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IDENTIFYING CRITICAL SKILLS FOR LOGISTICS PROFESSIONALS: ASSESSING SKILL IMPORTANCE, CAPABILITY, AND AVAILABILITY

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ABSTRACT

The purpose of this research is to identify critical skills needed in the logistics profession now and in the future. This study uses survey research, means tests, and importance analysis to explore a multi-factor framework that identifies critical supply chain skills perceived by 176 experienced supply chain professionals from manufacturing, transportation, and retail/wholesale segments. Results indicate significant differences exist between current and future needed skills, among current capabilities and current availability of skills, and among skill needs utilizing a multi-factor index. Identifying needed skills based on importance is common. Considering more factors than just importance offers a more thorough assessment that reduces potential oversights and inefficiencies that can occur if decision makers focus on one factor when planning key processes, such as recruiting, hiring, and training, in a talent management program.

INTRODUCTION

Collaborative consumption, globalization, outsourcing, and technological advances in business are serious challenges that have created a turbulent environment for supply chain managers, and more specifically for logistics managers that are the focus of this article (Christopher and Holweg, 2011; Margaritis, Anagnostopoulou, Tromaras, and Boile, 2016; Shaheen, Mallery, and Kingsley, 2012). These turbulent events resonate within supply chain organizations where they amplify other challenges such as talent management (Shi and Handfield, 2012). Many logistics and supply chain organizations are strained by the urgent need to attract and retain logistics talent (Keller and Ozment, 2009; Leon and Uddin, 2016; Partida, 2014). Unfortunately, these increased needs come at a time of increased retirements (Wolff et al., 2009) and shortages (Cottrill, 2010). As such, it is

not surprising that a number of industry reports have shown many employers are experiencing significant challenges caused by talent shortages (Gibson et al, 2013 CSCMP; ManpowerGroup, 2013).

The importance of talent management in logistics cannot be overstated. For example, finding the “right talent” is the first major step to establishing an effective supply chain strategy (Sloan et al., 2013, p. 41). Moreover, Stank et al (2011) declared finding the right talent as one of five major “pillars” that form the foundation from which supply chain managers can enhance organizational performance (p. 941).

Identifying and acquiring talent with the skills necessary to perform the essential functions of a job is the foundation of any talent management program. Employees that lack the requisite skills to perform at acceptable levels in an organization may experience

a high level of incompatibility and decide to quit or they might discover a misalliance through negative performance appraisals that could lead to termination of employment. Employment separations create additional turbulence that manifest as disruptions with negative consequences on performance (Glebbeck and Bax, 2004; Kacmar, Andres, Van Rooy, Steilberg and Cerrone, 2006). It is critical that companies effectively assess talent needs to fill supply chain skill gaps in order to remain competitive (Daugherty et al., 2000; Leon and Uddin, 2016; Richey et al., 2006), as it has been shown that SC disruptions impede performance and limit profitability (Hendricks and Singhal, 2005; Kacmar et al., 2006). One should not find it surprising that researchers have been calling for further research on supply chain talent management, and logistics in particular (e.g., Cottrill, 2010; Ellinger and Ellinger, 2013; Myers et al, 2004; Williams, Garver, and Taylor, 2011; Shi and Handfield, 2012; Thai, 2012). Before turbulent employment issues become more damaging to logistics, it is important that managers learn more about essential logistics skills that are currently needed so decision makers can acquire the right talent with the right skills, at the right time, to achieve the right performance in the right jobs – i.e., the perfect hire. What skills are perceived as needed most in view of not only the importance of a given skill or skillset, but also by understanding current capabilities in the firm and current availability of skills in today’s labor market, will help lead to better talent management results.

The following section reviews literature involving supply chain skills. The next section presents the methods and results of this research. The concluding sections discuss the findings and implications for academics and practitioners.

LITERATURE REVIEW

This section provides the theoretical underpinning of the study, then defines talent management and describes a number of relevant and influential skills studies in logistics and supply chain management that pertain to the purpose of this research. The following synthesis of literature aims to further the

understanding of critical skills for supply chain professionals.

Resource-Based View of Skills and Capabilities

Cappelli (2008) asserts that failing to manage talent, from acquisition to retention, is no different than failing to manage the supply chain from beginning to end. Research suggests that an effectively managed supply chain with the right talent and human resources behind it can become a source of competitive advantage that enhances supply chain performance (Ellinger and Ellinger, 2013; Kim and Han, 2012; Schuler, Jackson, and Tarique, 2011). Such findings align with the Resource-based View (RBV) that is the theoretical basis under which an organization assesses the importance of various resources (e.g., processes, information, skills) that when managed effectively can enhance capabilities thereby resulting in greater competitiveness. (Barney, 1991; Wernerfelt, 1984; Wright, Snell, and Dunford, 2001). Organizations must be responsive in SCM talent management by developing strategies (Leon and Uddin, 2016) and taking appropriate steps (e.g., needs assessment, job analysis) to ensure that they have appropriately skilled people in place to facilitate high performance (Gibson et al 2013). Consequently, researchers and practitioners have increased the amount of attention directed at talent management in recent years (Ariss, Cascio, and Paauwe, 2014; Ellinger and Ellinger, 2013; Gibson et al SCQ, 2015; Langley et al 2015; Leon and Uddin, 2016). Understanding requisite foundational elements is important in order to facilitate even the most rudimentary talent management program, but ideally to achieve a sustainable talent pipeline. Thus, this study examines critical logistics skills as perceived by logistics professionals.

