Schriftenreihe Logistik der Technischen Universität Berlin Band 39

Hrsg.: Frank Straube, Helmut Baumgarten, Raimund Klinkner

Feng Ding

Developing E-commerce Logistics in Cross-border Relation

Universitätsverlag der TU Berlin

Technische Universität Berlin

Feng Ding

Developing E-commerce Logistics in Cross-border Relation

The scientific series *Schriftenreihe Logistik der Technischen Universität Berlin* is edited by:
Prof. Dr.-Ing. Frank Straube,
Prof. Dr.-Ing. Raimund Klinkner,
Prof. Dr.-Ing. Dr. rer. pol. h.c. Helmut Baumgarten

Schriftenreihe Logistik der Technischen Universität Berlin | 39

Feng Ding

Developing E-commerce Logistics in Cross-border Relation

Universitätsverlag der TU Berlin

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.dnb.de.

Universitätsverlag der TU Berlin, 2018
http://verlag.tu-berlin.de

Fasanenstr. 88, 10623 Berlin, Germany
Tel.: +49 (0)30 314 76131 / Fax: -76133
E-Mail: publikationen@ub.tu-berlin.de

Zugl.: Berlin, Techn. Univ., Diss., 2017
Zugl.: Shanghai, Tongji Univ., Diss., 2017
Gutachter: Prof. Dr.-Ing. Frank Straube (TU Berlin)
Gutachter: Prof. Dr. Jiazhen Huo (Tongji Universität, Shanghai)
Gutachter: Prof. Axel Werwatz (TU Berlin)
Gutachter: Prof. Dr. Yanting Li (Shanghai Jiao Tong Universität, Shanghai)
Gutachter: Prof. Dr. Qiang Su (Tongji Universität, Shanghai)
Gutachter: Prof. Dr. Yongrui Duan (Tongji Universität, Shanghai)
Die Arbeit wurde am 23. November 2017 an der Tongji Universität, Shanghai (China) unter Vorsitz von Prof. Dr.-Ing. Frank Straube und Prof. Dr. Jiazhen Huo erfolgreich verteidigt.

Print: docupoint GmbH
Layout/Typesetting: Feng Ding

ISBN 978-3-7983-2972-0 (print)
ISBN 978-3-7983-2973-7 (online)

ISSN 1865-3170 (print)
ISSN 2197-0564 (online)

Published online on the institutional Repository of the Technische Universität Berlin:
DOI 10.14279/depositonce-6615
http://dx.doi.org/10.14279/depositonce-6615

ABSTRACT

Cross-border e-commerce (CBE) is a type of international e-commerce similar to cross-border e-retailing. With the support of advanced technology, growing demand and advantageous policy, an increasing amount of people is shopping online across the borders, especially in China. CBE is booming globally, but also facing challenges. Culture and consumer behavior, laws and regulations, product and marketing issues, payment conditions and logistics limitations were identified as the main obstacles to its success. Thereinto, logistics-related issues are the strongest concern in the industry, due to the requirement of long distance transport in CBE, which makes long transportation time, high shipping cost and bad return service increasingly prominent. The traditional logistics system is not sufficient to manage the new challenges. In order to improve customer service and reduce costs, the implementation of e-logistics system is necessary. However, many enterprises do not know how to develop e-logistics effectively and lack competitive logistics strategy in cross-border relation.

The factors affecting the implementation of cross-border e-logistics (CBEL) are highly complex. Previous researches have provided various single factors or focused on one particular factor, ignoring the bigger picture. Meanwhile, plenty of studies on the topic of either e-commerce or logistics have been published over the last two decades, but the development of CBEL is a joint effort carried out by both topics that few studies focused on. This is still an area that requires more in-depth study and investigation. Therefore, the aim of this thesis is to fill this gap, identify the current situation of CBE and e-logistics, point out the key factors affecting CBEL implementation and propose a conceptual framework to support formulating competitive strategies in cross-border relation. It contributes to both theory and practice. In order to achieve this purpose, both empirical methods and theoretical methods were used, including case study, questionnaire survey, expert interview, systematic literature review, factor analysis and game theory.

The contents and contributions of this thesis are briefly presented as follows:

Firstly, 21 initial influencing factors were found after systematic literature review. Then, through an exploratory factor analysis with principal component extraction and varimax rotation, a conceptual framework with 6 key factors composed of 19 indicators was constructed. Thereinto, the external factors are the “Government” and

“Consumer”, which represent the social environment and determine the development direction of enterprise; the internal factors include “Company”, “Product”, “Operation” and “Partnership”, which are organization condition and determine the strategy formulation of the enterprise. The rest of chapters will be closely linked around this framework and reveal the implications of these factors.

Secondly, considering the external factors, a trilateral game model was used to clearly understand the relationship between the government, merchant and consumer for the development of CBEL. As an organizer, the government plays a key leading role. And in order to improve the effectiveness of regulation, the government should form and prefect incentive mechanisms not just rely on subsidies and penalty, while invest special fund to improve infrastructure construction preferentially.

Thirdly, according to the business nature and the product features of case enterprises, a general normative decision model based on internal factors “Company” and “Product”, was presented to help CBE merchants match the appropriate “logistics strategy” to the possible “logistics problem” in CBE.

Fourthly, a game model was built to analyze that how differentiation of internal factors “Product” and “Operation” affect the competitive strategy making. And the optimal pricing and service level under centralized and decentralized decision were formulated. The equilibrium solution revealed that product competition tends to homogeneity and service competition tends to heterogeneity by the impact of consumer preferences. “Price-war” has been unable to meet the needs of market competition in CBE, and merchants must strive to improve the logistics service level.

Fifthly, a dual-channel supply chain consisting of overseas supplier, e-retailer and logistics service provider (LSP) was constructed. Trading off on internal factors “Operation” and “Partnership”, the optimal inventory strategy under centralized and decentralized managed, the optimal transportation strategy under LSPs cooperation and non-cooperation, were obtained through the equilibrium solution and the numerical analysis. For the sustainable growth of profit, supplier and merchant should form an alliance and jointly manage the inventory, meanwhile, the appropriate contract need to be formulated to ensure benefits and risks sharing in the entire cross-border supply chain. And when merchant outsources cross-border transportation, should choose different LSPs according to phases or channels, so that prevent lose the initiative in service pricing.

Finally, the Walmart Global Store at JD.com platform in China market was chosen as case study, the development of their CBEL strategy verified the rationality and applicability of the framework found in this thesis.

The e-logistics in cross-border relation is still a new topic and deserves to explore and further study. This framework provides academics and practitioners a clear knowledge of where the field currently stands and the type of research that is needed to advance.

Key words: cross-border e-commerce; e-logistics; conceptual framework; competitive strategy; game theory

Catalogue

List of Figures

List of Tables

List of Abbreviations

3PL	Third Party Logistics
AVG	Average
B2B	Business to Business
B2C	Business to Customer
B2B2C	Business to Business to Customer
C2C	Customer to Customer
CBE	Cross-border E-commerce
CBEC	Cross-border E-commerce Community
CBEL	Cross-border E-commerce Logistics
CD	Centralized Decision
CMI	Centralized Managed Inventory
CSF	Critical Success Factor
C&M	Click-and-Mortar
DC	Distribution Center
DD	Decentralized Decision
DMI	Decentralized Managed Inventory
EDI	Electronic Data Interchange
EFA	Exploratory Factor Analysis
ERP	Enterprise Resource Planning
EU	European Union
E-commerce	Electronic Commerce
E-fulfillment	Electronic Fulfillment
E-logistics	E-commerce Logistics
E-marketplace	E-commerce Marketplace
E-procurement	Electronic Procurement
E-retailer	E-commerce Retailer
E-retailing	E-commerce Retailing
FTZ	Free Trade Zone

GMV	Gross Merchandise Volume
ICT	Information and Communication Technology
Info.	Information
IOIS	Internet-based Inter-organizational Information Systems
IT	Information Technology
JD.com	JingDong.com
KMO	Kaiser-Meyer-Olkin
LSP	Logistics Service Provider
Mgmt.	Management
No.	Number
O2O	Online-to-Offline
PCA	Principal Component Analysis
PIF	Initial Influencing Factors
RFID	Radio Frequency Identification
QED	Quod Erat Demonstrandum
SCM	Supply Chain Management
SEM	Structural Equation Modeling
SMEs	Small and Medium Enterprises
SLR	Systematic Literature Review
Std. Dev	Standard Deviation
TOE	Technology Organization Environment
XML	Extended Markup Language
YHD	Yihaodian.com
VAT	Value Added Tax
VMI	Vendor Managed Inventory

1. Introduction

The introduction is aim to attract attention and raise interest to the area of research. In this chapter, an overview of this thesis will be presented, including definition, motivation, question, method and expect outcome. The structure of thesis and the relevance between each chapter will be explained in the end.

1.1 Research Definition

1.1.1 Cross-border E-commerce

1.1.1.1 Object Definition

The consumer online shopping from merchants located in different areas or countries, the transaction though internet, and deliver/receive the goods via cross-border logistics, is the common definition of cross-border e-commerce (Hereinafter referred to as CBE) (Accenture, 2012). In addition, the CBE defined by Wang (2014, P.141) is an international e-commerce that international business transacting among different countries, making deals and transactions through an e-commerce platform, and delivering goods through cross-border planning and management agreements. Liu et al. (2015, P.15) defined CBE as a transaction realized in different areas or country by using Internet or platform with related information. Two main points can be concluded in those definitions: transacting in different countries and using information and communication technology (ICT). Based on above, this research specifically focuses on the CBE studies using Cross-border E-commerce Community (CBEC)'s definition:

International ecommerce is called cross-border ecommerce, when consumers buy online from merchants, located in other countries and jurisdictions. Online trade between consumers and merchants which share one common language and border or which make use of the same currency are not always perceived as cross-border by consumers. EU neighbors which speak a common language, united by SEPA, are just one example.

Nowadays, CBE is almost equal to cross-border e-retailing (iResearch, 2015a), which is synonymous with business-to-consumer (B2C) transaction (Rajavel, 2015). However, unlike a strict B2C e-commerce, CBE needs to integrate the activities along with the logistics value chain, and the transaction is often from overseas supplier via

domestic retailer to consumer. It is kind of business-to-business-to-consumer (B2B2C) process. Thus, CBE in this thesis implies cross-border B2B2C e-retailing (Figure 1).

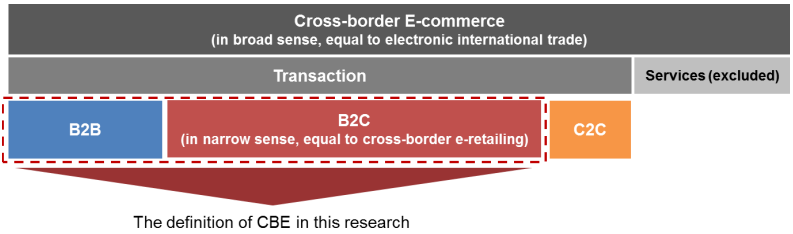

Figure 1 Definition of CBE in Thesis

According to the goods flow, CBE can be divided into import and export. The import flow is shown in Figure 2 (iResearch, 2015a). The export flow is just opposite.

Figure 2 Import Flow of CBE

1.1.1.2 Status Quo

CBE has the potential to reduce trade barriers and promote trade growth (Terzi, 2011). According to the recent researches, the global B2C CBE market reached over $230 billion in 2014, and will further growth to $1 trillion in 2020 (Erickson, 2015). By that year, nearly 1 billion people around the world are projected to be shopping online across the borders, and their transactions will account for one-third of all global B2C transactions (Accenture and AliResearch, 2015). (Figure 3)

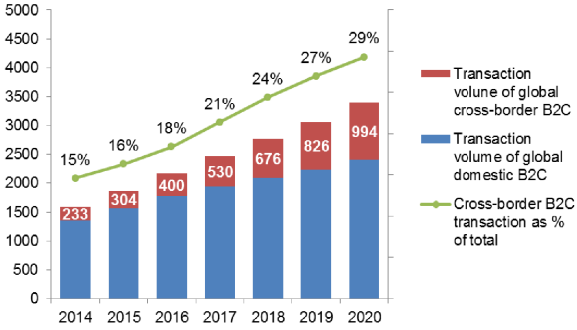

Figure 3 Global Cross-border B2C Volume (in $ billions)

The booming is especially in some developed countries due to superior infrastructure and regulation for e-commerce. Because of a well-established cross-border shopping tradition, more than 25% online shoppers in European Union (EU) have made purchases from other countries (PRNewswire, 2015), and the sales of B2C CBE in Europe will up to €116 billion in 2018 (Statista, 2015[1]). (Figure 4)

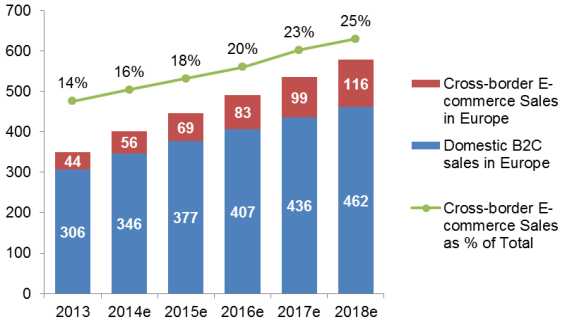

Figure 4 Cross-border B2C E-commerce Sales in Europe (in € billion)

In the short term, CBE revenue will be concentrated in developed countries (UNCTAD, 2015), nevertheless in the long run, after the overcome of some IT limitations, a leapfrog development is expected by developing countries (Panagariya, 2000). For instance, in China, the gross merchandise volume (GMV) of CBE is expected to contribute over 20% of total foreign trade volume in 2017 (Liu et al.,

[1] In this statistics, B2C E-commerce turnover includes online travel, digital downloads and event tickets; excludes online gaming and financial services.

