Competence Requirements for Logistics and Supply Chain Management Students by Adopting BLM and APICS Competency Framework: An Importance-Expertise Matrix Analysis

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Abstract

This research proposes to investigate dissimilarity between importance and perception in expertise of logistics and supply chain management students in order to improve the curriculum for corresponding to employers' desire. The study adopts American Production and Inventory Control Society (APICS) competency framework and together with Business Logistics Management (BLM) framework to explore the investigation. The respondents are supervisors who work and advice the logistics and supply chain management students. The locations of study are in Bangkok, Chonburi, and Rayong because these three provinces have the companies with plenty of logistics and supply chain activities. Moreover, Importance-Expertise Matrix is applied to discover the result based on research objective. All of skills is significantly different between importance and perception except being self-confidence. As the result, 15% of all skills fall in critical skill gap, 40% falls into competence in critical skills, 37% falls in non-critical skills and 8% falls into competence in non-critical skills.

Keywords: Competency, Logistics and supply chain management, Importance-Expertise Matrix, APICS, BLM

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สมรรถนะที่จำเป็นของนักศึกษาสาขาการจัดการโลจิสติกส์และห่วงโซ่อุปทาน
ด้วยกรอบโครงร่างของ BLM และ APICS
ด้วยเครื่องมือวิเคราะห์ Importance-Expertise Matrix

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บทคัดย่อ

งานวิจัยฉบับนี้มีวัตถุประสงค์เพื่อศึกษาความแตกต่างระหว่างความสำคัญและการรับรู้ใน
ความชำนาญของนิสิตการจัดการโลจิสติกส์และห่วงโซ่อุปทานเพื่อการพัฒนาหลักสูตรให้ตรงตาม
ความต้องการของนายจ้าง การศึกษาได้นำกรอบโครงร่างของ สมาคมควบคุมการผลิตและสินค้า
อเมริกัน (American Production and Inventory Control Society: APICS) และการจัดการ
ธุรกิจโลจิสติกส์ (BLM) มาใช้ในการศึกษาครั้งนี้ ผู้ตอบแบบสอบถาม คือ นายจ้างที่ดูแลและให้
คำแนะนำนิสิตสาขาการจัดการโลจิสติกส์และห่วงโซ่อุปทาน โดยเก็บแบบสอบถามในพื้นที่ 3 จังหวัด
ได้แก่ กรุงเทพฯ ชลบุรี และระยอง เนื่องจาก 3 จังหวัดนี้มีบริษัทที่ทำกิจกรรมเกี่ยวกับการจัดการ
โลจิสติกส์และห่วงโซ่อุปทานเป็นจำนวนมาก จากการวิเคราะห์ข้อมูลด้วยเครื่องมือวิเคราะห์
Importance-Expertise Matrix พบว่ามีความแตกต่างอย่างมีนัยสำคัญระหว่างความคาดหวังและ
ความชำนาญในทุกด้านยกเว้นความมั่นใจในตนเอง นอกจากนี้ มีความชำนาญจำนวนร้อยละ 15 ของ
ความชำนาญทั้งหมดอยู่ในกลุ่ม Critical skill gap ร้อยละ 40 ของความชำนาญทั้งหมดอยู่ในกลุ่ม
Competence in critical skills ร้อยละ 37ของความชำนาญทั้งหมดอยู่ในกลุ่ม Non-critical skills
และร้อยละ 8 ของความชำนาญทั้งหมดอยู่ในกลุ่ม Competence in non-critical skills.

คำสำคัญ: สมรรถนะ, การจัดการโลจิสติกส์และห่วงโซ่อุปทาน, Importance-Expertise Matrix,
APICS, BLM

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Introduction

Logistics and supply chain management have the crucial role and are charming job to support the economy of Thailand. Currently, The Office of National Economic and Social Development board (2017) launches the strategic plan of Thai logistics development in order to: enhance the supply chain value; enhance the trade facilitation; drive the policy and build the capacity of logistics in Thailand. Human capability development in logistics is mentioned in the third strategic plan to train the logistician for conforming the business requested.

With the movement of globalization, the logistics and supply chain activities are extended internationally. The inadequate of human resources in logistics and supply chain management leads to deviate the organization's objectives because logistics and supply chain management can support the opportunities of organization and enhancing the organizational competitive advantages (Tatham, Wu, Kovács, & Butcher, 2017). As a consequence, selecting human resource is the important for human resource department to have the high potential people to foster logistics and supply chain capability of organization. The competency of logistics and supply chain management should be investigated for recruiting the appropriate workforce.

However, without producing the mismatch logistics and supply chain workforce's qualification, the educational institution has an important role to equip the people for being logistics and supply chain profession. However, the division between academic and pragmatic has always shown in every career. The institution cannot deliver the adequate knowledge and practice the students to conform the enterprises and organizations' requirement unless the institution investigates what competencies required for working in logistics and supply chain management. The institution must collaborate with industry (Gravier & Theodore Farris, 2008). The universities should develop and conduct the curriculum by consulting with logistics association, business association or industry professionals (Thai, Cahoon, & Tran, 2011).

This research is beneficial substance to educational institutions where are able to design the curriculum and educate the students to be ready for being usable

workforce in logistics and supply chain field. In addition, the instructors are able to develop the logistics and supply chain curriculum, design the courses and enhance the students' knowledge, skills, abilities and other characteristics to respond needed proficiencies and diminish the deficient competencies.

The objectives of this research are:

1. Collating between the necessary and perception in logistics and supply chain management competencies based on employer's perspective;

2. Investigating the competency requirements and training need analysis;

3. Ranking the level of rapidity of logistics competences for improvement.

Literature Review

The core competency in logistics and supply chain management is considerably studied (Ahn & McLean, 2008; Beniušiené & Oržekauskas, 2008; Elzarka, Tipi, Hubbard, & Bamford, 2008; Kovács & Pató, 2014; S. F. Lai, 2014) and extensively interesting because many countries understand how much importance of logistics and supply chain in order to foster their economic growth, especially, in Southeast Asia such Malaysia (Daud, 2014), Singapore (Vinh, Ibrahim, Vidya, & Huang, 2012).

