Research on the Relationship among Information Sharing, Supply Chain Integration and Logistics Performance

Jie Jian[1, a], Yingqun Zhang[1, b], Pu Yang[2, c], Mengmeng Zhou[1, d]

[1]Chongqing University of Posts and Telecommunications, Chongqing 400065, China

[2]University of Electronic Science and Technology, Chengdu 611731, China.

[a]443120751@qq.com, [b]827064567@qq.com, [c]499793476@qq.com, [d]1047034281@qq.com

Abstract

To explore the mutual relationship and mutual influence path among information sharing, supply chain integration and logistics performance, a theory model consisting of the three elements above is presented, and followed an empirical research. It can be found that: information sharing and supply chain integration has mutual promotion, supply chain integration has a positive effect on the logistics performance, and information sharing promotes the logistics performance.

Keywords

Information Sharing, Supply Chain Integration, Logistics Performance, Empirical Research.

1. Introduction

Improving logistics performance is one of the most important segments in the supply chain management, so as to information sharing and resource integration among supply chain partners. However, there exist many problems, such as asymmetric information among the members of the supply chain system and high cost of supply chain integration, lead to the logistics, which is called "the third profit source", fail to create deserved benefit. Thus, the research on the influence mechanism of information sharing, supply chain integration and logistics performance offers a theoretic guarantee for innovating supply chain management under the tide of "Internet plus". In view of this, this paper first constructed the theoretical framework of information sharing, supply chain integration and logistics performance, collected the data of small and medium enterprises in Chongqing, then carried out an empirical analysis to explore the interrelation among the three elements and the mutual influence path.

2. Research Hypotheses and Models

Information sharing refers to the node enterprises in supply chain make it come true that the requirement information, sales information, inventory information, order information, purchasing information, logistics information and capital flow information among different enterprises and departments through certain technical means to achieve sharing. Supply chain integration mainly include internal integration, marketing integration and supplier integration. By integrate the enterprise, the market and the supplier, remove the barriers that hinder the interaction and cooperation, the financial flow, information flow and logistics in the supply chain can flow smoothly. Logistics performance is a measure of the efficiency, quality, cost and flexibility of the logistics activities involved in the daily production and operation of an enterprise.

2.1 The relationship between information sharing and supply chain integration

Yeung et al consider that supply chain integration is conducive to the integration of supply chain stakeholders who need to share the key information sharing through a common platform [1]. Zeng Min-gang and Wu Qian-qian found that supply chain integration has a significant positive impact on information sharing and supply chain performance, but the low level of information sharing has no

significant effect on supply chain performance [2]. Based on the above analysis, this paper puts forward the hypothesis H1:

Hypothesis H1: Supply chain integration can promote information sharing.

Li et al hold that information technology and information sharing have a significant impact on the supply chain integration of logistics system, and indirectly affect logistics performance [3]. Zhang Rui-rui et al agree that high quality information transmission and sharing in supply chain are the basis of supply chain coordination [4]. Based on the above analysis, this paper puts forward the hypothesis H2:

Hypothesis H2: Information sharing can promote the integration of supply chain.

2.2 The Relationship between Supply Chain Integration and Logistics Performance

Stank et al found that internal cooperation and external cooperation are highly relevant, and internal cooperation can directly improve the performance of logistics services. However, there is no direct impact on the performance of logistics services by external integration [5]. Jia Ping supposes that the improvement of logistics efficiency can be realized under the management of supply chain integration [6]. Based on the above analysis, this paper puts forward the hypothesis H3:

Hypothesis H3: Supply chain integration has a positive effect on Logistics Performance.

C. The relationship between information sharing and logistics performance

In Dai Kun's opinion, information sharing is helpful to improve the integrated logistics strategy framework, and improve logistics performance [7]. Zhang Ju-liang et al think that if there is no corresponding coordination mechanism to make the members of the supply chain coordinate and cooperate. Information sharing can not only improve the efficiency of the supply chain, but also reduce the efficiency of the supply chain [8]. Based on the above analysis, this paper puts forward the hypothesis H4:

Hypothesis H4: Information sharing has positive effect on Logistics Performance.