Talent Management

Talent can be summarized as the amount of experience, knowledge, skills, and abilities that is possessed and practiced by each employee in an organization. Talent management involves the various processes for identifying roles, responsibilities, and requisite skills, and establishing a pool of professionals to employ in each position.

It includes efforts to attract, onboard, develop, retain, and replace talent, in order to achieve top performance (Collings and Mellahi, 2009). Gibson et al. (2013) explore talent management and suggest that talent forecasts, roles, responsibilities, and critical capabilities and skills be established, as these foundational activities ensure that subsequent acquisition activities (onboarding, mentoring, and training) are focused on organizational needs necessary for an effective talent management program. Assessing needs and identifying requisite skills is an essential starting point.

Supply Chain Skills

The logistics literature does include a stream of research dedicated to talent, primarily focused on skills importance and identification. For example, the Council of Logistics Management (now the Council of Supply Chain Management Professionals) put forth a comprehensive study on this topic called *The Growth and Development of Logistics Personnel* (1999) that was primarily focused on using auditing gap analysis to identify skill deficiency and subsequent development plans.

Gibson and Cook (2001) collected data from interviews and surveys of executives and mid-level managers from 40 of the top 100 3PL firms that showed various skills that were important to entry level management positions. These included problem solving, oral communication, planning/organizing, ability to learn, decision making, teamwork, relationship management, creative thinking, written communication, and analytical (logistics analysis). This research was replicated and updated in (Cook, Gibson and Williams, 2009). The replicated research identified and highlighted the importance of leadership characteristics and abilities for SCM personnel.

Gammelgaard and Larson (2001) utilized relevant literature (e.g., Murphy and Poist, 1991) and executive interviews to derive forty-five basic skills to include in their research on the importance of logistics skills and competencies. The skills were categorized into three primary factors: interpersonal/managerial basic skills, quantitative/technological skills, and logistics core skills (p. 40). Teamwork,

problem solving, listening, and communicating topped the list of highly important skills for logistics managers. Gammelgaard and Larson suggested further research that captures organizational situations within an industry.

Myers, Griffith, Daugherty, and Lusch (2004) surveyed entry-level and mid-level logistics and supply chain professionals to assess perceived relationships between 16 skills and job performance. The results suggest organizations should work to develop talent in four broad skill areas: social, decision-making, problem-solving, and time-management. The skills categories were significant predictors of job performance, while experience and education were not statistically significant. These authors further recommended future research that investigates how to identify critical skills.

In a longitudinal study that spanned more than a decade, Murphy and Poist (2007) updated their comprehensive Business-Logistics-Management (BLM) framework, which is composed of more than 80 skills, and examined the relative importance of each skill in senior-level logistics positions. Supply chain management and transportation and logistics business are important in senior-level positions, as are customer service, inventory management, motivating others, integrity, and communication. Managerial skills were found to be more important than other skills. They concluded that “logisticians should be managers first and a logistician second” (p. 423). Results indicate that essential or requisite skills can change over time.

Thai (2012) surveyed logistics executives in Australian firms using a shortened version of the BLM framework and found personal integrity, problem-solving, relationships, cost control, and planning to be among the top-ranking skills based on perceived importance now and in the future. All three skill groups in the BLM framework (Business, Logistics, and Management) were equally important. Research by Wu et al (2013) suggest that it is important for global supply chain personnel to possess communication, financial analysis, customer relationship management, and people

skills. Ellinger and Ellinger (2013) put forward a summarized list of requisite skills for supply chain managers that includes problem solving, communication, leadership, global orientation, change management, and coaching, which were drawn from four studies (i.e., Christopher, 2012; Cotrill, 2010; Fawcett et al, 2010; Slone et al, 2010).

In summary, the majority of studies in the logistics literature focus on the importance of each skill, where researchers aim to list or categorize items based largely on importance, as perceived by industry professionals, academics, or students. The body of work in this area falls short of examining skills in a greater context that ventures beyond current importance to include additional circumstance, such as current skill capabilities, future skill importance (skill forecasting) and current skill availability, when assessing skill needs for effective talent management.

RESEARCH QUESTIONS AND METHODOLOGY

Research Questions/Purpose

While it is imperative for an organization to know what skills are important for logistics and supply chain positions, it is equally crucial for organizations to understand its current internal skill capabilities and the current external skill availability in the labor market as this could dictate the most strategic and appropriate response, whether it means externally acquiring talent or internally developing talent. Thus, this research aims to answer three major questions:

- 1) What skills are currently important for logistics and supply chain management professionals (i.e., at time of completing survey) Current Interest (CI) and in the future (i.e., beyond five years from today) Future Interest (FI)?
- 2) What skills are perceived as Current Capabilities (CC) within the firm or are Currently Available (CA) in today's labor market?

- 3) What skills are needed most considering Current Capabilities (CC), Current Importance (CI) and Future Importance (FI), and Current Availability (CA) in today's labor market?

