

# Study on Effects of Incentive Factors on supply chain Performance in E-commerce Environment

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**Abstract.** The past studies aimed at the effects which related incentive factors of supply chain management on supply chain performance are mostly concentrated on the manufacturing sector. Few literature regards the e-commerce system leading enterprise as the core enterprise of supply chain. In the e-commerce environment, supply contract, trust, relationship commitment is regarded as a motivating factor in Inter-enterprise supply chain and the operating conditions with suppliers, financial situation of enterprises in two dimensions are used to measure the performance of the supply chain, and then construct the theoretical model assumptions. Using structural equation modeling empirical analysis, the results show that the supply contract, trust, relationship commitment have significant positive effects on suppliers operating performance and supply contracts have a significant positive impact on corporate financial performance; Effects of trust, relationship commitment and supplier operational performance on corporate financial performance are not significant.

**Keywords.** E-commerce system, incentive factor, Supply Chain Performance, Structural equation model.

## 1 Introduction

In the supply chain management practice, in order to maximize its own interests and maintain the competitive advantage, each node enterprise on supply chain has difficulty to carry out effective cooperation [1]. So as to arouse the enthusiasm of each node enterprises on supply chain and improve supply chain performance, establish a reasonable incentive mechanism of supply chain is an effective way.

Supply Chain incentive mechanisms relevant factors in supply chain performance impact on the domestic and foreign scholars from different angles to answer. Wang Xia Yang [2] and others believe that contract incentive, information sharing, coordination in the supply chain plays a vital role. Chen Shuzhen [3-4], who studied the impact of optimal supply chain promotion and compensation investment promotion for the supply chain contract design under dual channel mode, which proposed the optimal combination of supply chain incentive contract design. Some scholars have analyzed the causes of the supply chain, think through each node enterprise incentive analysis, a good supply chain information sharing incentives can significantly improve supply chain performance [5-7].

However, the view is mostly based on manufacturing background, manufacturing enterprises as the core enterprise supply chain, but with the continuous development of e-commerce, enterprise supply chain management is also a result of e-commerce applications in various industries occurred very big changes, which increasingly reflected in e-commerce environment of the supply chain management [8-9]. Ye Azhen [10] and others, who studied the problem of optimal incentives core enterprise e-commerce environment of the supplier's activities and information sharing activities that affect the core of the enterprise's own characteristics generate greater sharing of information, the greater the incentive coefficient, the greater the impact on supply chain performance. Liu Anwen [11] and others studied the incentives of

supply chain e-commerce environment design from the agency's perspective, research shows that the core business of the agency cost earnings and asymmetric information in case of a great relationship. Shaik[12]and others, who analyzed the development trend of supply chain,they believe that the emergence of the internet and related technology changed the way of global business,and the sustainable development of supply chain management can not do without the e-commerce. But in terms of supply chain performance, Shkoukani[13]believed that supply chain management with the development of e-commerce is also changing after studied the changes in suppliers, customers and product flow, the relationship between supply chain integration and corporate performance.

Based on foregoing analysis,the paper orientation of core enterprise in supply chain management as the dominant enterprise in e-commerce system,selecting supply contract, trust and relationship commitment factors as supply chain incentive mechanism,and using vendor operating performance, the financial situation of the core business in two dimensions to measure the performance of the supply chain. Build a theoretical model and studied Supply chain incentive relevant factors on the supply chain performance.

## **2 Research hypothesis and model foundation**

### **2.1 Supply contracts and supply chain performance**

Building supply contract is to be able to develop a stable supply chain between enterprises and improve supply chain performance.Under reasonable conditions of supply contracts, e-commerce systems in the enterprise to respond quickly to market changes and meet customer needs, improve operational efficiency. Hou Yali[14]and others found a reasonable set about contract parameters of price subsidy can improve vendor enthusiasm, it have a significant impact on improving performance.Wang Xiayang[15]thinks that the reasonable design of supply contract has significant effect to improve supply chain performance.Thus, the paper propose the following hypothesis:

Hypothesis 1:Supply contracts have a significant positive impact on suppliers operating performance (H1) ;

Hypothesis 2:Supply contracts have a significant positive impact on corporate financial performance (H2) .

### **2.2 Trust and supply chain performance**

Trust is the precondition of cooperation, but also the key factor for win-win cooperation.Supply chain, the higher the trust level between each node enterprises of supply chain, the lower the transaction cost will be, thus improving the ability to respond quickly to the entire supply chain, and ultimately affect the overall performance of the supply chain.Ye Fei [16]and other studies have shown that trust each node in the supply chain between enterprises contribute to bilateral cooperation. Pan WenAn[17] and others found a significant relationship commitment through positive impact on organizational performance in the fierce competition in the market.Thus, the paper propose the following hypothesis:

Hypothesis 1: Trust has a significant positive impact on the operational performance of suppliers (H3) ;

Hypothesis 2: Trust has a significant positive impact on corporate financial performance (H4) .

