

# The Impact of Logistics Outsourcing Relationship Quality on Logistics Integration and Performance

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**Abstract:** While logistics outsourcing relationship and logistics integration have are key factors of achieving competitive advantages and supply chain success, the understanding of the linkage between these two factors and how they contribute to business performance is still limited. In this paper, we propose an overarching model, in which logistics integration acts as a mediator of the relationship between logistics outsourcing relationship quality and performance. The model is empirically tested using survey data from mainland China. Findings confirm the mediation role of logistics integration. Research and practical implications discussed.

**Keywords:** Logistics outsourcing; relationship quality; logistics integration; performance

## I. Introduction

The last decade has witnessed dynamic changes in business logistics requirements. Logistics outsourcing has become an imperative vehicle for companies, manufactures in particular, to save logistics cost and obtain competitive advantage [1] [2]. With increased global competition and higher customer expectations, an increasing number of companies are outsourcing their logistics activities to third-party logistics (3PL) [3].

As the largest emerging economy in the world and a global manufacturing center, China has witnessed a fast growth of manufacturing industries, leading to a rapid growth of its logistics industry [4]. In fact, logistics has been one of the fastest growing industries in China [2]. The total amount of social logistics increased, with an average annual growth of about 25 percent in the new century [4]. In 2009, China's logistics contributed about RMB 2.31 trillion of value-added, 16.1 percent of the value-added of the servicing industry [5]. However, the total expenditure of social logistics constituted about 18.1 percent of China's GDP in 2009 [5], compared to only 10 percent in developed countries [2]. Therefore reducing logistics costs is critical to improving Chinese companies' competitiveness. The increasing competition and mounting pressure for cost reduction is not only forcing companies to outsource their logistics functions but also forcing them to improve the management of the logistics outsourcing relationship in order to access their supply chain effectiveness to improve business performance.

However, logistics outsourcing itself may not save costs for companies. It is imperative to better manage the outsourcing relationship [6]. The literature has reported that companies need to build and manage closer, long-term relationships with all supply chain partners [7], especially with 3PL firms [2] [6] [7]. However, how to manage the logistics outsourcing relationship has not been well investigated in the logistics literature. Marasco [8] called further research on the strength of logistics outsourcing relationships.

In response to Marasco's call, this study develops and empirically tests a model of relationship management in the context of logistics outsourcing. The primary objective of the present study is to investigate the impact of logistics outsourcing relationship quality on logistics integration and their impacts on business performance.

The rest of the paper is organized as follows. In the next section, the theory foundation and research hypotheses are developed, followed by a description of methodology and analysis. Then, discussion and implications are reported. Finally, conclusions and limitations are presented.

## II. Theoretical Background and Research Hypotheses

A variety of theoretical frameworks have been used to explain the nature of supply chain relationships. Resource dependence theory (RDT), and transaction cost economics (TCE) were widely employed to analyze the impact of inter-firms relationship and integration on performance. RDT argues that firms may develop closer supply chain relationships to obtain some unique and inimitable resources outside of the realm of the organization [9]. TCE views inter-firms relationships and integration as governance structures to overcome the limitations of restricted rationality, to reduce transaction costs, to realize transaction stability from opportunistic threats, and to reduce hazards of uncertainty and asset specificity [10] [11]. TCE also asserts that the higher the costs of safeguarding opportunistic behaviors and of adapting to the uncertain environment, the more likely firms will use integration as governance mechanism [12].

This paper draws on both RDT and TCE and focuses on the logistics outsourcing relationship. The conceptual model is presented in Figure 1.

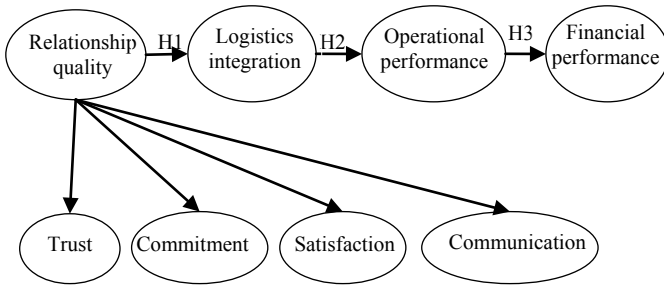


Figure 1 Conceptual model

### Logistics outsourcing relationship quality

Relationship quality was used to describe the extent to which a relationship is healthy in the literatures. In the supply chain management literature, relationship quality is defined as “the degree to which both parties in a relationship are engaged in an active, long-term working relationship” [11]. This definition is similar to the construct - relationship magnitude in [7], which was defined as “the degree or extent of closeness or strength of the relationship among organizations” in the context of shipper-carrier relationships. Therefore, in context of logistics outsourcing relationship, in the present study, relationship quality is defined as the degree to which logistics user and its 3PL provider are engaged in an active, cooperative and long-term logistics outsourcing relationship.

