EasyChair Preprint

№ 858

Relationship Between Supply Chain Integration and Enterprise Performance of E-commerce in China: An Empirical Study based on Structural Equation Model

Hongmei Shan, Shuang Xue and Jing Shi

March 27, 2019

Relationship Between Supply Chain Integration and Enterprise Performance of E-commerce in China: An Empirical Study based on Structural Equation Model

Hongmei Shan[a*], Shuang Xue[a*], Jing Shi[b*].

[a] Department of E-commerce & Logistics Management, College of Posts and Logistics, Xi'an University of Posts and Telecommunications, Xi'an, Shaan xi 710061, China

[b] Department of Mechanical and Materials Engineering, College of Engineering & Applied Science, University of Cincinnati, Cincinnati, OH 45221, USA

[*]Corresponding author:1354258727@qq.com (+86) 13709112974;; jing.shi@uc.edu (1) 5135562380

Abstract:

Supply chain management (SCM) has become an important strategy for e-commerce enterprises to gain competitive advantage. The key to SCM is to promote the integration of business processes and logistic, information and capital flow both inside and outside of the enterprise. This paper aims to study the supply chain integration (SCI) of electronic commerce (EC) and its impact on enterprise performance (EP) by constructing the structural equation model (SEM) and using the survey data of 237 e-commerce enterprises in China. The results show that supplier integration (SI) and internal integration (II) have significant positive influence on enterprise performance in China's EC, while customer integration (CI) has negative influence on EP. This paper contributes to the theory of electronic commercial SCM and provides empirical-proven explanations for manager to differentiate the impact of SI, CI and II on EP.

Keywords:

E-commerce; Supply chain integration; Structural equation model; Enterprise performance

1. Introduction

With fierce competition in the global market, the diversification of consumer demand and the rapid development of advance information technology, e-commercial enterprises are facing increasingly severe challenge. Every enterprise has realized that individuals are not enough to improve and maintain their competitiveness in the market, and the individual competition between firms has been gradually transformed into the unity competition between supply chain and supply chain. Therefore, strengthening supply chain management （(SCM)） has become a principal strategy for e-commerce managers to gain competitive advantage, and the key to successful implementation of SCM is to promote the integration of business processes and logistic, information and capital flow both inside and outside of the enterprise. Practically, in order to improve the competitive edge and reduce the operating cost, the successful e-commerce (EC) enterprise has made reform and optimization of the existing operation management mode by implementing supply chain integration (SCI). For example, Amazon carries out the vertical integration strategy along the supply chain by the aggregation of modern information technology(such as cloud computing, big data and so on), robot warehouse, unmanned distribution, network payment and distinguished transportation system. . The strategy not only has achieved the seamless docking of transaction between traders and manufacturers, but also won more customer satisfaction through speed, innovation, low cost and one-click service, thus greatly improving enterprise performance (EP) . However, the strategy of SCI putting in practice by other e-commerce enterprises may not be as successful - the performance is not satisfactory as expected, and even serious financial losses are incurred with firms. As such, one has been curious about the following questions:

(1) Does the implementation of SCI for e-commerce enterprises really bring about the improvement of EP ?

(2) Which modes of SCI, supplier integration (SI), internal integration (II) or customer integration (CI) is truly positive effect on EP for the e-commerce?

(3) Are there direction or indirection correlations between SCI and EP for e-commerce?

Supply chain integration (SCI) is about the integration of information flows, logistics and financial flows between enterprises and supply chain partners (Bowersox & Morash, 1999; Rai, 2006). It is regarded as the soul of supply chain management (Horvath, 2001). As for the relationship between SCI and EP, many scholars have made valuable attempts. Horvath (2001) reckons that SCI is the soul of

supply chain management. Rai (2006) deems that SCI is also the integration of information flows, logistics and financial flows between enterprises and supply chain partners. As for the relationship between supply chain integration and enterprise performance, many scholars have made valuable attempts. A number of studies have investigated how supply chain integration can affect enterprise performance. While the majority of literature (Wiengarten, 2014; Frohlich & Westbrook, 2001; Rosenzweig, 2003; Vickery, 2003) shows the positive impact of supply chain integration, some studies (Stank, Keller & Daugherty, 2001; Swink, 2007; Koufteros, 2005) suggest the otherwise relationship. Therefore, the findings from literature are still divided, and not conclusive. Furthermore, many existing studies are focused on manufacturing industry. To the best of our knowledge, little is concerned about whether supply chain integration is correlated with the performance of the emerging e-commerce, and which supply chain integration mode is efficient for e-commerce firms. A number of studies have investigated how SCI can affect EP. While the majority of literature (Wiengarten, 2014; Frohlich & Westbrook, 2001; Rosenzweig, 2003; Vickery, 2003) shows the positive impact of supply chain integration, some studies (Stank, Keller & Daugherty, 2001; Swink 2007; Koufteros 2005) suggest a negative or no obvious relationship. Therefore, although many researchers have studied the relationship between SCI and EP, their conclusions are still divided and needed to be further clarified. Furthermore, The existing literatures are focused on manufacturing industry. To the best of our knowledge, little is concerned about whether SCI is correlated with EP for the emerging e-commerce, and which mode of SCI is more effective for e-commerce enterprises.

This paper intends to give evidence of the relationship between SCI and EP of e-commerce in China by employing the structural equation model (SEM). More than 1000 enterprises including B2B and B2C e-commerce firms are included in the empirical study. The framework of this article is as follows. Section 2 prepares a brief and comprehensive literature review on SCI. Theoretical models and relational assumptions develops in Section 3. Section 4 introduces the validation methodology, including variables measurement and data collection. Section 5 describes the results of empirical study and provides a discussion. Finally, the conclusions and further researches s generalize in Section 6 .

The main contribution of this study is reflected by the efforts to (1) fill the empirical research gap on relationship of SCI and EP in e-commerce; (2) explore the effectivity effectiveness of different modes such as SI, CI and II on EP for e-commerce; (3) further enrich the theories of integration-commerce SCM. . These results are helpful to the efficient implementation of SCM for

e-commerce enterprises in China.

2. Literature review

2.1 Supply chain integration (SCI)

As early as 1978, Lambert and other famous scholars put forward a concept tying together a number of distribution activities. This concept represents an "integration" of the traditional management functions which is fragmented and physically dispersed . However, researchers do not begin to attach importance to the integration of supply chains until 1990s. Various concepts of SCI have been proposed. Nambisan (2002) states that SCI is to smooth financial, logistics, resources and information flows, which can be achieved by removing all barriers between different functions, different enterprises and different regions. Kahn KB (1996) believes that trans-department integration is a close integration of departments, through inter-departmental communication and collaboration. However, Bowersox & Morash (1989) propose that sci refers to the integration of all channel partners, activities, departments, processes and positions. Vickery (2003) considers that SCI should be managed as a single system rather than as a separate optimization management. By combining the above studies, it can be summarized that SCI refers to the establishment of strategic cooperative partnership with upstreamward and downwordstream firms in supply chain, which simultaneously promotes the collaborative management of internal and external processes of the enterprise to achieve efficient flow of product, logistics, information, capital and decision, and efficiently create maximal rewards with low expenses for customers. Meanwhile, Themistocleous (2002) divides SCI into low and high dimension integration according to the business dependence and emphasis on partner. Das et al. (2006) points out that SCI includes customer aggregation , market integration, information accumulation, logistics and distribution combination, supplier congregation etc. Stank & Frohlish (2001) assort SCI into the internal integration (II) and external integration(EI), where the EI is further split into SI and CI. Morash & Clinton (1998) study the integration processes of cross-functional departments in internal organization (e.g. production, logistics and market), and cross-enterprise consolidation along the supply chain. Finally, many studies also focus on applications of SCI in specific industry. Vargas, Cardenas & Matarranz (2000) analyze the SCI activities of Spanish equipment manufacturing enterprises. It is indicated that II rather than EI effectively achieves strategic goals in Spanish equipment manufacture .

