Managing market turbulence: Organizational performance effects of customer integration in 3PLs

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Abstract
This paper extends the research on customer integration and organizational performance by presenting a framework for sustainable performance in the presence of market turbulence, applying it to operations management, and tying customer integration research to the 3PL environment. SEM was used to test relationships between 3PL operations and these variables.

Keywords: Market Turbulence, Customer Integration, Organizational Performance

Purpose
It is well known that third-party logistics companies (3PLs) require capabilities to integrate their services with their customers' supply chains (Lambert et al. 1999), adapting their services to fit independent supply chains (Large 2007). Integration is not a single, one-time, event because demands and preferences of 3PL customers, and their customers' customers, evolve over time (Wagner 2008; Wallenburg 2010). These changes in demand are likely to require 3PLs to adjust their operational capabilities to suit the evolving requirements of their customers. The complexities associated with these adjustments are likely to be significant for those 3PLs with scale because they service multiple customers, often in multiple markets (Leib and Leib 2010). Compounding the complexity is the psychological threat of the material impact to company profitability and survival that changes in demand can generate (Lee 2004).

We hypothesized that 3PLs implement formal search functions, in the form of learning (Zollo and Winter 2002; Kale and Singh 2007; Crossan et al. 2011) and customer oriented processes (Narver and Slater 1990), and recruit staff members with appropriate levels of absorptive capacities (Cohen and Levinthal, 1989, 1991; Jones 2006; Tu et al. 2006), to ensure they are able to adapt their integration capabilities effectively as their customer demands and preferences change. We hypothesized that these actions enable 3PLs to maintain their organizational performance in the presence of turbulent markets.

The purpose of the present study was to test whether these hypotheses were correct.

Literature Review

Customer integration and organizational performance

There are many studies that have identified positive performance effects related to customer integration (e.g., Stank, Keller and Closs 2001; Rodrigues et al. 2004; Singh and Power 2009; Wong et al. 2011). These have generally been linked to operational financial performance or performance indicators reflecting logistics operations, rather than firm financial performance (Souder et al. 1998; Stank, Keller and Closs 2001; Rodrigues et al. 2004; Swink et al. 2007; Lee et al. 2007; Flynn et al. 2010; Iyer 2011; Wong et al. 2011; Huo 2012). The relationship between the variables is thought to hold in 3PLs but evidence is scarce (Fabee-Costes et al 2009).

Hypothesis 1: 3PL customer integration positively affects 3PL operational performance

Market turbulence, organizational learning, and organizational performance

While there are now a considerable number of studies that identify the complementarity of internal integration and customer integration (e.g., Droge et al. 2004; Germain and Iyer 2006; Flynn et al. 2010) there has been minimal research to examine the mechanisms that maintain performance effects of customer integration in environments affected by market turbulence. These are environments where there are substantial changes in customer demand or in customer preferences, sometimes within very short periods of time (see Emery and Trist 1965, or Kohli and Jaworski 1990, for discussions related to market turbulence). Emery and Trist (1965) and Lee (2004) described situations where market turbulence caused catastrophic damage to firms. These situations generally related to rapid changes within competitive environments that were difficult to detect without substantial understanding of implications of changes in environments outside those in which companies normally compete. Terreberry (1968) and Cheung et al (2010) suggested organizations needed to establish learning and external search functions in order to adequately adapt to these rapid changes in environments. Thus, it is possible that the learning and external search functions mediate the negative effects of market turbulence on organizational performance.

Hypothesis 2A: Market turbulence negatively influences the organizational performance

Hypothesis 2B: Market turbulence positively affects organizational learning processes

Organizational learning and performance

Organizational learning has been extensively reviewed by Crossan et al. (1999), Zollo and Winter (2002) and Crossan et al. (2009). Kale and Singh (2007), and Vera et al. (2011), also linked learning mechanisms to organizational performance. Research focusing on organizational learning and performance within supply chain environments has been conducted by a number of groups over the past decade (e.g., Hult et al. 2006; Cheung et al. 2010). The performance effects of organizational learning have also been studied within 3PL contexts (Panayides 2007). The relationship between the two variables has generally been hypothesized and found to be positive. Hult et al. (2007) and Hanvanich et al. (2006) also demonstrated the beneficial effects on performance of learning mechanisms under conditions of market turbulence. Cheung et al. (2010) demonstrated the strong positive effects of relationship learning on relationship value in the presence of environmental uncertainty and dissimilarity. Together, these reviews and studies suggest that organizational learning will have a positive influence on operating capabilities and indirectly influence performance in the presence of market turbulence.