The following analysis and assessment identifies skills that are critical to logistics talent management based on the perceived importance (CI and FI) now and in the future. The research looks at the skills that employees need to possess and by the degree to which these skills are current capabilities (CC) internal to the firm and by the degree to which there is current availability (CA) external to the firm in the labor market for a given skill.

Methods

The present research used mixed methods to explore logistics skills. The study utilized a literature review, expert interviews, and an online questionnaire to provide added sources of data than what is ordinarily obtained using a single method. The first step involved a review of previous literature to frame the research question on skills. The second step included a series of focus groups and telephone interviews with logistics and human resources professionals with previous involvement in talent acquisition. The third step refined the findings from the previous actions into a questionnaire for online distribution. The primary areas of interest were to measure Current Importance (CI), Future Importance (FI), Current Capability (CC), and Current Availability (CA) of skills. A self-report questionnaire was selected to obtain the perceived importance that professionals in logistics place on select skills, for example. The resulting questions and corresponding responses were compiled into an online survey, which was pre-tested and refined for clarity and flow, then administered using Qualtrics software over a six-week period. Survey results were subjected to a series of analyses using means, standard deviations, *t*-tests, standardized *z* scores, and rankings.

Measures

The decision as to which skills to include in this study for each respondent to rate Current Importance (CI), Future Importance (FI), Current

Capability (CC), and Current Availability (CA) was informed by previous skills research (e.g., Gibson and Cook, 2001) and expert input from interviews. Recent research has demonstrated a need for logistics to possess both “hard” (technical) and “soft” (behavioral) skills to meet the challenges in complex supply chains (Christopher, 2012; Cottrill, 2010). Thus, a parsimonious mix of hard and soft skills was included in the present study as shown in Table 1. Input from a small group of logistics researchers helped finalize the questionnaire that resulted in 19 single-item measures used as a representative range of hard and soft skills to be examined in this exploratory study.

Respondents were asked to assess importance as well as the current capability and current availability of each skill listed in Table 1. **Current Capability (CC)** is the extent to which a professional perceives that the firm in which he or she works currently has an internal competency in a given skill. **Current**

Importance (CI) is the degree to which a professional perceives that a specified skill is important to logistics and supply chain professional(s) to be successful working in the current business environment. **Future Importance (FI)** is the degree to which a professional perceives that a specified skill is likely to be important to logistics professional(s) to be successful working in the future business environment. **Current Availability (CA)** is the extent to which a professional perceives that a given skill is available in the current labor market. All items were assessed on a 5-point scale ranging from 1 (not important, no internal capability, or very low availability) to 5 (very important, high internal capability or very high availability).

Sample

The pool of potential study participants was derived from the Council of Supply Chain Management Professionals membership list and logistics alumni

TABLE 1
LIST OF SKILLS, CORRESPONDING CODES, AND ITEM SOURCES

Skill	CODE	Sources
Analytical Skills	S1	Gibson and Cook 2001
Communication	S2	Gibson and Cook 2001
Change Management**	S3	Murphy and Poist 2007
Project Management	S4	Gibson and Cook 2001
Problem-solving	S5	Gibson and Cook 2001; Gammelgaard and Larson 2001; Murphy and Poist 2007
Leadership	S6	Gibson and Cook 2001
Ability to plan	S7	Gibson and Cook 2001; Murphy and Poist 2007
Decision-Making	S8	Gibson and Cook 2001; Murphy and Poist 2007
Creative thinking	S9	Gibson and Cook 2001
Relationship***	S10	Gibson and Cook 2001; Murphy and Poist 2007
Negotiation skills	S11	Gibson and Cook 2001
Financial analysis	S12	Gibson and Cook 2001; Murphy and Poist 2007
Technical capability	S13	Gibson and Cook 2001; Gammelgaard and Larson 2001; Murphy and Poist 2007
Big Picture	S14	Gammelgaard and Larson 2001
Active listening	S15	Gammelgaard and Larson 2001; Murphy and Poist 2007
Ability to learn quickly	S16	Gibson and Cook 2001
Ability to work in teams	S17	Gammelgaard and Larson 2001; Gibson and Cook 2001
Ability to handle high pressure	S18	Gammelgaard and Larson 2001
Measurement/assessment****	S19	Gibson and Cook 2001

*M&P 2007 adapt to change; **M&P 2007 motivate, mentor, supervise others. *** quality analysis, spreadsheet/database

contact lists from two universities in the United States. Given the focus of the research, the lists were culled to ensure that only individuals working in logistics industry roles would participate in the survey. Hence, educators, students, retirees, and professionals outside the SCM discipline were excluded. An electronic survey link was emailed to approximately 3,100 U.S. SCM professionals. in the targeted segment. Email reminders were sent two weeks after the original survey release date.

The email campaign generated 358 total responses. However, not all respondents answered all the questions regarding skill importance (now and in the future), internal skill capabilities, and labor market availability of skill required for this analysis. After eliminating responses that skipped any of the

questions regarding each of the 19 skills, the remaining 176 responses were analyzed in light of the three research questions.

