Multi-study analysis of learning culture, human capital and operational performance in supply chain management

The moderating role of workforce level

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Abstract

Purpose – The purpose of this study is to empirically evaluate the relationship between learning culture, workforce level, human capital and operational performance in two diverse supply chain populations, aircraft maintenance and logistics readiness.

Design/methodology/approach – Drawing upon competence-based view of the firm and human capital theory, this paper analyzes data from two studies.

Findings – The results provide support for the hypothesized model. Workforce level moderates the relationship between learning culture and human capital, and human capital partially mediates the relationship between learning culture and operational performance.

Research limitations/implications – The findings have implications for behavioral supply chain management research and implications for educating and training the supply chain management workforce. While the populations represent a diverse set of logistics functions and responsibilities, the participants are all military members, which may limit generalizability.

Practical implications – This study should help leaders understand the importance of learning culture and the perceived differences in its effect on human capital based upon workforce level.

Originality/value – This research is among the first to investigate the role of workforce level and answers a multitude of calls for research into the human side of supply chain management.

Keywords Human capital, Behavioural supply chain management, Learning culture, Competence-based view, PROCESS model

Paper type Research paper

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Introduction

Researchers acknowledge that supply chain management is first and foremost about the people that make up the supply chain workforce; however, studying those people remains the most underrepresented topic in supply chain management research (Myers, Griffith, Daugherty, and Lusch, 2004; Sweeney, 2013; Wieland *et al.*, 2016; Schorsch *et al.*, 2017). The boundary spanning nature of supply chain management in today's global marketplace requires a workforce with an ever-increasing level of knowledge, skills and abilities to ensure firm success (Hohenstein *et al.*, 2014). Regrettably, there is a predicted shortage of talented supply chain managers (Ellinger and Ellinger, 2014; Ruamsook and Craighead, 2014; Leon and Uddin, 2016; Harrist, 2018). Consequently, it is of the utmost importance that researchers address the neglected area of educating, developing and training the supply chain workforce (Ellinger *et al.*, 2005; Carter *et al.*, 2007; Keller and Ozment, 2009; Derwik and Hellström, 2017).

A firm with a learning culture works to create, acquire, and transfer knowledge through development and training of its workforce (Garvin, 1993). Cooper *et al.* (2016) acknowledged two major forces leading to an increased emphasis on supply chain workforce development and training: effective management of a firm's supply chain is essential to its success, and the judicious investment in human capital is needed to make the best use of limited resources. Having an active and formulated learning culture has been shown to be a factor in creating competitive advantage for a firm (Hult *et al.*, 2003; Manuj *et al.*, 2013). This firm-specific learning culture can be the catalyst for establishing long-term competitive advantage and enabling the firm to develop the workforce to fit the precise needs of their specific supply chain. Workforce competence in the form of human capital is not only significant to supply chain operational and financial performance but also may very well be the only sustainable competitive advantage (Stata, 1989; Bowersox *et al.*, 2000; Ellinger *et al.*, 2002; Derwik and Hellström, 2017). This leads to our research question:

> *RQ.* How are learning culture, human capital and operational performance related and what is the role of workforce level in that relationship?

Thus, the purpose of this research is to examine the relationship between learning culture, human capital and operational performance and how workforce level influences the perceived relationship between learning culture and human capital. Two datasets were collected one year apart from 449 Logistics Readiness Officers (LROs) and 448 Aircraft Maintenance Officers (Mx Officers) to examine their perspectives across three workforce levels as recommended by Autry and Daugherty (2003) and Williams *et al.* (2011). The jobs performed by LROs vary greatly and typify a wide array of functions performed by civilian logistics managers (e.g. air terminal manager, inventory manager, logistics planner, petroleum storage and distribution manager, vehicle fleet manager). Although related to LROs, Mx Officers perform distinct functions that also have civilian counterparts (aircraft production, aircraft maintenance, material ordering, scheduling, etc.).

This study makes important theoretical and empirical contributions to behavioral supply chain management literature. With the predicted shortfall of talent within the supply chain workforce, there is growing interest in human resource management and the development of the knowledge, skills and abilities needed to effectively manage today's global supply chain (Sweeney, 2013; Ellinger and Ellinger, 2014; Hohenstein *et al.*, 2014). This research contributes to the literature by leveraging competence-view of the firm and human capital theory to increase our understanding of how learning culture effects operational performance and the mediating role of human capital and the moderating role of workforce level. Limited research efforts have studied the human side of supply chain management (Tokar, 2010; Donohue and

Siemsen, 2011; Thomas, 2014; Schorsch *et al.*, 2017) and fewer still have evaluated the individual level of analysis (Knemeyer and Naylor, 2011; Cantor, Blackhurst, and Cortes, 2014). This paper adds to that small, but growing body of research by evaluating perception data from supply chain managers at multiple workforce levels.