Hypothesis 3A: Organizational learning positively influences customer integration under conditions of market turbulence

Hypothesis 3B: Organizational learning indirectly positively influences organizational performance under conditions of market turbulence

Customer orientation and performance effects of customer integration

Customer orientation is likely to have a positive influence on the performance effects of customer integration. Customer orientation is the organizational commitment to fully understand customers' needs and create value for customers, and to maintain ongoing monitoring of customers to ensure these objectives are achieved (Narver and Slater 1990). Rodrigues et al. (2004) demonstrated the positive influence of a relational strategy on information and measurement system within organizations. These, in turn, positively influenced the internally and externally integrated operations of organizations and their subsequent effects on organizational performance. Seggie et al. (2006) identified that partner dependence significantly influenced inter-firm system integration and its effects on brand equity, which in turn affected organizational performance. The influence of customer integration is less certain under conditions of turbulence (Slater and Narver 1995). Most studies that have examined customer orientation under conditions of market turbulence have found its effects to be greater in less turbulent environments (e.g., Baker and Sinkula 1999; Hult et al. 2007). Thus, while limited in range, these studies suggest that customer orientation will have a positive influence on customer integration and organizational performance in the presence of market turbulence.

Hypothesis 4A: Customer orientation positively influences customer integration under conditions of market turbulence

Hypothesis 4B: Customer orientation positively influences organizational performance under conditions of market turbulence

Employee absorptive capacity and customer integration

Ultimately, employees will determine the responses of organizations to market turbulence. The capacities of employees to understand the shifts in trends and knowledge in the external environment are known as absorptive capacities (Cohen and Levinthal 1990). These capacities are "learning capacities" (Cohen and Levinthal 1989, p569) that are used within companies to adapt to changes in the external environments. Studies of absorptive capacities within the present context are limited. Zacharia et al. (2011) demonstrated that absorptive capacity was one of three factors that significantly affected collaborative engagement, which, in turn, positively influenced operational and relational outcomes. We hypothesize that absorptive capacities have a positive influence on the performance effects of customer integration under conditions of market turbulence.

Hypothesis 5A: Absorptive capacities of employees positively influence customer integration under conditions of market turbulence

Hypothesis 5B: Absorptive capacities of employees indirectly positively influence organizational performance under conditions of market turbulence

Layers of learning link organizational learning, customer orientation and absorptive capacities

Models of learning suggest there are three levels of learning capabilities within organizations. The lowest level of learning is single-loop learning reflective of near term, tactical, adjustments to operational capabilities (Zollo and Winter, 2002; Vera et al., 2011). This is the level at which customer integration is adjusted to meet short-term shifts in demand. The second level of learning reflects changes to operating capabilities that enable broader adjustments to change in

operating environments (Zollo and Winter, 2002; Vera et al., 2011). This is the level at which customer orientation and absorptive capacities are likely to be operating. They are likely to influence organizational performance by enabling change in the operating capabilities; that is, they will enable customer integration capabilities to adapt to longer-term changes in demand or in customer preferences by providing insights and understanding of the need to adapt (c.f., Teece, 2007). Finally, learning processes that enable the adjustments to customer orientation and absorptive capacities sit at the third level (Zollo and Winter, 2002; Vera et al., 2011). These are learning mechanisms that influence ongoing adaptation of the dynamic capabilities by enhancing organizational understanding of the relevance of market changes (Zollo and Winter, 2002; Argyris, 2003) which, in turn, ensure operational capabilities continue to adapt in the presence of ongoing change. These models of learning suggest that learning mechanisms directly influence customer orientation and absorptive capacities of employees.

Hypothesis 6A: Learning mechanisms directly positively influence customer orientation under conditions of market turbulence

Hypothesis 6B: Learning mechanisms directly positively influence employee absorptive capacities under conditions of market turbulence

Methodology

The two-step structural equation modeling approach of Anderson and Gerbing (1998) was used to test relationships between organizational performance of 3PL operations, customer integration of 3PL operations, 3PL employee absorptive capacities, customer orientation of 3PL operators, learning processes implemented by 3PLs, and market turbulence affecting 3PLs. Indirect effects were tested using the approach of Cheung and Lau (2008).