RESEARCH RESULTS

Demographic and Firmographics

The respondents represented a diverse group of firms within the supply chain and in their own personal backgrounds as exhibited in Table 2. On average, the respondents yielded over 16 years of supply chain related experience. When asked about knowledge of talent management, respondents indicated a high-level, exceeding four on a five-point scale (1=Not knowledgeable at all; 5=Very knowledgeable).

TABLE 2
DEMOGRAPHIC AND FIRMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Role Within the Organization	
C-Level	3.4%
VP	11.4%
Director	27.3%
Manager/Supervisor	36.4%
Analyst	18.2%
Other	3.4%
Corp. Role Within Supply Chain	
Carrier/3PL	31.3%
Manufacturer	48.3%
Retailing/Wholesaling	20.5%
Number of Employees	
1-499	16.0%
500-999	5.7%
1,000-4,999	14.3%
5,000-9,999	20.0%
10,000+	44.0%
Annual Revenue	
\$1 to \$9.9 million	14.2%
\$100 million to \$999.9 million	22.7%
\$1 billion to \$9.9 billion	33.5%
Over \$10 billion	26.1%

A number of analyses were conducted to explore the study's three major research questions. First, a means analysis involving several individual *t*-tests was performed to identify, describe, and rank the current importance (CI) of each skill and a repeated measures means analysis was conducted to identify and rank the future importance (FI) of each skill and to test if a significant difference exists between CI and FI skill ratings, followed by a paired within-subjects *t*-test to test for a significant difference in ratings to determine if significant movement exists in the mean score rankings. Second, a means classification process was utilized to describe and categorize CC and CA ratings. Third, a final analysis of means was conducted using *z* scores and weighted factors that accounted for current capabilities (CC), current importance (CI) and future importance (FI), and current availability (CA) of skills in today's labor market. Means were transformed into corresponding *z* scores to standardize the CC, CI, FI, and CA data that were measured using different Likert scale anchors so they could be combined into composite scores.

Analysis 1: Current and Future Importance Ratings and Ranking Comparisons

Mean scores were calculated for each of the 19 items and individual paired *t*-tests were performed for each pair of means to test differences between the importance ratings and to identify the skill ranking. At the 95% confidence level, significant differences were found between 73% of the pairs tested (124/171), as shown in Appendix A, with insignificant differences occurring mostly between items that are next to or immediately succeeding one another in rank.

Insert Appendix A Here (Was Table 6 Originally)

Perceptions of the importance of logistics professionals (business) skills and perspectives on ranking, which are shown in Table 3, indicate that some of the more important skills needed **today**, in order of importance, are: 1) Problem-Solving, 2) Communication, 3) Analytical Skills, 4) Ability to Learn Quickly, and 5) Decision Making. Whereas, some of the important skills identified for the **future**

are: 1) Communication, 2) Problem Solving, 3) Analytical Skills, 4) Ability to Learn Quickly, and 5) Leadership.

To evaluate the Current Importance (CI) and Future Importance (FI) ratings of the skills and the overall skillsets, a paired within-subjects (repeated measures) *t*-test was performed on the data. This analysis was conducted in order to better understand skills important today in comparison to skills important for the future. The within-subjects test is beneficial because it helps to understand if a skillset is likely to become more or less important as deemed by the sample and whether or not a difference exists in the overall importance ratings of the skillsets. The overall importance rating was higher for the future skillset than for the skillset that was perceived as important today, as indicated by a statistically significant *t*-test, $t(18) = 2.765, p < .05$. This finding indicates that significant differences exist in importance ratings between the two periods (i.e., today versus in the future) that was not likely due to chance. The significant difference suggests that there were not only significant rating changes in the individual skills but also significant rank changes as a result of the rating changes that occurred within the analyzed skillset (i.e., the list of select skills). The within-subjects test has more power or a better likelihood to detect effects when effects exist because variation due to individual differences is eliminated in the paired within subjects design.

A post-hoc Wilcoxon rank sum test was used to analyze the resulting rankings (1 to 19) of the 19 skills in each skillset and confirmed a significant difference, $p < .05$, exists between the ranks of current and future importance of skills. Many of the top skills that are currently viewed as most important today remain nearly unchanged for what is deemed to be important skills for tomorrow or in the future. Some of the most notable differences were in Leadership which leaped three (3) positions to take the fifth spot, while Decision Making dropped to eighth, with both skills still showing above average importance. Another noticeable difference was Relationships moved up three (3) positions to the seventh spot. Interestingly, the least

important skills in the given skillset, from both current and future perspectives, were Financial Analysis, Technical Capability, and Negotiation.

Analysis 2: Current Capability and Current Availability Categorization (Classification)

A subsequent inquiry aimed to measure Current Capability (CC) and Current Availability (CA) to gain perspective on existing internal competencies reflected in the CC measures and on external accessibility of skill reflected in the CA measures. Table 4 lists the mean ratings perceived for the CC and CA for each skill and are categorized as high (above) or low (below) the grand means of 3.450 and 3.201 for CC and CA, respectively. Results show less than half of the included skills received LL (low-low) classification for having low CC and low CA, which indicates a scarcity for the given skills. Interestingly, many of the skills that were perceived as highly important were rated HH (high-high) for having high CC and high CA, which indicates a potential surplus for these skills. Leadership, however, was classified as LL and falls in the top ten for Current Importance (CI) skills and in the top five for Future Importance (FI) skills. Firms may judge their internal talent as capable in several skills and

not capable in other skills, then discover that a number of the same skills may or may not be available in the labor market to fill any deficiencies. Thus, it appears useful to measure CC and CA to gain a broader view on potential skill shortages and potential skill surpluses by assessing what firms have internally and what firms believe is available externally.