Although logistics integration is at a lower resolution, it still does bring competitive advantage and economic benefit. Cristina Gim é nez & Eva Ventura (2003) study the SCI of Spanish retail industry. It is discovered that II is correlated to EI, and the firms with successful internal congregation will gain a competitive advantage and achieve higher performance in the industry.

2.2 Relationship between SCI and EP

Regarding the relationship between SCI and EP, it is commonly believed that SCI has positive impacts on EP, and the internal and external business aggregrationaggregation is necessary to improve performance. For instance, Wiengarten (2014) discovers that SI has a positive affection on cost and flexible performance; Frohlich &Westbrook (2001) reckon that the company with great SI and CI can improve the performance to the greatest extent; Rosenzweig (2003) holds a similar standpoint that SCI can improve business performance and customer satisfaction; Vickery (2003) regards the strategic management of SCI as a single system and believes that it can effectively improve the performance of enterprises; Braganza's (2002) results show that the integration of partial functional modules of different organizations could achieve higher performance than the industry average; Lau & Yam (2007) indicate that the higher level of integration of upstream and downstream enterprises, the easier it will be to obtain more profits; Henry Jin (2013) shows that SCI affects operation and business performance through affecting production and customer service; Yim & Leem (2013) suggests that SCI positively affects EP, and enterprise performance includes innovation-oriented, operation-oriented and growth-oriented performance; M.Davis (2014) conducts a study of cross-cultural impact in supply chain and finds in the United States and Singapore, in the supply chain, companies with the ability to innovate super value insist on mutual dependence and cooperation, and put their personal interests after the collective interests of the companythe company with super innovation is that significantly insists interdependence and collaboration, and subordinates individual interests to overall interests of supply chain, , thatis is say, cross-cultural integration and communication have a positive effect on corporate operating performance.

On the other hand, Stank, Keller & Daugherty (2001) argue there is no evidence indicating significant correlation between SCI and EP. Swink et al. (2007) & Koufteros. (2005) even suggest a negative relation between SI and EP. Also, Sezen (2008) proposes that SCI has no significant impact on flexible accomplishment , resource performance and output performance, which belongs to the category of operating performance; Cousins & Menguc (2006) deem that SCI has no significant impact

on supplier achievement ; Yu (2013) considers that the customer and supplier integration outside of the firms are influenced by II, CI has no effect on financial performance, however SI has a positive effect on financial performance; Cousins & Menguc (2006) show that SCI has no significant impact on operational performance. By digging into the research cases, it is found that although SCI can bring benefits to enterprises, but many factors hinder the SCI implementation. The factors include information asymmetry, high cost threshold, and appropriate management system, , proprietary assets, etc.

3. Hypotheses development

3.1 Supply chain integration

Bowersox & Morash (1999) propose that SCI refers to the integration of activities, relationships, processes, departments and locations of all channel partners in supply chain. Vickery (2003) deems that SCI should be administrated as a single system rather than as a separate optimization management from organization management perspective. Considering that e-commerce enterprises congregrate their business and process along the supply chain by extending upstream integration which involves supplier enterprise, logistics service providers, technical support and equipment suppliers, and stretching downstream integration which includes intermediate customers or the end consumers. Another , in order to improve the efficiency of internal departments of e-commerce enterprises, it is necessary to carry out internal integration such as purchasing department, finance department and logistics department. Therefore, in this paper we follow Stank & Frohlish (2001) and divide the SCI pattern of e-commerce enterprises into SI, II, and CI. It is a three-dimension systematic view that is helpful to understand the SCI effect on firm performance deeply.

3.2 Enterprise performance

EP is regarded as the achievements of implementing specific market behavior for the firms under a certain resource, market structure and environment. Luo (2012) conducts a meta-studied on relationship and performance, and separate organizational performance into business performance and operational performance. The business performance focuses on economic results , including financial and market indicators based on operational results, while the operational performance concerns with the non-economic outcomes of enterprises, including customer satisfaction, social relations and

corporate reputation. Kim (2006) defines corporate performance into customer satisfaction, market performance and financial performance. Wong (2011) suggests that the operational performance is comprised of distribution performance, production cost, services' quality and production flexibility. In general EP can be popularly classified into financial performance and non-financial performance by predecessors. Meanwhile, owing to the different research contents and perspectives, there are great differences in the aspects of non-financial performance. Considering the open sharing feature of network economy, e-commerce enterprises usually pursue the non-financial performance in the early period of rapid growth, such as website reputation , user attraction, the scale of delivery service network, the popularity of payment platform, rather than financial performance. Therefore, this paper investigates EP of e-commerce from financial performance and non-financial performance. Among them, the financial performance mainly can be evaluated by the common financial measurement, such as profit growth, monetary gain and currency holdings and so on. The non-financial performance can be divided into two aspects: operating performance and market performance. Operational performance generally includes logistics service, payment method, main operation cost and rapid response to customer's requirement, while market performance mostly includes enterprise brand credibility, market share, sales and growth levels etc.

3.3 Theoretical model

The purpose of this study is to certify the relationship between SCI and EP in e-commerce. According to previous discussion, SCI is measured from three dimensions: SI, II and CI. EP is measured from two dimensions: non-financial performance and financial performance (FP), and non-financial performance is investigated from operating performance (OP) and market performance (MP). Kim (2006) assumes that the non-financial performance of enterprises is an ideal mediation variable, such as operational performance and customer performance; Luo (2012) thinks that SI, CI and II exert influence on corporate performance through non-financial performance. It's assumed that the three dimensions of SCI have positive impacts on OP and MP, OP and MP also have different degree positive impacts on the FP of enterprises. Thus, we propose the model approach as shown in Fig.1.