The sample of 458 prospective respondents generated 213 usable responses from executives, managers, and supervisors of a major Asia-Pacific-based 3PL and from managers within the 3PL's customer base, once cases generating outliers had been removed. The company had more than 75 operating profit centers in Australia that provided logistics services to many of Australia's largest companies.

There are various approaches that can be used to address late response and non-response bias (e.g., Armstrong and Overton 1977; Lambert and Harrington 1990). In this study, this type of bias was examined for all measured indicators with t-tests using scores from two groups: those respondents who answered the survey without prompting; and, those respondents who answered the survey once the follow up email was sent, four weeks after the first email. One indicator returned a significant effect and was removed from the analysis.

All construct indicators were selected from extant literature and measured using a survey instrument with seven point Likert scales. The performance factor accounted for both service and cost and was adapted from Hult et al. (2006). The performance effects of logistics integration of 3PL service providers with their customers are less well researched than other aspects of customer integration (Fabbe-Costes et al. 2009, p72) so indicators developed by Chen and Paulraj (2004) were adapted for the study to extend knowledge in this area. The scales developed by Tu et al. (2006) for employee absorptive capacity were adapted to suit the present study. These indicators specifically address the existing knowledge of managers and first line operational staff, a critical faculty that facilitates further learning (Cohen and Levinthal 1990; Tu et al. 2006). Customer orientation scales were adapted from Narver and Slater (1990). Scales for learning processes were adapted from Kale and Singh (2007). The indicators of market turbulence developed by Jaworski and Kohli (1993) were adapted for the study. These indicators

have been used in many other studies (e.g., Souder et al. 1988; Hult, et al. 2007) that have examined changes in market and customer preferences.

Multiple measures were taken to reduce the likelihood of common method variance (CMV) significantly affecting the results, because this may be an issue of relevance when using single survey instruments (Podsakoff et al. 2003). Procedures were also developed to statistically test for common method variance using one of the procedures recommended by Podsakoff et al. (2003). The selected procedure introduces an unmeasured common method variance variable to the theoretical model to examine whether doing so improves the fit of the model and whether the adjusted model explains a greater proportion of variance (Carlson and Perrewe 1999; Carlson and Kacmar 2000).

Multiple tests of validity and reliability were performed on the data sets. Initially, data for Confirmatory Factor Analysis (CFA) measurement models were examined in Amos 18 to ensure uni-dimensionality, via the use of sample correlation Eigenvalues with one item exceeding 1. The corresponding variables were also analyzed in SPSS 18 for Cronbach's alpha with a threshold of .7 being used (Hinkin 1995). Correlations among measured indicators for each factor were examined using Amos 18 to ensure there was no item redundancy using $r < 0.8$ (Cunningham 2010), but that they were of sufficient magnitude that they were at the higher end of the scale (Bollen and Lennox 1991). A similar test was also used to assess factor redundancies in the multi-level, multi-factor, CFA models where inter-factor correlations were in excess of 0.9 (Kline 2011). Psychometric properties were deemed acceptable if standardized regression weights for measured variables approached 0.7 (Kline 2011) or higher. Tests of construct reliability, variance extraction and discriminant validity for the latent variables were based on the recommendations of Fornell and Larcker (1981) using the process presented by Cunningham (2010). Cunningham's (2010) process for analyzing pattern and structure coefficients of latent variables was also applied to establish discriminant validity of latent variables.

Data were accepted as fitting specified models using the following measures, which were based on the recommendations of Shah and Goldstein (2006) and Kline (2011): Chi-square (X^2) scores were not significant at p=.05, or the Bollen-Stine bootstrap $p > .05$ for multivariate non-normal data; chi-square/degrees of freedom <2; the root mean square error of approximation (RMSEA) <.05 with the lower (Lo90) and upper (Hi90) bounds of the 90% confidence interval below .05 and .1 respectively, with a p value > .05 (Pclose); the comparative fit index (CFI) >.95; and, the Tucker-Lewis coefficient (TLI) > .95.