### **2.3 Relationship commitment and supply chain performance**

Relationship commitment is considered to be the basis to establish long-term cooperative partnership.A high level of relationship commitment will enhance the trust between enterprises, reduce the incidence of opportunistic behavior, and have a significant impact on the share of each node enterprise between information and profit.Ye Fei [18]explored the relationship commitment on supply chain operational performance, we found that the relationship commitment between supply chain partners have significant positive impact on operational performance. However, some scholars have come to different conclusions.For example,Craig and Marianne found that the relationship commitment to supply chain nodes does not significantly affect the performance of cooperation[19].Based on the above study, we proposed the following hypothesis:

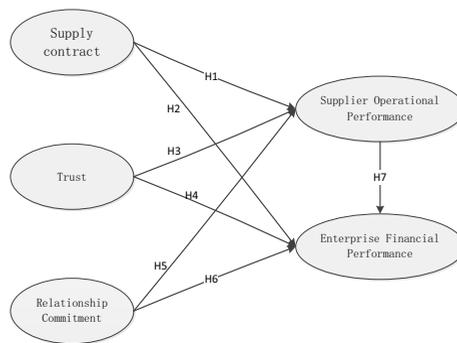
Hypothesis 1: Relationship commitment have significant positive impact on suppliers operating performance (H5) ;  
 Hypothesis 1: Relationship commitment have significant positive impact on corporate financial performance (H6) .

**2.4 Suppliers operating performance and corporate financial performance**

Under e-commerce environment, the market competition becomes increasingly fierce, which requires companies to be more flexible, fast, high-quality product improvement, timely and accurate delivery of products to meet different consumer needs. So suppliers operating performance is considered to be in supply chain management decisive factor. Suppliers only timely and rapid response to the needs of downstream business supply chain, improve product quality, reduce inventory in order to reduce costs and improve ROI. Thus, the paper propose the following hypothesis:

Hypothesis 1: Suppliers operational performance has a significant positive impact on corporate financial performance (H7) .

Based on the above analysis and assumptions, we propose a conceptual model of this study, shown in Figure 1.



**Fig1 .The conceptual model**

**3 Research design and analysis**

**3.1 Questionnaire Design and Data Collection**

For the supply chain incentives and the study of supply chain performance , home and abroad have proven Q-item scale. While learn from home and abroad have been employed at the same scale, considered that we are regard the e-commerce ecosystem of leading enterprise as a core enterprise in supply chain , paper is assumed to be the e-commerce ecosystem of leading enterprise and its main supplier of secondary supply chain, and survey involving materials, food, machinery, medicine, electronics and other 18 industries about e-commerce business in senior management, sales manager, in charge of logistics and supply chain operations and related personnel. Scoring systems and indicators using likert Scale for five, according to the actual situation review from "completely disagree" to "completely agree."

The main scope of the study is the e-commerce ecosystem of leading enterprise and its main suppliers in first line, second-tier cities , so there is no geographical restrictions. using a combination of email and the field survey, issued a total of 700 copies, of which e-mail 500 parts, 200 parts of paper questionnaires. Recycling 287 parts excluded for obvious errors and incomplete answer after 29 questionnaires were collected from 258 parts, which Effective recovery rate was 36.9%.

**3.2 Correlation analysis**

With SPSS21.0 to analyze three relevant factors about supply chain and supplier operational performance, financial performance. From Table 1, the correlation coefficient between 0.487-0.740, where the supply contract and corporate financial performance correlation weaker than other factors , while the most relevant between relationship commitment

and supplier operational performance, and relations between the various other factors are significant. From the overall, good correlation.

**Tab1.** The correlation coefficient matrix

	Supply contract	Trust	Relationship Commitment	Supplier Operational Performance	Enterprise Financial Performance
Supply contract	1				
Trust	.646**	1			
Relationship Commitment	.606**	.680**	1		
Supplier Operational Performance	.708**	.686**	.740**	1	
Enterprise Financial Performance	.487**	.592**	.606**	.650**	1

Note:\*\* At .01 level (bilateral) significant correlation.

### 3.3 Reliability and validity analysis

Reliability analysis, also known as reliability analysis, to measure the results of stability and consistency. In this paper, Cronbach's  $\alpha$  coefficient to test the internal consistency of variables.  $\alpha$  is more than 0.7 is generally considered feasible. Table 2 is made, Cronbach's  $\alpha$  values in excess of 0.7, show that the measurement model has good reliability.