2015). China will become the largest CBE market by 2020 (Accenture and AliResearch, 2015). (Figure 5)

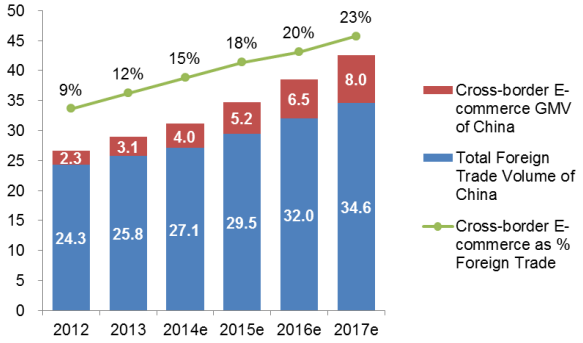

Figure 5 Foreign Trade Volume and CBE GMV in China (in￥trillion)

In addition, the CBE between China and Europe is also developing rapidly. 32% of European survey respondents believe CBE to and from China has become more accessible (Payvision, 2015). Nowadays, China is the No.1 source of merchandise imports into the EU (Figure 6). As China's most important trading partner in the EU by far, Germany is particularly well placed to benefit from an intensification of bilateral trade (Deutsche Bank, 2014). Therefore, the comparative study between Germany and China is particularly important and worthy for the development of CBE.

Figure 6 Trade Flows between China and EU in 2013

1.1.1.3 Main Driver

The prosperity of CBE can be mainly attributed to the following drivers:

(1) Advanced Technology

Globalization refers to the growing volume and variety of cross-border transactions in goods and services through the rapid and widespread diffusion of technology (Pounder, 2013). The fast paced internet has brought a large growth of online shopping users (Okamura, 2006). The combination of Internet and foreign trade supported the CBE development (AliResearch, 2015). The developed ICT, on the one hand, makes it easier for consumers to shop online cross invisible borders (Alkadi et al., 2004; Payvision, 2015), such as convenient cross-border payment (CNNIC, 2015) and growing usage of smart mobile (Marceux, 2015). On the other hand, it reduces marketing costs and administration expenditures while enables company to reach dispersed markets (Burinskiene, 2012; Grant and Bakhru, 2004; Shama, 2005). Therefore, international business market is expanded by advanced e-commerce technologies (Shewmake and Sapp, 2000; Hwang, 2006; Panagariya, 2000).

(2) Growing Demand

In an era of e-commerce and international businesses, a company's operational model must be build based on the customers' requirements (Lee et al., 2010). The lack of products' availability and better prices in foreign market are still the most cited triggers for cross-border online shopping. In addition, the pursuit of better quality products is another important reason for emerging countries' consumers purchasing frequently from abroad (DHL, 2013[2]; Forrester, 2014[3]) (Figure 7). In China, current gradually liberalization of birth policy will prompt the growth of baby's birth, while domestic milk powder and food safety problems will increase the demand of overseas baby products (Analysys, 2015).

[2] Source from DHL Global Mail 2013, surveyed 7289 global distance online shopping consumers.
[3] The result is based on the survey of 9006 global online shoppers.

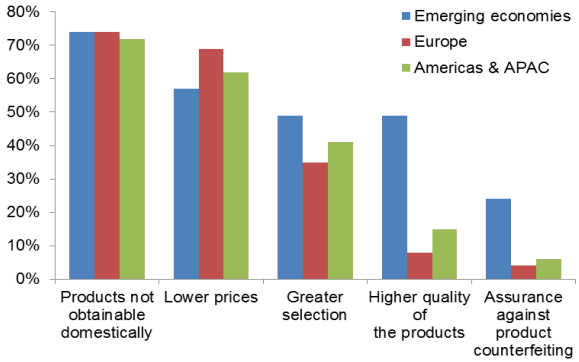

Figure 7 Reasons for Consumer Ordering Abroad

(3) Advantageous policy

Trade liberalization increased exports of goods and services to new markets, for instance, the establishment of European Free Trade Agreement and China Free Trade Area. Previously, such trade was not feasible due to the net effect of import tariffs made being competitive in foreign markets improbable (Pounder, 2013). The advantageous policies will open up markets for trades, including those from developing countries (Nielson and Morris, 2001). The Chinese government introduced a series of favorable policies for CBE (Analysys, 2015; CECRC, 2015), established several free trade zones (FTZ) to lower the duties and concise customs clearance procedures (PwC, 2015). Up to now, the total number of FTZs has reached 11, they are Shanghai, Tianjin, Fujian, Guangdong, Liaoning, Zhejiang, Henan, Hubei, Sichuan, Shaanxi and Chongqing (CRIENGLISH, 2016) (Figure 8).

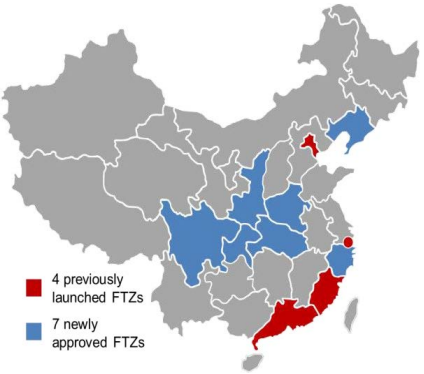

Figure 8 Free Trade Zones in China

Similar to FTZ, all member states of the EU form a customs territory (the European Customs Union) where unified customs arrangements are applied, that is European Free Trade Agreement (Figure 9). Goods imported into the EU are subject to EU-wide import regulations, customs tariffs and customs procedures. Once goods have been imported into the EU, no further customs duties must be paid within the customs territory - even if the goods cross internal borders of member states (GTAI, 2015). Individual postal products (online procurement) which are sent from Non-EU and the total value below 22 euros are admitted free of import duties. The others need to pay a 19% VAT according to customs regulations of EU Member States (ZOLL, 2015).

Figure 9 Free Trade Area in Europe

1.1.1.4 Confronted Barrier

Along with the development opportunities, CBE is also facing barriers. After an extensive complete review of the latest studies (Table 1), the six categories were identified, which are culture & consumer, marketing, product, laws & regulations, payment and logistics.

Table 1 List of Studies Mentioned CBE Barriers

Author/Institution	Year	Culture & Consumer	Marketing	Product	Laws & regulations	Payment	Logistics
Accenture	2012	x	x		x	x	x
Adyen	2015					x	
Carlton Mansfield	2015			x			x
Colliers	2015						x
DHL	2013	x		x		x	x

Author/Institution	Year	Culture & Consumer	Marketing	Product	Laws & regulations	Payment	Logistics
DHL	2015a	x	x			x	x
DHL	2015b						x
Ecommerce Europe	2015				x		x
Forrester	2014	x			x	x	x
Froelich, I.	2014	x	x		x	x	x
Gordon, J.	2014						x
IPC	2010	x	x			x	x
iResearch	2015		x	x			x
JLL	2013						x
Kommerskollegium	2012		x		x	x	x
Landmark global	2015a					x	x
McDermott, K.	2015	x			x	x	x
Paypal	2013					x	
Paypal	2014a					x	x
Paypal	2014b			x	x		x
Pitney Bowes	2010	x			x	x	x
Tentinet	2015		x	x	x	x	x
UNCTAD	2015				x		x
van Heel et al.	2014						x

(1) Culture and Consumer

At first, the flows of information and goods cross borders and encounter cultural differences along the way. The typical difference is language, which can change the distribution culture of that market and hinder consumers' consumption from abroad (Youngdahl and Loomba, 2000). Secondly, consumer behaviors are different according to countries, more information about commodities preferences, delivery and online payment options of foreign consumer, are especially needed. Finally, the merchants' reputation is showed to be an important factor during decision making with most consumers concerning about the reliability of international delivery and online payments.

(2) Marketing

Commonly e-commerce businesses struggle to find adequate information about foreign market operation. For brands that are relatively unknown in target markets,

the cost of building brand awareness turns to be high, such as advertising through multi-channel. Additionally, global markets place businesses have been continuously extending their operations overseas, posing a threat to domestic e-commerce enterprises (Liu et al., 2015).

(3) Product

Consumers lack of trust towards cross-border sellers is frequently cited as one of the challenges due to fake and counterfeit goods, which are most commonly observed in emerging markets. Additionally, due to the high standardization, popularity and profitability, some commodities such as computer, communication and consumer electronic products are very suitable for cross-border e-commerce, resulting in a serious homogenization of competition.

(4) Law and Regulation

Different laws and regulations between countries limit the ability of cross-border business, such as data privacy and return police. The customers can unconditionally return online purchase within 7 days after received in Germany, but only 7 days in China. Furthermore, when consumers choose purchase abroad, duties must be considered taking into account the total cost. High tariffs, taxation limits and VAT thresholds often reduce cross-border purchasing intentions.

(5) Payment

In order to make buying online more attractive to consumers from target markets, e-retailers have to be familiar with local payment preferences. For example, in Russia, it is still very common to pay in cash upon receipt of the goods, whereas this rarely happens in Western countries. Moreover, the unavailability to use local currency, complex conversion systems, exchange rate fluctuations and additional depreciation also harder cross-border shopping and increase the consumers' costs. Lastly is the lack of effective surveillance system. Fraud and non-payment result in enormous losses for e-commerce merchants, while customers worry about misuse of payment data and disclosure of personal information.

(6) Logistics

First, the basic logistics' infrastructure, such as highways, railways and also warehouses, are considered underdeveloped in some countries. The outdated customs system and complicated clearance procedures are general problem for all international

trade. The extra costs incurred cam make the operation of small e-retailers unfeasible. Once the CBE delivery requires long distances through different countries, extensive time and untimely delivery, uncertain or non-delivery, are observed as the largest obstacles in the delivery process. Besides, difficulties are also cited regarding specific requirements from different countries, e.g. incompatible addressing systems. For the same reason, long distance shipping in cross-border e-commerce generates higher costs compared to domestic delivery. Moreover, delivery information allows customers to take control over receiving or collecting their goods, limited transparency and different information systems make tracking online orders of international transportation more difficult. Finally, infeasible and inefficient international return processes result in customer dissatisfaction.

In order to overcome these barriers, a need for cooperation between all involved parties - government, merchant and service provider is called (McDermott, 2015; Reynolds, 2001).

(1) Government's support

Government has the ability and obligation to promote the development of CBE, which represents the profit of the public and has more direct and mandatory influence.

- Investment in logistics' infrastructure. The settlement of FTZ can simplify clearance procedures, reduce administrative interventions and relax restrictions on investment, which could boost the cross-border sales.
- Positive legislation for facilitating customs clearance and combating counterfeit products can increase the enthusiasm of cross-border purchase.

(2) Merchants' Localization

Different cultures and policies from different countries lead inevitably to specific consumer behavior, such as payments and goods preference. Merchants need to take local characteristics into account when designing CBE operations. The following points can be considered as feasible localization solutions.

- Add local-language website (Alkadi et al., 2004). English version is already standard in Europe. Some European merchants even set up a webpage in Chinese.
- Extend Local payment options. Globally, credit card is widely popular, but some countries have distinctly local preferences, such as AliPay in China, Sofort in

Germany and cash in Eastern European markets. It is critical to consider the local payment set-up in order to improve customer satisfaction.

- Use the local popular channels. If brands are relatively unknown in a new market, the usage of local social media and search engine, are effective methods for image awareness improving fleetly (Froelich, 2014).
- Set up domestic service center. The establishment of call centers in target market, aligned with after-sale services can support companies maintaining similar service levels as they are used to in domestic market (Ecommerce Europe, 2015).

(3) Service provider's assistant

If merchants do not have the ability or the capital to develop localization strategies, cooperating with third party service providers might access to international markets easily and rapidly. The right partners can support CBE merchants in the following aspects:

- Payment service. Simplify the process of currency conversion and tax calculation, establish connections with multiple payment options, improve security and reduce fraud (Froelich, 2014).
- Marketing service. Understand local consumers and legal issues, find potential products, view pricing in preferred currencies, support check out online with the payment customers prefer (Pitney Bowes, 2010).
- Logistics service. Provide global coverage, delivery speed/consistency and competitive costs. In addition, LSPs can support calculating taxes and duties, filling out paperwork and simplifying cross-border returns (Forrester, 2014).

1.1.1.5 Development Tendency

In view of the opportunities and challenges encountered in e-commerce, the CBE will develop towards the following trends:

(1) From product competition to service competition

In the early days of cross-border e-commerce, merchants are primarily competing in products. With the development of internet technology and supply chain optimization, this competition is turning to service level (Figure 10) (Analysys, 2015). Because the products in CBE often require long distance transport. Those capable to provide convenient and fast service will reach competitive advantage and consumers' loyalty

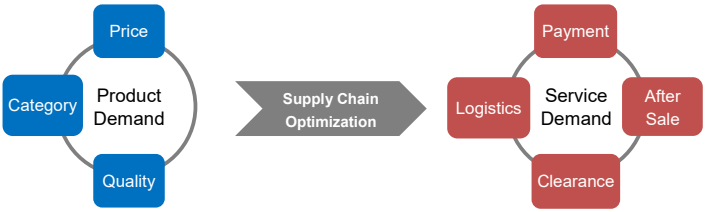

Figure 10 Competition in CBE Transferred from Product to Service

(2) One-stop service

Brand merchants or those with larger online volumes often have their own fulfillment facilities. However, for small and medium enterprises (SMEs), there is a demand for integrated solutions, such as global online marketplace (Forrester, 2014). Some provide a full range of one-stop services: payment processing, customer services, shipping, clearance, return processing and delivery, such as Amazon.com and Alibaba.com (UNCTAD, 2015).

(3) Omni-channel

Besides pure online retailers, traditional retailers and even producers are also showing interest in developing international online channels. Meanwhile, mobile commerce continues to grow, smartphone and tablet are becoming another channel for cross-border shopping (McDermott, 2015). The ultimate evolution of multi-channel and cross-channel retail is "Omni-channel" retail, where, consumers are able to access the retailers from any platform (DHL, 2015b).

1.1.2 Merchant in Cross-border E-commerce

In this research, "Merchant" is referring to the enterprise that sells products directly to end consumers. It can be a manufacturer, a retailer, and even a service provider. Those purchase products from abroad or sell products to foreign is called CBE merchant (Chen, 2004; Turban, 2006). According to the nature of business, they are divided into two categories: pure player and click-and-mortar.

(1) Pure player:

Pure players are the enterprises that do not maintain physical stores and sell products directly to consumers only via the internet (Boyer, 2001). They are further distinguished into following three types on basis of whether purchase, storage and delivery products by themselves.

- Marketplace: these enterprises don't purchase products, and just provide platform and online trading service for merchants who want display their goods for global consumer. Some of them are also not responsible for storage and delivery which are outsourced to LSPs, such as ebay.com. Others operate distribute center and provide logistics solution to merchants like Tmall.com. Their profit mainly come from commission and advertising.
- Self-operation: these enterprises purchase products from supplier firstly, and then sell to consumer. Some of them even handle the logistics by themselves, such as Zalando.com and Jumei.com. Their profits mainly depend on price difference.
- Integrated: combine both platform and online retail store, such as Amazon.com and JD.com.