Results

Both the theoretical model, and a model that constrained the direct effect of learning processes on logistics integration to zero, had acceptable fit. The CMV model improved fit compared with the fully saturated model but had no significant effect on the extracted variance. CMV is therefore unlikely to have had a significant effect on the results (Carlson and Perrewe 1999; Carlson and Kacmar 2000). There was no significant difference in fit between the theoretical and the constrained models ($p > 0.05$), so the latter was accepted as the better model because it is more parsimonious (Anderson and Gerbing 1988). The fit of each of these two models is shown in Table 1.

Table 2 presents standardized total effects for relationships between latent variables in the constrained model. Our results support the hypothesis that organizational learning processes mediate the influence of market turbulence on organizational performance. We found that

market turbulence had significant positive indirect effects on employee absorptive capacities and customer orientation, as well as customer integration and organizational performance. Its direct effect on organizational performance in our theoretical model was not significant, nor was its total effect on organizational performance in this model, as can be seen in Table 2.

Table 1 - Fit statistics for the theoretical and constrained models

Model	X^2	DF	Bollen-Stine p	X^2/DF	TLI	CFI	RMSEA	Lo90	Hi90	Pclose
Theoretical	370.101	288	.671	1.285	.963	.967	.037	.025	.047	.984
Constrained	370.117	289	.682	1.281	.963	.967	.036	.024	.047	.985

We found organizational learning processes to significantly affect directly the employee absorptive capacities and customer orientation. In turn, these capabilities directly affected logistics integration. Customer orientation had both a direct and an indirect effect on organizational performance. Employee absorptive capacities indirectly affected organizational performance via a direct effect on customer integration. Customer integration had a significant direct effect on organizational performance.

Table 2 - Standardized total effects and two-tailed significance levels in the constrained model

Latent Variable	Latent Variable				
	Market Turbulence	Learning Processes	Customer Orientation	Employee Knowledge	Logistics Integration
Learning Processes	.346[A]				
Customer Orientation	.208[A]	.602[A]			
Employee Absorptive Capacity	.273[A]	.787[A]			
Logistics Integration	.204[A]	.588[A]	.257[A]	.551[A]	
Logistics Performance	.084[B]	.412[A]	.375[A]	.237[A]	.429[A]

NOTE: A = $p < .005$, significant; B = $p > .05$, not significant.

The squared multiple correlations for the constrained model are shown in Table 3. The table highlights that the model explains more than 35 per cent of the variance of logistics performance and more than 50 per cent of the variance of logistics integration. Squared multiple correlations for all latent variables were significant at $P < .005$.

Table 3 - Squared multiple correlations of latent variables in the constrained model

Latent Variable	Estimate	Lower bound of 95% bias corrected CI*	Upper bound of 95% bias corrected CI*	P
Learning Process	.120	.029	.285	.001
Customer Orientation	.363	.202	.541	.001
Employee Absorptive Capacity	.620	.408	.810	.001
Logistics Integration	.503	.348	.642	.003
Logistics Performance	.359	.190	.502	.005

*CI = Confidence Interval

Discussion and Contribution:

The causal chain identified in our research supports our argument that organizations implement key learning and search functions to cope with market turbulence *in advance* of its presence, most likely due the potential catastrophic effects of being unprepared for major market changes. It is likely that companies invest in learning processes and customer orientation capabilities, and recruit suitably qualified staff members, to ensure they are able to deal with the changing nature of markets. In this sense, our study reinforces the speculation of Cheung et al. (2010, p481), who reasoned that organizations make investments in organizational learning due to the risks associated with environmental uncertainty.

Our research extends the work of operations management scholars on customer integration and organizational performance by presenting a framework for sustainable performance in the presence of market turbulence. In doing so we build on the work of researchers in strategic management and organizational learning by extending and operationalizing a major framework (see Zollo and Winter 2002, Vera et al. 2011) and applying it to operations management.

Further, our study answers the call of Fabbe-Costes et al. (2009) to tie customer integration research to the 3PL environment. Our research confirms that logistics integration has a significant direct effect on logistics performance in 3PL operations. The research also demonstrates that it is possible to maintain this effect in the presence of market turbulence by implementing appropriate mediating learning mechanisms and customer orientation capabilities, and by recruiting suitably skilled and experienced staff members.

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