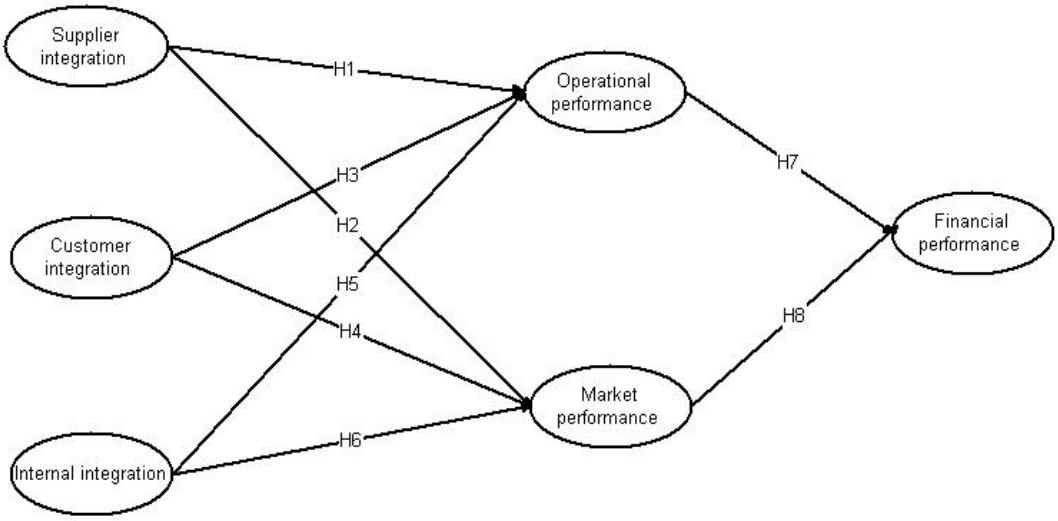

Figure 1. Proposed structural equationmodeling approach

3.4 Hypotheses development

Supplier integration and non-financial performance: The influence of SI is mainly evaluated from the following three aspects: Firstly, e-commerce enterprises actively discuss with suppliers on product design, service quality and other aspects (SI1). with the view of the personalized needs of consumers, e-commerce enterprises cooperate with upstream suppliers of the supply chain to pursue customized products and services, supplier participation and continuous improvement in product design have positive impacts on customer satisfaction (Tracey & Tan 2001) and reduce the quality problem by about 30% and 80% (Burton 1988). Secondly, e-commerce enterprises share customer demand data with upstream companies (SI2), so that all stakeholders can reduce indeterminacy risk , improve the logistics and market response, maximizes performance and enhance competitive capacity of the overall supply chain in market (Frohlich & Westbrook 2001). Thirdly, e-commercial firms establish long-term cooperation relationship with the valuable suppliers in organization management (SI3) , which will bring benefits in terms of cost and time savings and service quality, and thus improve operational performance. Wong (2011) reckons that SI has positive impacts on distribution, quality, cost and flexible performance; Wiengarten (2014) considers that SI has positive effects on cost and flexible performance. From the point of above view analysis, we develop the coming hypotheses for e-commerce enterprises:

H1: SI has positive impact on OP

H2: SI has positive impact on MP

Customer integration and non-financial performance: CI is investigated from the following three aspects: Firstly, establishing customer contact procedures and systems can ensure regular communication with the customers (CI1). Danese (2009) regards it as an important guarantee to interact with customers. Lagrosen (2001) holds that customer's need is regarded as a key prerequisite for successful development of new product the enterprises hope customers to participate in designing products, which is more in line with the market. Also, the deeper interaction can certainly promote regular communication and lead to improved market performance of enterprises. Secondly, e-commerce enterprises can actively encourage customers to participate in improvement of product design or service quality (CI2), which results in improving the operational performance of enterprises, such as cost, flexibility and delivery performance (Wiengarten 2014, Droge 2012). Frohlich & Westbrook (2001) deem that the company with the largest 'arc' of SI and CI can improve accomplishment of enterprises to the greatest extent. Thirdly, e-commerce firms endeavor to create long-term and stable collaboration with customers (CI3), which transcends the communication and interaction based on mutual trust and loyalty, stressing to establish of a stable contractual cooperation between two sides. This helps to improve both MP and OP for e-commerce enterprises. Therefore, we develop the later hypotheses for e-commerce enterprises:

H3: CI has a positive impact on OP

H4: CI has a positive impact on MP

Internal integration and non-financial performance: The internal integration is mainly measured from the following three aspects: Firstly, the internal departments of enterprises often develop communication and coordination in order to provide customers with high level of quality service (II1). Cooperation and communication frequently in various departments can help to bridge the gap between departments, and avoid the inefficiency of the entire e-commerce enterprise due to information asymmetry and lack of mutual understanding further, significantly contribute to improvement of operation performance. Secondly, the internal cross-departmental management system is relatively perfect and standardized (II2), which establishes a fixed management procedures to regular and constrain the cooperation between different departments within the enterprise. As a result, market performance of enterprises can be improved. Thirdly, the various departments within the enterprise can set up a closer cross-departmental team (II3). Stank (2001), Braunscheidel (2010), Jonsson P (2011)

and Wong (2011) find that the closer cooperation in cross-departmental integration affects the logistics service performance, logistics cost, reliability of distribution, inventory turnover of orders and improve the response to market needs. Germain R(2006) reckons that the higher internal integration of enterprises can be reached to the maximum level of performance. On the above analysis, we assume the following ideas for e-commerce enterprises:

H5: II has a positive impact on OP

H6: II has a positive impact on MP

Non-financial performance and financial performance: Based on the above assumptions, the three dimensions SCI is directly related to non-financial performance, OP and MP, and indirectly related to e-commerce firms' financial performance (FP). If the operation performance of e-commerce is improved, the logistics and payment speed will be faster, which can reduce the operation expense of enterprise and improve FP; If the market performance of e-commerce is improved, the brand influence of the enterprise will become larger, and the sale will be increased gradually, thus improving FP. Therefore, we propose the later hypotheses:

H7: OP has positive influences on FP

H8: MP has positive influences on FP

4. Methodology

4.1 Empirical analysis

Structural equation modeling (SEM) approach is employed to verify the proposed hypothesis. The premise condition of empirical analysis is that the sample data should conform to the multivariate normality assumption. A complete structural equation model is composed of a structural model and a measurement model.Eq. (1) stands for the structural model in the consequent formula, while Eqs. (2)-(3) indicate the measurement model.

$$\begin{cases} \eta=\gamma\xi+\beta\eta+\zeta & (1) \\ X=\lambda_x\xi+\delta & (2) \end{cases}$$

$$Y=\lambda_y\eta+\varepsilon \quad (3)$$

Where ξ is exogenous latent variable (i.e., independent variable), η is endogenous latent variable (i.e., dependent variable), ζ is a random disturbance item, γ is the coefficient matrix of exogenous latent variables, β is the endogenous latent variables that describe influence of endogenous latent variables η, X is the observation index of ξ ,Y is the observation index of η, δ is the measurement error of X, ε is the measurement error of Y, λ_x is the coefficient matrix of X, and λ_y is the coefficient matrix for Y.

4.2 Variables and measurement development

As for the measures of SI, CI and II, they are relatively mature and commonly accepted, we identify three variables including SI, CI and II based on investigating previous literature, such as Zhao L,Huo B (2013), Taiwen Feng, Linyan (2010) and Danese P (2011) and so on. To measure these three - dimension integration level, a total of 9 measurements are used, in which SI, CI and II respectively are measured from 3 items (see Table 1). The measurement scales in the survey employ a five-level Likert Scales with the score between 1 and 5, representing the level from the “extremely low” to “extremely high”.

About EP, multi-dimension indicators from financial factors to non-financial factors are employed to comprehensively apprehend e-commerce firm performance, which is evaluated from the following three measures: OP, MP and FP (see Table 1). Considering the SCI characteristics of e-commerce enterprise, we measure the operation performance from the aspects of logistics service (OP1), payment method (OP2) and operation costs (OP3), customer response speed (OP4). About MP, sale growth (MP1), market share (MP2) and recognition of enterprise brands (MP3) are measured for e-commerce enterprise. FP of each sample is measured by profit growth (FP1), monetary gain (FP2) and currency holdings (FP3). All performances are measured on a five-point scale too. Among them, we assume that MP and OP are the mediation variables between SCI and FP. Thus, implementation of supply chain integration indirectly affect financial performance, it affects corporate financial performance by improving operational performance and market performance. Total 19 items identified in Table 1 are used to measure SCI and EP.