Human resources should be more intensively considered to dramatically increase the supply chain performance in the organization (Daugherty, 2000). In the past decade, the organization had invested intensively on infrastructure and equipment. However, these matters; will be effective or non-effective used, depend on human competencies who are capable to monitor and control supply chain process. Competencies are not solely mentioned on human but also organization and inter-organization (Krishnapriya & Baral, 2014). Even, human is the tiny unit in organization, they are related in all activities and also drive the organization with their competencies. Therefore, this research mainly focuses on the realm of human competencies.

Logistics and supply chain job functions

As the holistic view, the supply chain management activities are defined for planning, implementing and controlling all activities related with sourcing and procurement, conversion for conforming the customer's requirements and satisfaction as efficiently as possible. In addition, the coordination and collaboration with the channel partners such as suppliers, intermediaries, third parties, third-party service providers and customers, must be well engaged (Gibson, Mentzer, & Cook, 2005). The logistics and supply chain job functions are clustered into eight clusters; sourcing management, operations consultant, service operations management, buyer planning, supply chain information management, integrated logistics management, outbound logistics management, and manufacturing management (Rossetti & Dooley, 2010).

In addition, the logistics and supply chain will be worldwide if logisticians have various skills and enable to work in international corporation; understand all aspects of supply chain business, market and competition; work of various branches of industry; enable to motivate and manage people and team; identify the problems and solve them; seek for increment of all income of company; apply the information technology and its system (Poist, Scheraga, & Semeijn, 2001).

The supply chain management activities are digested into detail (Voorhees, Teas, Allen, & Dinkler, 1988) and concluded into 18 activities: 1) buying of resources and goods, 2) management of resources and goods being bought, 3) planning of production, 4) storage of finished products, 5) warehouse plan and its arrangement, 6) location of warehouse, 7) management of transportation, 8) management of storage, 9) inventory, 10) calculating of inventory costs, 11) determining of warehouse safety level, 12) booking and processing of orders, 13) filling of order, 14) customer service policy, 15) packing, 16) remake of materials, 17) transportation and usage of dangerous materials, 18) removal and storage of dangerous materials.

Lambert and Stock (1993) mentioned that the activities of logistics into 13 activities: 1) customer service, 2) order processing, 3) demand forecasting, 4) purchasing, 5) inventory management, 6) transportation, 7) warehousing and

storage, 8) reverse logistics, 9) parts and service support, 10) plant and warehouse site selection, 11) material handling, 12) packaging, and 13) logistics communication (Lambert & Stock, 1993).

Consortia of European organizations gathering of universities, consulting companies, professional organization, union, and etc. developed the job structure to fit in supply chain. They classified the tasks in supply chain into 11 groups: 1) formulating and implementing supply and waste chains strategy, 2) resource management, 3) production planning and control, 4) warehousing, 5) conceiving transport solutions, 6) managing and monitoring transport solutions, 7) haulage, 8) vehicle maintenance, 9) compliance functions, 10) administrative, and 11) freight forwarding (Kovács, Pató, & Elbert, 2011)

According to The Supply Chain Council develops supply management framework which is called Supply Chain Operations Reference model[1] (SCOR model). The scope of the model is focusing on the second tier of suppliers to the second tier of customers. The processes based on SCOR model are clarified into 5 processes: planning, sourcing, producing, delivering, and returning. Based on the list of activities, competencies of logistician are necessary to be re-investigated in order to foster and improve the quality of logistics and supply chain specialists.

With the fast pace of globalization - imbalance of workforce and dynamic markets, competencies should be updated and studied because, some competency, human is replaced by advanced technologies such as robots, machine learning, cloud computing or internet of things (IoT). However, the business and management skills have high degree of dissimilarity with the duration changed and logistician should have more supply chain oriented skills (Murphy & Poist, 2007). As a consequence, the competencies of logistician should be revised by including with the 21st century skills.

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[1] Supply Chain Council: Supply Chain Operations Reference Model [Online]. 2005. http://www.supply-chain.org. Retrieved on 10 May 2018

Competency

Competencies are capabilities of a person for fostering the success in their employment and their life. They are also inferred as the potential in required pursuit in professional practices in order to achieve the accomplishment (Lindberg & Rantatalo, 2015). Competencies are conceptualized as a measurable pattern of knowledge, skills, abilities, behaviors, and other characteristics (Soderquist, Papalexandris, Ioannou, & Prastacos, 2010) that are one of asset in the organization.

Competencies are imperative for developing business competitive advantage of the organization which reflect the organizational goals, strategies and achievement development (Agha, Alrubaiee, & Jamhour, 2012). They are needed to respond to market uncertainties and to find out the solution when the organization faces the unpredicted situations. They are useful to identify the capabilities needed to recruit the future staff and to arrange training for developing the employees' skills and knowledge in order to eliminate the aperture of capabilities needed and available competence (Campion et al., 2011).

The competency is originally proposed by McClelland. He mentioned that, beside intelligence, competency is another alternative for driving the organizational success (McClelland, 1973). Competency has 5 components: knowledge, skill, social role, self-image, and motive/attitude. Agha, Alrubaiee, and Jamhour (2012) describes the competencies as the characteristics of employee which result in the organizational performance improvement. Competency can be indicator to classify the superior and average of employee or to measure the employee whether his/her competence is over or under the criterion-reference (Spencer & Spencer, 2008).

Competencies are proposed into three levels (Krishnapriya & Baral, 2014): individual competencies, organizational competencies, and inter-organizational competencies. However, human competencies are crucial and involved in every level; they are foundation of organization and affect in every aspect of organization process (Homer, 2001). Furthermore, organizational competencies are the amalgam of knowledge, skills, abilities and other characteristics which are manifestly collected from the individual competencies (KSAOs) (Campion et al., 2011). In addition, inter-

organizational competencies are rarely studied which relate to other partners such as suppliers and other partners.

This research emphasizes on studying the individual competencies in order to discover the situation of required competencies that employers are interested to hire a person who graduated in logistics and supply chain management. The educational institutions are also able to design, develop or improve the quality of curriculum to produce the graduates for fulfilling the requirement which are always changed according with social, environment and economics. As a consequence, the competencies that are studied will only be accentuated in human competencies or individual competencies.