In the next two sections, the pertinent literature and theory motivate the theoretical model and hypotheses. The fourth section describes the methodology, which includes the development and testing of the survey instruments, a discussion of the two samples, and the data analysis using covariance-based structural equation modeling and the PROCESS Procedure for SPSS Release 3.00. Finally, the fifth section discusses the research findings, contributions to theory and managers, limitations, and future research.

Theoretical grounding

This research is grounded in the competence-based view of the firm and human capital theory. These theories help explain the connections between learning culture, human capital and operational performance.

Competence-based view

The competence-based view is founded upon and has theoretical footings in studying the competitiveness of the firm (Freiling, 2004; Freiling *et al.*, 2008). As such, the predominant purpose of competence research is to explain firm performance differences by attributing them to the firm's ability to leverage competences (Barney, 1991). These competencies are the knowledge, skills and capabilities imbedded in the firm's structure, technology, processes and interpersonal relationships (Lado and Wilson, 1994; Teece *et al.*, 1999). To differentiate a firm from its rival, these competencies should provide a repeatable, non-random ability to render competitive output based on knowledge (Hult *et al.*, 2003; Freiling *et al.*, 2008).

Improving firm competences does not depend simply on achieving excellence in one or two key success factors, but rather on developing an interrelated and balanced set of success factors that in turn depend on achieving proper balance and alignment between competences and managerial processes. Competence-based view, as a part of the resource-based view of the firm, has helped bridge the gap in the field of human resource management and corporate strategy (Barney and Arikan, 2001; Wright, Dunford, and Snell, 2001). This area of research has focused on various bundles of human resource practices that can have the effect of creating significant firm-specific human capital investments (Barney and Arikan, 2001). Learning as a competency is an intangible resource that seems likely to drive supply management success (Das and Teng, 2000; Hult *et al.*, 2000). As most members of a supply chain do not have a common firm affiliation to link them, the development of a strategic resource such as learning may provide a bonding element to enhance supply chain success (Hult *et al.*, 2003).

Human capital theory

Schultz (1961) formally introduced the concept of human capital theory. The theory suggests that the economic benefits from human capital investment not only benefit the individual but also society at large (Sweetland, 1996). The general consensus is that the aim of human capital (i.e. the skills, knowledge, and experience possessed by employees) is to increase both employee and firm performance (Ployhart and Moliterno, 2011). However, a basic premise of human capital theory is that firms do not own human capital, the individual employees do (Wright *et al.*, 2001). While firms may have access to human capital, managers may not always deploy that human capital in a manner that achieves strategic impact (Wright *et al.*, 2001).

Becker (1962) specified human capital as either general or specific to the job. General training increases trainee productivity by the same amount as in other firms offering the same training while specific training is provided by firms to equip trainees with knowledge, skills and abilities that will differentiate their trainees from those of other firms (Becker, 1962; Hatch and Dyer, 2004). Employer provided training that is valuable, rare, inimitable, and non-substitutable will result in a workforce that is expected to earn a higher return on the firm's human capital investment (Blundell *et al.*, 1999; Wright *et al.*, 2001; Hatch and Dyer, 2004). As with investments in physical capital, human capital investment will only be undertaken by the individual or firm if the expected return from the investment is greater than the market rate of interest (Blundell *et al.*, 1999).

There is broad agreement that a strategic approach to human resource management involves designing and implementing a set of internally consistent policies and practices that ensure human capital contributes to the achievement of a firm's business objectives (Huselid *et al.*, 1997). The significant relationship between strategic human resource management effectiveness and employee productivity is consistent with the competence-based view of the firm (Huselid *et al.*, 1997). That is, human resources should be managed strategically to fit the characteristics of the firm and its environment and to facilitate a firm's ability to achieve its intended outcomes (Lengnick-Hall *et al.*, 2013). Clearly, strategic human resource management practices aimed at leveraging human capital contribute to creating and capitalizing on strategic benefits for the firm. From this perspective, the idea has expanded at the firm level to include human capital as unique intellectual, process, or product competencies that give a firm a competitive advantage, and where the collective learning and performance capabilities of the firm contribute to overall firm success (Barnes and Liao, 2012).

Hypothesis development

Research model

This study integrates the competence-based view of the firm and human capital theory to investigate the relationship between learning culture, workforce level, human capital and operational performance. To address the aforementioned gaps in research, this research proposes a conceptual model (Figure 1) and develops the pertinent hypotheses below.

Learning culture and human capital

Culture is critical to a firm's success. Firms with a learning culture are skilled at creating, acquiring, transferring knowledge, and, when needed, modifying its behavior to reflect new knowledge and insights (Garvin, 1993). Researchers and practitioners alike have become increasingly interested in the competitive advantages created by firms that foster and promote learning (Kontoghiorghes *et al.*, 2005; Manuj *et al.*, 2013).