Table 1 Summary of measurement indicators

Research variables	Measurement indicators	Reference literature
SI (Supplier integration)	SI1:The level of cooperation with suppliers about product quality and design	(Zhao L,Huo B(2013);Taiwen

	SI2:The level of sharing the requirements or inventory information with the supplier SI3:The level of long-term relationship with suppliers in organization management	Feng,linyan(2010); Danese P(2011) ea al.)
CI (Customer integration)	CI1:The procedures of contacting with customers and deliver marketing messages regularly CI2:The level of customer involvement in products development or services improvement CI3:The level of long-term and stable, reliable collaboration with customers	
II (Internal integration)	II1:The frequency of internal cross-departmental communication II2:The perfect and standardized level of internal cross-departmental management system II3:The closer cross-departmental working groups with great cooperation mechanism	
OP (Operational performance)	OP1 Logistics: Whether the goods are safely delivered on time in good condition OP2 Payment: The degree of diversification, fast and safe of payment method OP3 Cost: The expenses of collection, processing, transportation, inventory and others OP4 Response: The timely extent of response to market customer needs	(Henry Jin Y(2013);Jonsson P(2011);Germain R(2006) et al.)
MP (Market performance)	MO1:The growth level of sales volume MO2:The proportion of market share MO3:Market recognition of enterprise brands	
FP (Financial performance)	FP1:The level of profit growth FP2:The level of return on corporate assets FP3:The level of return on investment	

4.3 Sample and data collection

In this paper, the email and contact information of the senior, middle and grass-roots level managers of e-commerce enterprise are obtained from the e-commerce research center (ECRC), and the questionnaires are sent to them to collect relevant research data through China research network (CRN). We chose a web-based survey because it is generally accepted as a reliable way to collect data. We refer to a large number of previous questionnaires and select some indicators in line with the actual situation of Chinese e-commerce enterprise. The questionnaires (see appendix) released in the mainland of China during the summer vacation of 2018. The proportion of respondents is roughly the

same between men and women and 73.31% of respondents are aged between 31 and 50. As we can see from the table 2 , 54.43% of their companies are private enterprises and joint venture enterprises, and 85.66% of the companies' annual revenue is below 5 billion, 43.87% of the respondents are senior and middle management. At the same time, when selecting effective data, the questionnaire of those who are not familiar with the supply chain situation is eliminated. In order to strengthen the reliability of measurement, respondents can discuss with others in SCM department or appropriate functional executives when answering questions. The questionnaires were dispatched by individual visit, fax, and mail to e-commerce firms. A total of 1185 questionnaires are distributed, however, most of the responses are eliminated because of incomplete or invalid entries, such as, there are a lot of people who say they all agree or disagree. Then, there are only 237 valid responses, representing an effective response rate of 20%. Table 2 shows the descriptive statics of 237 collected questionnaires, and Table 3 summarize the statistics of responses to each question.

Table 2 Sample characteristics

Enterprise nature	Number of samples	Percentage (%)
State-owned enterprises	29	12.22
Private enterprise	103	43.46
Joint venture enterprise	26	10.97
Foreign capital enterprise	58	24.47
Others	21	8.86
Total	237	100
Annual sales	Number of samples	Percentage (%)
Under 1 million	31	13.08
1 millions—5 millions	62	26.16
5 millions—1 billion	49	20.68
1 billions— 5 billions	61	25.74
More than 5 billions	34	14.35
Total	237	100
The position of the respondent in the company	Number of samples	Percentage (%)
Senior management	32	13.5
Middle management	72	30.37
Management at the grass-roots level	53	22.36

Technical employees	39	16.46
Ordinary employees	41	17.3
Total	237	100

Table 3 Measurement variables statistics

Research variables	Mean value	Standard deviation	Variance	Number of samples
SI1	3.73	0.857	0.734	237
SI2	3.92	0.812	0.659	237
SI3	3.95	0.84	0.705	237
CI1	3.56	0.953	0.909	237
CI2	3.71	0.898	0.807	237
CI3	3.5	0.955	0.912	237
II1	3.92	0.84	0.706	237
II2	3.93	0.781	0.609	237
II3	3.94	0.8	0.641	237
MP1	3.96	0.75	0.562	237
MP2	3.9	0.841	0.707	237
MP3	3.94	0.757	0.573	237
OP1	3.92	0.777	0.604	237
OP2	3.74	0.905	0.819	237
OP3	3.8	0.863	0.744	237
OP4	3.89	0.764	0.584	237
FP1	4.35	0.966	0.933	237
FP2	3.76	0.872	0.760	237
FP3	3.71	0.884	0.782	237

There are two main methods for non-response bias. First, using thethe methods proposed by Armstrong and Overton's (1977), the early and late reactions to the questionnaire are compared. Second, all participants make a comparison with 30 non-participants selected casually on 10 non-demographic questions by using ANOVA (Lohr, 1999; Mentzer & flint, 1997). AllThe results ($\Delta X^2=1146.472$, $\Delta df=171$, $\Delta X^2/\Delta df=6.704$) suggests that, in this research , non-reactive tendencies are not a threat, because both of the above approaches are not a significant difference.

We also conducted a number of tests to assess potential common method bias (CMB) problems. Firstly, Harman's single-factor test is conducted by the principal component factor analysis (PCFA), including all the items. When one factor accounts for the majority of covariancecovariance, there is

evidence of a CMB, which is not always true in the paper. Second, a partial correlation is used. Specifically, the highest factor through PCFA is put into the partial least squares model as control factor on all dependent variables. If the general method variance is a common factor carried by all variables, the factor can contain approximation of CMB. Since this factor does not obviously enhance the variance explicated in the dependent variable, all indicate that there is no common method deviation. Thirdly, as we can see from Table 4, evidence of common method deviation should lead to high correlation (r>0.90), and correlation matrix does not represent any highly correlated factors. The final results show the CMB is not a main issue.

Table 4 Construct correlation matrix

Construct correlation matrix	SI	CI	II	OP	MP	FP
Supplier integration(SI)	1					
Customer integration(CI)	0.312** [0.99]	1				
Internal integration(II)	0.301** [0.091]	0.395** [0.156]	1			
Operational performance(OP)	0.421** [0.177]	0.338** [0.114]	0.352** [0.124]	1		
Market performance(MP)	0.322** [0.110]	0.336** [0.113]	0.273** [0.075]	0.407** [0.166]	1	
Financial performance(FP)	0.307** [0.094]	0.311** [0.97]	0.247** [0.061}	0.314** [0.099]	0.531** [0.282]	1

Notes: **Correlation is significant at the 0.01 level (two-tailed)
*Correlation is significant at the 0.05 level (two-tailed)
The coefficient in parentheses is the square relation between constructs

4.4 Measurement assessment

The reliability of variables reflects the internal consistency of indicators system. The internal consistency is usually estimated and verified through Cronbach's α. In this paper, the problem items that affect the reliability are excluded from the survey data. SPSS17 software is used for estimating Crobach's α. Actually, if the reliability coefficient Crobach's α is greater than 0.6, the reliability is acceptable. As shown in Table 5, Crobach's α values are from 0.691 to 0.861, and thus the entirety reliability is good. Meanwhile, the average variance extraction(AVE) is about 0.5, indicating that latent variables have acceptable convergent validity. So, internal consistency of the structure variables is better.