Logistics and supply chain competency models and framework

Competences of logisticians have been extensively studied; not only focused on the expertise in logistics or supply chain management (Derwik, Hellström, & Karlsson, 2016). Logistics and supply chain management use comprehensive skills in business, logistics, and management (P. R. Murphy & Poist, 1991), interpersonal /managerial basic skills, quantitative/technological skills (Gammelgaard & Larson, 2001), generic skills, functional skills, supply chain management qualifications and leadership, expertise, and industry-specific skills (Shou & Wang, 2017), soft aspects such as emotional and social skills (Van Hoek, Chatham, & Wilding, 2002).

Originally, Murphy and Poist (1991) studied the important skills of senior-level logisticians for managing in logistics function. They proposed in three skills areas: business skills, logistics skills, and management skills which is called BLM framework. Business skills comprises of 33 entries of knowledge that relate directly and indirectly to business. Logistics skills comprises of 18 entries that relate logistics function, educational knowledge in transportation, warehousing, forecasting, and etc. Management skills are divided into three groups; traditional category refers to basic management functions such planning, organizing, leading and controlling; non-traditional category refers time management and ability to adapt to change; and personal skills refer to attributes of managers such as assertiveness and personal

grooming. This model is widely applied in Singapore and Malaysia (Razzaque & Sirat, 2001; Vinh et al., 2012), Australia (Thai et al., 2011), Egypt (Elzarka & El-Nakib, 2014).

Vinh et al. (2012) applied BLM framework to compare ranking in the importance of competencies between present and future in Singapore logistics industry. Based on *business-related* competencies, top 5 of present competencies – transportation and logistics, supply chain management, business ethics, business strategy, and risk management; top 5 of future competencies – supply chain management, transportation and logistics, risk management, quality management, and business ethics. For *logistics-related* competencies, top 5 of present competencies – customer service, logistics information management, integrated logistics, inventory management, and warehousing management; top 5 of future competencies – customer service, logistics information management, integrated logistics, logistics-related regulations, and international logistics. In *management-related* competencies, top 5 of present competencies – personal integrity, manage customer relations, ability to organize, self-motivation, and ability to implement; top 5 of future competencies – personal integrity, manage customer relations, self-motivation, ability to organize, and ability to plan. In addition, the outstanding increment in ranking of competencies from present to future are regional planning, international business, statistics, and international logistics.

Employment and Training Administration, United States Department of Labor[2] (2014) reports that the competencies of transportation, distribution, and logistics are classified into 5 tiers: personal effectiveness competencies, academic competencies, workplace competencies, industry-wide technical competencies, and transportation sectors. Personal effectiveness competencies consist of 7 components: interpersonal skills, integrity, professionalism, initiative, dependability and reliability, adaptability and flexibility, and lifelong learning. For the second tier, academic competencies consist of 7 components: communication both visual and

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[2] Employment and Training Administration, United States Department of Labor [Online]. 2014. https://www.careeronestop.org/competencymodel/info_documents/transportation-industry.pdf Retrieved on May 16, 2018.

verbal, reading, locating and using information, writing, STEM, critical and analytical thinking, and information technology fundamentals. For the third tier, workplace competencies comprise of 8 components which are teamwork, customer focus, planning and organizing, problem solving and decision making, working with tools and technology, scheduling and coordinating, checking, examining, and recording, and business fundamentals. The fourth tier, industry-wide technical competencies, are gathering 7 components: industry fundamentals, design and development, operations and management, maintenance and repair, technology applications, regulations, and safety and security. The last tier is transportation sectors which consist of air, rail, maritime, highway, public transit and ground transportation systems, warehousing, pipeline, and scenic and sightseeing, postal service, and couriers and messengers.

APICS (2011) has followed the guidelines set by Employment and Training Administration, United States Department of Labor and classified the competencies of distribution and logistics manager into 3 levels: Foundational competencies, Profession-Related competencies, and Occupation-Related competencies. Foundational competencies are declared into 3 sub-competencies which are personal effectiveness competencies, academic competencies, and workplace and leadership competencies. Professional-related competencies have 2 sub-competencies which are distribution and logistics managers' knowledge areas and technical competencies and operations management knowledge areas and technical competencies. Lastly, occupation-related competencies are gathering the competence in distribution and logistics managers' specific requirements.

Competencies of new entry-logisticians

For newly recruited employees, Lai and Chang (2012) aimed to probe the job market to understand what competencies are determined to recruit the new coming applicants in logistics industry. Mainly, they focus on the individual qualities which comprise of negotiability, communication abilities, problem-solving abilities, social skills, conflict management, and analytical abilities. Secondly, professional abilities which are knowledge of warehouse and logistics management, supply chain

concepts, order management, and office software operation. Thirdly, experience of applicants which consists of degree, work experience, foreign language, and extra-curricular activities.

Elzarka and El-Nakib (2014) compared the required skills of entry-level logisticians between academics' and practitioners' perceptions based on BLM model. According to their study, in logistics skills, they recommended that the curriculum must be restructured and practice the undergraduate students more on customer service, warehousing, international logistics, return goods handling, salvage and scrap disposal (Thai et al., 2011). In business skills, the undergraduate students have to be developed in strategic management whereas it is mentioned be emphasized on senior level (Thai et al., 2011), business regulations (Thai et al., 2011). For management skills' category, the entry-logisticians should develop themselves in ability to train subordinates, ability to supervise, and analytical reasoning ability.

However, the logistics curriculum should be reviewed in order to supply the undergraduate students meeting with the demand side. The curriculum should merge the area of information technology (Sinha, Millhiser, & He, 2016) by combining the computer simulations (Gravier & Theodore Farris, 2008), high demand in soft skills in communication, team player, presentation, and etc. (Lai & Chang, 2012; Lambert & Stock, 1993; Sinha et al., 2016), learning evaluation relevant to knowledge (Sinha et al., 2016), project management (Sinha et al., 2016). Yew Wong et al. (2014) analyzed the requested skills of jobs related in logistics and supply chain management through job advertisements. Their required skills are classified into 6 categories: formal or professional qualifications, subject knowledge, work experience, practical or professional skills, intellectual skills, and general management and leadership skills.