Relationship quality is widely viewed as a meta-construct, consisting of several components that support, reinforce, and complement each other [13]. Prior research has proposed a variety of relationship quality dimensions [13], including trust, commitment, satisfaction [13] [14], communication, and interdependence [15]. Therefore, our study operationalizes relationship quality as a second-order construct with sub-dimensions of trust, commitment, satisfaction, and communication.

### Logistics integration

Collaborative relationships between a manufacturer and either its customer and/or suppliers are widely investigated and identified as a vital strategy to obtain strategic resources outside its boundaries to secure competitive advantage in a dynamic environment. However, supply chain integration, the management process of the establishment and maintenance of such relationship, is relatively new as an area of research [16]. Supply chain integration was defined as “the degree to which a firm can strategically collaborate with its supply chain partners and collaboratively manage the intra- and inter-organization processes to achieve effective and efficient flows of product and services, information, money and decisions with the objective of providing maximum value to customers at low cost and high speed” [16] [17]. Flynn et al. suggested that supply chain integration has three dimensions: customer, supplier and internal integration [16]. Accordingly, logistics integration was defined as “the degree to which logistics tasks and activities within the firm and across the supply chain are managed in a coordinated fashion” [18], and it can be

internal and external. Internal logistics integration refers to the integration of logistics activities across functional boundaries within a firm, while external logistics integration refers to the logistics integration across firm boundaries, such as logistics integration with customers or/and suppliers. In the current study, we focus on logistics user’s logistics integration with its 3PL providers. It is a type of supply chain integration, and also a type of external logistics integration. It is defined as the degree to which a logistics user strategically collaborates with its 3PL providers in logistics activities and collaboratively manages inter-organization (across logistics user to its 3PL providers) logistics process. The goal is to improve logistics effectiveness and efficiency. For convention, we name it logistics integration in this paper.

Recently, several studies investigated the antecedents of supply chain integration. For example, Kim found that supply chain practice and competition capability have positive impacts on supply chain integration [10]. Zhao et al. also found that relationship commitment and power have positive impacts on the integration between manufacturers and customers in supply chain [17]. On the other hand, the literature also documented that relationship commitment and trust can foster greater cooperation, reduce functional conflict, and enhance integration [19]. Especially, information technology and strategic buyer-supplier relationship were identified as antecedents of external logistics integration in logistics literature [20].

In fact, companies are increasingly placing their emphases on building and managing closer, long-term relationships with their supply chain partners [7], especially 3PL firms [2] [6] [7]. The underlying reason is that 3PL firms within a closer, long-term relationship are more likely to be motivated to guarantee delivery, quality and even cost to logistics users, and are willing to work closely to understand and try to meet the users’ requirements. A quality relationship between logistics user and its 3PL providers based on trust, commitment, satisfaction, and communication enhances the joint planning and decision making, leading to collective responsibilities for the outcomes. Such coordination between the logistics user and provider firms are essential to ensure delivery of high-quality services to customers and facilitate the ability to seamlessly integrate logistics activities across organizational boundaries [20]. A quality relationship, characterized by high level of trust, commitment, satisfaction and communication, can facilitate complementary interactions among dyadic partners, which ultimately improves logistics coordination. Therefore a positive impact of logistics outsourcing relationship quality on logistics integration is proposed.

*H1: The outsourcing relationship quality has positive impact on logistics integration.*

### Logistics integration and performance

The literature on the relationship between supply chain integration and business performance is quite extensive [11].

The majority of previous studies reported the positive impact of supply chain integration on performance [10]. For example, Flynn et al. found that supplier integration is positively related to the operational performance of the manufacturer within a supply chain [11]. Paulraj and Chen found that external logistics integration has a positive impact on agility performance [20]. Chen et al. argued that “both internal and external integration can contribute to achieving reductions in costs, stock-outs, and lead-time, and can lead to competitive advantage” [21]. Therefore, we hypothesize that logistics integration improves operational performance.

*H2: The logistics integration has a positive effect on operational performance.*

The literature has widely reported the positive impact of operational performance on financial performance [22] [23]. It is because effective and efficient operations improve the rate of utilization of facilities and on-time delivery. To build a broader picture of our model, we therefore also hypothesize the positive relationship between operational performance and financial performance.