Questions of the questionnaire and evaluation are most used through empirical research results at home and abroad, thus ensuring content validity of the questionnaire. But the terms of construct validity, taking into account the characteristics of the contents of this paper, we consulted the relevant scholars, the questionnaire part of the structure, content was amended with SPSS21.0 factor analysis. From the table 2, load factor and AVE value of each Q-item is greater than 0.5, this shows that the inherent quality of the model is good, and measurement model has good construct validity.

**Tab2.** The reliability analysis and confirmatory factor analysis

Variable	Q-item	Means	Cronbach's $\alpha$	Load factor	AVE
Supply contract	SC1	3.362	0.723	0.771	0.608
	SC2	3.576		0.775	
	SC3	3.543		0.551	
	SC4	3.610		0.550	
	SC5	3.562		0.951	
Trust	Tr1	3.600	0.845	0.789	0.623
	Tr2	3.648		0.723	
	Tr3	3.505		0.608	
	Tr4	3.662		0.498	
Relationship Commitment	RC1	3.552	0.844	0.736	0.701
	RC2	3.581		0.716	
	RC3	3.724		0.690	
Supplier Operational	SOP1	3.538		0.740	0.612

Performance	<i>SOP2</i>	3.595		0.680
	<i>SOP3</i>	3.610	0.845	0.663
	<i>SOP4</i>	3.595		0.564
	<i>SOP5</i>	3.624		0.610
	<i>FP1</i>	3.591		0.614
Enterprise Financial Performance	<i>FP2</i>	3.505		0.705
	<i>FP3</i>	3.586	0.861	0.790
	<i>FP4</i>	3.533		0.805
	<i>FP5</i>	3.581		0.811
				0.663

## 4 Hypothetical model processing

### 4.1 model fit test

According Bogazzi and Yi's[20]point of view,we can find the basic goodness of fit, the overall model fit and internal structural adaptation which three test model whether is well suited for the actual data.

#### 4.1.1 Basic adaptation degree

Basic adaptation of a standard model include four aspects: no negative measurement error, measurement error reaches a significant level, standard error control in the lowest range and the load factor must be between 0.5 to 0.95.Here in each latent variable measure of factor loadings are between 0.5 to 0.9, and the error variable is greater than 0, indicating that the theoretical model has a good basic adaptation degree.

#### 4.1.2 The overall adaptation degree

Overall model adaptation degree is used to test the sample data and the degree of entire model.Generally it believed that the overall model adaptation degree measure include Absolute adaptation index, value-added adaptation index and Simple adaptation index.Overall modeladaptation degree in this paper are shown in Table 3, the overall adaptation in good condition.

**Tab3.** Model overall adaptation degree

	Adaptation index	The model adaptation value	Acceptable values
	Chi-square value $X^2$	292.546	The smaller the better
Absolute adaptation degree	<i>RMR</i>	0.032	<0.05
	<i>RMSEA</i>	0.041	<0.05
	<i>GFI</i>	0.957	>0.9
	<i>AGFI</i>	0.942	>0.9
Value-added adaptation degree	<i>NFI</i>	0.977	>0.9
	<i>RFI</i>	0.968	>0.9
	<i>IFI</i>	0.935	>0.9
	<i>TLI</i>	0.982	>0.9
	<i>CFI</i>	0.973	>0.9
Simple adaptation	<i>PNFI</i>	0.743	>0.5

degree	<i>PGFI</i>	0.649	>0.5
	<i>PCFI</i>	0.686	>0.5

**4.1.3 Model of the internal structure of fit**

Inner structure adaptation degree is used to evaluate the reliability and validity of each indicator variables, estimate significant degree of parameters .It is generally believed that the composite reliability of potential variable is greater than 0.6, the average variance extracted values of latent variables (AVE) is greater than 0.5, the project reliability of individual observed variables is greater than 0.5, the model can explain the internal structure adaptation degree is good.

**4.2 hypothesis test**

According to the model after AMOS 21.0 hypothesis proposed for analysisist,Get the results shown in Table 4, hypothesis that H1, H2, H3, H5 is verified, the P value of H4, H6, H7 is not significant.

**Tab4 .Model hypothesis test results**

Hypothesis	Path Direction	Standard path coefficients	P value	Conclusion
H1	Supply contract→Supplier Operational Performance	0.496	0.026*	support
H2	Supply contract→Enterprise Financial Performance	0.812	0.032*	support
H3	Trust→Supplier Operational Performance	0.453	***	support
H4	Trust→Enterprise Financial Performance	0.157	0.076	support
H5	Relationship Commitment→Supplier Operational Performance	0.522	***	support
H6	Relationship Commitment→Enterprise Financial Performance	0.224	0.085	fefuse
H7	Supplier Operational Performance→Enterprise Financial Performance	0.539	0.078	fefuse

Note: The significant level \* P <0.05, \*\* P <0.01, \*\*\* P <0.001

**5 Discussion**

Through theoretical model is verified by Table 4, we found that the supply contract to supplier operational performance and corporate financial performance has a significant impact. This means that H1 and H2 are supported.This article select revenue sharing, quality guaranteed, price subsidies, minimum order quantity commitment and information sharing as the parameters of the supply contract, fit the requirements change of supply chain management under the e-commerce environment , the resonance between each node enterprises in supply chain.This resonated with each node in the supply chain between enterprises.Thus the supply contract to improve the supply chain performance of the core businesses and suppliers have a significant impact.