Importance-Expertise Matrix (IEM)

Rahman et al. (2012) assessed the strengths and weaknesses skills in logistics professional (Rahman, Yang, & Xiaoyan, 2012). They adapted Importance-Expertise Matrix (IEM) (Martilla & James, 1977) which consists of 2×2 format with the vertical

axis represents the perceived importance and horizontal represents the perceived expertise. The interpretation of each quadrant is presented.
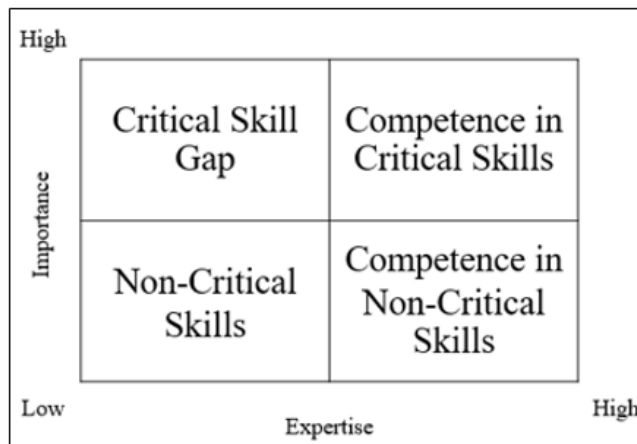

Figure 1 Importtance-Expertise Matrix (IEM) Adapted from "Skill requirements for logistics professionals in china: An importance-expertise matrix analysis" by Rahman, S., Yang, L., & Xiaoyan, Y., 2012, *Supply Chain Forum: An International Journal, 13*(2), p. 43.

The skills in *non-critical skills* quadrant are suggested to be low priority for improvement. For the skills that are in *competence in non-critical skills* quadrant, are suggested that the resource has not been allocated into the right area. The employee should be reallocated into the right job and task. In *critical skill gap* quadrant, the management in each department has to consider and conduct training to improve their employees' competencies for corresponding the organizational objectives. Lastly, *competence in critical skills* quadrant, the competencies that are in this quadrant are good characteristics because the employees' competencies are answering the requirement of employers' needs. Importance-Expertise Matrix (IEM) in this research is constructed by drawing the scatter plot between the average of perception (x-axis) and importance (y-axis). The quadrant of the diagram is separated by grand mean of perception and importance in each competency.

In summary, the researchers incorporate and select the attributes of BLM model (Murphy & Poist, 1991) together with APICS competency framework (APICS, 2011), and unduplicated competencies from many publications (Derwik et al., 2016; Gammelgaard & Larson, 2001; Vinh et al., 2012). The gaps in previous studies are

studying solely on BLM model and lack of studying in Thailand. With the first gap fulfillment, the attributes of APICS framework are revised and added into research because this framework is implemented globally to train logistics and supply chain practitioners to be professional in logistics and supply chain management. In addition, the collected attributes are compared between importance and perception of logistics and supply chain students' competencies based on supervisor's perspective and analyzed by Importance-Expertise Matrix (IEM) (Martilla & James, 1977) in order to suggest what competencies should be prior developed and focused by educators or instructors in Thailand. The conceptual framework is drawn in Figure 2
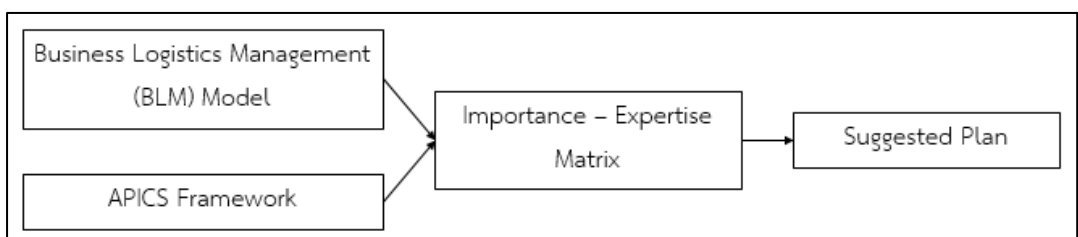

Figure 2 Conceptual framework

Research Methodology

With the literature review, the questionnaire consists of 100 items of logistics competencies which are gathered by BLM model (Murphy & Poist, 1991), APICS competency framework (APICS, 2011), and others (Derwik et al., 2016; Gammelgaard & Larson, 2001; Vinh et al., 2012). The unit of analysis is the company where accepts logistics and supply chain students to work in logistics and supply chain area and locates in Bangkok, Chonburi, and Rayong because these three provinces have many industrial estates zone with the plenty of logistics and supply chain activities. The respondents of this study are selected by purposive sampling technique; the respondents must be the employees who work closely in logistics and supply chain management field and also supervise logistics and supply chain students on cooperative education subject. These respondents are highly able to recommend what competencies in logistics and supply chain needed. The questionnaires are

appointed and distributed directly to logistics and supply chain students' supervisor but they are free to reply to the researchers. As a consequence, the response rate of reply is 62%; the questionnaires are distributed 150 companies but they are usable 93 companies. The questionnaire has three parts: company's information, importance of skills and perception of skills. From 100 skill items, there are 99 skill items remained because the value of IOC exceeded 0.70. With 99 skill items are classified into Personal Effectiveness (PE) 20 skill items, Academic Competencies (AC) 17 skill items, Workplace and Leadership Competencies (WL) 24 skill items, Operations Management Knowledge Areas and Technical Competencies (OMK) 18 skill items, and Distribution and Logistics Managers Knowledge Areas and Technical Competencies (DLMK) 20 skill items. In each item, the respondents must give the score of the importance in each attribute and also give the score of perception in each attribute. Both of score are scoring in 5 points Likert scale. The importance is measured by the importance of each skill whereas the perception is measured by the perception of the skill on logistics and supply chain students' performance. The techniques to analyze consist of two techniques which are t-test with pairs and Importance-Expertise Matrix (IEM). Paired t-test is the technique to compare the average between importance and perception whereas the result of average in each attribute will be plotted into Importance-Expertise Matrix (IEM) diagram.

Data Analysis

The response rate of reply is 62%; the questionnaires are distributed 150 companies but they are usable 93 companies. Based on 93 companies, 51.2% has the employees below 500 persons, 11.9% has the employees between 500 and 1000 persons, and 36.9% has the employees above 1,000 persons. The averages of difference between importance and perception of logistics skills are analyzed by paired t-test. According to the result, there are significantly different between importance and perception for all skills except self-confidence skill. In all pairs of comparison, the importance score is more than perception score. As a consequence, the logistics and supply chain students have to improve their competences in all dimensions of soft skills and hard skills.