*H3: Operational performance is positively related to financial performance.*

III. Methodology and Analysis

Sample and data collection

The data were collected using a questionnaire survey in mainland China. All subjects were the members of the China Federation of Logistics and Purchasing. More than 500 questionnaires were sent out and 134 completed questionnaires were returned. Of 134 responses, 130 were usable, representing a response rate of 26 percent. Table 1 illustrates the characteristics of the responding companies.

Table 1 Firm Profile

<i>Ownership</i>		
State owned		16.9%
Chinese private		44.6%
Joint-Venture		17.7%
Wholly Foreign		20.8%
<i>Number of full-time employees</i>		
Less than 100		25.2%
100~499		39.0%
500~999		10.6%
1000~4999		13.8%
5000 or more		11.4%
<i>Annual sales (million RMB Yuan)</i>		
Less than 5		11.3%
5~10		8.9%
10~50		13.7%
50~100		16.9%
100~300		19.4%
300 or more		29.8%
<i>Industries variety</i>		
Manufacturer		59.2%
Retailing		12.3%

Importer/exporter/distributor	16.2%
Others	12.3%
<i>Number of years of relationship history</i>	
Less than 4	35.0%
4~8	35.7%
8 or more	29.3%

Measures and Psychometrical Properties

The scales were adapted from existing studies (see Appendix). The instrument was also subject to experts’ review, focus group discussion, and pilot study.

The results of an exploratory factor analysis (EFA) show that all items had strong loadings on the construct they were supposed to measure with the loadings higher than 0.5 and lower loading on constructs they were not supposed to measure, therefore indicating unidimensionality of all constructs [24].

Following Golicic and Mentzer [7], the items of communication, trust, commitment and satisfaction were combined into a composite score. As shown in Table 2, the Cronbach’s alpha values rang from 0.822 to 0.945, which are above 0.7, suggesting an acceptable reliability [25].

Table 2 Reliability

Construct	No. of items	Cronbach’s alpha
Communication	4	0.822
Trust	10	0.936
Commitment	6	0.919
Satisfaction	4	0.945
Relationship quality	4	0.843
Logistics integration	9	0.908
Financial performance	4	0.913
Operational performance	7	0.893

A second order confirmatory factor analysis (CFA) is conducted to test the validity of logistics outsourcing relationship quality. The results are shown in Table 3. The fit indexes ( $\chi^2=724.08$  ( $df=248$ ,  $p=0.000$ ),  $\chi^2/df=2.92$ , NNFI=0.95, CFI=0.96, SRMR=0.077) show a good fit, indicating the second order model is acceptable. All factor loadings were greater than 0.50 with the  $t$ -values greater than 2.0, suggesting convergent validity. The average variance extracted (AVE) of each construct was greater than the squared correlation between the focal construct and other constructs, suggesting discriminant validity [26].

Table 3 CFA of Logistics Outsourcing Relationship Quality

Indicator (AVE)	Coefficient	$t$ -value
<i>Communication (0.558)</i>		
CN1	0.70	
CN2	0.74	7.52
CN3	0.87	8.31
CN4	0.65	6.70
<i>Trust (0.600)</i>		
TR1	0.79	
TR2	0.68	8.32
TR3	0.81	10.32
TR4	0.86	11.32

TR5	0.77	9.70
TR6	0.75	9.41
TR7	0.69	8.47
TR8	0.84	10.90
TR9	0.81	10.34
TR10	0.75	9.32
Commitment (0.655)		
CT1	0.70	
CT2	0.83	8.97
CT3	0.80	8.63
CT4	0.82	8.90
CT5	0.87	9.42
CT6	0.83	9.01
Satisfaction (0.818)		
SA1	0.92	
SA2	0.86	15.08
SA3	0.96	20.67
SA4	0.87	15.57
Second-order factor		
Relationship quality (0.638)		
Communication	0.54	5.10
Trust	0.89	9.19
Commitment	0.85	7.80
Satisfaction	0.87	10.56

Finally, a first-order CFA was conducted to evaluate the validity of the whole model [27]. Following Panayides and So [23], the logistics outsourcing relationship quality is evaluated by the composite scores of its sub-dimensions (i.e., communication, trust, commitment, and satisfaction). The results are described in Table 4 and the correlation matrix of all constructs is presented in Table 5. The fit indexes ( $\chi^2=565.13$  ( $df=246$ ,  $p=0.000$ ),  $\chi^2/df=2.30$ , NNFI=0.93, CFI=0.93, RMSEA=0.100, SRMR=0.077) suggest an acceptable fit of the model to the data. As shown in Tables 4, all factor loadings were greater than 0.50 and the t-values were all greater than 2.0, suggesting convergent validity [27]. The AVE of each construct shown in Table 4 is higher than all squared correlation coefficients of the focal construct with other constructs shown in Table 5, suggesting discriminant validity [27]. In addition, all confidence intervals of the correlations excluded 1.0, also suggesting discriminant validity [27].