While it is useful to measure and classify CC and CA, as it contrasts what resources a firm has internally and what resources are available externally, only assessing CC and CA may fall short of distinguishing how critical a resulting skill shortage or skill surplus in supply really is without factoring in some weight for importance of a skill to provide more precision in assessing overall skill needs. For example, a firm might express concern whenever they find a sizeable skill gap from having low CC (capability) and low CA (availability). However, the concern could be moot if it is discovered that a particular skill is perceived as having low Current Importance (CI), low Future Importance (FI), or both. A firm would likely face a similar paradox when making talent management decisions based solely on skill importance, as a highly important skill may be prevalent internally as a current capability

TABLE 3
INDUSTRY RATING & RANKING COMPARISONS OF CURRENT AND FUTURE SKILL IMPORTANCE

SKILL CODE	Current Importance		Future Importance		Mean difference	t	p-value	Rank Current Imp.	Rank Future Imp.	Δ RANK
	M	SD	M	SD						
S1 = Analytical Skills	4.470	.6220	4.460	.6110	.0100	.249	.803	3	3	0
S2 = Communication	4.560	.6290	4.510	.5860	.0500	1.164	.246	2	1	1
S3 = Change Management	4.140	.7980	4.290	.6850	-.1500	-2.827	.005*	12	10	2
S4 = Project Management	3.970	.8580	4.110	.8170	-.1400	-2.384	.018*	15	15	0
S5 = Problem-solving	4.590	.5460	4.470	.5920	.1200	2.252	.026*	1	2	-1
S6 = Leadership	4.260	.7760	4.380	.6730	-.1200	-2.029	.044*	8	5	3
S7 = Ability to plan	4.190	.7070	4.170	.6940	.0200	.482	.630	11	12	-1
S8 = Decision-Making	4.350	.7170	4.310	.6460	.0400	.391	.696	5	8	-3
S9 = Creative thinking	4.010	.7960	4.130	.6930	-.1200	-2.159	.032*	14	13	1
S10 = Relationship	4.220	.7500	4.320	.6910	-.1000	-1.668	.097†	10	7	3
S11 = Negotiation skills	3.630	1.0120	3.800	.9400	-.1700	-2.557	.011*	17	19	-2
S12 = Financial analysis	3.600	.9870	3.920	.8380	-.3200	-4.975	.000*	19	18	1
S13 = Technical capability	3.620	.8520	4.030	.7630	-.4100	-6.409	.000*	18	17	1
S14 = Big Picture	4.260	.7840	4.290	.6910	-.0300	-.669	.504	9	11	-2
S15 = Active listening	4.100	.7150	4.130	.7140	-.0300	-.464	.643	13	14	-1
S16 = Ability to learn quickly	4.400	.6830	4.390	.6380	.0100	.218	.828	4	4	0
S17 = Ability to work in teams	4.340	.7690	4.370	.7050	-.0300	-.507	.613	6	6	0
S18 = Ability to handle high pressure	4.300	.6970	4.310	.7080	-.0100	-.201	.841	7	9	-2
S19 = Measurement/assessment	3.850	.8080	4.060	.7260	-.2100	-3.354	.001*	16	16	0
Paired Within-Subjects t-test	4.150	.3032	4.234	.1933	.0837	2.765	0.013*			

*p < .05; †p < .10

TABLE 4
CURRENT CAPABILITY & CURRENT AVAILABILITY MEAN CLASSIFICATION

SKILL CODE	Current Capability (CC)		Current Availability (CA)		Combined Classification (CC/CA)	Rank Current Imp.	Rank Future Imp.
	M = 3.450	Category	M = 3.201	Category			
S1 = Analytical Skills	3.660	H	3.330	H	HH	3	3
S2 = Communication	3.560	H	3.370	H	HH	2	1
S3 = Change Management	3.310	L	2.840	L	LL	12	10
S4 = Project Management	3.360	L	3.080	L	LL	15	15
S5 = Problem-solving	3.660	H	3.410	H	HH	1	2
S6 = Leadership	3.350	L	3.010	L	LL	8	5
S7 = Ability to plan	3.590	H	3.270	H	HH	11	12
S8 = Decision-Making	3.600	H	3.230	H	HH	5	8
S9 = Creative thinking	3.220	L	3.050	L	LL	14	13
S10 = Relationship	3.550	H	3.250	H	HH	10	7
S11 = Negotiation skills	3.110	L	2.900	L	LL	17	19
S12 = Financial analysis	3.110	L	3.010	L	LL	19	18
S13 = Technical capability	3.380	L	3.310	H	LH	18	17
S14 = Big Picture	3.150	L	2.870	L	LL	9	11
S15 = Active listening	3.320	L	3.090	L	LL	13	14
S16 = Ability to learn quickly	3.760	H	3.760	H	HH	4	4
S17 = Ability to work in teams	3.830	H	3.750	H	HH	6	6
S18 = Ability to handle high pressure	3.700	H	3.100	L	HL	7	9
S19 = Measurement/assessment	3.360	L	3.180	L	LL	16	16

and widely accessible in terms of CA in the labor market, thus presenting less reason for concern given the forecasted skill surplus in periods of high or low demand. It follows that conducting a more extensive skill needs assessment using a composite measure index, which gives weight to importance, capability, and availability, would likely be more informative in the planning and acquisition process in forecasting talent in terms of supply and demand.