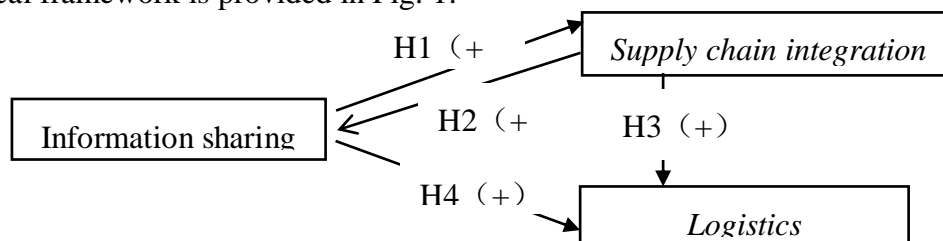The theoretical framework is provided in Fig. 1:

Fig. 1 The theoretical framework

3. Empirical Analysis

3.1 Questionnaire Design

In this paper, the data are collected through questionnaire survey. The variables include supply chain integration, information sharing and logistics performance. The supply chain integration is divided into internal integration, customer integration and supplier integration in three categories that were measured, including a total of 13 items. Information sharing includes 5 items. The level of logistics performance index includes 5 items. The logistics performance takes the level of logistics as measurement index, which contains 5 items. In the structural equation model, the supply chain integration, information sharing and logistics performance are the three test indicators as latent variables, 23 items for the observed variables. In the scoring method, scale uses Likert 7 meter scale. The "7" means "complete agreement", "1" means "totally disagree", between 2 and 6, indicating that the situation is completely out of agreement. Respondents can score of 23 items according to the actual situation of enterprises. The scale of the study by principal component analysis and validity test is shown in Table 1:

Table 1 Research Scale

variable	Variable measure	index
Supply chain integration	Internal integration	Different departments in the enterprise often communicate and cooperate with each other
		High degree of information between different departments within the enterprise
		The functional departments of the enterprise can coordinate their activities
		Enterprises in the new product development can cross functional team
	Market integration	Enterprises and major customers are partners
		Companies often receive feedback from customers about quality and delivery outcomes
		The customer can actively participate in the product design process of enterprise.
		Enterprises and key customers through the information network keep in touch
		Enterprises can respond quickly to customer needs
	Supplier integration	The company has a good strategic partnership with suppliers
		Enterprises help suppliers improve production to meet the needs of enterprises
		The enterprise and the supplier closely communicate about the quality factors and design changes
		Companies allow key suppliers to participate in product development projects
Information sharing	Information sharing	Enterprise and major supply chain partners share information about the production of related products
		Enterprise and major supply chain partners share the inventory information of related products
		Enterprise and major supply chain partners share the sale information of related products
		Enterprise and major supply chain partners share the order information of related products
		Enterprise and major supply chain partners share the product information of related products
		Enterprise and major supply chain partners share the logistics information of related products
Logistics performance	Logistics level	Enterprises can shorten the logistics time
		Enterprises can reduce logistics cost
		Enterprises can improve the overall quality of service
		The enterprise can increase the flexibility of product (quantity, delivery, mixture etc.)

3.2 Research Sample

In this paper, the middle and small enterprises in Chongqing are as the main object of investigation, in addition to large enterprises, including more than middle-level managers and the more comprehensive understanding of the researchers of the supply chain management. The industry attributes of this study include manufacturing, logistics and other services (non-logistics). Among them, the manufacturing industry is mainly composed of the members of the ship statistical association under the jurisdiction of the Chongqing Military Commission. The working life of the respondents or the research on supply chain management is more than three years. In this study, a total of 200 questionnaires were issued (including a total of 80 network questionnaires and a total of 120 paper questionnaire), and a total of 162 valid questionnaires were collected. In this paper, the Cronbach's Alpha coefficient is used to test the reliability of the sample data. The results show that the overall Cronbach 's coefficient of the measured data in this study is 0.926 (Alpha). Information sharing, supply chain integration and logistics performance of these three latent variables of the Cronbach 's Alpha coefficients were 0.822, 0.872 and 0.837, respectively. The coefficients of all Cronbach 's Alpha are above 0.8. The scale has high reliability and good reliability.