Table 4 Full Measurement Model

Indicators (AVE)	Coefficient	t-value
Relationship quality (0.601)		
Communication	0.59	6.95
Trust	0.85	11.57
Commitment	0.84	11.39
Satisfaction	0.82	10.94
Logistics integration (0.534)		
LI1	0.74	9.57
LI2	0.73	9.48
LI3	0.52	6.17
LI4	0.61	7.45
LI5	0.79	10.60

LI6	0.66	8.19
LI7	0.88	12.46
LI8	0.82	11.12
LI9	0.78	10.27
Operational performance (0.543)		
OE1	0.79	10.41
OE2	0.84	11.38
OE3	0.72	9.11
OE4	0.75	9.63
OE5	0.68	8.59
OE6	0.65	8.00
OE7	0.71	8.99
Financial performance (0.735)		
A5a	0.91	13.32
A5b	0.89	12.65
A5c	0.90	12.93
A5d	0.71	9.15

Table 5. The Correlation Matrix

	X1	X2	X3	X4
Financial performance (X1)	1.0			
Operational performance (X2)	0.59*** (0.07)	1.0		
Logistics integration (X3)	0.34*** (0.08)	0.33*** (0.09)	1.0	
Relationship quality (X4)	0.35*** (0.09)	0.46*** (0.08)	0.74*** (0.05)	1.0

Note: \*\*\* significant at level of 0.01; the number in parentheses is standard errors.

#### Structural equation model and hypotheses testing

A structural equation model (SEM) was analyzed to test the hypotheses using the maximum likelihood estimation method. Figure 2 shows the estimation results of the model, including the fit indices. The SEM estimation yields satisfactory key model fit indices ( $\chi^2/df=2.08$ , NNFI=0.94, RMSEA=0.092, CFI=0.94, SRMR=0.098), providing evidences that the model is overall acceptable. Then, we assessed each hypothesis using the standardized regression coefficients and  $p$ -values, as well as the variance explained ( $R^2$ ). All hypotheses are significantly supported.

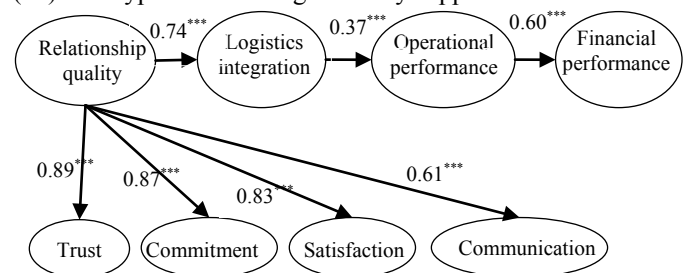


Figure 2: Estimated structural equation model

#### IV. Discussion and Managerial Implications

Hypothesis 1 is supported, as indicated by the strong path coefficient of 0.74 ( $p<0.01$ .) The finding is consistent with

Paulraj and Chen [20] that strategic buyer-supplier relationship can engender external logistics integration, and also with Zhao et al. [18] that commitment has a significantly positive effect on supply chain integration. The support of hypothesis 1 reflects that closer relationship with 3PL firms could lead to superior logistics coordination with 3PL firms. The finding shows that if logistics users aim to improve logistics integration with 3PL firms, they should develop closer relationship with their 3PL providers, adopting trust and commitment as logistics outsourcing relationship management mechanism. When a logistics user trust and commit to its logistics providers, the extent to joint planning and working together with its logistics providers are significantly higher, mandating a better integration of logistics activities. Moreover, as the logistics user is satisfied with the logistics outsourcing relationship, the user may make the outsourcing relationship to be long-term one that helps the user foster co-operative and collaborative behavior and better integrate its logistics activities with its 3PL providers. Communication with logistics providers may also help enrich logistics user with information about logistics process and control, thus facilitating information sharing and fostering learning.