Analysis 3: Importance, Capability, and Availability

Composite Index and Skills Forecast

An exploratory effort was made to understand if assessing importance alone can fall short of truly understanding skill needs. Thus, further analysis was conducted to determine the skills needed most when considering multiple factors, specifically current capabilities (CC), current importance (CI) and future importance (FI), and current availability (CA) in today’s labor market. The practice of concurrently analyzing factors, such as importance and performance, has been around for decades (e.g., Martilla and James, 1977). A number of researchers in logistics and supply chain management (e.g., Garver, 2003; Lambert and Sharma, 1990; Lorentz et al., 2013) have demonstrated the utility and practicality of analyzing critical attributes, such as customer satisfaction and

employee skills, using multiple factors, specifically importance and performance. A similar technique is deployed here with CC, CI, FI, and CA in order to create a logistics skill needs assessment (SNA) index to rate and rank the skills in the study.

This analysis takes a comparable approach to the performance-importance method found in literature but utilizes the normalized z scores for importance (CI and FI), capability (CC), and availability (CA). Means were transformed into corresponding z scores to standardize the CC, CI, FI, and CA data because the items were measured using different Likert scale anchors. The transformation allows the standardized scores to be combined into composite scores. In addition, initial capability and availability scores measured on Likert scales were reverse coded before being standardized so original low scores (low capability, low availability) were transformed as higher coefficients. Next, each z score was multiplied by an assigned weight of 0.250 that is the same (equal) for each of the four factors used for this study (e.g., CI for S1 = 0.387 z score x 0.250 weight = 0.097 CI factor score). The separate factor scores for CI, CC, CA, and FI are then added to produce an overall skills needs assessment (SNA) index rating for the skill (e.g., SNA Index Rating for S14 Big Picture = 0.033 + 0.080 + 0.092 + 0.019 = 0.225; Index Rating for S1 Analytical Skill = 0.097 + 0.077 + -0.056 + -

0.036 = 0.082). The scenario examined for this study includes multiple factors that aim to determine needed skills in logistics and SCM. Skill rankings from the scenario are also compared to the initial one dimensional rankings by current skill importance alone to determine if significant differences exist between the rankings by each method. Results are displayed in Table 5.

The analysis follows previous research on importance (e.g., Garver, 2003; Lorentz et al., 2013) but assigns equal weight of 0.250 to each of the four factors: CI (is it important now), CC (do we have it now), CA (can we get it), and FI (is it important for the future). Equality is assumed because respondents were not asked to estimate a weight for each factor. The results shown in Table 5 reveal that some of the top skills needed today,

TABLE 5
ATINGS AND RANKINGS BY INDEX OF SKILL IMPORTANCE,
CAPABILITY, AND AVAILABILITY

SKILL CODE	CI	CC	CA	FI	CI * Weight	CC * Weight	CA * Weight	FI * Weight	Scenario 1 Index Rating by Multiple Factors CI+CC+CA+FI	Scenario 1 Index Rank by Multiple Factors CI+CC+CA+FI	Initial Rank by Single Importance Factor Current Skill	Δ Rank
	z Score	z Score	z Score	z Score	Weight z	Weight z	Weight z	Weight z	INDEX	Note: Rank by Multiple Factors	Note: Rank by Importance Factor Only	
					(0.25)	(0.25)	(0.25)	(0.25)	1.000			
S14= BIGPIC	0.133	0.321	0.369	0.076	0.033	0.080	0.092	0.019	0.225	1	9	8
S6= LEAD	0.133	0.108	0.213	0.199	0.033	0.027	0.053	0.050	0.163	2	8	6
S3= CHANG	-0.013	0.151	0.403	0.076	-0.003	0.038	0.101	0.019	0.154	3	12	9
S2= COMM	0.497	-0.116	-0.189	0.376	0.124	-0.029	-0.047	0.094	0.142	4	2	-2
S5= PR-SO	0.533	-0.222	-0.234	0.321	0.133	-0.056	-0.059	0.080	0.100	5	1	-4
S1= ANA	0.387	-0.222	-0.145	0.308	0.097	-0.056	-0.036	0.077	0.082	6	3	-3
S8= DECIS	0.242	-0.158	-0.033	0.103	0.060	-0.040	-0.008	0.026	0.039	7	5	-2
S18= PRESS	0.181	-0.265	0.112	0.103	0.045	-0.066	0.028	0.026	0.033	8	7	-1
S9= CR-TH	-0.170	0.247	0.168	-0.142	-0.043	0.062	0.042	-0.036	0.026	9	14	5
S15= LISTEN	-0.061	0.140	0.124	-0.142	-0.015	0.035	0.031	-0.036	0.015	10	13	3
S10= RELAT	0.084	-0.105	-0.055	0.117	0.021	-0.026	-0.014	0.029	0.010	11	10	-1
S4= PROJ	-0.219	0.098	0.135	-0.169	-0.055	0.024	0.034	-0.042	-0.039	12	15	3
S7= PLAN	0.048	-0.147	-0.078	-0.088	0.012	-0.037	-0.019	-0.022	-0.066	13	11	-2
S16= LEARN	0.303	-0.329	-0.625	0.212	0.076	-0.082	-0.156	0.053	-0.110	14	4	-10
S19= MEASU	-0.364	0.098	0.023	-0.237	-0.091	0.024	0.006	-0.059	-0.120	15	16	1
S12= FIN	-0.668	0.364	0.213	-0.428	-0.167	0.091	0.053	-0.107	-0.130	16	19	3
S11= NEGOT	-0.631	0.364	0.336	-0.592	-0.158	0.091	0.084	-0.148	-0.131	17	17	0
S17= TEAM	0.230	-0.403	-0.614	0.185	0.057	-0.101	-0.154	0.046	-0.151	18	6	-12
S13= TECH	-0.643	0.076	-0.122	-0.278	-0.161	0.019	-0.031	-0.070	-0.242	19	18	-1