3.3 AMOS Analysis and Research Hypothesis

3.3.1 Structural equation model

Based on the former theoretical framework and questionnaire measure items, we build a structural equation model showed in figure 2:
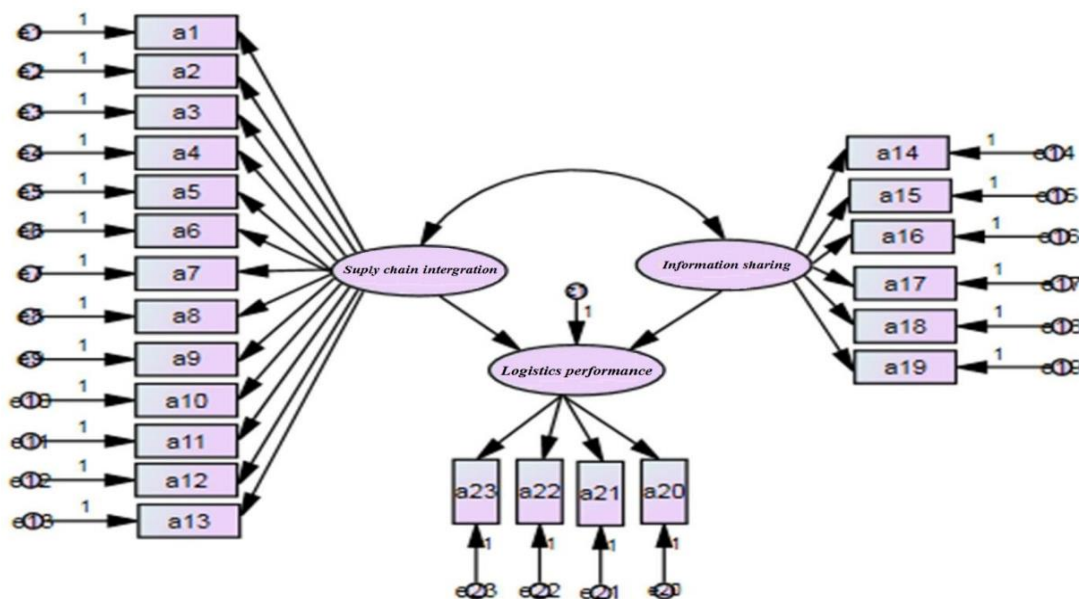

Fig.2 Structural Equation Model

3.3.2 Model Fitting

a) Standardized Coefficient

AMOS software is used to standardize the path of the model. Unstandardized coefficient estimation and standardized coefficient path are given in Table 2 and Table 3, respectively.

Table 2 Unstandardized Coefficient Estimation

Standardized Regressions Weights:(Group number 1 Default model)			
			Estimate
Logistics performance	<----	Supply chain integration	.355
Logistics performance	<----	Information sharing	.701
a1	<----	Supply chain integration	.307
a2	<----	Supply chain integration	.622

a3	<----	Supply chain integration	.623
a4	<----	Supply chain integration	.601
a5	<----	Supply chain integration	.604
a6	<----	Supply chain integration	.485
a7	<----	Supply chain integration	.520
a8	<----	Supply chain integration	.654
a9	<----	Supply chain integration	.614
a10	<----	Supply chain integration	.514
a11	<----	Supply chain integration	.599
a12	<----	Supply chain integration	.596
a13	<----	Supply chain integration	.583
a23	<----	Logistics performance	.742
a22	<----	Logistics performance	.746
a21	<----	Logistics performance	.747
a20	<----	Logistics performance	.806
a14	<----	Information sharing	.710
a15	<----	Information sharing	.629
a16	<----	Information sharing	.572
a17	<----	Information sharing	.674
a18	<----	Information sharing	.731
a19	<----	Information sharing	.686

Table 3 Standardized Coefficient Estimation

Maximum Likelihood Estimates Regression Weights:(Group number1-Ddfault model)							
			Estimate	S.E	C.R	P	Label
Logistics performance	<----	Supply chain integration	1.000				
Logistics performance	<----	Information sharing	.727	.096	7.574		Par_2
a1	<----	Supply chain integration	1.000				
a2	<----	Supply chain integration	2.482	.477	5.206		Par_3
a3	<----	Supply chain integration	1.995	.383	5.212		Par_4
a4	<----	Supply chain integration	2.433	.475	5.127		Par_5
a5	<----	Supply chain integration	2.236	.435	5.139		Par_6
a6	<----	Supply chain integration	1.616	.352	4.587		Par_7
a7	<----	Supply chain integration	1.821	.382	4.769		Par_8