Table 1 The average difference between importance and perception of each skill by paired t-test.

Number	Skill Items	Importance		Perception		Mean Difference	Sig.
		Mean	Std. Dev.	Mean	Std. Dev.		
Personal Effectiveness Competencies (20 skill items)							
1	Ability to perform under pressure	4.18	.722	3.64	.768	.549	.000
3	Ability to think outside of box	4.00	.780	3.51	.848	.473	.000
8	Ambition	4.26	.690	3.70	.678	.556	.000
13	Creativity	3.90	.647	3.66	.768	.225	.006
15	Cross-functional awareness	3.75	.761	3.40	.731	.344	.000
25	Ethical Awareness	4.22	.786	3.81	.782	.416	.000
26	Enthusiasm	4.27	.709	3.88	.712	.396	.000
28	Expertise in interpersonal relations	4.05	.765	3.58	.809	.472	.000
30	Flexibility	4.12	.720	3.85	.802	.275	.004
31	Foreign language	4.10	.723	3.86	.797	.231	.019
56	Multi-cultural awareness	3.53	.799	3.38	.771	.153	.080
59	Negotiation	4.14	.833	3.51	.898	.643	.000
65	Public relations	3.77	.821	3.42	.871	.329	.001
66	Personal integrity	4.68	.592	4.32	.736	.375	.000
67	Presentation skills	4.10	.724	3.67	.823	.425	.000
83	Speaking / Oral communication	4.10	.861	3.73	.790	.385	.000
87	**Self-confidence**	**3.95**	**.757**	**3.84**	**.749**	**.110**	**.123**
88	Self-motivation	4.14	.768	3.76	.840	.382	.000
89	Self-directed learning	4.25	.670	3.87	.859	.396	.000
90	Self-discipline	4.40	.630	4.00	.783	.404	.000
Academic Competencies (17 skill items)							
29	Engineering logistics	3.69	.831	3.40	.826	.313	.001
35	General business administration	3.66	.679	3.31	.791	.345	.000
36	Human resource management	3.62	.828	3.18	.794	.440	.000
38	IT systems	3.77	.765	3.48	.662	.253	.005
43	Identifying opportunities and threats	3.55	.893	3.16	.843	.395	.000
44	Knowledge of the industry	3.63	.710	3.28	.710	.356	.000
53	Marketing	3.49	.843	3.23	.779	.237	.025
73	Quantitative Methods	3.72	.750	3.37	.766	.333	.000
78	Strategic management	3.68	1.03	3.27	.837	.395	.000
82	Software knowledge	3.88	.657	3.53	.767	.344	.000
84	Spreadsheet abilities	4.27	.648	3.85	.847	.427	.000
85	Statistical awareness	3.72	.730	3.39	.681	.317	.000
86	Supply chain awareness	3.74	.870	3.43	.913	.301	.001
91	The impact of globalization	3.83	.672	3.52	.743	.333	.000
97	Understanding economic principles	3.51	.781	3.22	.822	.284	.001
99	Understanding logistics terminology	4.10	.739	3.67	.816	.448	.000
100	Writing / Written communication	4.04	.744	3.64	.787	.416	.000

Table 1 (Continued)

Number	Skill Items	Importance		Perception		Mean Difference	Sig.
		Mean	Std. Dev.	Mean	Std. Dev.		
Workplace and Leadership Competencies (24 skill items)							
2	Ability to see the BIG picture	4.05	.743	3.58	.668	.473	.000
4	Ability to plan and prioritize	4.25	.747	3.65	.766	.615	.000
5	Ability to train subordinates	4.06	.807	3.47	.700	.588	.000
6	Ability to motivate staff	3.84	.771	3.30	.690	.536	.000
7	Ability to delegate	3.98	.807	3.36	.796	.605	.000
11	Change Management	4.13	.815	3.50	.727	.614	.000
12	Conflict Management	3.97	.912	3.31	.752	.678	.000
14	Critical Reasoning	4.16	.613	3.72	.779	.422	.000
17	Customer service	4.23	.831	3.79	.746	.461	.000
18	Customer focus	4.08	.792	3.64	.761	.432	.000
21	Decision making	4.14	.731	3.49	.782	.667	.000
27	Effective supervision of staff	3.79	.776	3.41	.773	.372	.000
32	Facilitation (of meetings)	3.40	.776	3.61	.784	.200	.006
47	Knowledge of client's systems	3.78	.790	3.41	.821	.376	.000
50	Leadership	3.96	.769	3.63	.851	.299	.003
51	Listening	4.24	.597	3.98	.730	.253	.001
54	Managing organizational culture	3.60	.819	3.32	.804	.247	.007
58	Managing client relationship	3.96	.823	3.57	.774	.383	.001
60	Networking skill	3.62	1.05	3.28	.968	.363	.005
63	Organizing	3.78	.836	3.33	.880	.469	.000
64	Organizational Culture Awareness	3.82	.815	3.61	.907	.230	.026
68	Problem solving	4.28	.657	3.64	.766	.663	.000
92	Teamwork	4.41	.647	4.09	.744	.344	.000
93	Training	3.92	.781	3.51	.651	.470	.000
Operations Management Knowledge Areas and Technical Competencies (18 skill items)							
10	Business process improvement	4.18	.783	3.53	.847	.644	.000
16	Cost control	3.91	.816	3.30	.733	.598	.000
24	Developing environmentally sustainable systems	3.71	.792	3.19	.938	.513	.000
34	Financial management	3.37	.914	2.94	.848	.416	.000
37	ISO standards	3.88	.887	3.37	.882	.512	.000
41	Information system management	3.72	.835	3.56	.773	.161	.034
45	Knowledge of latest technology	3.92	.805	3.61	.695	.333	.001
46	Knowledge of newest techniques	3.94	.764	3.60	.838	.381	.000
48	Knowledge of environmental issues	3.77	.792	3.48	.722	.289	.001
49	Knowledge of operations	3.91	.725	3.61	.877	.295	.004
55	Managing corporate knowledge	3.73	.789	3.43	.832	.280	.002
69	Project management	3.83	.843	3.34	.826	.513	.000
70	Production planning	3.60	1.01	3.32	.841	.373	.001
74	Quality management	3.83	.770	3.41	.753	.402	.000
80	Salvage and scrap disposal	3.46	.837	3.22	.903	.250	.004
81	Scheduling	4.08	.796	3.80	.847	.276	.002
94	Time management	4.29	.719	3.71	.820	.578	.000
98	Use of logistics specialized software	3.78	.928	3.52	.843	.274	.019