(2) Click-and-Mortar

The enterprises operate physical store and online store at the same time, is called "Click-and-Mortar" (Ashworth et al., 2006). It can be traditional retailers use internet-based electronic commerce to diversify their distribution channel and interact with consumers, such as Metro. It also can be pure players running physical stores with offering online services, such as home24.com.

Some representatives of CBE merchants are shown in Figure 11.

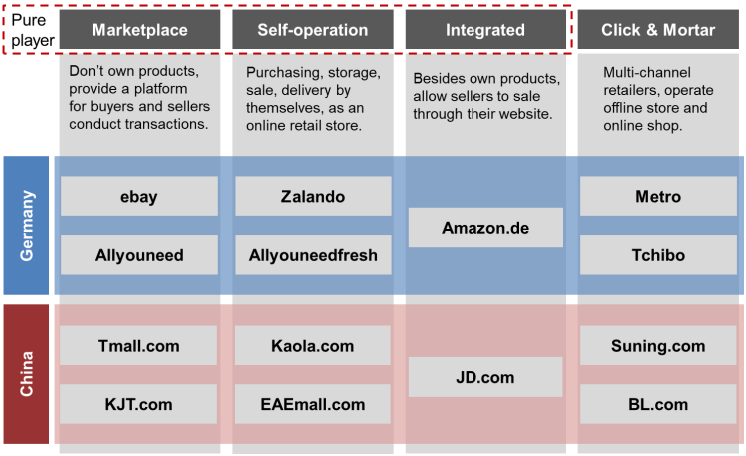

Figure 11 Definition and Example of CBE Merchants in Thesis

1.1.3 E-commerce Logistics

1.1.3.1 Object Definition

E-commerce logistics, or e-logistics, is a holistic methodology and strategic planning of all logistics systems and processes which are necessary for electronic transaction processing as well as their administrative and operational physical form (Straube, 2004; Viswanadham and Gaonkar, 2001). In simple terms, the definition can be the application of modern ICTs in logistics process in order to transfer the goods bought online to the final consumer (Bhuiyan, 2013; Gunasekaran and Ngai, 2003; Islam and Zunder, 2013).

E-logistics is a specialized part of retail logistics, developed within the part of distribution logistics (Klumpp and Jasper, 2008). It rebuilds the relationship in supply chain by breaking the monopoly of wholesalers and distributors (Figure 12). In traditional retail logistics process, it is a linear flow of products from the suppliers to the stores and the last mile logistics being performed by consumer himself. In e-commerce, most retail stores were replenished by direct deliveries from suppliers or wholesalers. The consumer can select products on online store and be fulfilled with home delivery (Delfmann et al., 2002; Hesse, 2002; Xing, 2006).

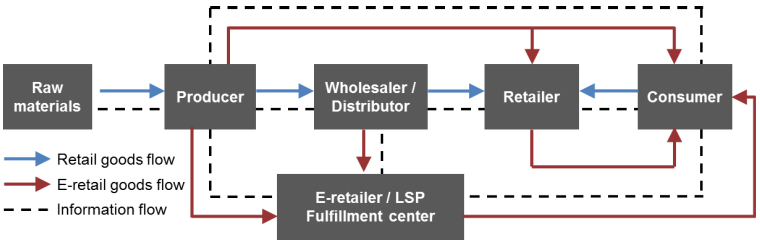

Figure 12 Retail Logistics in E-commerce

However, not merely distribution, e-logistics should involve a wider scope from producing to delivering a final product to the consumer (Bhuiyan, 2013; Croom, 2005; Vaidyanathan and Devaraj, 2008). It covers interactive network connections between producers, retailers, service providers and consumers (Muffatto and Payaro, 2004a; Płaczek, 2010). Therefore, in this thesis, e-logistics consists of procurement and fulfillment process, which manage the upstream and downstream relationships respectively. (Figure 13)

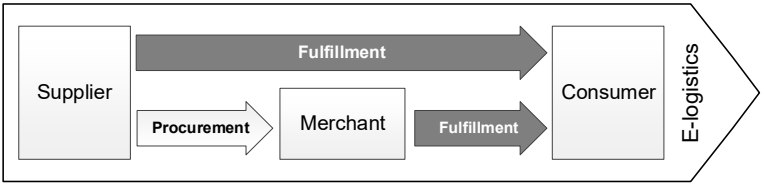

Figure 13 Definition of E-logistics in Thesis

1.1.3.2 E-procurement

E-procurement is the electronic integration using ICT in the purchasing process (Boer et al., 2002; Hung et al, 2014; Muffatto and Payaro, 2004a;). It contains all procurement activities that begin with the initial need identification by users (Corina, 2011; Croom and Brandon-Jones, 2007; Vitkauskaitė and Catautis, 2008). (Figure 14)

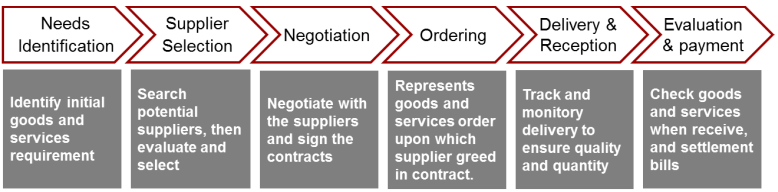

Figure 14 Process of E-procurement

Based on the quantity of buyers and sellers in the purchasing process, e-procurement can be divided into four models (Pavlou and Sawy, 2002; Singh and Thomson, 2002) (Figure 15). Thereinto, marketplace model brings multiple buyers and sellers together in a virtual environment (Giménez and Lourenço, 2004; Reynolds, 2001).

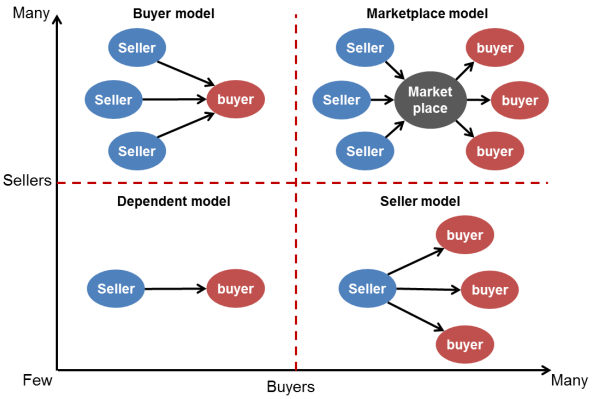

Figure 15 E-procurement models

1.1.3.3 E-fulfillment

E-fulfillment refers to employing ICT to manage the order fulfillment process (Lang and Bressolles, 2013; Muffatto and Payaro, 2004). It is the back end of e-logistics, sometimes used to describe as act of distribution or crucial part of complete process between vendor and customer. (Croxton, 2003; Rodriguez and Larsson, 2006; Straube and Lueck, 2000). More than just "pick, pack and ship", it integrates people, processes and technology to meet customer expectation and ensure customer satisfaction with its quality and functionality (Bayles, 2002; Tarn et al., 2003). The process begins with point of sales inquiry, including all of the activities from orders accepted until the product delivered at right time and right place (Isac, 2014; Pyke et al., 2001; Ricker et al., 1999). The entire e-fulfillment flow can be described in following. (Figure 16)

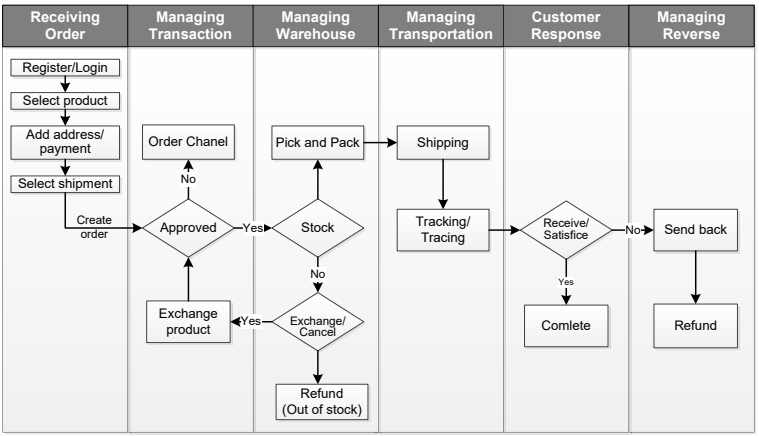

Figure 16 Description of a General E-fulfillment Flow

By reviewing the literatures, the main components of e-fulfillment are warehousing, order processing, pick & pack, shipping and reverse (Table 2).

Table 2 Composition of E-fulfillment in Literatures

Author/ Institution	Purchasing	Warehousing	Order processing	Pick & pack	Shipping	Sales	After sales and return
Straube & Lueck		x	x	x	x		x
Pyke, et al.	x	x		x	x	x	

Author/ Institution	Purchasing	Warehousing	Order processing	Pick & pack	Shipping	Sales	After sales and return
Lummus & Vokurka	x	x	x	x	x		x
Croxton,L.K.			x	x	x		x
Tarn, et al.		x	x	x	x		x
Muffatto & Payaro		x	x		x		x
Agatz, et al.			x	x	x		x
Hung, H.N.		x	x	x	x		x
Bulger, S.		x	x	x	x		x
eCommerceMILO		x	x	x	x		
Isac, C.		x	x	x	x		
VendorSeek		x	x	x	x		x
Weber logistics		x	x	x	x		

These actions are interpenetrating and mutually inclusive, for example, pick & pack follows order confirmation but can be carried out as same as warehousing in fulfillment center. Therefore, e-fulfillment processes were grouped into four parts in this thesis:

(1) Warehousing:

Receive ordered products from supplier and returned products from consumer, check the quantity and quality of the goods before storage, sort and place goods on shelves according to specifications and frequency of orders.

(2) Order processing:

Take consumer buying decision through successful data capture and checkout, check whether in stock when receive order, manage the payment with customer and bank, pick the correct items, inspect and prepare them for shipment.

(3) Shipping:

Deliver the goods “last mile” from the warehouse or DC to consumers’ address, share information with LSP, provide consumer delivery status via multi channels.

(4) Reverse:

Manage the products damaged or inappropriate. In case of the former, transfer the product to the repair center, for the latter, repackage and re-shelves.

It should be noted that the fulfillment center plays a key role in the whole process of e-fulfillment. It offers a wide range of services and consolidates procurement and distribution flows (Gudehus and Kotzab, 2012). (Figure 17)

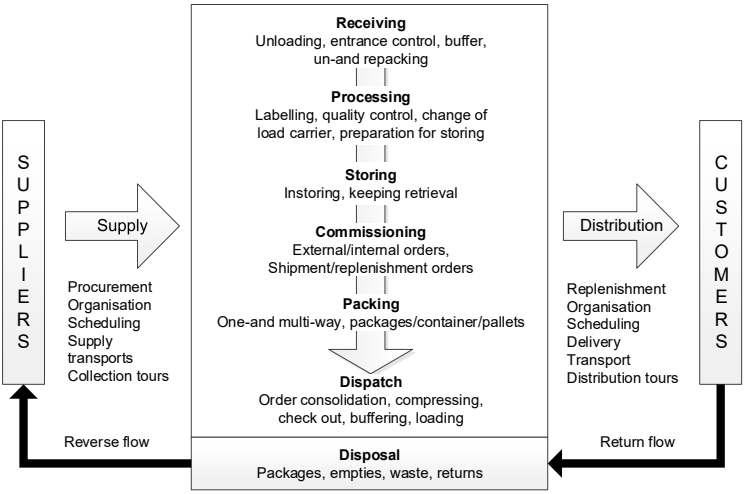

Figure 17 Functions of a Fulfillment Center

The classification of fulfillment models depends on whether the product is distributed from fulfillment center and from whose fulfillment center (Lummus and Vokurka, 2002; Reynolds, 2001):

(1) From existing fulfillment center

In this model, merchant could distribute goods from one of its current fulfillment centers utilizing existing facilities for shipping and picking. This approach minimizes the upfront investment and could be launched quickly. It is well suitable for self-operation and click-and-mortar merchants. However, this model is hard to simultaneously execute the different processes required for different consumer groups.

(2) From dedicated e-fulfillment center

Another alternative is to acquire or establish own dedicated fulfillment centers. This model can help merchant yield and measure the delivery costs and times required for one-item shipments. And it is very suitable for pure player due to reduction of delivery costs for low-margin items, such as book and computer. However, this model needs high up-front investment and inventory-carrying costs.

(3) From third-party fulfillment center

In order to accommodate unpredictable demand better, merchant can lease the skills and facilities from third party rather than owning them. Marketplaces often cooperate with LSP due to their robust and professional capability. The primary drawback of this model is that few existing LSPs can accommodate a wide range of products. Multiple fulfillment centers also increase costs and required stock levels.

(4) From supplier direct to the consumer (Drop shipping)

In this model, merchant forwards the orders to supplier or distributor who will directly ship products to consumer. The merchant acts as a sales intermediary and owns the consumer database, while the supplier owns the products and pays sales commission. This model is mainly used in merchant offering a wide range or generalized base of products. The advantages include flexibility, lower inventory and facility costs. But the merchant will give up much control over the fulfillment process, so that cannot ensure service quality and reliability. In order to be successful with this model, the value chain relationships must be equitable, and merchants own integrating Web-front-end operations technology to synchronize deliveries from many points must be in place.

(5) From existing offline stores

For traditional retailers, another possible model is to ship from existing offline stores. This model can avoid additional facilities and share inventories for both online and offline. But adding direct shipping capability at every store may be cost prohibitive, and increasing the complexity of the information system integration.

1.1.3.4 E-logistics Strategy

Different merchants implement distinctive process of procurement and fulfillment. Self-operation purchases products and fulfill orders by themselves. Marketplace doesn't own products, and the order could be fulfilled by LSP directly from supplier. Click-and-mortar allows consumer pick up online order at offline store (Cai, 2010; Fernie and Sparks, 2009). (Figure 18)

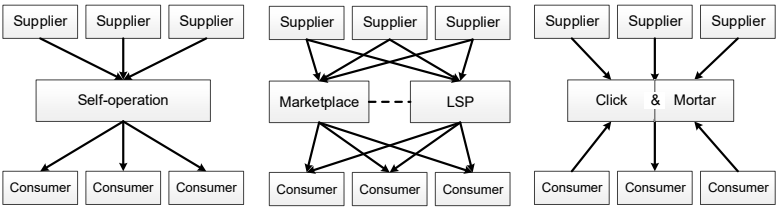

Figure 18 Process of Procurement and Fulfillment in Different E-retailers

Therefore, in the face of different circumstances, merchants can implement the following logistics strategy (Interlog, 2010; Masters, 2013; Wallenburg et al., 2011).