based on the composite of weighted z scores for CI, CC, CA, and FI are: 1) Big Picture, 2) Leadership, 3) Change Management, and 4) Communication. When ranking by importance averages alone, Big Picture, Leadership, and Change Management fall much further down the list in the 9th, 8th, and 12th positions, respectively. A Wilcoxon rank sum test confirmed a significant difference, $p < .05$, exists between the ranks of current skill importance and the index ranks of needed skills, suggesting significant rank changes or differences exist. The most significant change was Change Management moved up nine positions to take the third spot in the ranking of skills. Leadership moved up six positions to second, while Big Picture moved up eight positions to assume first place as the most needed skill in the given skillset. The index method resulted in other significant differences in rankings, particularly the ability to work in teams, which was relegated from the 6th position to the 18th position in the overall ranking of the 19 different skills for logistics and supply chain management.

CONCLUSIONS

Discussion and Implications

From a theoretical perspective, this research supports Barney's (1991) Resource-based View (RBV) theory, as it demonstrates the skills that are important to an organization. Skills must be assessed in terms of availability to make sure critical skills are abundant in an organization or readily acquirable to form the capabilities to achieve high performance and competitive advantage.

From a practitioner perspective, this study shows that compared to earlier studies of important skills for supply chain management and logistics professionals, a different set of skills are most important now. Specifically, big picture, leadership, and change management skills made significant moves to become the most important. Similar to Murphy and Poist (2007), soft managerial skills emerged as being more important than other hard skills. What remains the same, however, are several skills that are corroborated as consistently important

as revealed by this study and past research (e.g., Gibson and Cook, 2001), where Communication, Problem Solving, and Decision Making approach the top of many lists.

Results from this research suggest that skill needs assessments should be conducted regularly as needed skills may change over time. This study also suggests that routine assessments look not only at skill importance but also at internal skill capabilities and external skill availability of requisite job skills to determine the skills that are critically needed to meet current and future job demands of logistics professionals. Leadership, for example, was rated as having low internal capability and low external availability, which indicates that a greater challenge will likely exist when it comes to filling or satisfying the demand for this explicitly important skill from current sources of supply. Practitioners can use the skills needs assessment method with a comparable index to run scenarios specific to their own organization, i.e., using equal or different weights for each factor included in the framework, to produce skill forecasts and to plan for improved talent acquisition.

Organizations with low skills must make it a strategic priority to acquire and develop essential skills to improve performance (Slone et al, 2013). However, with limited external availability for certain skills, employers may have no choice but to "build" an internal bench than to spend additional effort looking to "buy" what they need (Myers et al, 2004). To develop skills, organizations can institute formal training, education, mentoring, or job rotations, for example, that are shown to be impactful in meeting hiring and development needs that in turn enhance performance (Aguinis and Kraiger, 2009). In addition, organizations could benefit from having improved selection methods (e.g., better defined job postings) so the proper talent is available at time of hire versus after a period of internal development (Gibson et al, 2013; Williams et al, 2011). Improving talent fit in a given role is beneficial to keeping logistics employees satisfied in their role or career (Goffnett et al, 2012). Ellinger and Ellinger (2013) suggest a number of HR

interventions that can improve specific skill sets, such as Team Leadership.

From an academic perspective, educators can be better informed of changing demands and work to support industry needs by helping to produce talent who possess essential skills. Curriculum should cover important and essential skills, particularly those that are critical with low current capabilities or availability in industry. Skills can be introduced through cases, lectures, quizzes, tours, etc. In addition, educators can provide greater skills awareness and competency development by exposing students to stimulating group work and special projects (Pyne, Dinwoodie, and Roe, 2007; Yi, 2012). This can also be accomplished through supply chain simulations and logistics case competitions, student organization activities involving real-world projects, professional development events (e.g. career fairs, facility tours, industry certifications) and community service. Educators could develop a service-learning project opportunity with a non-profit organization that requires students to use needed or essential skills, such as change management and problem solving, to enhance learning and develop professional skills while providing supply chain solutions (Goffnett et al, 2012; Yi, 2012).