Table 5 test scale and reliability analysis

Variables	Item	α	Factor loading	Composite reliability	AVE
SI	SI1	0.796	0.318	0.712	0.507
	SI2		0.464		
	SI3		0.805		
CI	CI1	0.691	0.796	0.674	0.45
	CI2		0.589		
	CI3		0.683		
II	II1	0.781	0.672	0.734	0.54
	II2		0.541		
	II3		0.526		
OP	OP1	0.796	0.539	0.761	0.58
	OP2		0.693		
	OP3		0.757		
	OP4		0.28		
MP	MP1	0.861	0.483	0.814	0.662
	MP2		0.657		
	MP3		0.728		
FP	FP1	0.81	0.397	0.773	0.597
	FP2		0.559		
	FP3		0.711		

The validity analysis is also conducted. Table 6 summarizes the results of KMO and Bartlett sphericitysphericity test, the correlation coefficient and partial relative size of the observed variables are indicated by KMO coefficient, which is used for testing whether the indicatorsiors are fit for factor analysis. In general, if the KMO value is greater than 0.5, which mean that factor analysis can be followed out. In our study illustrated in Table 6, the KMO value is 0.787, which suggests that the selected variables are applicable to factor analysis. At the same time, the Bartlett sphericitysphericity test is performed by converting the x^2 test to test whether the variables are independent, it can be seen that the observation value of Bartlett sphericitysphericity test is 1146.472, the corresponding accompany probability is 0.000, below the significant level of 0.05, so we rejected the null hypothesis of Bartlett sphericity test. It means that correlation coefficient matrix is significant differences from unit matrix, thus the original variables are applicable to factor analysis.

Table 6 Results of KMO and Bartlett tests for validity analysis

Take the Kaiser Meyer Olkin metric of sufficient sampling	.787

Bartlett spherical test	The approximate chi-square	1146.472
	df	171
	Sig.	.000

5.Results interpretation

5.1 Goodness of fit for SEM

Based on the maximum likelihood estimation of model parameters, the goodness of fit is summarized in Table 7. The following indicators are considered for evaluation, (1)*P* generally speaking, if P value is below 0.05, the original hypothesis is rejected, indicating that S matrix of observed data does not agree with the matrix implied by the hypothesis model, however, the larger the sample is, the easier is to reject it, so P value is not used as the criterion for determining the degree of tolerance in practical application; (2) *GFI* refers to the goodness of fit index, the *GFI* value close to 1 clearly states that the model fits well; (3) *RMR* refers to root mean square residual value. RMR value close to 0 indicates that good fitting; (4) *NFI* refers to norm fit index, it's also called the deltal1 index, it's value close to 1 impliesys that the model provides a good fit ; (5) *IFI* refers to incremental fit index, it's also called the deltal2 index, the value close to 1 means that imitation results of the model is better. ; (6) *CFI* refers to comparative fit index. *CFI* value close to 1 indicates a good fitting; (7)*TLTI* refers to taucker-lewis index, it's also called the non-norm fir index, the value close to 1 suggests that the model results is satisfactory ; (8) *PNFI* refers to parsimoney-adjusted *NFI*, If *PNFI* value is above 0.50, the theoretical model is acceptable; (9) *PGFI* refers to parsimoney goodness of fit index, the nature of *PGFI* is similar to *PNFI*, if the *PGFI* value is above 0.50, the assumed theoretical model is acceptable; (10) *CMIN/DF* also is the normed chi-square(NC) as a complement and correction of chi-square value, NC value between 1 and 3 is an ideal value under strict conditions. As can be learned from table 9, SEM analysis in the study provides a good fit.

Table 7 Verification factor analysis of goodness of fit analysis

Statistical test quantity		Fitting standard	Results	Model fit judgment
Absolute fitting index	P	＞0.05	0.000	no reference value
	GFI	＞0.9	0.908	ideal
	RMR	＜0.05	0.046	ideal
Value-added fitting	NFI	Close to 1	0.806	ideal

index	IFI	Close to 1	0.91	ideal
	CFI	Close to 1	0.906	ideal
	TLI	Close to 1	0.989	ideal
Simplify the fitting index	PNFI	＞0.5	0.636	ideal
	PGFI	＞0.5	0.645	ideal
	CMIN /DF	1—3	1.702	ideal
Statistical test quantity		Fitting standard	Results	Model fit judgment

5.2 Structural equation path coefficients

The path coefficient in the structural equation model is a kind of regression coefficient, which is the same as the interpretation of standardized and non-standardized coefficient of regression analysis in SPSS. It reflects the correlation between variables. Negative Numbers mean negative correlation, negative prediction, and negative impact, as opposed to positive correlation, positive impact and positive prediction. The structural equation path coefficients are summarized in Table 8 and Figure 2. The path coefficients from SI to OP and MP are 0.204 and 0.475 respectively, both of them are greater than 0 at a significance level of 0.05, the results support H1 and H2. The path coefficients from CI to OP and MP are -0.066 and -0.048 respectively, both of them clearly reject H3 and H4. The path coefficients from II to OP and MP are also greater than 0 at the same significance level , H5, H6 are trueure. ; The path coefficients directing OP to FP and MP to FP are 0.826 and 0.025 at 0.05 significance . The results show that H7, H8 are all verifiedset up respectively, and the path coefficient of H7 is the largest, which suggests a strongest positive correlation between OP and FP. The path coefficient absolute value of path coefficient of H3 and H4 areis less than 0.1, indicating that H3 and H4 are not true and even show a weakened negative correlation. that the correlation is not significant. As for the figure 2, in the AMOS results report, the non-standardized regression weight estimate is divided by the standard error (S.E.) to get the T value, namely the critical ratio(CR). The β value represents the path coefficient, and the Δ value represents the indirect effect. The dotted line represents the indirect correlation, for example ,and the arrow ASI points to BOP indicates the effect of ASI on BOP.

Table 8 Path coefficients between research variables and measurements

Research variables	Path coefficient	Research variables	Path coefficient
H1 : SI → OP	0.204**	H5 : II → OP	0.433**
H2 : SI → MP	0.475**	H6 : II → MP	0.466**