(1) In-house:

When logistics activities are critical to an enterprise's success, they always are carried out in-house. Merchants can purchase products by themselves in order to ensure the quality of goods, and provide consumer logistics service through existing infrastructure so that guarantee the timeliness of delivery. Self-operation and click-and-mortar generally adopt this strategy.

(2) Outsourced:

When logistics' perceived value to the focal business strategy is low. Thus the choice to spin off the logistics function is logical. In order to focus on core businesses, merchants can hand over control of partial even whole logistics process to LSP. In this way, they can reduce costs and increase flexibility. Outsourcing service is characterized by a long-term orientation and becomes an increasingly popular and effective strategy, particularly suitable for pure-player.

(3) Drop shipping:

When the capabilities and resources for developing logistics core competence are not available within the enterprise, while the logistics is not a critical success factor in the decision calculus, then fully outsource the function to a capable LSP is the best choice. In this strategy, merchants are only responsible for the online transaction, and then transfer the consumer order to the supplier, who is in charge of order fulfillment. Since the merchants never took possession of the product, does not incur any of the costs associated with storing or purchasing the product. The idea of drop-shipping packages directly to the end user is appealing to marketplace looking to streamline the delivery process.

(4) Integrated:

Mixing the above strategies in different parts of logistics process forms the integrated strategy. It is not a simple “and/or” solution between in-house or outsourced. The decision regarding how merchant will handle its logistics obligations rests mainly with its willingness to form partnerships with third parties and its ability to oversee partner relationships.

1.1.4 E-logistics in Cross-border Relations

The characteristics of e-commerce decide that its competition should launch in the global scope, therefore, e-logistics should be extended to be internationalized logistics (Shi and Ruan, 2008). Cross-border e-commerce logistics or cross-border e-logistics (Hereinafter referred to as CBEL) is defined as an international logistics and supply chain system to fulfill the rise of CBE. And overseas warehouse and FTZ are main storage models mentioned in most studies:

(1) Overseas warehouse:

Warehouse located in foreign countries and regions is called overseas warehouse, where CBE merchants could stock in advance and then directly ship and distribute to consumer when receive orders, gather order goods firstly and then send them together to the destination. This solution can greatly reduce the inventory holding cost for merchants (Meng and Zhang, 2014; Wu and Dou, 2015).

(2) Free trade zone:

It is an economic region launched or approved registration by the national customs, where goods can be storage beforehand for a long time under customs’ supervision and management. With this solution, CBE merchants can benefit from the large-scale shipping, provide fast delivery and convenient return for consumer just like domestic fulfillment (Wan et al., 2014).

Based on these two storage models, the CBEL strategies are mainly divided into the following three categories. (Figure 19)

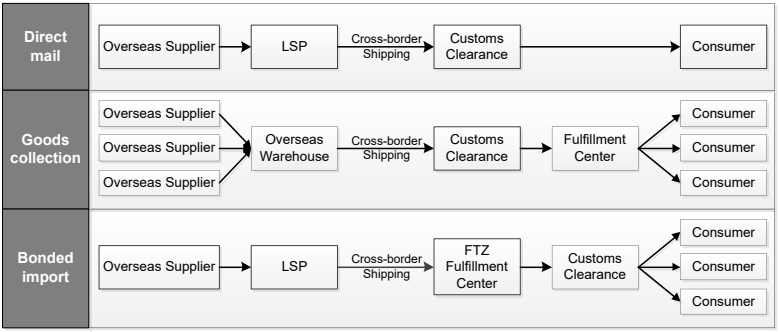

Figure 19 Logistics Strategies in CBE

(1) Direct mail

Products will be directly shipped from overseas supplier. Airlift is the most common transportation mode. Using this model merchant can easily operate logistics and avoid additional inventory costs. But meanwhile, high shipping cost and hard to return are main disadvantages. This model is suitable for marketplace, or SMEs to sell long-tail products.

(2) Goods collection

This model is similar to direct mail, but firstly, merchants gathered the orders during the same period into overseas warehouse, and then ship them together. The advantage is to reduce the shipping cost because of scale effect. However, this model requires high ability of overseas warehouse management, multimodal transportation and information systems. Therefore, it is suitable for large self-operation enterprise and click-and-mortar.

(3) Bonded import

In this model, merchants can stock abundant goods in FTZ warehouse beforehand through cheap ocean shipping, then delivery goods by local distribution when receive order. The transportation cost of this model is the lowest, and the delivery speed is the fastest. However, good ability of demand forecasting is required due to pre-inventory. Otherwise it will result in higher inventory costs and shortage costs. This model is particularly suitable for hot-selling products.

No matter CBE merchants choose which logistics model, the implementation of e-logistics in cross-border relation is not an isolated act of a single enterprise. The best

way is to seek assistant from LSPs, which is an acceptable cost-effective manner to ship to international destinations (Fernie and Sparks, 2009; Rao and Young, 1994; Reynolds, 2001). Like for direct mail, the major services provider for cross-border shipping into China are international express carrier, postal parcel and shipping agent, their usage rate respectively are 69.1%, 66.9% and 54.7% (iResearch, 2015b).

1.2 Research Motivation and Question

Under e-commerce age, marketing is no longer the emphasis among many mature merchants (Ricker et al., 1999). The logistics-related issues were shown to be still the biggest concern in many studies (Pitney Bowes, 2010). Some researchers believe that logistics may impede the successful development of global-businesses and also international e-commerce (JLL, 2013; Xu et al., 2002). As in table 1 before, 92% studies mentioned logistics as a main barrier in CBE. Specifically, long transportation time (64%), bad return service (50%), and high shipping cost (36%) are key problems. The major reason is due to the changes in consumption patterns caused by the rise of e-commerce and globalization. The traditional system is not sufficient to manage the new challenges (Delfmann et al., 2002; IPC, 2010). Logistics systems should be designed to meet the following requirements: small, diverse and high frequency pickups; deliveries at different locations; different packaging; different schedules; stringent customer service requirements (Hu, 2015; Samiee, 2008; Tarn et al., 2003). The logistical in cross-border is proving to be complex and costly. In order to improve the logistics' efficiency in CBE, the implementation of e-logistics system is necessary (Islam and Zunder, 2013). However, many enterprises do not know how to implement e-logistics in cross-border relation. They still applied old models to new business and lack an effective logistics strategy (Reynolds, 2001; Ricker et al., 1999). Meanwhile, plenty of studies and researches on the topic of either e-commerce or logistics have been published over the last two decades, but the development of CBEL is a joint effort carried out by both topics that few studies focused on (Ho et al., 2006). This is still an area that requires more in-depth study and investigation. Therefore, the aim of this thesis is to fill this gap, and provide value both in theory and practice.

The key research question (RQ) in this thesis is:

How to develop an effective and competitive CBEL?

More specifically, three sub-questions were addressed as follow:

RQ1: What is the current situation of CBE and e-logistics?

- What are the drivers, barriers and trends of CBE?
- What are the definition and structure of e-logistics in CBE?

This question is the origin of this thesis. By answering it, clear where the field currently stands and the type of research that is needed to advance, hackle e-logistics strategies in CBE and reveal existing problems of CBEL developing.

RQ2: What factors affect the development of CBEL?

- What are the key factors and the relationship between each other?
- What's the different between China and Germany?

This question is the basis of the entire thesis. By answering it, construct a conceptual framework to present key factors which affect the development of CBEL, and understand the comparison in different countries.

RQ3: How to formulate competitive strategy of e-logistics in cross-border relation?

- How to adopt an appropriate strategy for problem in CBEL?
- How to develop the strategy with considering the impact of these factors?

This question is practicability of this thesis. Based on the framework, formulate the comprehensive logistics strategy to solve problem in CBEL developing and increase the competitive advantage of enterprises.

1.3 Research Method

In order to solve the above research questions, both theoretical method and empirical method were adopted in this thesis.

1.3.1 Systematic Literature Review

Research can be understood as systematic investigation to develop theories, provide evidences and solve problems. When start a research, we can either undertake new research or learn from what others have already studied. No matter what kinds of, the significance and found will inevitably be judged in relation to other people's research and their findings. Therefore, researchers need to "map and assess the existing intellectual territory" that will enhance subject knowledge and help to clarify research question further. This process is called "literature review" (Tranfield et al., 2003).

Traditional literature reviews summarize what is known on a topic of interest, and provide details on the typically present research findings. However, sometimes the review author didn't explain the criteria used to identify, or ignore the other potentially relevant studies because of unaware. If the including studies are not explicit, it is not possible to assess the appropriateness and consistency of the result, also not possible to interpret the meaning of the review findings (Angela et al., 2013). In contrast, systematic literature review uses a more rigorous and well-defined approach (Ryan, 2010). A systematic review is a literature review that is designed to locate, appraise and synthesize the best available evidence related to a specific research question to provide informative and evidence-based answers. It is considered the best way to synthesize the findings of several studies investigating the same questions, and help to develop a good understanding and insight into relevant previous research and the trend that have emerged.

Systematic reviews often proceed through a number of following stages (Angela et al., 2013; Gough et al., 2012; Khalid et al., 2003): framing questions for a review; literature searching; quality assessment and data extraction; analysis and synthesis; interpreting the findings. The literature sources are very wide and can be divided into three categories (Mark et al., 2009):

- Primary literature sources: including published sources such as reports, white papers and planning documents, else unpublished manuscript sources such as letters, memos and committee minutes.
- Secondary literature sources: such as books and journals which are aimed at a wider audience. They are easier to locate than primary literature.
- Tertiary literature sources: also called "search tools", such as indexes and abstracts which are designed either to help to locate primary and secondary literature or to introduce a topic.

In this thesis, systematic literature review was mainly used for identifying, evaluating and synthesizing existing research related to CBE and e-logistics in Chapter 1 and Chapter 2.

1.3.2 Case Study

Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple

sources of evidence (Robson, 2002). And it can be classified into following three types (Zaidah, 2007; Pamela and Susan, 2008; Yin, 2013):

- Exploratory: this case study sets to explore any phenomenon in which the intervention being evaluated has no clear, fieldwork and data collections are frequently undertaken prior to defining the final questions and hypotheses. It is often considered a prelude to prepare an initial framework of the study, usually focus on "what" questions, such as "What are the ways of increasing sales?"
- Descriptive: this case study is used to present a complete description of a natural phenomenon within its context. It begins with a theory to support the description of the phenomenon and to point the right direction of data collection. Research questions here can again focus on "what", such as "What have been the effects of a particular sales activity?"
- Explanatory: this case study tests the data and finds out the cause-effect relationships in real-life, in order to explain why or how the thing happens or happened. It is more likely to answer "How" or "Why" questions, such as "Why did a particular promotion activity lead to increased sales?".

In this thesis, case study was mainly used to collect experts' scores on influencing factors in Chapter 2; generalize the logistics problems and strategies of case enterprises in Chapter 4; verify the rationality and practicability of the framework in Chapter 8.

1.3.3 Factor Analysis

Factor analysis is a statistical technique, which is used to examine the relationships between variables and measure the extent of sharing common variance. It is sometimes termed a "data reduction" technique because the method is frequently used to determine if the information could be extracted in a few underlying components or condensed relevant variables into groups from a large initial set of observed variables (Janssens et al., 2008).

Approaches to factor analysis can be grouped into two different types, "exploratory factor analysis" (EFA) and "confirmatory factor analysis" (CFA). In the case of EFA, the researcher may have only a vague idea at best as to how many factors are included in the set of variables being studied. In addition, they may not have strong expectations as to which observed variables will be associated with which factors. The

EFA is thus used to gain an understanding of how variables might be related and discover the likely underlying factor structure. Factors in EFA are typically defined as uncorrelated to one another. The CFA is more sophisticated. The researcher has expectations as to the true number of underlying factors and can apply different types of tests to determine if the hypothesized structure is correct (Child, 2006).

In this thesis, exploratory factor analysis was mainly used to group the meaningful factors together and sort out the key factors affecting the development of CBEL in Chapter 2.

1.3.4 Game Theory

Game theory is the study of the ways in which interacting choices of economic agents produce outcomes with respect to the preferences (or utilities) of those agents, where the outcomes in question might have been intended by none of the agents. Simply said, the content of game theory is the analysis of a very wide spectrum of decision influencing situations. In some respects, game theory is the science of strategy, or at least the optimal decision-making of independent and competing actors in a strategic setting (Sawyer, 2012; Sláviková, 2015). Especially in mathematical economics and business, it is used to understand a large collection of economic behaviors, including behaviors of government, firms, markets, and consumers (Myerson, 1997; Shapiro, 1989).

A strategic game consists of the following elements (Osborne and Rubinstein, 2011):

- A finite set N (the set of players)
- For each player $i \in N$ a nonempty set A_i (the set of actions available to player i)
- For each player $i \in N$ a preference relation a_i on $A = \times_{j \in N} A_j$ (the preference relation of player i).
- Under a wide range of circumstances, the preference relation a_i of player i in a strategic game can be represented by a payoff function u_i, also called a utility function.

A game theorist typically uses these elements, along with a solution concept of their choosing, to deduce a set of equilibrium strategies for each player such that, when these strategies are employed, no player can profit by unilaterally deviating from their strategy (Rasmusen, 2007). A common assumption is that players act rationally.

In non-cooperative games, the most commonly used solution concept in game theory is that of Nash equilibrium. This notion captures a steady state of the play of a strategic game in which each player holds the correct expectation about the other players' behavior and acts rationally. Each represents a best response to the other strategies. If all the players are playing the strategies in Nash equilibrium, they have no unilateral incentive to deviate, since their strategy is the best they can do given what others are doing. When the players' choices are not deterministic, the notion of mixed strategy Nash equilibrium is designed to model a steady state in which either one outcome occurs or a set of outcomes occur with known probability. A mixed strategy Nash equilibrium of a strategic game is Nash equilibrium of its mixed extension. It follows that every action in the support of any player's equilibrium mixed strategy yields that player the same payoff.