Managers must engage in knowledge management processes to create a culture that values and promotes learning (Marsick and Watkins, 2003; Kandemir and Hult, 2005; Pantouvakis and Bouranta, 2013). However, managers at different workforce levels play differing roles with regard to education and training decisions based upon their differing responsibilities and

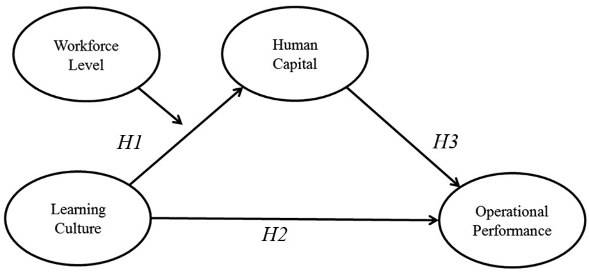

Figure 1.
Conceptual model

objectives (e.g. program approval, resource allocation, and importance placed on the program) (Maloni *et al.*, 2017). While the importance of employee perceptions across workforce levels in supply chain management has been noted by scholars (Autry and Daugherty, 2003; Williams *et al.*, 2011), little empirical work has been done in this area. The importance of organizational learning toward organizational performance has been outlined as a process by which managers try to increase human capital capabilities to effectively understand and manage the organization and its environment (Škerlavaj *et al.*, 2007). Thus, this research seeks to add to this important research area by proposing and testing the following hypothesis.

H1. The relationship between learning culture and human capital, while positive, will differ based upon workforce level.

Learning culture and operational performance

Effective training and development programs are an integral part of a learning culture that can attract and retain a supply chain workforce with the needed skills and competencies. Firms with such programs have a process in place to transform learning into a mechanism to create value (Aggestam, 2006). Researchers have shown a significant correlation between firms with a learning culture and increased firm performance, both operational and financial (Ellinger *et al.*, 2002; Marsick and Watkins, 2003; Yang, 2003; Kontoghiorghes *et al.*, 2005; Škerlavaj *et al.*, 2007; Tseng, 2010). Therefore, we propose the following hypothesis:

H2. Learning culture is positively related to operational performance.

Mediating effect of human capital

A firm's success is inextricably linked to the investment it makes in enhancing human capital through employee training and education, which creates unique, distinctive and difficult-to-imitate competencies (Barnes and Liao, 2012). The positive relationship between human capital investment and firm performance is widely acknowledged (Huselid *et al.*, 1997; Hitt *et al.*, 2001; Hatch and Dyer, 2004; Hsu, 2008; Alpkan *et al.*, 2010; Barnes and Liao, 2012; Lengnick-Hall *et al.*, 2013). Therefore, firms train and educate employees in the hope of gaining a return on the investment in terms of being more productive, more competitive, and consequently a more successful firm in the future (Blundell *et al.*, 1999).

Based upon this understanding, it follows that a firm that invests in, develops, and values its human capital should garner positive firm-level outcomes. We posit that human capital not only has a direct effect on operational performance, but also a mediating effect between learning culture and operational performance. Thus, we propose the following hypotheses.

H3. Human capital mediates the relationship between learning culture and operational performance.

Methodology

Instrument development and refinement

Existing scales were adapted and incorporated into a single survey to capture participant perceptions about learning culture, human capital and operational performance. The learning culture scale was adapted from the scale developed by Marsick and Watkins (2003). Human capital was measured with the scale developed by Subramaniam and Youndt (2005). The dependent variable, operational performance of the particular unit to which the participant was assigned at the time, was measured using a scale adapted from the work of Delaney and Huselid (1996). All items were measured on a seven-point Likert scale ranging from strongly disagree to strongly agree. All constructs had an original Cronbach's alpha measure greater than 0.70. Appendix 1 contains all of the survey questions.

Pilot test

In both studies pre-tests were done to ensure item specificity, readability, representativeness and face validity. Graduate students, faculty members and logistics practitioners were selected to complete the survey and provide feedback about any procedural or production problems (Dillman, 2007). The survey was edited for better clarity and grammatical fidelity based on their feedback. Additionally, both studies included pilot tests and no issues were identified prior to the full-scale release of the surveys.

Study 1

Overview

In 2013, survey data were collected from LROs from around the world in their own organizational setting. Thus, the population of interest for Study 1 was LROs in the ranks of lieutenant (less than 4 years in the military) through colonel (up to 30 years in the military). The workforce levels below represent substantially different levels of responsibility. The aim was to sample the entire population of 1,518 logisticians, but only 1,411 could be reached via e-mail. As depicted in Table I, 449 completed surveys for an effective response rate of 31.8 per cent were received.

Data preparation

Prior to factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) Measure of sampling adequacy and Bartlett's test of sphericity. Suitability for factor extraction is dependent on a KMO index greater than 0.50 and a significant Bartlett's test. The KMO index was 0.89 and the Bartlett's test was significant at $p < 0.001$, which indicates the suitability of the data for factor analysis. As shown in Appendix 2, three factors were retained using principal component analysis with Promax rotation.