H3 : CI → OP	-0.066**	H7 : OP → FP	0.826**
H4 : CI → MP	-0.048**	H8 : MP → FP	0.025**

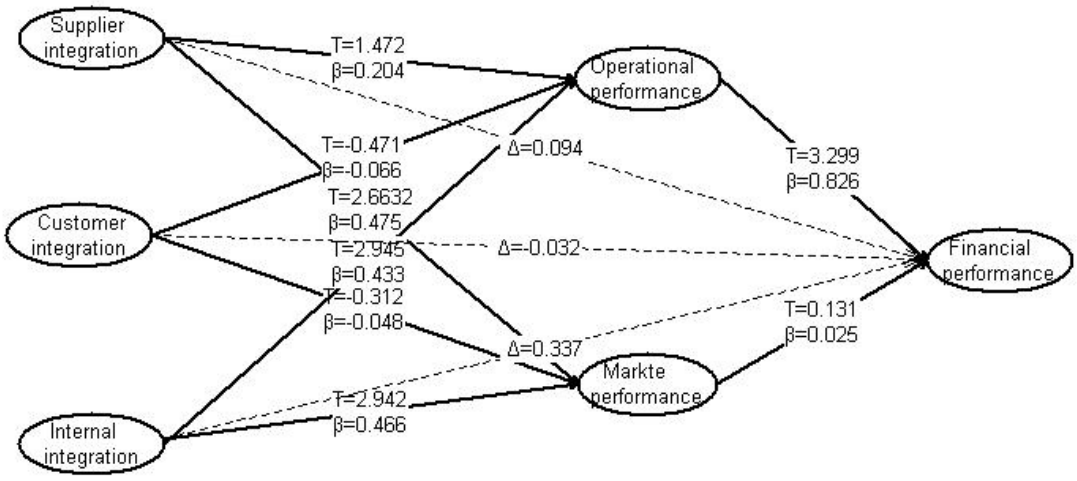

Figure 2 contest model test result

Table 10 estimateshows the direct orand indirect effect among the variables , the principle of direct and indirect effect calculation is mentioned in this paper, and we can see the direct and indirect effects from the AMOS output results directlythe indirect impact is product of the standardized path coefficient, and the total impact is equal to influence of the corresponding path., but whether there is a mediation effect between them should be further verified by using bootstrap. The total effect is equal to the direct effect plus the indirect effect. In general, the greater the direct effect, the greater the correlation between the two variables, indirect effects generally describe that one variable can affect the final variable through other variables, such as A-B-C. The indirect effects of A on C are A*B+B*C, provided that each path is significant. The indirect effects of SI, CI and II on FP is 0.094, -0.032 and 0.337 respectively, which means that II has great effect on corporate FP, the second is SI. The effect of CI on enterprise performance is the least obvious. The related calculations are listed in table 10.

Table 10 Analysis of direct and indirect effects

path	results	remark	corresponding hypotheses
SI→OP	0.113**	direct effect	H1
SI→MP	0.239**	direct effect	H2
SI→FP	0.094	indirect effect	H1,H2,H7,H8
	0.446	total effect	
CI→OP	-0.041**	Ddirect	H3

		effect	
CI→MP	-0.027**	Ddirect effect	H4
CI→FP	-0.032	Iindirect effect	H3,H4,H7,H8
	-0.1	total effect	
II→OP	0.421**	direct effect	H5
II→MP	0.413**	direct effect	H6
II→FP	0.337	indirect impact	H5,H6,H7,H8
	1.171	total impact	

Note:1 SCI=SI+CI+II; 2 The indirect effect calculation method is the product of standardized path coefficient; 3 The total effect is the sum of direct effect and indirect effect; 4 ** in the table indicates that P< 0.05, * indicates a multiplication sign..

Additionally, mediating effect (which refers to the effect of X on Y through M, which means that M is a function of X and Y is a function of M (y-m-x)) is verified by estimating indirect effects of OP and MP on FP. Generally speaking, if there is a mediating effect between two variables, it indicates that the mediating effect is better and the selected mediating variable is more appropriate, so we need to test for mediating effects in this paper. Bootstrap adopts the double-sampling technique to extract a certain number of samples from the original sample. This process allows repeated sampling, and the given statistic T is calculated according to the samples extracted, repeat the above N times generally greater than 1000 to get N statistics T, calculate the sample variance of the above N statistics T, and get the variance of the statistics. Currently the bootstrap method is a popular method, the original hypothesis proves that the mediation effect does not exist, its principle is, as long as the confidence interval does not contain 0, then the results reject the original hypothesis, and prove the mediation effect existed, if the confidence interval contain 0, the mediation effect does not exist, and the bootstrap results are reported in Table11, as we can see from the figure below, after 2000 times of bootstrap, the Upper Bounds (BC) and Lower Bounds (BC) intervals do not contain 0, which suggest that OP and MP are important mediating factors between SCI and FP.

Table 11 the results of Lower Bounds (BC)and Upper Bounds (BC)

Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)					
F3	F2	F1	F5	F4	F6

F5	0.168	0.236	0.067	0	0	0
F4	0.182	0.231	0.035	0	0	0
F6	0.172	0.292	0.331	0	0	0

Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	F3	F2	F1	F5	F4	F6
F5	0.745	0.114	0.491	0	0	0
F4	0.733	0.096	0.357	0	0	0
F6	0.523	0.42	0.107	0	0	0

6.6. Discussion and conclusion

6.1 Discussion

After a series of discussion and data analysis, we can disscusss the findings that whether hypotheses are established or not. The H7 path coefficient is 0.826, and we can infer that a positive correlation between enterprise operation performance and financial performance is the most obvious. The path coefficients of H1, H2, H5, H6, and H8 is 0.204, 0.475, 0.433, 0.466 and 0.025 respectively （P＜0.05）. (P. These hypotheses are established in various degrees, they are consist with previous studies ((Wiengarten 2014; Braganza 2002; Yim and Leem 2013,etc.)) . Similarly, the path coefficient of H3 is -0.066 and H4 is -0.048, they're all negative and the absolute value is less than 0.1, we can infer that customer integration is a slightly negative correlation with enterprise operation performance and enterprise market performance in e-commerce, the results are consistence with existingxsiting results (Cousins & Menguc 2006; Yu 2013; Devaraj 2007, ctc.) .The reasons may be as follows: due to the extensive online promotion, the customer loyalty of e-commerce is relatively lower and customer loss is higher, the performance of customer integration is hard to create. The critical ratio (CR), which in this case is equivalent to the value of t or z, if t is greater than 1.95, then p is less than 0.05, which means the hypothesis is true.

firstly, the customer loss in e-commerce is high, and the customer loyalty is relatively lower due to influenced of instant and extensive online promotion . Secondly, it is difficult to integrate these customers due to the high loss of e-commerce enterprise's customers, most of the e-commerce enterprise does not have fixed process and way to collect the customer information and establish a good interaction and cooperation with them. These reasons lead to the low integration of e-commerce enterprises to customers, if customer integration is low, it's not going to get promotion in terms of

payment convenience, cost reduction, etc. Similarly, low customer integration affects the influence of enterprise brands, obstructing the growth of sales and the gradual expansion of market sharing, which can have a negative effect on market performance. To sum up, the customer integration in this study is not obviously relevant to enterprise operation performance and market performanceThis paper also provides some enlightenments on strategic management. We need to recognize the power of strategic integration. Strategic integration is the premise of internal integration, only when e-commerce enterprises have the ability of internal integration can they further carry out external and strategic integration, especially the leaders, they can see from the perspective of suppliers and customers to integrate and coordinate the normal operation of supply chain, improving the efficiency of strategic integration, ensure that the entire supply chain can achieve the purpose of win-win cooperation..

Table 12 Hypotheses validation results

Path	Hypothesis content	Standardized regression weight	Critical ratio	Verification results
H1	SI has a positive impact on OP	0.204	1.972	Support
H2	Supplier integrationI has a positive impact on enterprise market performanceMP	0.475	2.663	Support
H3	Customer integrationI has a positive impact on enterprise operational performanceOP	-0.066	-0.471	Reject
H4	Customer integrationI has a positive impact on enterprise market performanceMP	-0.048	-0.312	Reject
H5	Internal integrationII has a positive impact on enterprise operational performanceOP	0.433	2.945	Support
H6	Internal integrationII has a positive impact on enterprise market performanceMP	0.466	2.942	Support
H7	Enterprise operational performanceOP has a positive impact on corporate financial performanceFP	0.826	3.299	Support

H8	Enterprise market performanceMP has a positive impact on corporate financial performanceFP	0.025	2.107	Support

6.2 Limitation

This empirical research provides a theoretical foundation for supply chain integration of e-commerce. However, there still are some limitations in this paper. Firstly, although China is in an appropriate research context because of dramatic development in electronic commerce, empirical research is still limited to a country. It is important to further investigate universality and validity of the research in other countries, such as Japan, USA, South Korea and Singapore; Secondly, We do not take into account the differences in supply chain integration in e-commerce segments. Further research will explore the different types of e-commerce enterprises' influences on enterprise performance in the supply chain integration, such as fresh agricultural product, clothing, books and electronics. ; FinallyThirdly, the shortcoming of this paper is to focus on enterprises performance of the e-commerce, and hardly consider performance of upstream suppliers and downstream customers. . The future research direction is that the data scope of investigation can expand the upstream and downstream enterprises of e-commerce. Finally, we don't take into account the correlation between SI, CI and II. When in the next research we will seriously consider the correlation between them, especially what are the same and different contributions to improving enterprise performance . .