In this thesis, game theory was mainly used to formulate logistics competitive strategy in cross-border relation from Chapter 3 to Chapter 7.

1.4 Research Content

In order to make the research process more logical and the chapters' arrangement more reasonable, an abductive research process was adopted. Abductive reasoning emphasizes the search for suitable theories to an empirical observation, which call "theory matching" or "systematic combining" (Kovács and Spens, 2005). This process starts with a real-life observation and attempts to find a new matching framework or to extend theory used prior to this observation. Its purpose is to understand the new phenomenon and to suggest new theory (Figure 20).

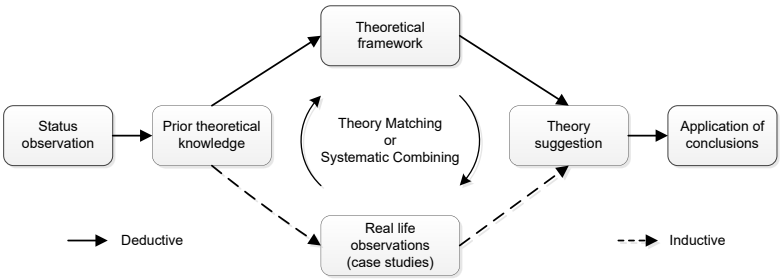

Figure 20 Abductive Research Process

This thesis aims to propose new theory in the area of CBEL by further building on and developing existing theory on e-commerce and international logistics. Refer to the

abductive reasoning process suggested by Purvis et al. (2014, P.105). In this thesis, stage 1 began with the question presented by the status observation and some prior theoretical knowledge with regards to the CBE and e-logistics. In stage 2 theory matching, survey and case study were used to collect observed data in real-life for constructing a conceptual framework and explore what the main factors that affect the development of CBEL. Then, based on above, the comprehensive logistics strategy to increase the competitive advantage of enterprises were presented. Further research employed a case study in order to test the new theory proposed and assesses its generalizability in stage 3. (Figure 21)

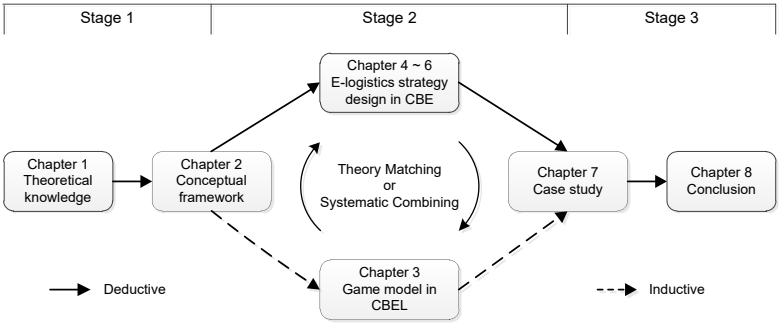

Figure 21 Research Process of Thesis

This thesis is composed by 8 chapters (Figure 22) and each chapter will be briefly introduced as following:

Chapter 1 – Introduction

The introduction is aim to attract attention and raise interest to the area of research. In this chapter, an overview of this thesis was presented, including definition, motivation, question and method. At last, the structure of thesis and the relevance between each chapter were explained.

Chapter 2 – A Conceptual Framework of Developing CBEL

The basis of the entire thesis is to find the main factors affecting the development of e-logistics in cross-border relation. In this chapter, firstly, a systematic literature review was used to find initial factors, then a questionnaire was deigned to collect case enterprises' data and the factor evaluation from experts. At last, a conceptual framework was presented through factor analysis, which consists of 6 key factors

including “Government”, “Consumer”, “Company”, “Product”, “Operation” and “Partnership”.

Chapter 3 – Game Model and Strategy between Behavior Subjects of CBEL

Based on the framework obtained in Chapter 2, “Government” and “Consumer” are external factors which represent the social environment and determine the development direction of enterprise. In this chapter, a trilateral game model was used to clearly understand the relationship between government, merchant and consumer for the development of CBEL. As an organizer, the government plays a key leading role for the implementation strategy of e-logistics in cross-border relation.

Chapter 4 – A Decision Model of E-logistics Strategy in CBE

Besides the government’s support, the merchant should also actively seek effective approach to resolve the problems encountered in the development of CBEL. In this chapter, based on the survey results, considering internal factors “Company” and “Product”, a general normative decision model was presented to help merchants adapt the “logistics strategy” to possible forms of the “logistics problem” in CBE.

Chapter 5 – Competitive Strategy Based on Product and Service Differentiation

When formulate the logistics strategy, in addition to the logistics problems encountered by self, merchants should also take into account the increasingly fierce competition between each other. In this chapter, based on consumer utility, a game model was built to analyze how differentiation of internal factors “Product” and “Operation” affect the competitive strategy making. Finally, the optimal pricing and service level under centralized and decentralized decision were formulated.

Chapter 6 – Competitive Strategy for Inventory and Transportation in CBE

Inventory and transportation are the main components of e-logistics, which is difficult to attain for a single enterprise and requires cooperation between members in whole supply chain. In this chapter, internal factors “Operation” and “Partnership” were considered for balancing the relationship between supplier, retailer and LSP in cross-border relation. The inventory strategies under centralized and decentralized decision, the transportation strategy under LSPs cooperation and non-cooperation condition were obtained through the equilibrium solution and the numerical analysis.

Chapter 7 – Case study

In this chapter, the experts in Walmart and JD.com were interviewed to explain how they operate CBE and implement e-logistics successfully in China’s market. The

Walmart Global Store at JD.com Worldwide was chosen as case study to evaluate the rationality and applicability of the conceptual framework.

Chapter 8 – Conclusion

Identify propositions and conclusions that may lead to better adoption of new practice with more desirable implementation outcomes. In this chapter, the research results were summarized to demonstrate the answers of the three research questions. Then, the limitations of the study were presented and some of which can serve as extensions for future research.

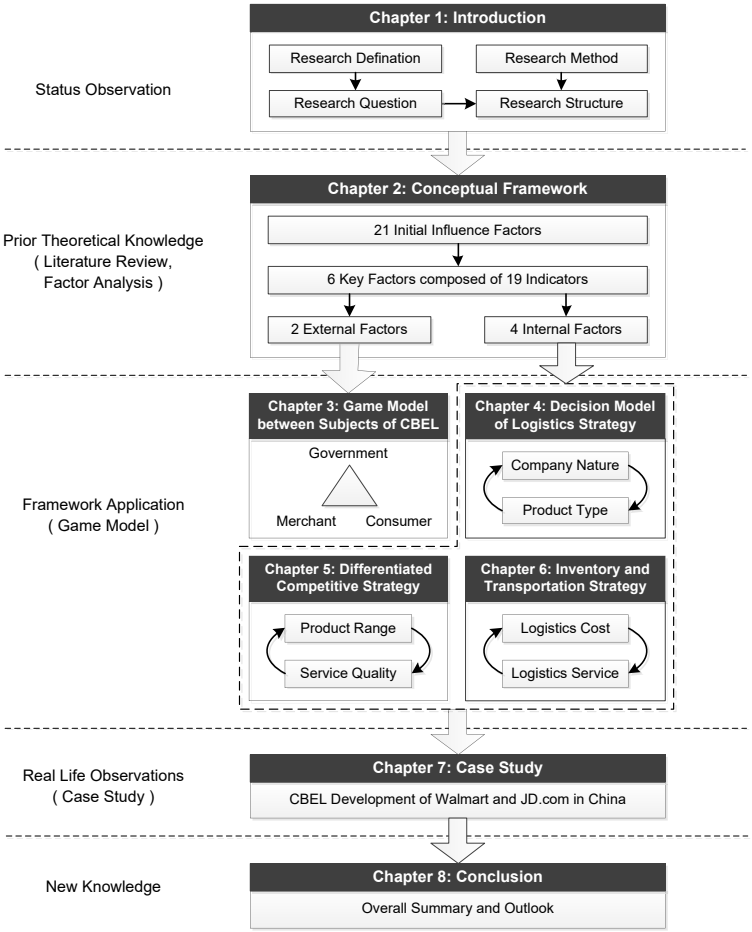

Figure 22 Structure of Thesis

2. A Conceptual Framework of Developing CBEL

When start a research, the existing intellectual territory need to be mapped and assessed, in order to enhance subject knowledge and help to clarify research questions further. Learn from what others have already studied that will help to develop a good understanding and insight into relevant previous research and the trend that have emerged. The core of thesis is to find the main factors affecting the development of e-logistics in cross-border relation. In this chapter, firstly, a systematic review was used to find initial factors, then, in order to group the meaningful factors together, factor analysis was conducted with the data collected by online questionnaire survey.

2.1 Literature review

In order to identify research evidence for the systematic review, searching multiple electronic databases was chosen. The selected databases were: Elsevier, Emerald, Taylor and Francis, Springer, ABI, and Inderscience. This study searched for relevant articles including academic journals, books, book chapters, conference proceedings, reports, etc. And only considered articles published in English and Chinese in order to fully analyze without misunderstanding in translating. The searching keywords are used simultaneously as following:

- “cross-border” or “international” or “global”
- “e-commerce” or “ecommerce” or “electronic commerce”
- “supply chain” or “logistics” or “fulfillment”

The references in the obtained publications and recommendations from other researchers were also examined to find additional studies.

A total of 582 articles published were found in the initial search (Table 3). Then, three criteria were developed to screen studies for inclusion in this analysis. First, the topic of the study must include e-commerce logistics and global supply chain. Second, the focus of the study must be on the B2C process rather than B2B or C2C. Third, the emphasis is on consumer product instead of industrial product. The resulting sample of 73 studies that qualified for our analysis was investigated independently by two researchers for pertinent information to ensure agreement. All the inconsistencies (overall agreement >93%) were solved through a discussion and the participation of the third researcher.

Table 3 Searching Results of Systematic Literature Review

Resource	Initial list	After title/abstract reading	After full text reading
Web of Science	121	43	22
BSC via EBSCO	354	40	15
Extra literature from reference	107	57	36
Total	582	140	73

As shown in Figure 23, the publication does not have a prominent trend, but has been obvious increasing since 2015.

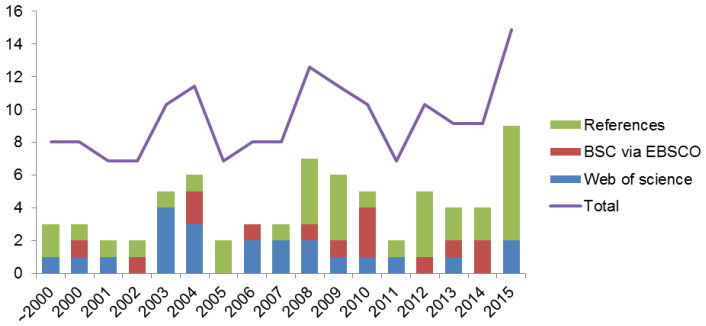

Figure 23 Distribution of Publishing Year in Systematic Literature Review

Table 4 shows the research methodologies used in the reviewed articles contained in the database. The proportion of theoretical (48%) and empirical approach (52%) are almost same.

Table 4 Research Methodologies Used in Systematic Literature Review

Method	Total	Procedure	Tool	Num. of articles
Theoretical	37			
Descriptive study	17			
Conceptual modeling	9			
Literature review	7		General	5
			Systematic	1
			Content analysis	1
Mathematical	4		Game theory	2
			FANP&PFIGP	1
			Analysis of variance	1

Method	Total	Procedure	Tool	Num. of articles
Empirical	40			
Case study	17		Multiple	9
			Single	8
Survey	23	Data collection	Questionnaire	17
			Interview	11
			Focus group	3
			Delphi	2
		Statistical analyses	Structural equation modelling	6
			Experts grading	4
			Factor analysis	4
			Regression analyses	3
			Fuzzy AHP	2
			Confirmatory factor analysis	1
			SWOT analyses	1
			DANP	1
			IPA	1
			Partial least squares	1

As it is shown, descriptive study (46%) is the most widely used theoretical approach, followed by conceptual modeling (24%), and literature review (19%). In total, 43% of the empirical studies were qualitative case studies. Questionnaire survey and interview have been the main tools for gathering qualitative data for case studies. Among the statistical methods used, structural equation modeling (SEM) is the most popular one. It is worth noting that many papers used multiple methodologies.

Although numerous articles on e-commerce and international logistics have been published over the last two decades, none have thoroughly reviewed nor concluded to the effect of e-logistics in CBE research. This is due to the fact that it is still a new topic and deserves to explore and further study (Liu et al., 2015). It is therefore essential for this fragmented research (investigating just a few varied factors in more depth, or a range of factors in less depth) to be combined in a more cohesive and comprehensive manner. Thus, the purpose of this research is twofold. First, intends to consolidate the existing research efforts concerning the impact towards CBE, global logistics, and supply chain by providing a systematic literature review that is greater in breadth and depth than previous studies. The second goal is to comprehensively analyze the existing literature as it pertains to the past and current trends to reveal existing literature gaps. Hope that by summarizing the literature and identifying the gaps, it provides CBEL academics and practitioners a clear knowledge of where the field currently stands and the type of research that is needed to advance.

With the initial influencing factors identified from the literature review, a focus group discussion was conducted to filter these factors and organize them into a two-level hierarchy. The reason for applying the focus group discussion method because it is a carefully planned discussion designed to obtain perspectives regarding a definite topic; it was possible to invite and obtain the contribution of participants with known involvement and expertise. To ensure that a comprehensive and meaningful result would be derived, a total of 3 focus groups were organized in compliance with the focus group requirements of knowledgeable, homogeneity and heterogeneity. Each of which had three to six participants, who had years of substantial work experience and spread across several major disciplines of e-commerce and logistics operation. They were asked the following two questions:

- Which factors are fractional but related enough to be combined into one?
- Which factors are similar in nature and can be grouped into categories?

The factors affecting the implementation of CBEL are highly complex, previous studies provided various single factors or focused on a particular factor. After systematic synthesized, a two-level hierarchy of factors is comprised of 7 high-level key dimensions of company, product, country, market, technology, operation and partnership, and 21 detailed-level factors are constructed as shown in Appendix 1. The reference following the factors denotes literature in which the factor was originally been discussed. The relative importance of factors is not represented by the number of references in which it was discussed.

The result addressed that ICT application and outscoring strategy are the most mentioned factors. The important component in the setting-up an e-logistics system is developing a logistics community network with suitable ICTs and outsourcing strategy (Gunasekaran et al., 2007; Hernandez et al., 2014). In the following sections, each of factors is explained in more detail.