To ensure the data met the assumptions of covariance-based structural equation modeling, we first analyzed the data in IBM SPSS Statistics 24. There were no missing values, the Durbin-Watson value was 1.73, indicating no significant autocorrelation, and the highest variance inflation factor was 2.16, indicating no significant multi-collinearity (Gefen *et al.*, 2011). Additionally, an evaluation of the histogram of the standardized residuals and the normal P-P plot indicate no significant departures from normality.

To evaluate the measurement model, we used covariance-based structural equation modeling in AMOS 24 because of the confirmatory nature of this study (Hazen *et al.*, 2015). Following the procedure recommended by Anderson and Gerbing (1988), we performed a confirmatory factor analysis using maximum likelihood estimation on the survey measures.

Table I.
Study 1: Sample characteristics

Workforce level	Time as logistician	Count	(%)
Lieutenants	<4 years	86	19.2
Captain and majors	4-15 years	238	53.0
Lieutenant colonel and colonels	>15 years	125	27.8

Note: $N = 449$

We evaluated each latent construct separately and found that all item loadings were statistically significant. The exact fit measure for the model [$\chi^2_{(308)} = 503.30, p < 0.001$] was significant. However, the exact fit test is influenced by sample size and is considered too stringent by some researchers (Hu and Bentler, 1999; Chen *et al.*, 2008). The approximate fit indices (χ^2/df = 1.63, GFI = 0.94, CFI = 0.97, RMSEA [0.90 CI] = 0.03 [0.02, 0.03], and SRMR = 0.04) collectively indicate acceptable model fit (Hair *et al.*, 2010).

All three constructs had a Cronbach's alpha greater than 0.85 and composite reliability values were greater than 0.84, providing evidence of construct reliability (Table II). Also, every item loaded on the intended construct with a significant critical ratio and the standardized loadings were all greater than 0.5, providing evidence of convergent validity (Gefen and Straub, 2005). The square root of the average variance extracted (AVE) for each construct was compared to the correlation between each possible pair of constructs. Discriminant validity was supported by each correlation being smaller than the square root of the construct AVE (Fornell and Larcker, 1981; Hair *et al.*, 2010).

In an effort to help prevent common method bias, we followed steps prescribed in survey method literature during our study's early stages to help preclude common method bias (e.g. we ensured the participant of confidentiality and limited the jargon used in the survey). Following data collection, we used Harman's one factor test to determine if common method bias was a significant threat. Analysis of the unrotated factor solution revealed three factors with eigenvalues greater than one. The three factors accounted for 63.80 per cent of the variance collectively, and individually accounted for 39.92, 14.45 and 9.43 per cent the variance, respectively. There was no general factor that accounted for more than 50 per cent of the variance (Podsakoff *et al.*, 2003; Yang *et al.*, 2008). Additionally, we inserted a common latent factor into the model which did not change the significance of any model paths providing further support that common method bias does not appear to be a significant problem (Flöthmann *et al.*, 2018).

To assess non-response bias, we compared early and late responses (Armstrong and Overton, 1977; Rogelberg and Stanton, 2007; Clottey and Grawe, 2014). Data from individuals who completed the survey between the initial contact and the second contact were compared against the data from the individuals who completed the survey between the second contact and the time the survey was closed. A comparison of the mean value for each construct between the two groups was performed via two-way t-tests. Results suggested no significant difference in means, indicating non-response bias is unlikely to threaten the validity of this study.

Results

We followed the guidance of Hayes (2018) to test our conceptual model and hypotheses and used PROCESS Procedure for SPSS Release 3.00 Model 7 as shown in Figure 2. Because the

	Mean	SD	CA	CR	LC	HC	OP
Learning Culture (LC)	5.48	0.99	0.86	0.88	*0.74*		
Human Capital (HC)	5.60	0.89	0.87	0.89	0.41	*0.78*	
Operational Performance (OP)	4.66	1.06	0.86	0.85	0.65	0.43	*0.75*

Notes: SD: standard deviation; CA: Cronbach's alpha; CR: composite reliability; The square-root of the AVE is shown on the diagonal in italics; Bivariate correlations are shown in the off diagonal; All correlations are significant at $p < 0.01$. $N = 449$

Table II. Study 1: Descriptive statistics and correlations

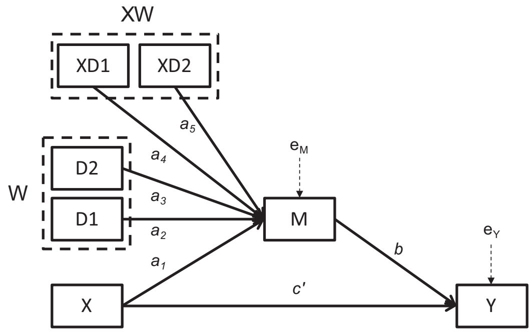

Figure 2.
Statistical diagram

moderator variable is multicategorical, we followed Hayes' (2018) step by step guidance to use SPSS syntax to create dummy variables for two of the three workforce levels. The results of the regression analysis are shown in Tables III.