Table 1 (Continued)

Number	Skill Items	Importance		Perception		Mean Difference	Sig.
		Mean	Std. Dev.	Mean	Std. Dev.		
Distribution and Logistics Managers Knowledge Areas and Technical Competencies (20 skill items)							
9	Business regulation	4.28	.816	3.78	.836	.528	.000
19	Contract management	3.77	.845	3.31	.864	.464	.000
20	Database Ability	3.95	.780	3.65	.785	.303	.002
22	Demand forecasting	3.77	.835	3.26	.814	.506	.000
23	Distribution communications	3.99	.767	3.47	.807	.547	.000
33	Facility location / Network design	3.42	1.05	3.19	.865	.293	.002
39	Inventory management	3.97	.923	3.59	.761	.365	.000
40	International business regulation	3.95	.820	3.53	.874	.458	.000
42	International logistics	3.95	.843	3.42	.795	.571	.000
52	Modelling of operations systems	3.71	.844	3.35	.787	.423	.000
57	Material handling / Warehouse management	3.85	1.00	3.44	.974	.386	.000
61	Occupational health and safety	3.85	.779	3.53	.817	.325	.002
62	Order processing	3.66	.749	3.28	.928	.398	.000
71	Packaging	3.46	.983	3.35	.757	.221	.019
72	Procurement / Purchasing management	3.53	.959	3.14	.916	.430	.000
75	Risk management	3.86	.842	3.35	.916	.518	.000
76	Reverse logistics	3.77	.941	3.32	.946	.468	.000
79	Spare parts support	3.41	.899	3.03	.838	.387	.000
95	Transport management	3.99	.794	3.54	.860	.432	.000
96	Transport and related regulation knowledge	4.03	.818	3.47	.867	.541	.000

With the Importance-Expertise Matrix (IEM) analysis, competencies are categorized based on APICS competency framework (APICS, 2011): Personal Effectiveness (PE) 20 skill items, Academic Competencies (AC) 17 skill items, Workplace and Leadership Competencies (WL) 24 skill items, Operations Management Knowledge Areas and Technical Competencies (OMK) 18 skill items, and Distribution and Logistics Managers Knowledge Areas and Technical Competencies (DLMK) 20 items. All 99 skill items are classified into 4 quadrants as shown in Appendix A.

Based on Personal Effectiveness Competencies shown in Figure 3, the result reveals the first priority for improving the logistics and supply chain students' competencies are ability to perform under pressure, ambition, negotiation, and presentation skills. For working with new generation students, they have high self-

confidence to express their opinions and attitudes; students have done well for being self-confidence but supervisor does not perceive its importance for logistics and supply chain students.

Based on Academic Competencies shown in Figure 4, the first priority for improving the logistics and supply chain students' competency is human resource management. IT systems and supply chain awareness skills are highly perceived by the supervisors but they are less important.

In Workplace and Leadership Competencies shown in Figure 5, the first priority for improving the logistics and supply chain students' competencies are ability to train subordinates, ability to delegate, change management, conflict management, and decision making. For organizational culture awareness is highly perceived by the supervisors but they are less important.

In Operations Management Knowledge Areas and Technical Competencies shown in Figure 6, the first priority for improving the logistics and supply chain students' competencies are cost control, ISO standards, quality management, and project management. For information system management, knowledge of environmental issues, and use of logistics specialized software are highly perceived by the supervisors but they are less important.

In Distribution and Logistics Managers Knowledge Areas and Technical Competencies shown in Figure 7, the first priority for improving the logistics and supply chain students' competency is risk management. There is no any skills fall into non-critical skills.

Discussion of the Results

This study reveals the assessment of importance and perception of supervisors who advise the logistics management students based on APICS framework. According to the result, 15% of all skills fall in critical skill gap, 40% falls into competence in critical skills, 37% falls in non-critical skills and 8% falls into competence in non-critical skills.

In critical skill gap criteria which is highly recommended to focus, the institution where trains logistics and supply chain students should train students on both soft skills and hard skills. For soft skills, ability to work with others, addressing the conflict and change, negotiation, working under pressure, presentation are highly recommended to improve the ability of logistics and supply chain students when they work in logistics and supply chain field. Many soft skills are accumulated by the experience, therefore, the subjects delivered by the high experience of instructors and logisticians will be benefit for students to practice their soft skills for being the logistics manager.

For hard skills, knowledge on quality management such as ISO standards, cost control and project management are essential as the key competitive advantages for logistics and supply chain industry: quality, cost and time. As a consequence, the institution must focus on the knowledge required by the real industry, otherwise, the graduate have been produced by under qualification. In China, the skills in critical skill gap are foreign language, inventory management, warehousing management distribution management, understanding supply chain (Rahman et al., 2012).

For competence in non-critical skills category, this category regards the logistics skills have not been allocated to the right areas. This category implies that the institution trains the students with unnecessary requirement. According to the result, this category consists of IT systems and information system management, logistics specialized software, and supply chain awareness. Technology is imperative for logistics but only software knowledge and spreadsheet such as Microsoft Excel. Therefore, IT systems and information system management, logistics specialized software are unnecessary for logistics and supply chain students to learn. With high competition in logistics industry, supply chain awareness is only the fundamental knowledge for logistics and supply chain students to aware of. Hence, the institutions, where do not have high quality of instructors and experts, are not able to serve students to have enough logistics skills. To be high quality logisticians, students must be well trained rather than just foundation knowledge. In China, ISO

standards are not being focused; the experts' opinions do not perceive that ISO standards are important and also not well trained (Rahman et al., 2012).

Apparently in competence in critical skills, students who have learnt logistics management in Thailand, 40% skills are well qualified. These skills are focusing on business, logistics' regulations, and logistics management but statistical analysis and quantitative modelling are not perceived as being importance. In contrast to China, logisticians' skills are not being emphasized only on management but also statistical analysis and quantitative modelling in order to formulate the model for obtaining lowest cost, shortest time and highest quality (Rahman et al., 2012).