a8	<----	Supply chain integration	2.402	.451	5.322		Par_9
a9	<----	Supply chain integration	2.247	.434	5.177		Par_10
a10	<----	Supply chain integration	1.909	.403	4.740		Par_11
a11	<----	Supply chain integration	2.350	.459	5.118		Par_12
a12	<----	Supply chain integration	2.218	.434	5.108		Par_13
a13	<----	Supply chain integration	2.113	.418	5.052		Par_14
A23	<----	Logistics performance	.794	.073	10.902		Par_15
A22	<----	Logistics performance	.902	.082	10.968		Par_16
A21	<----	Logistics performance	.908	.083	10.998		Par_17
A20	<----	Logistics performance	1.000				
a14	<----	Information sharing	1.000				
a15	<----	Information sharing	.818	.105	7.810		Par_18
a16	<----	Information sharing	.760	.107	7.120		Par_19
a17	<----	Information sharing	.877	.105	8.353		Par_20
a18	<----	Information sharing	.882	.098	9.043		Par_21
a19	<----	Information sharing	.924	.109	8.506		Par_22

Besides, the variances estimation is provided in Table 4:

Table 4 Variances Estimation

Variances:(Group number1 Default model)					
	Estimate	S.E	C.R	P	Label
Information sharing	.987	.204	4.843		Par_23
Supply chain integration	.478	.105	4.558		Par_24
z1	.346	.075	4.623		Par_25
e1	1.061	.119	8.919		Par_26
e2	1.302	.150	8.666		Par_27
e3	.831	.096	8.653		Par_28
e4	1.397	.160	8.740		Par_29

e5	1.157	.133	8.723		Par_30
e6	1.145	.127	9.036		Par_31
e7	1.249	.139	9.019		Par_32
e8	1.074	.125	8.618		Par_33
e9	1.171	.133	8.783		Par_34
e10	1.398	.155	9.041		Par_35
e11	1.365	.155	8.805		Par_36
e12	1.201	.137	8.771		Par_37
e13	1.165	.132	8.805		Par_38
e14	1.101	.140	7.875		Par_39
e15	1.475	.168	8.776		Par_40
e16	1.640	.183	8.941		Par_41
e17	.825	.111	7.443		Par_42
e18	.863	.115	7.535		Par_43
e19	1.079	.132	8.151		Par_44
e20	.491	.076	6.440		Par_45
e21	.737	.095	7.765		Par_46
e22	.760	.096	7.954		Par_47
e23	.574	.073	7.891		Par_48

b) Coefficient Estimation Result

By using the "Calculate Estimate" function in Analyze menu of AMOS to calculate the structural model, we can get the coefficient estimation result shown in Figure 3:
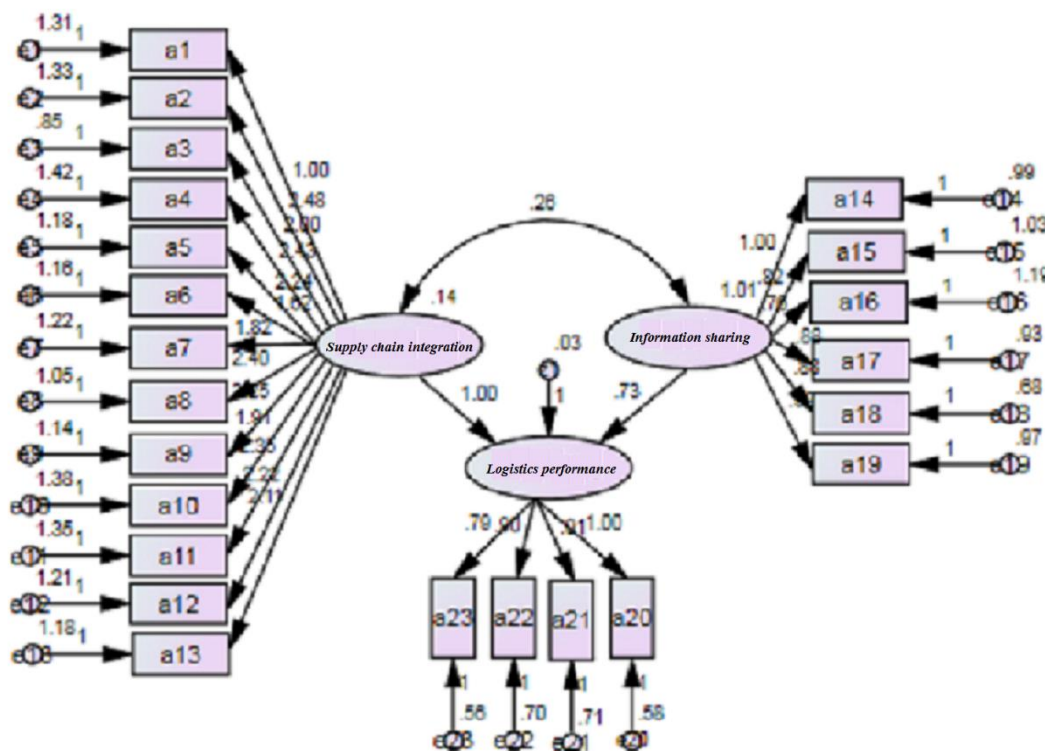