Limitations, and Future Research

This exploratory research suggests that the supply chain profession needs leaders – today! The industry needs transformational leaders who see the Big Picture, can inspire with Leadership character to motivate others toward common goals, identify and manage needed Change, while exercising clear Communication to aid in Problem-Solving and Analytics that inform Decision Making for success.

This study, however, had a number of limitations. First, a convenience sample of logistics alumni was used in this research, thus the generalizability of the study may be narrow. Future research that investigates a larger or more representative sample should be completed to extend the body of skills research. For instance, it would be interesting to see what skill sets are important in other SCM related functions, such as purchasing or production

control. Second, this study encompassed a broad set of skills that may or may not be applicable to every function or level in logistics and supply chain management. A third limitation is the inherent challenge with accuracy that surrounds practically every method used to forecast something. One truism is forecasts are always wrong (Wallace, 2006). A fourth limitation may be present in the single-item measures for each skill. Future research might explore the specific structure of each skill to identify items that may offer greater characterization and accuracy in measuring the variables used in the study and to enhance reliability and validity of each skill domain. For example, the “technical capability” variable is likely to have multiple dimensions to it that may better describe the skill and allow improved assessment of criticality using a skill needs assessment (incl. importance, capability, availability). For example, “technical capability: could include dimensions related to everything from modeling, to Excel skills, to an understanding of engineering drawings depending on the job function. Likewise, research on “relationships” show that relationship skill can include or be demonstrated by items such as amount of interaction, information sharing, and cooperation (Boles, Brashear, Bellenger and Barksdale, 2000), and research has also shown that relationships and communication, specifically information exchange, are strong predictors of buyer satisfaction with supplier performance (Graca, Barry and Doney, 2015).

Additional research that explores essential KSAs not only at various levels in the organizational hierarchy but also in terms of workforce differentiation (Huselid and Becker, 2011) that examines key employee segments (Dries and De Gieter, 2014; Gibson and Cook, 2003), specifically high performing groups that exist are needed within an organization, given their potential to have a positive impact on performance (Collings and Mellahi, 2009; Myers et al, 2004; Zheng, Garrick, Atkinson-Palombo, McCahill, and Marshall, 2013). For example, previous studies in the sales segment show that top sales people possess strong “people skills” such as communication and relationship building (Rich and Smith, 2000), which in turn can impact performance (Graca, Barry and Doney,

2015). Research that examines the skills needed by sales people who work in logistics for freight brokerages would provide greater understanding of the skills needed in both the Sales and logistics fields. What specific type of supply chain logistics skills are needed at each hierarchical level from entry level to executive level? When important skills are not available, how do organizations respond to fill gaps and needs?

As SCM truly is a multi-disciplinary function, it is likely that the human resource activities to support logistics, and many other SCM functions, may provide unique challenges that call for much needed future research. Skills needs assessment and talent management in SCM related jobs require additional research (Leon and Uddin, 2016). While recent literature shows no consensus as to the specific skills that are most important for supply chain and logistics professionals, this trend suggests that industry needs change over time. Thus, further research might take a longitudinal view to evaluate skill requirements at each hierarchical level in logistics careers to determine the changes or differences in what is essential to each role over time.

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APPENDIX A
SIGNIFICANTLY DIFFERENT MEAN SKILL IMPORTANCE
RATINGS SORTED HIGH TO LOW
PAIRED T-TEST RESULTS FOR ANALYSIS 1

	Mean	SD	S5	S2	S1	S16	S8	S17	S18	S6	S14	S10	S7	S3	S15	S9	S4	S19	S11	S13	S12	
S5	4.590	.546																				
S2	4.560	.629	ns																			
S1	4.470	.622	ns	ns																		
S16	4.400	.683	***	*	ns																	
S8	4.350	.717	***	**	ns	ns																
S17	4.340	.769	***	**	ns	ns	ns															
S18	4.300	.697	***	***	*	ns	ns	ns														
S6	4.260	.776	***	***	**	ns	ns	ns	ns													
S14	4.260	.784	***	***	**	ns	ns	ns	ns	ns												
S10	4.220	.750	***	***	***	*	ns	ns	ns	ns	ns											
S7	4.180	.707	***	***	***	**	*	ns	ns	ns	ns	ns										
S3	4.140	.798	***	***	***	**	**	*	*	ns	ns	ns	ns									
S15	4.100	.715	***	***	***	***	**	**	**	*	*	*	ns	ns								
S9	4.010	.796	***	***	***	***	***	***	***	*	***	*	*	ns	ns							
S4	3.970	.858	***	***	***	***	***	***	***	**	***	**	**	ns	ns	ns						
S19	3.850	.808	***	***	***	***	***	***	***	***	***	***	***	***	**	ns	ns					
S11	3.630	1.012	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	*				
S13	3.620	.852	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	**	ns		
S12	3.600	.987	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	ns	ns

*p < .05; **p < .01; ***p < .001; ns = not significant (p ≥ .10)

Note: This Appendix presents the results of the series of paired t-tests and lists the skills from most important to least important that informed Analysis 1.