | 4.099 | 3.880 |

Table 2: Factor analysis for logistics skill attributes

A reliability test based on Cronbach’s Alpha was used to test whether these dimensions were consistent and reliable. In Table 1, Cronbach Alpha values for the six business skill factors were all more than 0.6; while in Table 2, Cronbach Alpha values for the four logistics skill factors were all more than 0.75. The reliability values for business and logistics skill factors were considered adequate for a satisfactory level of reliability in the research (Nunnally, 1978; Iacobucci and Churchill, 2010).

Table 1 and 2 also revealed the importance of the critical factors of both business and logistics skills requirements based on the mean values. For business skills factor shown in Table 1, Factor 6 (communication skill) was considered as the most important factor, followed by Factor 2 (customer and strategy management skill), Factor 4 (computer skill), Factor 5 (finance skill), Factor 3 (international trade and regulation skill) and factor 1 (data analysis). In Table 2, the most important factor was Factor 3 (transportation skill), followed by Factor 4 (global logistics and supply chain management skill), Factor 2 (logistics information management skill) and Factor 1 (logistics operation skill).

**Analysis of variance (ANOVA) results**

Analysis of variance (ANOVA) was used to examine whether the skills factors differ among the scholars and the four groups of international logistics firms. As shown in Table 3, LSPs were divided into four roles, namely forwarder, maritime carrier, 3rd party, and airline carrier to compare the perceptual difference with those in logistics academics.

For business skill, the maritime carrier in the dimensions of communication (mean = 4.356) and computer (mean = 3.961) tended to gain the higher mean scores than those of other international logistics firms and logistics academics, whereas forwarder had higher mean score in the customer and strategy skill (mean = 3.997). In contrast, logistics academics had higher mean scores in business factors of finance (mean = 3.992), international trade and regulation (mean = 4.122) and, data analysis (mean = 3.565) than the other four international logistics firms.

For logistics skill, the 3rd party had the highest mean score in the factor of transportation (mean = 4.125), while maritime carrier gained the highest mean score in the dimension of logistics operation (mean = 3.783). Airline carrier had the higher mean score Global logistics and supply chain management skill (mean = 4.100). Furthermore, the results also indicated that logistics academics had higher mean score (mean = 3.896) than the other international logistics firms.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Skill Factor | Type of international logistics service providers | | | | Logistics academics(5)  N= 39 |  |  |
| Forwarder  (1)  N = 85 | Maritime carrier (2)  N = 44 | 3rd party  (3)  N = 8 | [Airline](http://tw.dictionary.yahoo.com/search?ei=UTF-8&p=%E8%88%AA%E7%A9%BA) carrier(4)  N = 5 |  |  |
| Mean | Mean | Mean | Mean | Mean | P | LSD |
| **Business skill** |  |  |  |  |  |  |  |
| Communication | 4.200 | **4.356** | 4.125 | 4.133 | 4.021 | 0.009\*\* | (1,5)(2,5)  (3,5)(4,5) |
| Customer and strategy management | **3.997** | 3.767 | 3.969 | 3.800 | 3.961 | 0.362 |  |
| Computer | 3.877 | **3.961** | 3.575 | 3.590 | 3.898 | 0.000\*\* | (2,5)(3,5) (4,5) |
| Finance | 3.788 | 3.807 | 3.625 | 3.400 | **3.992** | 0.774 |  |
| International trade and regulation | 3.716 | 3.682 | 3.417 | 3.700 | **4.122** | 0.000\*\* | (1,5)(2,5)  (3,5)(4,5) |
| Data analysis | 3.181 | 3.395 | 3.313 | 3.475 | **3.565** | 0.387 |  |
| **Logistics skill** |  |  |  |  |  |  |  |
| Transportation | 4.112 | 4.091 | **4.125** | 3.900 | 4.023 | 0.000\*\* | (1,5)(2,5) (3,5) |
| Global logistics and supply chain management | 3.871 | 3.864 | 3.938 | **4.100** | 3.889 | 0.933 |  |
| Logistics information management | 3.637 | 3.712 | 3.646 | 3.867 | **3.896** | 0.000\*\* | (1,5)(2,5)  (3,5)(4,5) |
| Logistics operation | 3.530 | **3.783** | 3.778 | 3.044 | 3.667 | 0.000\*\* | (2,5)(3,5) (4,5) |