2.1.1 Company

Nature of business

Industry type and business scope are identified as important determinants for e-business adoption (Hafeez et al., 2010). Also, the variation of business model surrounding which party owns the inventory will determine the complexity of the possible logistics issues (Ghezzi et al., 2012). Pure player can expect the greatest

annual online growth expectations due to the ability to offer a broad range of products without any physical store operations cost. A marketplace is a crucial driving force for CBE across the world, where merchants can easily operate an online store without high investment while utilizing the customer base the e-marketplace has accumulated.

Size of company

A variety of company size has been suggested to impact innovation and technology adoption. The large company will have capacity to implement new systems and technologies as well as to enjoy the benefits of economies of scale from adoption (Ho et al., 2012). However, larger companies are less flexible in implementing new technology due to internal process and existing complexity. Smaller organizations are more likely to be innovative because of the flexibility afforded by smaller size and fewer levels of bureaucracy. But at the same time, they will face higher delivery costs due to weak bargaining power to negotiate with logistics operators, and generally suffer from limited resources - financial, technological and human resources (Patterson et al., 2003).

Human factor

Either manager or staff, employees are the most valuable assets for a company to ensure smooth operations. This impacts the successful implementation of IT in SCM. Human resource can be considered as a situational variable whose knowledge, skills, goals and personalities must be previously evaluated during the recruitment process. These factors can be improved over time through employee training and development. A company can fully utilize their strength to capture the opportunities brought on by the implementation of e-logistics and to make it competitively advantageous to its competitors. Therefore, well-trained staffs are the backbone of any good company which is more willing to implement e-logistics system (Ho et al., 2012). Management support/commitment is another human factor for an enterprise level IT/IS system implementation, which usually exist across multiple organizations (Gunasekaran and Ngai, 2004). The commitment of the management can allocate enough financial support and the deployment of the necessary resources for achieves the project's success. In addition, management support will ensure that the project should take priority and receive constant attention within the organization (Hernandez et al., 2014). Manley points out that the degree of support for the management of a project on the part of management will give rise to significant variations in the acceptance or resistance on the part of involved parties (Hwang and Lu, 2013).

2.1.2 Product

Range of commodity

Offering a wide range of products online is a critical success factor for many e-commerce retailers. The product range is a very important factor that will significantly affect logistics complexity and increase management costs. For example, the greater product range will generate the greater complexity of procurement network and, as a consequence, the higher procurement costs (Ghezzi et al., 2012).

Property of product

Logistics strategy depends on the specific logistics problem, which has to be fully analyzed by the merchant in terms of product features (Ghezzi et al., 2012). Within the literature, product type (either commodity or innovative) is one of factors have been described as influencing supply chain selection and a key performance measure in logistics, such as sourcing decisions (Fraering and Prasad, 1999; Lovell et al., 2005). The properties of the product being moved or stored, such as its value, size, and typical demand pattern (seasonal or regular) are key drivers of inventory carrying costs and influence the choice of inventory ownership (Mason et al., 2003).

The factor of product value, physical size/weight and their ratio, generally known as value density is widely recognized as an important impact on logistical costs within final product price and logistical performance, such as shipping costs and inventory complexity (Gunasekaran and Kobu, 2007; Maruntelu, 2008). Customer expectations are higher for products with a high value density. Because of expensive to inventory and relatively inexpensive to move, it more centralized inventory holding associated with higher product value densities (Wanke and Zinn, 2004).

Obsolescence of products is a critical variable analogous to demand variability in influencing supply chain decision. For example, perishable products are risky to inventory, therefore it will affect decisions regarding procurement, distribution, and centralization. The shorter the product lifecycle, the more sensitive to depreciation, this will generally yield higher than expected inventory-related costs. Goods with short shelf lives or that are fragile, such as groceries and food, make logistics more difficult in international trade due to the complexity of the environment (temperature, humidity, presence of contaminants, etc.) that has to be considered in both warehouse and delivery management. Food quality is determined by perishables conditions, which is used to measure the logistics performance (Rao and Young, 1994; Van der Vorst et al., 2009).

2.1.3 Government

Infrastructure

When analyzing the viability of e-commerce in any country, infrastructures including electronic network, transportation, public facilities, banking and accounting are major factors that may be considered (Murillo, 2001). In particular, the unsatisfactory quality of the transportation and communications infrastructure will obstruct successful international sourcing and logistical operations (Fraering and Prasad, 1999). Infrastructure development is likely to act as an external constraint factor within the global supply chain operating and design (Ibrahim et al., 2015; Lovell et al., 2005). Healthy e-commerce infrastructure needs to be supported both by advanced technologies and by a supportive business, regulatory and cultural environment (Ng, 2009).

Tax and tariff

With the globalization of the world economy and the increasing diversity and environmental issues, global SCM is more complex and has been emphatically affected compared to domestic SCM as it includes different taxes and duties, differential exchange rates, trade barriers (Tyan et al., 2003). All of these factors will influence a firm's global strategy, component sourcing, factory location and geography related decisions (Hameri and Hintsa, 2009; Ibrahim et al., 2015; Lovell et al., 2005). Thereinto, the barriers to trade (tariff and non-tariff barriers) constitute a significant logistical obstacle in international business (Kawa and Zdrenka, 2016; Xu et al., 2002). Tariff has direct implications on final price for e-consumers. It increases the costs of imported goods and discourages sourcing from abroad (Fraering and Prasad, 1999). Conditions in a country have a very significant impact on the type of logistics system. An environment with low tariffs will promote a greater flow of goods between nations.

Currency exchange

Currency exchange rate is also a critical factor that complicates the supply chain management scenario, such as influence supply chain location decisions (Youngdahl and Loomba, 2000). Different currencies are important in developing e-commerce marketing channels across international borders (Boyd et al., 2003). They affect the ability of a firm to procure abroad (Fraering and Prasad, 1999). When exchange rates remain stable, due to the minimal risk of sourcing from overseas, an external global

supplier becomes attractive. If exchange rates are volatile (the value of money made today may be different from money made tomorrow) and there is economic instability, international firms are exposed to high inventory costs (Xu et al., 2002).

Customs clearance

In CBE logistics, the condition become more complex, shipments often have to be subjected to additional operations, such as clearing through customs. This prolongs the delivery fulfillment time, and direct implications for e-consumers satisfaction (Boyd et al., 2003; Samiee and Walters, 2006; Yang and Shen, 2015). Electronic customs clearance can improve efficiency, but restricted by technology. The comprehensive level of international logistics industry in developing countries has a great gap compared with developed countries (Wang et al., 2015). As organizations globalize, guidance will be required in the intricacies of customs clearance (Tyan et al., 2003; Youngdahl and Loomba, 2000).

Law and regulation

The positive policy and regulation in promoting ICT and e-commerce can influence e-commerce success, such as prevent or delay products' entry to the market (Wang et al., 2015). Complex legalities will affect consumers who order items from foreign companies (Boyd et al., 2003). Sustainable development of modern logistics must rely on a stable regulatory environment (Shi and Ruan, 2008). The content and execution of government's rules and regulations have become the main cause of barriers to e-commerce policy in logistics and a constraint in ever more complex and global supply chains operate (Hwang and Lu, 2013; Lovell et al., 2005; Ng, 2009). Laws and regulations indirectly influence the international logistics performance through impacting the execution of cross-border payments, technology applications and electronic clearance. Some emerging markets still lack the relevant laws for the developing CBEL (Liu et al., 2015), especially for promoting the reverse logistics concept to companies (Ho et al., 2012). The government should popularize the e-logistics and e-supply chain knowledge with favorable policies and industrial information, meanwhile, promote the establishment of a suitable e-logistics system by providing an information platform and issuing some stimulant policies (Hameri and Hintsa, 2009; Ibrahim et al., 2015).

2.1.4 Market

Demand variability

The market factor of demand variability and its influence on supply chain design (which includes inventory levels and locations) are widely discussed in the supply chain literatures (Lovell et al., 2005). The demand variability is significant and negative with respect to the logistics strategic decision. In particularly, it impacts on inventory centralization decisions. Variation of product inventory turnover could lead to inventory decentralization (Wanke and Zinn, 2004).

Cultural difference

Cultural factors play a significant role in determining the right performance measures and metrics for effectively managing logistics operations, particularly in a competitive global economy (Gunasekaran and Kobu, 2007; Murillo, 2001). The flows of information and goods cross borders and encounter cultural differences along the way. The typical differences are language and taste, which can change the distribution culture of that market (Fernie and Sparks, 2009; Youngdahl and Loomba, 2000). Besides, participants in a global supply chain should not only carefully manage the cultural differences but also corporate culture compatibility for achieving supply chain-orientated benefits (Boyd et al., 2013; Ibrahim et al., 2015; Rajaguru and Matanda, 2013).

2.1.5 Technology

ICT application

ICT is an indispensable tool for setting-up of an e-logistics system and improved operations of logistics and supply chain systems (Gunasekaran et al., 2007; Hernandez et al., 2014; Patterson et al., 2003). ICT in e-commerce affect traditional supply chain practices, such as changed the distribution of consumer goods (Capineri and Leinbach, 2004), improved the procurement efficiency (Swaminathan and Tayur, 2003), applicable service tracking approach-GPS used to pinpoint shipments in transit (Hu et al., 2015; Trappey et al., 2004), and supported the implementation of sustainability (So et al., 2012). ICT is a fundamental support for linking and integrating both front-end and back-end processing in a supply chain. It increases efficiencies in supply chain management and strategic business relations, because it provides all parties (suppliers, intermediaries, and customers) with better and real-time accessing and information sharing, making logistics services more accurate,

faster and cheaper (Giménez and Lourenço, 2008; Krmac, 2007; Terzi, 2011). Thus, investing in cost-effective ICT is a key to increasing logistics flexibility and providing a more effective shopping experience for the customer (Gunasekaran and Kobu, 2007; Rao, 2000; Zhang, 2005).

The information revolution has enabled firms to develop supply chains globally. ICT stimulates the globalization of logistics operation. Its applications level had a significant impact on international logistics (Wang et al., 2015). In global competition, the companies must accelerate the incorporation of the advanced ICT in business strategies and in their logistics activities, with partners to establish more effective and efficient supply chains (Maruntelu, 2008; Van der Vorst et al., 2009). Meanwhile, the cost of ICT application is increased due to the complexity of booking, cross-border tracking and other transactions and the global reach of the logistics processes (Rao and Young, 1994).

In order to overcome the ever-increasing complexity of the systems, the advanced ICT deepens further and matures, including electronic data interchange (EDI), wireless and mobile communication technologies, radio frequency identification (RFID), enterprise resource planning (ERP), extended markup language (XML), Internet and Web technologies. For high-intensity adoption, multiple tools such as EDI and ERP, are used to establish only linear links between one buyer and one supplier (Puschmann and Alt, 2005; Tai et al., 2010; Tanner et al., 2008). However, implementing and maintaining EDI is costly, only large-sized enterprises can afford it for recurring volume purchases between frequently trading partners (Croom, 2005; Kehoe and Boughton, 2001; Tai, 2011). For low-intensity adoption, Web-based technologies can be used to create a vast network in the supply chain (Hung et al., 2014; Wagner and Essig, 2006; Wu et al., 2007), which provide SMEs with more options in selecting and configuring systems, and enable them to achieve higher levels of performance (Croom and Brandon-Jones, 2007; Saeed et al., 2005).

2.1.6 Operation

Payment

In order to have a successful logistics operation, a company needs to maintain effective financial flow. Online payment is a common barrier to e-commerce policy in logistics, and it had a significant impact on international logistics (Ng, 2009). The existing payment system did not satisfy the need of CBEL, particularly in developing

market (Wang et al., 2015). Therefore, realize local payment preference, provide multiple payment options, improve security and reduce fraud are the primary targets for CBE merchants.

Warehouse and inventory management

Warehouse promotes efficiency and quality of CBE logistics. As a buffer in cross-border supply chain for storage, a warehouse is a transshipment center connecting suppliers and cross-border inspection points. It can be used to provide temporary storage before receiving the delivery order from customers, consolidate products from different sources of suppliers, and provide value-added services such as packing/repacking and palletization (Lam et al., 2012). Most SMEs choose parcel direct mail through Universal Postal Union or international express, but it is not enough in the rush season for shopping. It is a normal phenomenon that expresses overstocks and blasting warehouse, which make an obstacle to the development of cross-border electronic commerce logistics. “Overseas warehouse” or “FTZ warehouse” are preferred when the order volume is big, and aim to reduce cost and improve timeliness. Through data collected by warehouse management systems such as inventory levels in supplier/customer and key customer ordering patterns, companies can determine what to store, where and how much effectively (Gunasekaran et al., 2007; Mason et al., 2003; Xu et al., 2002).

For logistics companies servicing international e-businesses, proper inventory management is basic requirements in order to maintain customer loyalty and control costs. Inventory management is still considered to be the most important managerial task in logistics operations. Vendor managed inventory (VMI) model has attracted much interest due to its high-performance result in e-logistics (Ji et al., 2006). There is a clear benefit in quantifying inventory turnover and delivery time trade-offs when managing a VMI system. Under the VMI system, the supplier decides on the appropriate inventory levels for each of the products and the appropriate inventory policies to maintain these levels, giving the manufacturer greater flexibility in replenishing without directly involving the retailer (Tyan et al., 2003; Wanke and Zinn, 2004; Zairi and Al-Mashari, 2002).

Sustainability

Sustainability is among the top global concerns. More attention has been given to sustainability by introducing the notion of “green” as importance in logistics and

SCM fields and firm's global strategy (Alkhatib et al., 2015; Ibrahim et al., 2015). As consumers are becoming more environmentally-conscious, retailers' green strategy is becoming a more important competitive differentiator, because environmental initiatives can reduce cost and increase customers' loyalty (Fernie and Sparks, 2009). Environmental issues with emission quotas will reshape both how supply chains are structured and how companies will seek energy efficient transportation solutions (Hameri and Hintsa, 2009). When design global supply chains, the environmental influence and approach must be addressed, the demand for sustainability need be considered. However, it is further complicated in management (Capineri and Leinbach, 2004; So et al., 2012; Van der Vorst et al., 2009). The implementation of reverse logistics in return processes that supports product recovery and goods return to the suppliers will reduce waste. Effective returns management is based on viable product return policy and to address the rising concern of the public on environmental issues (Ho et al., 2012). The role of the government should be identified by establishing regulations or policies to promote the reverse logistics concept to companies.