Fig. 3 Parameter Estimation Results

c) Model Fitting Evaluation

For the structural model, the model fitting index is a kind of test of the theoretical model. For different models, fitting index are also different. The goodness of fitting index can be used to measure the quality of the model from different angles, such as complexity, absoluteness and sample size. In this

paper, the relationship between supply chain integration, logistics performance and information sharing is analyzed by AMOS software. The fitting parameters of the model by maximum likelihood estimation are shown in Table 5.

Table 5 Fitting Index under Maximum Likelihood Estimation

Index name		Test result	Model fit judgment
Absolute fitness index	χ^2	0.053	Yes
	GFI	0.979	Yes
	RMR	0.093	Yes
	RMSEA	0.062	Yes
	AGFI	0.942	Yes
Value added fitness index	NFI	0.802	Yes
	TLI（NNFI）	0.903	Yes
	CFI	0.913	Yes
	RFI	0.901	Yes
	IFI	0.914	Yes
Simple fitness index	PGFI	0.683	Yes
	PNFI	0.723	Yes
	PCFI	0.823	Yes

As can be seen from Table 5, the overall fitness of the model χ^2 is 0.053, greater than 0.05. We can conclude that the model assumptions accepted by this paper are in agreement with the actual data obtained from the questionnaire survey. In addition, the other fitness index in addition to RMR and NFI did not meet the standard. Other indicators GFI, RMSEA, AGFI, TLI (NNFI), CFI, RFI, IFI, PGFI, PNFI and PCFI have reached the adaptation standard. On the overall model fit index, in this paper, the theoretical assumptions and theoretical models are established, and the results of the theoretical model and the questionnaire can be matched.

d) Analysis of Standard Path Map

Based on the above analysis, we can see that the model is well fitted. Then we get the standard path diagram of the theoretical model through the standardized path coefficient, as shown in Figure 4.
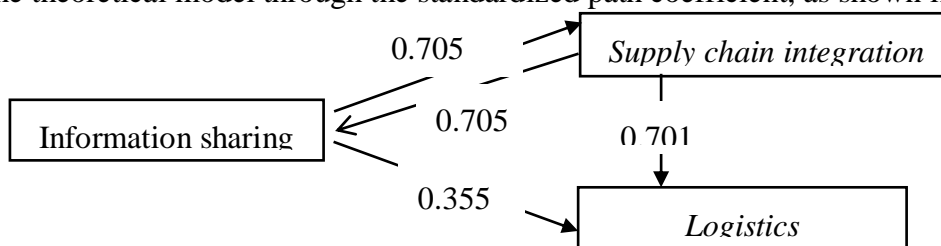

Fig. 2 The theoretical standardized path coefficient

As can be seen from the figure, the four assumptions H1-H4 proposed in the construction of the theoretical model are well verified.

4. Results Discussion

Through the analysis of the results of structural equation model, we find that: Information sharing can promote the integration of supply chain, supply chain integration can promote information sharing, supply chain integration has a positive role in promoting logistics performance and information sharing has a positive role in promoting logistics performance.

(1) Information sharing and supply chain integration has the relation of mutual promotion.