6.3 Conclusion

This paper constructs the structural equation model of e-commerce enterprises supply chain integration and performance, on the basis of questionnaire research, data was collected from more than 1000 Chinese e-commerce enterprises, and the relationship between them was analyzed empirically. Strategic supplier integration and strategic internal integration were both predicted to have a positive relationship to enterprise performance. Research findings support these hypotheses. The empirical results show that supplier integration and internal integration have significant positive influence on enterprise performance. However, customer integration has negative influence on enterprise performance. We state that when the e-commerce enterprises conduct the supply chain, they should pay attention to strengthening the supplier integration. Furthermore, the internal departments should communicate frequently, especially the big data platform should be opened to each department gradually, the information communication channels should be unblocked. Owning to the high liquidity

of e-commerce enterprises customers and low customer loyalty, e-commerce enterprises should strengthen their service ability in customer consolidation, cultivating its core competitiveness and brand influence. In terms of diversified payment methods, rapid reaction of logistics, personalized demands of consumers and the speed of market response, many endeavors are still needed to be done. Only in this way can we cultivate our core competitiveness and strive for more loyal customers, thus conducting the high degree of customer integration.

This paper constructs the structural equation model of e-commerce enterprises supply chain integration and performance, on the basis of questionnaire research, data was collected from more than 1000 Chinese e-commerce enterprises, and the relationship between them was analyzed empirically. The empirical results show that supplier integration and internal integration have significant positive influence on enterprise performance. However, customer integration has negative influence on enterprise performance. We state that when the e-commerce enterprises conduct the supply chain, they should pay attention to strengthening the supplier integration. Furthermore, the internal departments should communicate frequently, especially the big data platform should be opened to each department gradually, the information communication channels should be unblocked. Owning to the high liquidity of e-commerce enterprises customers and low customer loyalty, e-commerce enterprises should strengthen their service ability in customer consolidation, cultivating its core competitiveness and brand influence. In terms of diversified payment methods, rapid reaction of logistics, personalized demands of consumers and the speed of market response, many endeavors are still needed to be done. Only in this way can we cultivate our core competitiveness and strive for more loyal customers, thus conducting the high degree of customer integration.

Acknowledgement

The authors gratefully acknowledge the support of China Scholarship Council research fund under granted No.201408615022, as well as Social Science Foundation of Shaan Xi (Grant No.2017KRM076).

Reference

Armstrong, J.S., Overton, T.S. 1977. Estimating non-response bias in mail surveys. *Journal of Marketing Research* 4, 396–402.

Bowersox DJ, Morash EA. 1989. The integration of marketing flows in channels of distribution. *European Journal of Marketing*.23 (20):58 -67.

Braganza A. 2002. Enterprise integration:creating competitive capabilities. *Integrated Manufacturing Systems*. 13(8):562-572.

Braunscheidel M J, Suresh N C, Boisnier A D. 2010. Investigating the impact of organizational culture on supply chain integration, *Human Resource Management*, 49(5):883-911.

Burton T T. 1988. JIT/repetitive sourcing strategies: trying the knot with your suppliers. *Production and Inventory Management Journal*. 29(4):38-41.

Cousins P D, Menguc B. 2006. The implications of socialization and integration in supply chain management. *Journal of Operations Management*, 24(5): 604 -620.

Cristina Gim é nez & Eva Ventura. 2003. Supply chain management as a competitive advantage in the Spanish grocery sector. *The International Journal of Logistics Management*. 14(1): 77-88.

Danese P. Romano P. 2011. Supply Chain Integration and Efficiency Performance:A Study on the Interactions between Customer and Supplier Integration. *Supply Chain Management:An International Journal*. 16(4): 220-230.

Das A, Naraslmhan R, Tallurl S. 2006. Supplier integration-finding an optimal configuration. *Journal of Operation Management*. (z4): 563-582.

Davis J M, Mora-Monge C, Quesada G, Gonzalez M. 2014. Cross-cultural influences on e-value creation in supply chains. *Supply Chain Management: An International Journal*. 19(2): 187-199.

Devaraj S, Krajewski L, Wei J. C. 2007. Impact of E business Technologies on Operational Performance:The Role of Production Information Integration in the Supply Chain. *Journal of Operations Management*. 25(6): 1199-1216.

Droge C, Vickery S K, Jacobs M A. 2012. Does supply chain integration mediate the relationships between product /process strategy and service performance An empirical study. *International Journal of Production Economics*. 37(2): 250 -262.

Frohlich M T, Westbrook R. 2001. Arcs of integration: An international study of supply chain strategies. *Journal of Operations Management*. 19(2): 185-200.

Giménez C, Ventura E. 2003. Supply chain management as a competitive advantage in the Spanish

grocery sector. *The International Journal of Logistics Management*. 14(1): 77-88.

Germain R, Iyer K N. 2006. The interaction of internal and downstream integration and its association with performance. *Journal of Business Logistics*. 27(2): 29-52.

Germain R, Iyer K N. 2006. The interaction of internal and downstream integration and its association with performance. *Journal of Business Logistics*. 27(2): 29-52.

Henry Jin Y, Fawcett A M, Fawcett S E. 2013. Awareness is not enough: Commitment and performance implications of supply chain integration. *International Journal of Physical Distribution & Logistics Management*. 43(3): 205-230.

Hillebrand B, Biemans W G. 2003. The relation between internal and external cooperation:Literature review and proposition. *Journal of Business Research*. 56(9): 735-743.

Horvath L. 2001. Collaboration:The key to value creation in supply chain management. *Supply Chain Management*. 6(5): 205-207.

Jonsson P, Andersson D, Boon-Itt S. 2011. The moderating effects of technological and demand uncertainties on the relationship between supply chain integration and customer delivery performance. *International Journal of Physical Distribution & Logistics Management*. 41(3): 253-276.

Kahn KB, Mentzer J T. 1996. Logistics and interdepartmental integration. *International Journal of Physical Distribution &Logisticc Management*. z6(8): 6-14.

Kim S W. 2006. The effect of supply chain integration on the alignment between corporate competitive capability and supply chain operation capability. I*nternational Journal of Operation &Production Management*. 26(10): 1084-1107.

Koufteros, X.A., Vonderembse, M., Jayaram, J. 2005. Internal and external integration for product development: the contingency effects of uncertainty, equivocality, and platform strategy. *Decision Sciences* 36 (1), 97–133.

Lagrosen S. 2001. Strengthening the weakest link of TQM: from customer focus to customer understanding. *The TQM-Magazing*,13(5): 348-354.

Lau A K W, Yam R C M. 2007. Supply chain product co-development,product modularity and product performance. *Industrial Management&Data Systems*. 107(7): 1036 -1065.

Lohr, S.L. 1999. Sampling: Design and Analysis. *Duxbury Press: Pacific Grove, CA*.