One-stop service

One-stop service is fulfillment extended to additional services which can improve customer satisfaction. Brand merchants or those with larger online volumes often have their own fulfillment facilities. But for SMEs, there is a demand for a full range of one-stop services, such as payment processing, customer services, shipping, customs clearance, return processing and delivery provided by global e-marketplace (Forrester, 2014; UNCTAD, 2015). One-stop service is also a fulfillment extended to additional services which can improve customer satisfaction. It requires an integrated value chain to be linked to a customer-care advocate, so that customers can receive all of the required services with only one partner (Gunasekaran et al., 2007).

Service capacity

In the age of electronic commerce, the organization of a firm depends on the external requirement of customers. The quality of logistics service is a key component that ensures customer satisfaction. Both corporations and researcher are becoming increasingly aware on the strategic role of logistics service in a firm's overall success (Huang et al., 2009). Four indicators were chosen as measurement of e-logistics service performance: order fulfillment time, flexibility, delivery reliability and return management.

The order fulfillment time is one of the most important performance indicators for online customers. It is strongly connected to different features of the online offer. The products with short shelf-lives, such as some groceries, require shorter delivery times. Therefore, inventory must be in close proximity to the customer in order to shorten order fulfillment time. For logistics companies servicing international e-commerce, timely delivery is basic requirement in order to maintain customer loyalty and control costs. However, quick delivery cannot be guaranteed due to geographical reasons. There may then be opportunities for reducing fulfillment times by outsourcing some process components.

Logistics flexibility is the ability to respond quickly and efficiently in response to changing customer expectations for inbound and outbound delivery, support, and services. It is considered to be one of the fundamental factors for successful implementation of supply chain management initiatives. With logistics flexibility, a firm can delay commitment, embrace change, and fine tune delivery to meet specific customer needs without increasing stock levels. Offering flexibility requires the ability to update the order picking and preparation process on the run. Customers increasingly care about flexible delivery options in CBE (Jafari, 2015; Zhang, 2005).

Delivery of the right product within the time frame promised to the right place is the definition of delivery reliability. This is a key performance indicator for well managed logistics and supply chain. It is also an important requirement in choosing corresponding logistics service providers. In general, reliability of delivery is even more critical than the speed of delivery. This is especially true for international e-commerce. As for the order cycle time, wherein reliabilities, delivery punctuality is very important for almost 90% of online customers (Ghezzi et al., 2012). Good delivery reliability not only satisfies the customer but also disposes him to repurchase. It is a key determinant of consumer e-tailing satisfaction and quality perceptions.

Return is a necessity for the establishment of viable e-commerce business, but also a nightmare for an e-commerce firm. The request of the European Commission shows that the 57% of Europeans do not shop online cross-borders because due to concerns about returning goods (Kawa and Zdrenka, 2016). With the globalization of e-commerce, the reverse logistics will no longer be just a national problem and become more global in the future. Overseas delivery will take a significant amount of time and there is no standard industry return process. It is therefore fundamental to find the right tradeoff between the quality of returns management and related

operational costs. Consumers are usually responsible for the loss when they receive problematic goods but return period have already passed with no post-sale service in their own country for complaints. A well-managed return process can enhance firm's competitiveness and customer loyalty.

2.1.7 Partnership

Alliances and cooperation

Strategic alliances and cooperation with supply chain partners, such as suppliers, retailers, intermediaries and LSPs require the involvement of top management. Firms must work closely with their key suppliers on product availability, order processing, transportation, and other logistics issues to ensure high-quality product selection and quality control for customers (Colton et al. 2010; McGloin and Grant, 1998). Firms need to establish appropriate relationships with partners and structure stable management processes ensure operational efficacy (Gunasekaran et al., 2007; Hwang and Lu, 2013; Samiee, 2008). The degree to which the partners share information, infrastructure, facilities and technology will depend on the firm's specific needs. Such favorable partnerships may emerge if partnering organizations hold similar values, mutual trust, sincerity, shared risks, and rewards. This will offer a competitive advantage compared to a firm that may go about this alone (Hernandez et al., 2014; Ho et al., 2012; Rajaguru and Matanda, 2013).

Companies are globalizing due to the importance of international cooperation and partnerships (Van der Vorst et al., 2009). With the advancements of global logistics service industry, a well-established relationship is essential for a business' success in today's global supply chain world. E-commerce requires a global logistics system to promise efficient and stable flow of goods. This is difficult to attain for a single enterprise. This requires LSPs to cooperate with each other and to compete mutually in the premise of efficient and systematic logistics processes (Shi and Ruan, 2008). A holistic approach to managing supply chain systems through greater coordination of alliances and maintaining partnership is the core competencies and key strategy in the global market (Fernie and Sparks, 2009; Gong and Kan, 2013).

Real-time information sharing

The success of such partnerships or alliances mentioned above is determined by the information sharing (also called visibility) efficiency in real time regarding opportunities, threats, overall business performance (McGloin and Grant, 1998). This

will lead to developing relatively stronger relational ties amongst supply chain members. Firms need develop corresponding logistics capabilities in order to facilitate effective information sharing (Zhang, 2005). Better information sharing between supply chain parties will result in more controlled procurement and replenishment. This will significantly reduce logistics costs and inventory, shorten customer response time, and improve ordering and delivery processes (Giménez and Lourenço, 2008; Gong and Kan, 2013; Rajaguru and Matanda, 2013). Meanwhile, real-time communication can enhance interaction and coordination amongst all supply chain parties (suppliers, carriers, 3PLs, etc.). This will lead to a significant reduction of variability and costs, and improve the responsiveness of the firm while managing customers' expectation by providing transparency about their orders (Trappey et al., 2004). The flow of returned products through the reverse logistics channels also will increase the needs for information sharing (Ho et al., 2012; Hsu et al., 2009).

Additionally, a greater physical distance in international supply chains increases the need for frequent and effective information sharing and exchange. Sharing about product, technology and market structure with each other can reduce uncertainty about unforeseen changes. Also, end user preference helps suppliers to improve current processes and develop better product quality for their international customers (Jean and Sinkovics, 2010; Samiee and Walters, 2006).

Outscoring strategy

The logistics outscoring strategy is also the core process of e-logistics, which increase a firm's logistics capability and performance (Gong and Kan, 2013; Hernandez et al., 2014; Joong-Kun Cho et al., 2008). The implication of logistics outsourcing is one of most critical performance measures for successful development and operations of supply chains (Gunasekaran and Kobu, 2007). The integration of LSPs enables a fast reaction to unexpected developments and reduces inventory risk, operational costs, and transportation lead time (Klumpp and Jasper, 2008). The market for logistics outsourcing has grown steadily and rapidly. This is especially true for e-commerce companies, since e-commerce shipments require an entirely new distribution infrastructure to handle a sustainable online business. Besides, some online commodities involving limited complexity in logistics handling, so that the international logistics are likely to be outsourced, such as perishable products (Capineri and Leinbach, 2004; Gunasekaran et al., 2007).

Global trade is a fertile breeding ground for LSPs. With its increasing, firms require mature and established global supply sources to service their foreign customers (Samiee, 2008). These trends have created both issues and opportunities for LSPs including freight forwarders, customhouse brokers, ocean and air carriers, as well as logistics management companies who characterize themselves as third-party logistics providers capable of offering bundled services for the movement of international freight (Rao and Young, 1994). The importance of the LSPs as an integrator between players in the global distribution and delivering has increased (Hultkrantz and Lumsden, 2001; Trappey et al., 2004). The success of such integration is determined by LSPs' global transportation, warehousing, and information network (Tyan et al., 2003). The international freight forwarder (IFF) is recognized as a key logistical intermediary for facilitating cross-border trade (Liu et al. 2015).

The effects of globalization motivate firms to rethink the way they evaluate and select external partners. And how to select suitable partner become the real challenge and requires urgent solutions (Alkhatib et al., 2015; Yang and Shen, 2015). This choice directly impacts the efficiency of international logistics channels since each LSP possesses different strengths and weaknesses (Banomyong and Supatn, 2011). Wong (2012, P.602) reviewed previous studies and synthesized six selection criteria: globalization considerations, relationship building and integration competencies, operational performance, quality, finance, and information technology. Following the overall outsourcing trend, the focus is on core competences and the need for "trusted third parties" in international supply chains (Hameri and Hintsa, 2009).

2.2 Questionnaire Survey

2.2.1 Introduction and Report

In order to collect data for following two purposes:

- Collect case enterprises' data for the decision model, including their logistics problems and corresponding logistics strategies.
- Collect experts' evaluation for the initial influencing factors, which used for factor analysis.

Based on above literature review, a questionnaire survey was designed (Appendix 2), which consists of six parts:

(1) General Information:

Collect general data about the company for pre-classification, including company's nature and size and products' origins.

(2) Influencing Factors:

Collect expert scoring (Likert 5-scale: not important, slightly important, moderately important, important and very important, corresponding to 1-5 points) of initial factors which affect the development of e-logistics in cross-border relation.

(3) Product and Service:

Collect data of case enterprises for classifying logistics problems based on the product and service complexity.

(4) Technology and Operation:

Collect data to compare CBEL method between China and Germany.

(5) Partnership and Outsourcing:

Collect data of the partnership choosing, international logistics and supply chain strategy choosing and LSP selection criteria.

(6) Personal information:

Collect general data about participants, including job title, working year, contact information and so on.

The content and structure of questionnaire has been optimized through a research team's review, and in order to ensure the reliability of the survey, a small-scale pre-test was conducted before the official distribution.

Reliability means the credibility of the questionnaire, mainly used to test the consistent, reproducibility and stability of results. The results of a good sample should always remain the same through repeated measurements of the same thing. The substandard survey must adjust the question and overall structure. The scientific and the validity of the questionnaire are the basis of the sample survey. Cronbach's alpha is the most commonly used coefficient to measure scale reliability, that is, how closely related a set of items are as a group. It assesses the reliability of a rating summarizing a group of test or survey answers which measure some underlying factor (e.g., some attribute of the test-taker). A score is computed from each testing item and the overall rating, and then a "scale" is defined by the sum of the scores of all testing items.

Cronbach's alpha is defined as:

$$\alpha = \frac{K}{K-1}\left(1-\frac{\sum_{i=1}^{K}\sigma_{Y_i}^2}{\sigma_X^2}\right) \tag{2.1}$$

In formula 2.1, K is sum of components (K-items or testlets), σ_X^2 is the variance of the observed total test scores, and $\sigma_{Y_i}^2$ is the variance of component i for the current sample of persons. The coefficient of Cronbach's alpha is generally in the range 0-1. The alpha must not be lower than 0.5 (Cronbach, 1951).

A small sample including 20 participants were used to test the reliability of this questionnaire. The alpha coefficient is 0.895, indicates that the items have relatively high internal consistency, and the questionnaire has a high degree of reliability (Note that a reliability coefficient exceeding the cut-off point of 0.70 recommended by Nunnally (1978) is considered "acceptable" in most social science research).

Pasted the pre-test, "Unipark" was taken as the software for online questionnaire design and distribution. The Chinese and English versions were produced based on the same content, so that experts from different countries can understand the questionnaire more convenient and unambiguous.

The English version URL: http://www.unipark.de/uc/TUB-Tongji/CBE/

The Chinese version URL: http://www.unipark.de/uc/Tongji-TUB/CBE/

The introduction already elaborated that, China and Germany, as the representative of developing and developed countries, their experience and achievements in CBE hold a leading position in the world. Therefore, the online questionnaires were sent to total 475 experts in both countries, throughout retail, e-commerce and logistics industry. Data collection took 8 months from July 2016 to February 2017. Finally, totally 193 replies were received (Table 5).

Table 5 Field Report of Questionnaire Distribution

	China	Germany	Total
Sent	310	165	475
Received	116	77	193
Response rate	37.42%	46.67%	

Eliminated invalid questionnaires, the total of 77 Chinese and 57 Germany participants in different positions were included in following analysis. (Table 6)

Table 6 Statistics of Participants' Job Title in Survey

Job title	China		Germany	
	Count	Percent	Count	Percent
General Manager	6	7.79%	6	10.53%
Member of the Board	2	2.60%	4	7.02%
Department Manager	16	20.78%	27	47.37%
Team Manager	22	28.57%	12	21.05%
Team Member	31	40.26%	8	14.04%
Total	77		57	

They came from different size of enterprises. Because of the different national conditions, enterprises' size is divided according to the definition of the European Commission for Germany enterprises and China's National Bureau of Statistics for Chinese enterprises, which is the only difference between the two versions of the questionnaire. (Table 7)

Table 7 Statistics of Enterprises' Size in Survey

Enterprises' size	China		Germany	
	Count	Percent	Count	Percent
Micro-enterprise	9	11.69%	0	0.00%
Small enterprise	11	14.29%	2	3.51%
Medium enterprise	8	10.39%	7	14.89%
Big enterprise	46	59.74%	47	82.46%
Others	3	3.90%	1	1.75%
Total	77		57	

The survey covers all members of the entire cross-border supply chain, including manufacture, retailer and logistics service provider, the proportion of which are as follows. (Table 8)

Table 8 Statistics of Industries' Proportion in Survey

Industry	China		Germany	
	Count	Percent	Count	Percent
Manufacture	7	9.09%	3	5.26%
Retailer	48	62.34%	26	45.61%
LSP	17	22.08%	28	49.12%
Others	5	6.49%	0	0.00%
Total	77		57	

Among them, there are 48 retailers from China and 26 retailers from Germany, the retailers consist of the following types. (Table 9)

Table 9 Statistics of Retailers' Type in Survey

Retailer's type	China		Germany	
	Count	Percent	Count	Percent
Marketplace	7	14.58%	3	11.54%
Self-operation	13	27.08%	8	30.77%
Integrated	14	29.17%	6	23.08%
Click-and-Mortar	14	29.17%	9	34.62%
Total	48		26	

2.2.2 Comparative Analysis

The comparisons between China and Germany are presented in four aspects:

(1) Product Source

Most of cross-border products came from Europe, Asian and North American (Table 10). Especially for German companies, Europe is the No.1 source of supply due to the convenient trade and location in European Union.