H1 proposed that the relationship between learning culture and human capital, while positive, will differ based upon workforce level. In support of *H1*, the test of the highest order unconditional interaction was significant [$F(2, 443) = 4.20, p < 0.016$]. The conditional effects of the focal predictor at values of the moderator were also significant at each workforce level [Lieutenant ($\beta = 0.46, t = 4.71, p < 0.001$), Captain and Major ($\beta = 0.43, t = 8.28, p < 0.001$) and Lieutenant Colonel and Colonel ($\beta = 0.19, t = 2.54, p < 0.012$)]. The moderation effect is shown in Figure 3. As recommended by Hayes (2018), we evaluated low, middle and high values of learning culture using the 16th, 50th and 84th percentiles, respectively.

H2, which proposed a positive relationship between learning culture and operational performance, was supported ($\beta = 0.54, t = 12.71, p < 0.001$). *H3* proposed that human capital would mediate the relationship between learning culture and operational performance. Mediation is supported by all the bootstrapped conditional indirect effects being positive (0.10, 0.09 and 0.04) and their 95 per cent confidence intervals not including zero (Hayes, 2018).

Table III.
Study 1: Model output

		Consequent						
		M (HC)				Y (OP)		
		β	SE	$p \leq$		β	SE	$p \leq$
Constant	i_M	3.01	0.55	0.000	i_Y	0.55	0.27	0.047
X (LC)	a_1	0.46	0.10	0.000	c'	0.54	0.04	0.001
D1 (WL)	a_2	0.22	0.62	0.728				
D2 (WL)	a_3	1.67	0.69	0.016				
XD1 (LC × WL)	a_4	−0.03	0.11	0.814				
XD2 (LC × WL)	a_5	−0.27	0.12	0.027				
M (HC)					b	0.22	0.05	0.001
		$R^2 = 0.19$ $F(3, 445) = 33.59, p < 0.001$				$R^2 = 0.38$ $F(2, 446) = 138.65, p < 0.001$		

Notes: LC: learning culture; WL: workforce level; HC: human capital; OP: operational performance

Study 2

Overview

As a follow-on study in 2014, we collected survey data from Aircraft Maintenance Officers (Mx Officers) working around the world in their own organizational setting. The population of interest was Mx Officers in the rank of second lieutenant through colonel, which at that time was 1,337. As depicted in Table IV, we gathered 448 completed surveys for an effective response rate of 33.5 per cent.

Data preparation

The KMO index was 0.90 and the Bartlett's test was significant at $p < 0.001$, which indicates the suitability of the data for factor analysis. As shown in Appendix 2, three factors were retained using Principal Component Analysis with Promax rotation. There were no missing values. The Durbin-Watson value was 1.76 indicating no significant autocorrelation, and the highest variance inflation factor was 1.51 indicating no significant multi-collinearity (Gefen *et al.*, 2011). An evaluation of the histogram of the standardized residuals and the normal P-P plot indicate no significant departures from normality.

Following the procedure recommended by Anderson and Gerbing (1988), we performed a confirmatory factor analysis using maximum likelihood estimation on the survey measures. We evaluated each latent construct separately and found that all item loadings were statistically significant. The exact fit measure for the model [$\chi^2_{(344)} = 464.03, p < 0.001$] was significant. However, the approximate fit indices (χ^2/df = 1.35, GFI = 0.94, CFI = 0.99, RMSEA [0.90 CI] = 0.02 [0.02, 0.02] and SRMR = 0.03) collectively indicate acceptable model fit (Hair *et al.*, 2010).

All three constructs had a Cronbach's alpha greater than 0.87 and composite reliability values were greater than 0.86 (Table V). These measures provide evidence of construct reliability. Also, every item loaded on the intended construct with a significant critical ratio

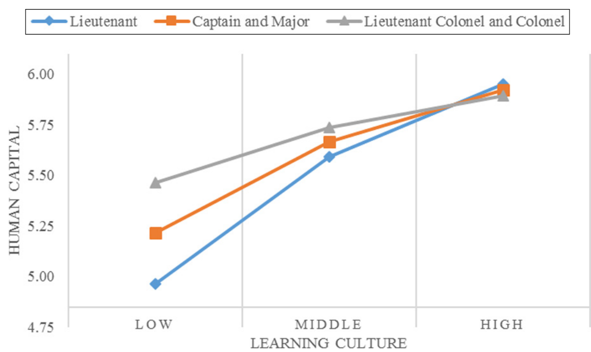

Figure 3. Study 1: Moderation effect of workforce level

Workforce level	Time as logistician	Count	(%)
Lieutenants	<4 years	87	19.4
Captain and majors	4-15 years	237	52.9
Lieutenant colonel and colonels	>15 years	124	27.7

Note: $N = 448$

Table IV. Study 2: Sample characteristics and the standardized loadings were all greater than 0.5, providing evidence of convergent validity (Gefen and Straub, 2005). The square root of the AVE for each construct was compared to the correlation between each possible pair of constructs. Discriminant validity was supported by each correlation being smaller than the square root of the construct AVE (Fornell and Larcker, 1981; Hair *et al.*, 2010).