Hypothesis 2 was also supported with a significant path coefficient of 0.37 ( $p < 0.01$ ). The finding confirms some results of prior studies. For instance, Fabbe-Costes and Jahre reviewed 31 papers providing empirical evidence of the link between supply chain integration and performance and found that 19 conclude that the more integration the better performance [28]. This finding provides valuable insights for logistics users. If logistics users pursue high operational performance, the user should integrate its logistics activities with its 3PL providers, and develop and manage a better logistics outsourcing relationship.

As expected, operational performance has significant impact on financial performance ( $\beta=0.60$ ,  $p<0.01$ ), suggesting support for hypothesis 3. This means relationship integration can improve financial performance through improving operational performance.

V. Conclusions and Limitations

This study examined the relationships among logistics outsourcing relationship quality, relationship integration, and performance. We found that relationship quality is an important antecedent of relationship integration, which in turn improves operational and financial performance. The research made contributions to the literature from several aspects. First, despite a great deal of research has been conducted on logistics outsourcing relationships in logistics and supply chain management literature [1] [2], there is very limited research conducted in China’s context. Second, as Bove and Johnson argued that “there is a clear need for empirical studies to validate the suggested relationship strength construct” [29]. Our study responded to Bove and

Johnson’s call in the context of logistics outsourcing relationship.

There are several limitations that open up venues for future research. Future research may extend the generalization of the results to regions with different social, economic, and culture backgrounds. Second, future research can investigate the effect of time through a longitudinal study, as the current study was cross-sectional. The longitudinal study can help understand how logistics outsourcing relationship change over time. Third, the model developed is not exclusive; future research can attempt to identify other addition antecedents of logistics integration. Additional studies can also explore other factors mediating or moderating the relationship between relationship quality and performance, such as logistics service quality, relationship history, and the importance of 3PL providers.

Appendices: Survey Instrument

<b>Communication</b>	
CN1	There is a high level of information exchange with our major 3PL
CN2	We share our 3PL’s information to follow our shipments
CN3	Our major 3PL shares available service capacity with us
CN4	We share our service demand forecast with our major 3PL
<b>Trust</b>	
TR1	Our major 3PL cares for us
TR2	Our major 3PL has made sacrifices for us in the past
TR3	We feel our major 3PL has been on our side
TR4	Our major 3PL is genuinely concerned we succeed
TR5	Our major 3PL considers our welfare as well as their own
TR6	Our major 3PL has no problems answering our questions
TR7	Our major 3PL is knowledgeable managing logistics activities
TR8	The advice our major 3PL gives us is helpful
TR9	Our major 3PL can help solve our problems
TR10	Our major 3PL has competence to satisfy our logistics demand
<b>Commitment</b>	
CT1	We talk up our major 3PL, to our friends and acquaintances, as a great provider to be connected with
CT2	We feel that our major 3PL views us as being an important “team member,” rather than our being just another customer
CT3	We are proud to tell others that we are a customer of our major 3PL
CT4	Our attachment to this provider is primarily based on the similarity of our values and those of our major 3PL
CT5	The reason we prefer our major 3PL to others is because of what it stands for, its values
CT6	During the past year, our company’s values and those of the major 3PL have become more similar
<b>Satisfaction</b>	
SA1	We are satisfied with the overall performance of our major 3PL
SA2	We are satisfied with the price of the service of our major 3PL
SA3	We are satisfied with the quality of the service from our major 3PL
SA4	Overall, we are satisfied with the value of services of our major 3PL
<b>Logistics integration</b>	
LI1	We help our major 3PL to improve their process to meet our needs
LI2	We hold meetings with our major 3PL to solve problems
LI3	We and our major 3PL informally work together
LI4	We and our major 3PL work together as a team
LI5	We conduct the joint planning to anticipate and resolve operational problems with our major 3PL
LI6	We develop a mutual understanding of responsibilities with our major 3PL
LI7	We make joint decisions with our major 3PL about ways to improve overall cost efficiency
LI8	We and our major 3PL achieve goals collectively
LI9	We and our major 3PL jointly design customized order process

<b>Operational performance</b>	
OE1	Customer service
OE2	Customer response
OE3	Delivery speed
OE4	Delivery reliability
OE5	Volume flexibility
OE6	Variety flexibility
OE7	New-product flexibility
<b>Financial performance</b>	
FP1	Growth of return of sales in the past two years
FP2	Growth of return of assets in the past two years
FP3	Growth of sales in the past two years
FP4	Growth of profit in the past two years

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