According to the standard path coefficient of standard path graph, the standard path coefficient between information sharing and supply chain integration is 0.261,which under the condition p<0.05

can reach a significant level; Therefore, we can conclude that information sharing and supply chain integration can promote each other. This indicates that the higher the degree of information sharing in the whole supply chain is, the higher the degree of supply chain integration is. Conversely, the higher the degree of supply chain integration in supply chain is, the higher the degree of information sharing is.

(2) Information sharing has positive relationship with logistics performance

According to the standard path coefficient of standard path graph, the standard path coefficient between information sharing and logistics performance is 0.701, which under the condition $p<0.05$ can reach a significant level; Therefore, we can conclude that information sharing can improve logistics performance effectively.

(3) Supply chain integration has positive relationship with logistics performance

According to the standard path coefficient of standard path graph, the standard path coefficient between supply chain integration and logistics performance is 0.705, which under the condition $p<0.05$ can reach a significant level; Therefore, we can conclude that supply chain integration can improve logistics performance effectively.

5. Conclusion and suggestion

Based on the field investigation and literature analysis, this paper makes a systematic and scientific research on Supply Chain Management in view of information sharing. Through structural equation modeling, make data processing and analysis of the relationship between the three aspects of information sharing, supply chain integration and logistics performance. Finally, the scientific argument reach a conclusion: Information sharing and supply chain integration can promote each other, information sharing has a positive effect on Logistics Performance, supply chain integration has a positive effect on Logistics Performance. This research not only perfects the theory system of information sharing and supply chain integration, but provides reference for the following research on supply chain integration and logistics performance; and it is of guiding significance for the effective management of Chinese enterprises in the fierce competition of supply chain.

Given this study, there are some suggestions when the enterprises carry out supply chain management. First, the enterprise can make full use of the external resources to response the market demand changing unpredictably fast through the supply chain integration. Such enterprises only need to seize their own core competitiveness of the business; other business can be outsourced to other professional bodies on the supply chain system. Second, carry out effective supply chain integration, which is necessary to transfer effective data and use between the main bodies of supply chain system. At present, information sharing can help companies quickly capture a variety of useful information, to a certain extent, to improve customer service and enhance customer contact. In addition, information sharing can also strengthen the monitoring ability of daily operation of supply chain enterprises. Propose solutions and corrective actions after appropriate data analysis, so as to improve

References

[1] J H Y. Yeung, W. Selen, M. Zhang, B F, H. "The effects of trust and coercive power on supplier integration," International Journal of Production Economics, vol. 120(2008), 66-78.

[2] M G. Zeng, Q Q. Wu. "The Indirect Effect Mechanism of Information Sharing on Supply Chain Performance," Science and Science Technology Management, vol. 34(2013), 22-30.

[3] G. Li, H. Yang, L, Sun. "The impact of IT implementation on supply chain integration and performance," International Journal of Production Economics, vol. 120(2009), 125-138.

[4] R R. Zhang, L H. Sun, J. "Summary of Research on Information Sharing in Supply Chain," Science Technology and Engineering, vol.9 (2009), 658-672.

[5] T P. Stank, S B. Keller, P J. Daugherty. "Supply chain collaboration and logistical service performance," Journal of Business logistics, vol. 22(2001), 29-48.

[6] P. Jia. "Logistics Operation and Value Realization Based on Supply Chain Integration Management," Commercial Age, vol. 1(2013), 45-47.

[7] K. Dai. "A Strategic Framework for Improving Logistics Performance," Enterprise Economy, vol.1 (2008), 55-57.

[8] J L. Zhang, X S. Zhang. "Information Sharing in a Supply Chain with Supplier and Retailer's Partial Information," China Management Science, vol. 20(2012), 109-116.

About the Author:

Jie Jian (1973-), Chongqing, China, received management doctor degree from Chongqing University in 2012, dedicated in E-commerce and logistics management research.

Yingqun Zhang (1991-), Chongqing, China, master of Chong University of Posts and Telecommunications, dedicated in E-commerce and logistics management research.

Pu Yang (1993-), Chengdu, China, master of University of Electronic Science and Technology, dedicated in supply chain and logistics management research.

Mengmeng Zhou (1995-), Chongqing, China, undergraduate of Chong University of Posts and Telecommunications, major in accounting.