Conclusion

This study aims to classify the logistics competency based on Importance-Expertise Matrix (IEM) Analysis in order to separate the level of importance for improving the logistics management students' skills. The skills are grouped by following APICS framework. Not all logistics skills are important, the instructors or academicians have to find out what skills are current highly required by logistics industry for arranging the training or modifying the curriculum corresponding to industry's needs.

Implication

The implication for educational institution, the educators should regularly conduct the need analysis about the competency of logistics and supply chain management in order to equip students corresponding to the future change. Otherwise, the students who graduated from educational institutions will not be accepted by the labor market. The government, especially Ministry of Higher Education, Science, Research and Innovation should support the institution by supporting the flexibility in regulation handling. For instance, the Ministry should allow the experts in the industry to teach in the university more than 50% of a particular subject.

The implication for entrepreneur, to reduce the cost of training new employee, the academic collaboration between entrepreneur and educational

institution is essential. The graduate students will be ready to use in the labor market. Based on the result of study, both soft skills and hard skills are necessary to have the experts in logistics and supply chain management to share the experience and teach the students.

Contribution of the Study

The contributions of the study are 1) to suggest the academic institution to develop the curriculum based on the employee's requirement, 2) to extend the required competency attributes on logistics and supply chain management by integrating between BLM model and APICS framework, and 3) to apply the statistical techniques and analysis for conducting the plan and setting the priority in human resource development in logistics and supply chain management.

Limitation of the Study

The study has several limitations which are: the competency requirement in different type of industry related to logistics and supply chain management, the competency requirement in different level of employee, and the study focuses on undergraduate students level. The study can be extended to compare the competency requirement in different type of industry because the researchers study logistics and supply chain as the whole; does not specify a particular industry. As a consequence, the required competency might be different in each industry. Furthermore, the level of employee might affect the difference of required competency. The blue collar and white collar employees will have required competency differently. Lastly, the undergraduate students will not be much required on competency unlike the others level of education. Hence, the different level of education will have different requirement competency based on employers' perspective.

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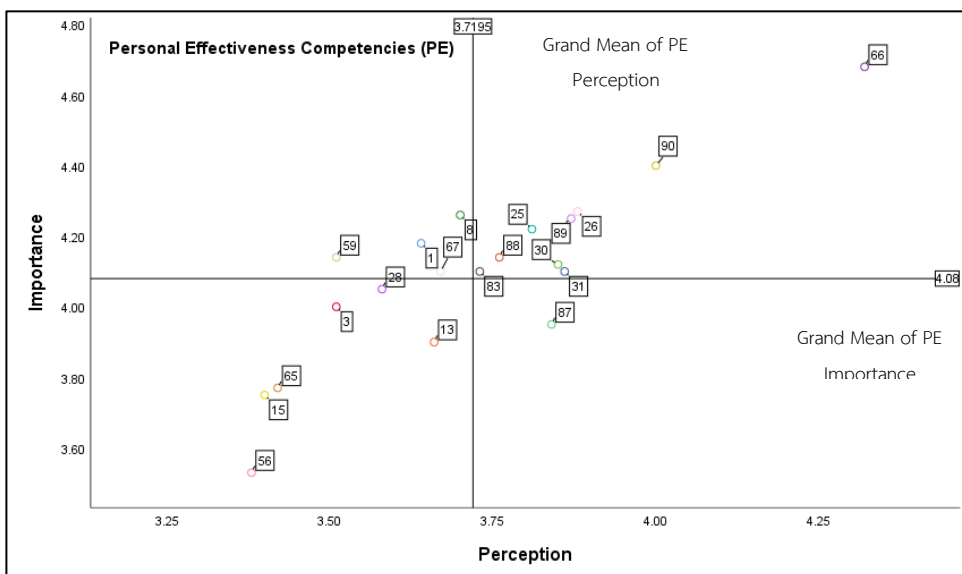**Appendix A:** Result of Importance-Expertise Matrix (IEM) Analysis

Figure 3 Importance-Expertise Matrix (IEM) in Personal Effectiveness Competencies (PE)
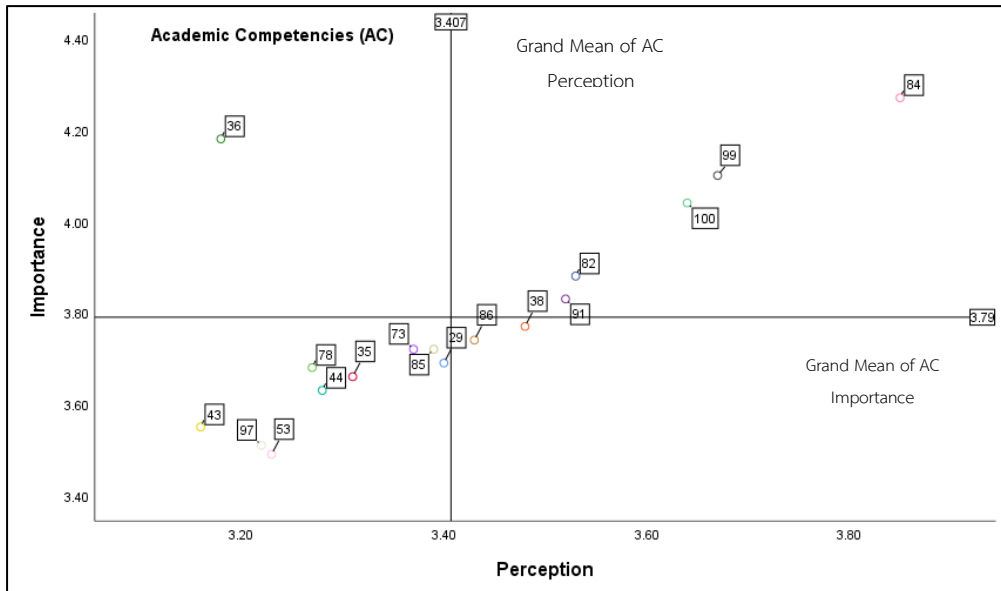
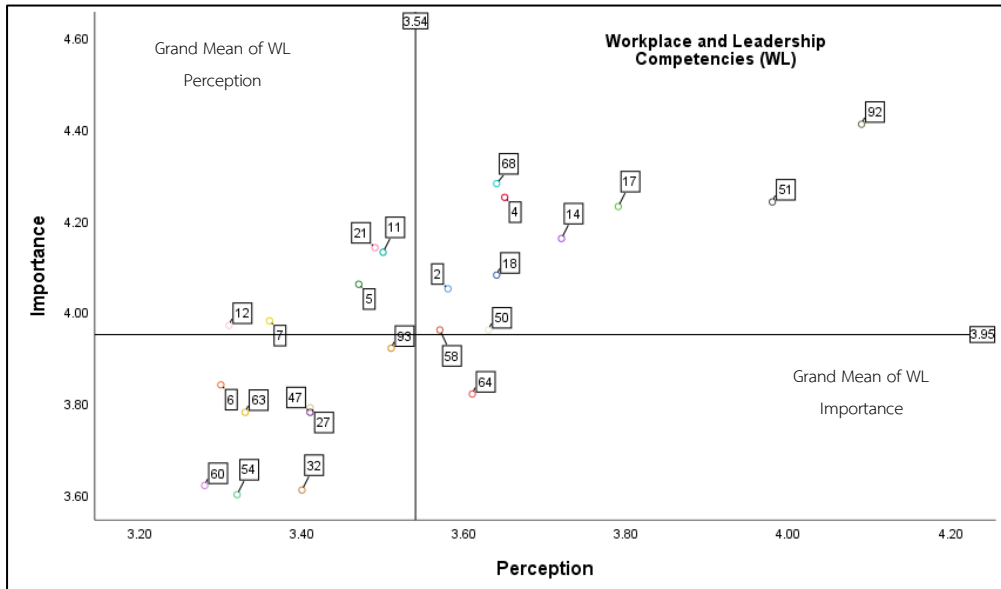**Figure 4** Importance-Expertise Matrix (IEM) in Academic Competencies (AC)