\*\* Significance level p<0.01

Table 3: ANOVA of skills factors’ differences among international logistics firms and academics

Results indicated that the evaluation statistically differed for the dimension of business skill in communication, computer, and international trade and regulation. While referring to the dimension of logistics skills, items including transportation, logistics information management, and logistics operation were found to significantly different between LSPs and academics. A post hoc with LSD method was then conducted to determine which groups are significantly different with other groups. In the business skill dimension, items such as “communication”, “international trade and regulation” revealed a perceptual difference between logistics academic and four groups of LSPs. In the item of “computer”, perceptual difference was also found between logistics academic and three groups of LSPs (i.e. maritime carrier, 3rd party, and airline carrier). With regards to logistics skill, “transportation” was perceived difference between logistics academics and three groups of LSPs (i.e. forwarder, maritime carrier, 3rd party). While regarding to “logistics information management”, four groups of LSPs’ perception were also found difference from logistics academics. Finally, maritime carrier, 3rd party and airline carrier hold difference opinion to logistics academics in evaluating “logistics operation”.

**Discussion and conclusion**

This study empirically investigated the crucial attributes and factors of business and logistics skill requirements from perspective of international LSPs and logistics academics. Survey data collected from 181 respondents from logistics practical and academic fields for identifying crucial logistics operation skills.

Factor analysis was employed to identify six crucial business skills, namely, data analysis skill, customer and strategic management skill, international trade and regulation skill, computer skill, finance skill and communication skill. Four logistics skills were also identified, namely, logistics operation skill, logistics information management skill, transportation skill, and global logistics and supply chain management skill. The findings suggest that communication skill is perceived as the most important business skill, followed by customer and strategy management skill, computer skill, finance skill, international trade and regulation skill, and regression analysis skill; whereas transportation skill is perceived as the most important logistics skill, followed by global logistics and supply chain management skill, logistics information management skill and logistics operation skill.

The results of ANOVA indicated that both business skill and logistics skill dimensions were significantly different between international LSPs and logistics academics. The results indicated that the perceptions are significantly different in the dimension of business skill on communication, computer, international trade and regulation; while in the dimension of logistics skill on transportation, logistics information management, and logistics operation are perceived differently between international LSPs and logistics academics.

Some of academic and practical contributions were provided by this study. From the academic aspect, while a majority of previous studies on logistics skills assessment have been discussed, there is still a lack of examination of logistics skill assessment compared between international LSPs and logistics academics. This study not only investigated the perceived importance of logistics skills between international LSPs and logistics academics but also to highlight the important factors of logistics skills. From the managerial perspective, the research findings help international LSPs identify and provide logistics skills training for the staff engaging in their logistics operations. Further, this study identified six crucial business skill factors and four logistics skills, which provide useful information for international LSPs to identify important skill requirements for strengthening logistics competence of international firms. This study also provides a comprehensive understanding of skill requirement discrepancy between international LSPs and academics. The results show that there is still a large cognitional gap of required skills in logistics area between industrial managers and educators. In order to reduce the different cognition between LSPs and educators, this study suggests that it is necessary to conduct regularly cooperative education by both roles. Educators can thus adjust the courses to meet the requirement by the international LSPs; whereas LSPs can also reduce training courses cost and time for the new employees.

This study is limited to examining skills requirements specifically in international logistics firms. There exists wide scope for future researches to investigate this issue by different industries. Future research can conduct an effect-and-cause analysis and consider enablers (e.g. logistics capability) and dependent variables (e.g. logistics performance and organizational performance) of logistics skill. Moreover, this study identified crucial logistics skills from international LSPs and academic perspective; future research can consider the perceptions of stakeholders. The other worth noting consideration is that since this research mainly focused on international logistics supply providers based on Taiwan, future research can apply the assessment approach of this study to identify logistics skills in other countries.

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