In an effort to help prevent common method bias, we followed steps prescribed in survey method literature during our study's early stages to help preclude common method bias (e.g. we ensured the participant of confidentiality and limited jargon). We used Harman's one factor test to determine if common method bias was a significant threat. Analysis of the unrotated factor solution revealed four factors with eigenvalues greater than one. The three factors accounted for 68.46 per cent of the variance collectively, and individually accounted for 45.06, 14.08 and 9.34 per cent of the variance, respectively. As there was no general factor that accounted for more than 50 per cent of the variance (Podsakoff *et al.*, 2003; Yang *et al.*, 2008). Additionally, we inserted a common latent factor into the model, which did not change the significance of any model paths. Taken together these tests support that common method bias does not appear to be a significant problem (Flöthmann *et al.*, 2018).

Non-response bias was measured by comparing the Likert scale data received in the first wave to that of the second wave as suggested by Rogelberg and Stanton (2007). Data from individuals who completed the survey between the initial contact and the second contact were compared against the data from the individuals who completed the survey between the second contact and the time the survey was closed. A comparison of the mean value for each construct between the two groups was performed via two-way t-tests. Results suggested no significant difference in means, indicating non-response bias is unlikely to threaten the validity of this study.

Results

We followed the guidance of Hayes (2018) to test our conceptual model and hypotheses. We used the PROCESS Procedure for SPSS Release 3.00 Model 7, as shown in Figure 2. Because the moderator variable is multicategorical, we followed Hayes' (2018) step by step guidance to use SPSS syntax to create dummy variables for two of the three workforce levels. The results of the regression analysis are shown in Table VI.

H1 proposed that learning culture and human capital, while positive, will differ based upon workforce level. In support of *H1*, the test of the highest order unconditional interaction was significant [$F(2, 442) = 5.47$, $p = 0.005$]. The conditional effects of the focal predictor at values of the moderator were also significant at each workforce level [Junior Management ($\beta = 0.75$, $t = 10.09$, $p < 0.001$), Middle Management ($\beta = 0.46$, $t = 9.29$, $p < 0.001$) and Senior Management ($\beta = 0.50$, $t = 6.12$, $p < 0.001$)]. The moderation effect is shown in Figure 4.

	Mean	SD	CA	CR	LC	HC	OP
Learning Culture (LC)	5.29	1.14	0.89	0.89	*0.76*		
Human Capital (HC)	5.41	1.07	0.90	0.91	0.63	*0.82*	
Operational Performance (OP)	4.52	1.09	0.88	0.87	0.57	0.42	*0.75*

Notes: SD: standard deviation; CA: Cronbach's alpha; CR: composite reliability The square-root of the AVE is shown on the diagonal in italics; Bivariate correlations are in shown the off diagonal; All correlations are significant at $p < 0.01$; $N = 448$

Table V.
Study 2: Descriptive statistics and correlations

			M (HC)				Y (OP)		
		β	SE	$p \leq$		β	SE	$p \leq$
Constant	i_M	1.30	0.39	0.001	i_Y	1.65	0.25	0.001
X (LC)	a_1	0.75	0.07	0.001	c'	0.40	0.05	0.001
D1 (WL)	a_2	1.73	0.46	0.001				
D2 (WL)	a_3	1.53	0.61	0.012				
XD1 (LC x WL)	a_4	−0.29	0.09	0.011				
XD2 (LC x WL)	a_5	−0.24	0.11	0.028				
M (HC)					b	0.14	0.05	0.005
			$R^2 = 0.36$				$R^2 = 0.26$	
			$F(5, 442) = 50.46, p < 0.001$				$F(2, 445) = 77.26, p < 0.001$	

Consequent

Notes: LC: learning culture; WL: workforce level; HC: human capital; OP: operational performance

Table VI. Study 2: Model output

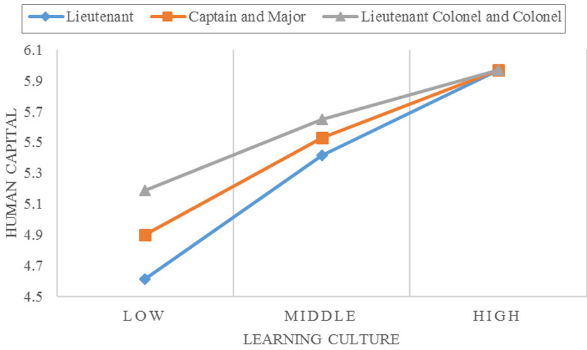

Figure 4. Study 2: Moderation effect of workforce level

H2 proposed a positive relationship between learning culture and operational performance. Here to we found support for our hypothesis ($\beta = 0.40, t = 8.23, p < 0.001$). *H3* proposed that human capital would mediate the relationship between learning culture and operational performance. Mediation is supported by all the bootstrapped conditional indirect effects being positive (0.11, 0.07, and 0.07) and the 95 per cent confidence intervals not including zero (Hayes, 2018).