Trust is the cornerstone of supply chain cooperation.Many scholars regard manufacturing enterprises as the core of supply chain enterprise , to study the effect of trust on supply chain performance is significant, and has been confirmed.The core business in supply chain is positioned as the dominant firms of e-commerce ecosystem , the results show, H3 was supported. This means that we can build trust

mechanism between the supply chain node enterprises, enhance the relationship of mutual trust, promote the improvement of supplier performance, thus improving the performance of the entire supply chain.

Relationship commitment is a desire on the supply chain node enterprises to maintain cooperative relations. H5 is supported, so our supplier of core enterprise promises to maintain cooperative relations as an incentive, so as to maintain long-term stable relationship.

From Table 4, H4, H6, H7 have been rejected, the reason may be to improve the financial performance of corporate governance is the result of factors strategy development, market environment, partnerships and other joint action.

## References

1. Ma Shihua, Lin Yong. Supply Chain Management (3rd Edition). Beijing: Machinery Industry Press, 2010.
2. Wang Xiayang. Dynamic coordinate of contract incentives, information sharing, supply chain. Management World, 2005, (4): 106-115.
3. Chen Shuzhen, Xiong Zhongkai, Liang Xi. Incentive Compensation Dual channel supply chain coordination contract design. China Management Science, 2009, 17(1): 64-75.
4. Su Yuning, Chen Chuhung. Incentives in Supply Chain under Random Demand. Operations Research and Management, 2010, 14(1): 150-154.
5. Zhang Xinfeng, Zhao Yan, Xu Guohua. Supply study on Chain Information Sharing Incentive Management. Engineering Management Journal, 2006, (2): 123-125.
6. Lee H L, So K C, Tang C. The Value of Information Sharing in a Two-level Supply Chain. Management Science, 2000, 46(5): 626-643.
7. Gupta D, Weerawat W. Incentive Mechanisms and Supply Chain Design for Quick Response. Minneapolis: University of Minneapolis, 2010, 12: 135-146.
8. Song Hua. Supply chain management changes in E-commerce Environment. Business Economics and Administration, 2013, (12): 4-7.
9. Tang Xuan, Wang Weifu. Study on electronic supply chain management system based on e-commerce. Technology Management Research, 2006, (3): 177-179.
10. Ye a zhen, Lin Yihua, Liu Xiaomin. Two stage supply chain incentive mechanism under the e-commerce environment. Chongqing University of Science and Technology Journal, 2010, (21): 85-88.
11. Liu Anwen, Wang Yueping. Study on incentive mechanism of Supply Chain Principal Agent Theory Electronic Commerce. Chongqing University Journal, 2012, 8(2): 50-54.
12. Shaikh A, Rafiq M, Iyer R K. Exploring e-Business Trends with Supply Chain Management Perspective. International Journal of e-Education, 2014, 4(3): 58-64.
13. Shkoukani M, Alnagi E, Abulail R. Comparison between Upstream and Downstream Supply Chain Management and How they are affected by E-business. Oriental Journal of Computer Science and Technology, 2013, 6(2): 1-8.
14. Hou Yali, Zhou Dequn. Coordination of the three segments of the contract price subsidies Supply Chain. Systems Engineering, 2006, 24(4): 25-30.

15. Wang XiaYang. Nonlinear cost constraint-s, Contract Design and Supply Chain p-erformance. *Modern management science*, 2008, (5):91-93.
16. Ye Fei, Xu Xuejun. On information sharing and operational performance of the supply chain partnership between the trust and relationship commitment. *systems engineering theory and practice*, 2009, 29(8):36-49.
17. Pan wenAn, Zhang Hong. Trust between supply chain partners, commitment on cooperative Performance. *Psychological science*, 2006, 29(6):1502-1506.
18. Lu Hui, Ye Fei, Qiang Rui. Information on collaborative supply chain resource dependence, trust and relationship commitment. *Industrial Engineering and Management*, 2010, 15(6):7-15.
19. Carig R, Marianne M. Social responsibility and supply chain relationships. *Transportation Research Part E: Logistics and Transportation Review*, 2002, 8(1):37-2.
20. Bagazzi R P, Yi Y Y. On the evaluation of structural equation model. *Academic of Marketing Science*, 1988, 16:76-94.