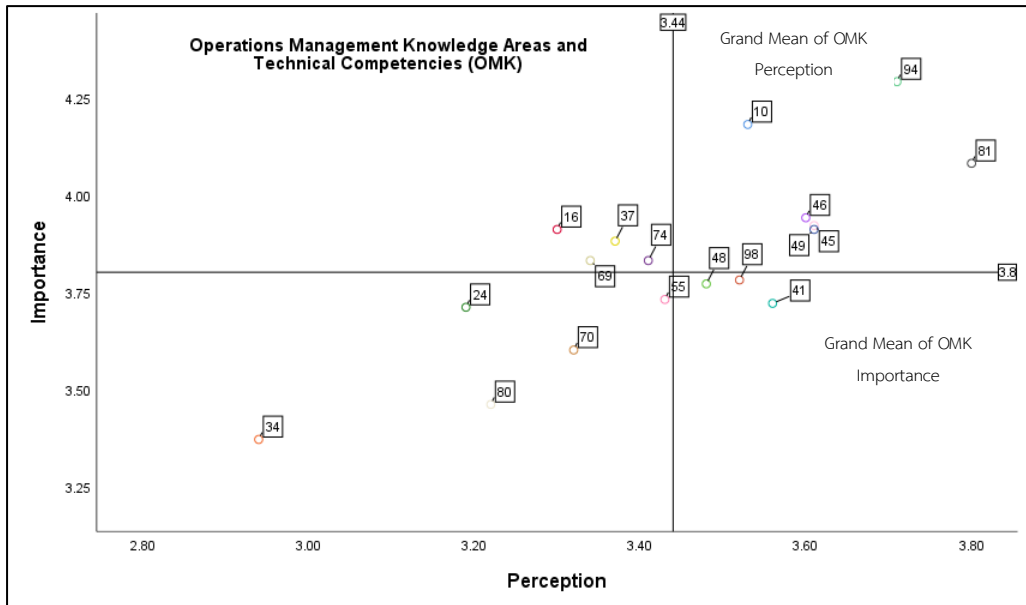**Figure 5** Importance-Expertise Matrix (IEM) in Workplace and Leadership Competencies (WL)

Figure 6 Importance-Expertise Matrix (IEM) in Operations Management Knowledge Areas and Technical Competencies (OMK)
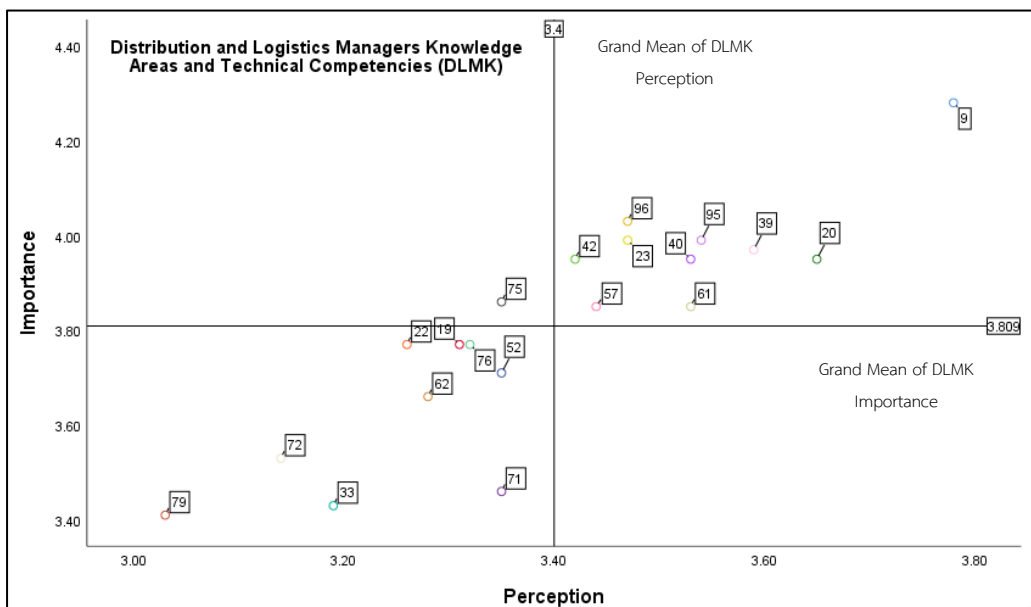

Figure 7 Importance-Expertise Matrix (IEM) in Distribution and Logistics Managers Knowledge Areas and Technical Competencies (DLMK)