Luo Y, Wang S L. 2012. Relationship and organizational performance:A meta-analysis. *Management*

and Organizational Review. 8(1): 139-172.

M.Davis J, Mora-Monge C, Quesada G. 2014. Cross-cultural influences on e-value creation in supply chains. *Supply Chain Management: An International Journal*. 19(2): 187-199.

Mentzer, J.T. and Flint, D.J. 1997. Validity in logistics research. *Journal of Business Logistics*. Vol. 18 No. 1, pp. 199-216.

Morash E A, Clinton S R. 1998. Supply chain integration:Customer value through collaborative closeness versus operational excellence. *Journal of Marketing Theory and Practice*, 6(4): 104-120.

Narasimhan, R. 1997. Strategic supply management: a total quality management imperative. *Advances in the Management of Organizational Quality* 2, 39–86.

Nambisan S. 2002. Designing Virtual Customer Environments for New Product Development:Toward a Theory. *Academy of Management Review*. 27(3): 392-413.

Rai A,Patnayakuni R, Seth N. 2006. Firm performance impacts of digitally enabled supply chain integration capabilities .*MIS Quarterly*. 26(2): 225-246.

Rosenzweig E D, Roth A V, Dean J W J. 2003. The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. *Journal of Operations Management*. 21(4): 437-456.

Sezen B. 2008. Relative effects of design,integration and information sharing on supply chain performance. *Supply Chain Management:An International Journal.* 13(3): 229-240.

Stank T P, Keller S B, Daugherty P J. 2001. Supply chain collaboration and logistical service performance. Journal of Business Logistics. 22(1): 25-48.

Swink, M., Narasimhan, R., Wang, C. 2007. Managing beyond the factory walls: effects of four types of strategic integration on manufacturing plant performance. *Journal of Operations Management* 25 (1), 148–164.

Taiwen Feng, Linyan Sun, Ying Zhang. 2010. The effects of customer and supplier involvement on competive advantage:An empirical study in China. *Industrial Marketing Management*, 39(8): 1384-1394.

Themistocleous M, Irani Z. 2002. Novel taxonomy for application integration. *Benchi marking:An International Journal*. 9(2): 154-165.

Tracey M, Tan CL.. 2001. Empirical analysis of supplier selection and Involve men,customer

satisfaction and firm performance. *Supply chain management*. 6(4): 174-188.

Vargas,G.,Cardenas,L.,Matarranz,L. 2000. Internal and external integration of assembly manufacturing activities. *International Journal of Operations & Production Management*. Vol.20 No.7, pp.809-822.

Vickery S K, Jayaram J, Droge C. 2003. The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships.*Journal of Operations Management*. 21(5): 523－539.

Wiengarten F, Pagell M, Ahmed M U. 2014. Do a country's logistical capabilities moderate the external integration performance relationship. *Journal of Operations Management*. 28(1): 51-63.

Wong C Y, Boon-Itt S, Wong C W. 2011. The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance. *Journal of Operations Management.* 25(6): 604-615.

Yim B, Leem B. 2013. The effect of the supply chain social capital. *Industrial Management & Data Systems*. 113(3): 324-349.

Yu W,Jacobs M A, Salisbury W D. 2013. The effects of supply chain integration on customer satisfaction and financial performance:An organizational learning perspective. *International Journal of Production Economics* 146(1): 346-358.

Zhao L, Huo B, Sun L. 2013. The impact of supply chain risk on supply chain integration and company performance:A global investigation. *Supply Chain Management:An International Journal*. 18(2): 115-127.

Appended document

Questionnaire on the integrated performance of Chinese e-commerce enterprises

The purpose of this questionnaire is to study the effect of e-commerce enterprises supply chain integration activities on enterprise performance. The problems investigated involve the collaborative integration of e-commerce enterprises with upstream suppliers, downstream customers and internal departments in logistics, capital flow and information flow. Please read and answer each question carefully and tick the "√" where you think it is appropriate. 1 means strongly disagree, 2 means disagree, 3 means uncertain, 4 means agree, 5 means completely agree. The statistical analysis results are only used for academic research and do not involve any personal or corporate information!If you are also interested in the results of this study, we will be happy to share the results with you.

Thank you very much for your participation and support!

1、The business nature of your company is:

- ○ State-owned or state-controlled enterprises.
- ○ Collective enterprise
- ○ Private enterprise
- ○ The joint venture enterprise
- ○ The foreign capital enterprise
- ○ others

2、The total number of employees in your company is:

- ○ less than 50
- ○ 50-99

○ 100-199
○ 200-499
○ 500-999
○ more than 1000

3、*Annual sales of your company*

○ under 1 million
○ 1 millions—5 millions
○ 5 millions—1 billion
○ 1 billions— 5 billions
○ more than 5 billions

4、*Your gender is*

○ male
○ female

5、*Your age is*

○ 0-20
○ 21-30
○ 31-40
○ 41-50
○ 51-60
○ above 60

6、*Your position in your company is:*

○ Senior management
○ Middle management
○ Grassroots management
○ Technical personnel
○ Ordinary employees

7、*Your department belongs to:*

○ Finance department
○ Production department
○ Technology department
○ Market department
○ Administration department
○ Purchase department
○ Customer service department
○ Logistics department
○ Other departments

8、*Do you comprehend supply chain integration?*

○ Don't comprehend
○ Familiar
○ Master

9、We work with suppliers to develop and design products/continuously improve service quality

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

10、We have established working procedures or information systems to share requirements or inventory information with suppliers

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

11、We have established a long-term contractual partnership with the supplier.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

12、We have established procedures and practices to keep in touch with customers and deliver marketing information.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

13、We have deep exchanges, cooperation and interaction with customers in product function, service quality and other aspects.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

14、We have a close relationship with customers and have established a relatively stable and reliable

customer group of members

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree
- ○ 5 Totally agree

15、Our company often organizes inter-departmental meetings to communicate with each other and exchange work experience

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree
- ○ 5 Totally agree

16、All departments in our enterprise have standardized management systems and collaborative working mechanisms, and all departments cooperate with each other and work well together.

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree
- ○ 5 Totally agree

17、We have set up inter-departmental collaborative working group within our enterprise and have a good cooperation mechanism.

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree
- ○ 5 Totally agree

18、After the integration of the supply chain, the sales scale of enterprises is expanding year by year.

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree
- ○ 5 Totally agree

19、After the supply chain integration, the market share of enterprises is increasing year by year .

- ○ 1 Totally disagree
- ○ 2 Disagree
- ○ 3 Neutral
- ○ 4 Agree

○ 5 Totally agree

20、After the integration of the supply chain, the recognition of the enterprise brand market is increasing year by year .

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

21、After the integration of the supply chain, enterprise logistics service can ensure the goods are safe and delivered to customers on time .

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

22、After the integration of the supply chain, the payment methods of enterprises are diverse, fast and safe .

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

23、After the integration of the supply chain, the procurement, transportation and inventory costs of enterprises are well controlled.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

24、After the integration of the supply chain, enterprises have improved their responsiveness to customers' market demands greatly.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

25、After the integration of the supply chain, the profit level of enterprises is constantly improving .

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

26、 After the integration of the supply chain, the return rate of enterprise assets is constantly improving.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree

27、 After the integration of the supply chain, the return of enterprises investment is constantly improving.

○ 1 Totally disagree
○ 2 Disagree
○ 3 Neutral
○ 4 Agree
○ 5 Totally agree