Discussion

Implications for research

The results offer several noteworthy research implications. First, we build upon a growing body of research that focuses on the study of the human side of supply chain management (Ellinger *et al.*, 2002; Autry and Daugherty, 2003; Hult *et al.*, 2003; Myers *et al.*, 2004; Tokar, 2010; Cantor, Macdonald, and Crum, 2011; Manuj *et al.*, 2013; Sweeney, 2013; Ellinger and Ellinger, 2014; Hohenstein *et al.*, 2014; Wieland *et al.*, 2016; Schorsch *et al.*, 2017). Herein, we expand the supply chain literature by offering a better understanding of how learning culture influences supply chain managers at different workforce levels and how that influence changes the perception of human capital within the firm. As hypothesized, both multi-functional logisticians and logistics service providers at different workforce levels viewed the relationship between learning culture and human capital differently. In both samples, when learning culture was perceived to be low, there was a significant difference in the perceived level of human capital. When perceived learning culture was high, essentially all workforce levels held the same, higher view of human capital. Additionally, this research contributes to the competence-based view literature by showing learning culture as a key enabler in developing supply chain workforce competence, which can differentiate a firm from its rival and provide a repeatable, non-random ability to render competitive advantage (Škerlavaj *et al.*, 2007; Freiling *et al.*, 2008).

Second, the shared view of the positive relationship between learning culture and operational performance highlights the shared value of creating, acquiring, and transferring of knowledge among multi-functional logisticians and logistics service providers. In both samples, there was a significant direct effect of learning culture on operational performance. The research implication is that learning culture, in addition to increasing human capital through education and training, leads to higher operational performance through mechanisms that are not clear and warrant future study.

Third, human capital was hypothesized to have a mediating effect on operational performance. This held in both samples with higher perceived human capital leading to higher perceived operational performance. Strategically, human capital includes intellectual, process, or product competencies that give a firm a competitive advantage (Barnes and Liao, 2012). These findings are congruent with human capital theory in that training viewed as valuable, rare, inimitable, and non-substitutable will result in a higher return on human capital investment (Blundell *et al.*, 1999; Wright *et al.*, 2001; Hatch and Dyer, 2004; Manuj *et al.*, 2013).

Implications for practice

In addition to the research implications, these findings suggest important implications for supply chain managers. Understanding how learning culture and human capital investments are viewed by different workforce levels can drive leader actions that can affect one of the biggest challenges facing the companies – the hiring, training and retention of logistics personnel (Autry and Daugherty, 2003). It is clear that workforce level differences exist in the perceived relationship between learning culture and human capital. What is not clear is why those differences exist and what could be learned from them. Based upon limited anecdotal evidence, it may be that senior managers who make training and education decisions for these logisticians have a confirmation bias toward that investment and the impact it has on human capital. Alternatively, it may be that senior managers may have a more strategic view of the value of human capital than do junior and middle managers who are, at present, more operationally focused and may not see the return on the investment in an immediate, operational sense. A follow-up, qualitative study that seeks to shed light on the reasons for the management-level differences would certainly be of value.

The very nature of military recruitment and training can also lead to this increased value of human capital and its perceived outcome on organizational performance. The military is not designed to recruit and hire senior managers. That is, the military nearly always hires junior officers as entry-level managers to operate its supply chain processes, which may create a myopic understanding of supply chain operations. As a military member develops and is promoted, they gain a broader understanding of the unique military supply chain operation and are likely better able to understand the advantage that distinct learning culture can have on all employees and to operational performance.

Further, workforce-level differences in the perception of human capital return on investment may indicate that training and education opportunities for multi-functional logisticians are in need of multi-level validation. When making training content and resource allocation decisions, senior managers should seek out the expertise of junior and middle managers to ensure that there is a common understanding of the rationale for various human capital investments and their expected return on investment. As senior managers in the military had to rise through the ranks of management in the same organization, it would be key to continually engage and solicit the feedback of the junior and middle managers. They are experiencing the operational impacts of training and resource allocation decisions, they have to implement and execute the mission based on the decisions of the senior leader. As well, they are on the path to senior management in the same organization, so as their input is sought, it provides them a lens into the more strategic purpose of human capital investment, beyond their own unit.

Additionally, it would be beneficial for supply chain managers to move beyond perception data and compare, where possible, human capital investment contributions to specific operational outcomes. As the government and military are not-for-profit, their performance measurement is not directly relatable to a typical corporate supply chain performance. There is no profit or revenue metric to compare against. Oftentimes, military metrics are based on a capability or future ability to execute a certain directive or activity. The goal is often not to do something, but to prevent something from happening. This factor makes determining the direct impact on human capital contribution to operational outcomes sometimes murky. There is the possibility of developing localized metrics to assess the impact on specific training events as they relate to operational outcomes. This can be of particular interest in specific regions of operations or during certain training events. Senior managers often correlate the successful execution of an operation to the organizational learning process that is in place. While that may have some validity, there are currently no direct metrics in place to capture this perceived correlation. With an ever-shrinking resource allocation, developing this type of measure for the military could be of great importance.

Limitations, future research and concluding remarks

The findings of this study and resulting implications are subject to limitations. Although the multi-functional logisticians and logistics service providers represent a wide array of comparative civilian logistics manager positions, there may be a limit to the generalizability of these findings because of the homogeneity of the military sample. Although the study was a multi-year effort, it was essentially two cross-sectional research designs using a single instrument to collect data on the independent, mediating, and dependent variables, which may have resulted in common method bias and nonresponse bias. We took precautions early in the development of the survey instruments and the results of several statistical tests reported above demonstrated that the threat of each is negligible.

Future research might use both primary and secondary data from multiple sources to further examine the relationships reported in our study. A true longitudinal design would be beneficial to go beyond our presentation of linear relationships and could provide evidence of casual relationships. There is also potential to research not-for-profit or non-governmental organizations who have a tendency to develop their supply chain senior managers much the same way as they are developed in the military. While not a perfect comparative other, these organizations are more similar than typical corporate supply chains. Similar to the military, not-for-profit or non-governmental organizations typically invest in human capital with an operational goal of preparedness to act and not necessarily performing the act itself. Research into this area could also shed light on the relationships tested in these studies.

In conclusion, this multi-study analysis identifies important workforce level differences regarding learning culture and perceived human capital investments. This research answers multiple calls for research and adds to the behavioral supply chain management body of knowledge. Our findings also have practical education and training applications for multi-functional logisticians and logistics service providers.

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Appendix 1

Human Capital (HC): On a scale from 1 (Strongly disagree) to 7 (Strongly agree), please indicate your level of agreement with the following statements	
HC1	Logisticians in my organization are very intelligent
HC2	Logisticians in my organization are very creative
HC3	Logisticians in my organization are very talented
HC4	Logisticians in my organization are specialized in their jobs
HC5	Logisticians in my organization are producing new ideas and knowledge
HC6	Logisticians in my organization are the best performers
Learning Culture (LC): On a scale from 1 (Strongly disagree) to 7 (Strongly agree), please indicate your level of agreement with the following statements	
LC1	In my organization, people are rewarded for learning
LC2	In my organization, people spend time building trust with each other
LC3	In my organization, teams/groups revise their thinking as a result of group discussions or information collected
LC4	My organization makes lessons learned available to all employees
LC5	My organization recognizes people for taking initiative
LC6	My organization works together with the outside community to meet mutual needs
LC7	In my organization, leaders ensure that the organization's actions are consistent with its values
Operational Performance (OP): On a scale from 1 (Much worse) to 7 (Much better), in relation to the factors below, how would you compare your organization's performance over the past 3 years to that of other organizations that do the same kind of work?	
OP1	Quality of products, services, or programs
OP2	Development of new products, services, or programs
OP3	Ability to attract essential employees
OP4	Ability to retain essential employees
OP5	Satisfaction of customers or clients
OP6	Relations between management (leadership) and other employees
OP7	Relations among employees in general

Note: HC4, LC4, OP6 and OP7 did not perform well in one or both studies and were removed

Table AI.
Survey items

Appendix 2

	Study 1			Study 2		
	1	2	3	1	2	3
HC1		0.87			0.87	
HC2		0.91			0.88	
HC3		0.89			0.93	
HC5		0.63			0.73	
HC6		0.73			0.82	
LC1	0.75			0.75		
LC2	0.76			0.73		
LC3	0.79			0.81		
LC5	0.84			0.86		
LC6	0.68			0.77		
LC7	0.76			0.82		
OP1			0.80			0.89
OP2			0.77			0.82
OP3			0.85			0.81
OP4			0.74			0.79
OP5			0.78			0.80
Eigenvalues	6.39	2.31	1.51	7.21	2.25	1.50
Cumulative variance extracted (%)	39.92	54.37	63.80	45.06	59.14	68.49

Notes: Principal component analysis with Promax with Kaiser normalization rotation; only values greater than 0.3 are shown

Table AII. Factor loadings

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