Table 10 Statistics of Product Source in Survey

Product's origin	China		Germany	
	Count	Percent	Count	Percent
Europe	33	42.86%	52	91.23%
North American	27	35.06%	21	36.84%
Latin American	2	2.60%	13	22.81%
Asia & Oceania	47	61.04%	24	42.11%
Africa	1	1.30%	14	24.56%

(2) Storage Location

The China's enterprises have benefited from the China government's vigorously support for CBE, most of them decide to fulfill customer from FTZ warehouse so that can lower the duties and concise the customs clearance procedures. In contrast, German enterprises still use domestic warehouse as the main storage location due to the favorable geographical location with neighboring countries. (Table 11)

Table 11 Statistics of Storage Location in Survey

Warehouse location	China		Germany	
	Count	Percent	Count	Percent
Domestic warehouse	20	37.04%	25	78.13%
Overseas warehouse	24	44.44%	9	28.13%
FTZ warehouse	39	72.22%	5	15.63%
Others	2	3.70%	2	6.25%

(3) Transportation Mode

From the types of cross-border transportation, different national conditions can be clearly perceived. As most of products in China's CBE need long-distance transport, such as from Europe and North America, airlift and ocean shipping are main mode of international transportation while mainly carried by international express and shipping agents. In contrast, land transportation is the first choice for German enterprises due to the geographical advantages of cross-border transportation between European neighbors, and they often are in charge by self. (Table 12)

Table 12 Statistics of Transportation Mode in Survey

International transport		China		Germany	
		Count	Percent	Count	Percent
Transportation method	Airlift	41	75.93%	15	46.88%
	Ocean shipping	39	72.22%	11	34.38%
	Railway	2	3.70%	9	28.13%
	Land transportation	5	9.26%	24	75.00%
	Others	1	1.85%	2	6.25%
Carrier	Postal parcel	5	10.00%	6	19.35%
	International express	21	42.00%	7	22.58%
	Shipping agents	34	68.00%	8	25.81%
	Self-operation	5	10.00%	11	35.48%
	Others	3	6.00%	4	12.90%

(4) Factor Score

As a comprehensive attitude towards the assessment of factors influencing CBEL, for Chinese and Germany participants, the frequency distribution of the scale is respectively shown in Figure 24.

Figure 24 Frequency Distribution of Scale's Total Factor Score

It can be seen from the Figure that the total score of both scale are mainly distributed on the right side of "Moderately important" (3*21=63), that is, the group attitude tends to be consistent with the importance of all factors. The mean of the total score of the Chinese participants' scale is 80.677 and the standard deviation is 10.1137. The mean of the total score of the Germany participants' scale is 76.371 and the standard deviation is 9.2198. This means that these factors are considered more important in Chinese participants, but the evaluation relatively more dispersed.

Besides, more detailed similarities and differences can be obtained through the scoring statistics on initial influencing factors by Chinese participants (Table 13) and the German participants (Table 14).

Table 13 Descriptive Statistics of Chinese Participants on Factors

No.	Factors	Not important (%)	Slightly important (%)	Moderately important (%)	Important (%)	Very important (%)	Mean	Std. Dev
1	Human factor	0.00	1.61	16.13	43.55	38.71	4.19	0.76
2	Warehouse and inventory mgmt.	0.00	3.23	19.35	37.10	40.32	4.15	0.84
3	Payment	0.00	3.23	20.97	38.71	37.10	4.10	0.84
4	Property of product	0.00	8.06	19.35	27.42	45.16	4.10	0.98
5	Service capability	0.00	4.84	20.97	35.48	38.71	4.08	0.89
6	Law and regulation	0.00	1.61	32.26	27.42	38.71	4.03	0.88
7	Customs clearance	0.00	3.23	27.42	32.26	37.10	4.03	0.88
8	Real-time info. sharing	0.00	6.45	25.81	30.65	37.10	3.98	0.94
9	Demand variability	0.00	0.00	29.03	46.77	24.19	3.95	0.73

No.	Factors	Not important (%)	Slightly important (%)	Moderately important (%)	Important (%)	Very important (%)	Mean	Std. Dev
10	Outscoring strategy	0.00	4.84	25.81	45.16	24.19	3.89	0.83
11	Tax and tariff	0.00	8.06	27.42	32.26	32.26	3.89	0.95
12	One-stop service	1.61	4.84	27.42	43.55	22.58	3.81	0.90
13	Cultural difference	0.00	4.84	33.87	38.71	22.58	3.79	0.85
14	ICT application	0.00	4.84	40.32	37.10	17.74	3.68	0.82
15	Range of commodity	0.00	9.68	37.10	30.65	22.58	3.66	0.93
16	Nature of business	0.00	12.90	29.03	38.71	19.35	3.65	0.93
17	Alliance and cooperation	0.00	8.06	37.10	38.71	16.13	3.63	0.85
18	Size of company	0.00	9.68	40.32	33.87	16.13	3.56	0.87
19	Infrastructure	0.00	6.45	43.55	40.32	9.68	3.53	0.76
20	Currency exchange	1.61	8.06	46.77	25.81	17.74	3.50	0.93
21	Sustainability	0.00	16.13	38.71	25.81	19.35	3.48	0.98

Table 14 Descriptive Statistics of German Participants on Factors

No.	Factors	Not important (%)	Slightly important (%)	Moderately important (%)	Important (%)	Very important (%)	Mean	Std. Dev
1	Cultural difference	0.00	0.00	20.00	25.71	54.29	4.34	0.79
2	Demand variability	0.00	0.00	17.14	54.29	28.57	4.11	0.67
3	Property of product	0.00	5.71	22.86	28.57	42.86	4.09	0.94
4	Customs clearance	0.00	11.43	14.29	37.14	37.14	4.00	0.99
5	Law and regulation	0.00	8.57	20.00	40.00	31.43	3.94	0.92
6	Outscoring strategy	5.71	2.86	25.71	28.57	37.14	3.89	1.12
7	Warehouse and inventory mgmt.	2.86	2.86	17.14	57.14	20.00	3.89	0.85
8	Payment	5.71	2.86	17.14	45.71	28.57	3.89	1.04
9	Service capacity	0.00	8.57	25.71	34.29	31.43	3.89	0.95
10	Real-time info. sharing	0.00	8.57	22.86	42.86	25.71	3.86	0.90

No.	Factors	Not important (%)	Slightly important (%)	Moderately important (%)	Important (%)	Very important (%)	Mean	Std. Dev
11	Range of commodity	0.00	2.86	37.14	34.29	25.71	3.83	0.84
12	ICT application	0.00	0.00	40.00	40.00	20.00	3.80	0.75
13	Infrastructure	2.86	8.57	22.86	40.00	25.71	3.77	1.02
14	Tax and tariff	0.00	8.57	34.29	37.14	20.00	3.69	0.89
15	Alliance and cooperation	2.86	14.29	37.14	31.43	14.29	3.40	0.99
16	Human factor	0.00	22.86	34.29	34.29	8.57	3.29	0.91
17	Nature of business	5.71	14.29	40.00	34.29	5.71	3.20	0.95
18	Size of company	11.43	11.43	45.71	28.57	2.86	3.00	0.99
19	Sustainability	5.71	22.86	45.71	22.86	2.86	2.94	0.89
20	One-stop service	11.43	22.86	42.86	17.14	5.71	2.83	1.03
21	Currency exchange	14.29	25.71	34.29	22.86	2.86	2.74	1.05

Through the comparison of the mean, it can be seen that the score of Chinese participants for 21 factors are higher than 3.4, which is relatively higher than German participants'. It means that Chinese participants are more care about these factors. The top ten consideration factors of the two countries' participants are shown in Table 15 by the rank of the mean.

Table 15 Top 10 Factors between Enterprises in China and Germany

No.	China	Germany
1	Human factor	Cultural difference
2	Warehouse and inventory management	Demand variability
3	Payment	Property of product
4	Property of product	Customs clearance
5	Service capability	Law and regulation
6	Law and regulation	Outscoring strategy
7	Customs clearance	Warehouse and inventory management
8	Real-time information sharing	Payment
9	Demand variability	Service capacity
10	Outscoring strategy	Real-time information sharing

The top ten factors scoring by Chinese and German participants are basically the same but in different order. The most significant difference is that, Chinese companies pay

more attention to the importance of internal factors, such as human factor, while German companies believe that the impact of external factors more significant, such as cultural difference.

2.3 Factor Analysis

Although 21 influencing factors were summed up by literature review and analyzed the importance through the questionnaire survey. However, the data have strong subjectivity so that the internal relation cannot be found. In order to group the meaningful factors together and replace most information of the original variable with fewer independent factor variables, a statistical analysis method, factor analysis was conducted to sort out the key factor affecting the development of CBEL.

2.3.1 Introduction and Procedure

The starting point is determining the optimal number of factors to extract from the matrix of correlations among the observed variables (such as responses to questionnaire items). The most common criteria are based on the increment in common variance explained by extracting an additional factor. Factor weights are computed to extract the maximum possible variance, with successive factoring continuing until there is no further meaningful variance left.

The first factor extracted by the method will explain the greatest amount of common variance in the set of observed items, and the second factor will be the uncorrelated (or “orthogonal”) factor that explains the next largest component of common variance, and so forth. Factor extraction can continues until what the researcher believes is an optimal number of factors have been extracted. The maximum number of factors can be extracted is equal to the number of observed variables, but usually the actual number is much smaller. A widely used stopping point in factor extraction is the point at which the “eigenvalue” (a mathematical term related to the matrix manipulation methods employed to extract factors) of a factor to be extracted is no greater than one. This suggests that the factor explains no more variance among the variables than that explained by a single variable. Such factors are often associated strongly with only one observed variable and are likely explaining only the measurement errors in observed variables.

The principal components analysis (PCA) is widely used method for factors extraction, due to the fact that this is recommended when the primary objective is to

determine the minimum number of factors necessary to explain or justify the maximum portion of the variance represented in the series of original variables.

The process of factors extraction can be represented by following mathematical model：

$$\begin{cases} x_1 = a_{11}F_1 + a_{12}F_2 + \mathrm{K} + a_{1m}F_m + \varepsilon_1 \\ x_2 = a_{21}F_1 + a_{22}F_2 + \mathrm{K} + a_{2m}F_m + \varepsilon_2 \\ \cdots \\ x_p = a_{p1}F_1 + a_{p2}F_2 + \mathrm{K} + a_{pm}F_m + \varepsilon_p \end{cases} \tag{2.2}$$

In formula 2.2, a set of p observable random variables, x_1 ,..., x_p. Suppose for some unknown constants a_{ij} and m unobserved random variables F_j (called "common factors", because they influence all the observed random variables), where $\mathrm{i} \in 1,..., p$ and $j \in 1, \ldots, m$, $m \le p$, the ε_i are unobserved stochastic error terms with zero mean and finite variance, which may not be the same for all i. In matrix terms is $X = AF + \varepsilon$. Any solution of the above set of formulas following the constraints for F is defined as the factors, and A as the factor loading matrix.

Once the optimal number of factors has been determined, examined the table of factor loadings generated by the analysis to try to interpret the meaning of the factors. The factor loadings give an idea about how much the variable has contributed to the factor. The larger the factor loading means the more the variable contributed to that factor. The observed pattern of factor loadings is generally used as a way of interpreting the underlying factors. This pattern will depend on a number of decisions made by the researcher, including the number of factors extracted and the factor extraction methods specified. Unfortunately, the set of factor loadings produced in EFA is not determinant, and it is possible to generate only "relative" factor loadings. This means that the factor loadings can all be systematically transformed in an infinite number of ways and still explain the same common variance among the observed variables (i.e., EFA determines the proportionality among loadings, but not their exact values). To solve this problem, a second procedure, called "factor rotation", is normally used after the initial set of factor loadings has been generated. Factor rotation involves a systematic transformation of the set of loadings, according to one of many possible mathematical criteria, to provide optimal differentiation among the factors. Factor rotation helps the researcher interpret the meaning of each factor.

Varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor

matrix, which has the effect of differentiating the original variables by extracted factor. Each factor will tend to have either large or small loadings of any particular variable. A varimax solution yields results which make it as easy as possible to identify each variable with a single factor. This is the most common rotation option.

In summary, an exploratory factor analysis with principal component extraction and varimax rotation was performed to assess construct validity of the measurement items in this thesis.

2.3.2 Analysis and Result

To ensure that the process of factorial analysis might be appropriate, before performing factor analysis, firstly determine whether the variables are suitable for the analysis. Bartlett test of sphericity was applied for testing the significance level of the correlation coefficients between variables. The test is significant if the p value is smaller than 0.05 (Bartlett, 1951); as well as the extent of the adequacy of the sample Kaiser-Meyer-Olkin (KMO) that compares the magnitudes of the coefficients of the observed correlation with the magnitude of the partial correlation coefficients. The KMO measure of sampling adequacy varies between 0 and 1, when the value is closer to 1, the variables are more suitable for factor analysis. Generally, the indices between 0.70 and 0.80 are considered acceptable (Kaiser, 1974).

After testing, the KMO of 0.725 with p-value of 0.000 indicated the sufficiency of the data from questionnaire in this thesis (Table 16). It proves that all variables under these dimensions are suited for factor analysis. Therefore, the validity and reliability of the sample can be considered reasonable.

Table 16 KMO and Bartlett's Test of Factor Analysis

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.725
Bartlett's Test of Sphericity	Approx. Chi-Square	757.455
	df	210
	Sig.	.000

In the results of the principal component analysis with a varimax rotation, the first 6 components with eigenvalues greater than 1 were obtained, and the cumulative variance explained was 63.967%. It means that the original variables were grouped into 6 new factors and can explain the 63.967 % of the total variance (Table 17).

Table 17 Total Variance Explained of Factor Analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.738	27.326	27.326	5.738	27.326	27.326	2.785	13.261	13.261
2	2.051	9.765	37.091	2.051	9.765	37.091	2.521	12.006	25.267
3	1.748	8.322	45.412	1.748	8.322	45.412	2.496	11.884	37.151
4	1.588	7.563	52.975	1.588	7.563	52.975	2.037	9.700	46.851
5	1.255	5.975	58.950	1.255	5.975	58.950	1.805	8.594	55.444
6	1.054	5.017	63.967	1.054	5.017	63.967	1.790	8.523	63.967
7	.944	4.493	68.460						
8	.875	4.165	72.625						
9	.789	3.756	76.381						
10	.751	3.577	79.958						
11	.697	3.319	83.277						
12	.598	2.849	86.126						
13	.523	2.489	88.615						
14	.477	2.271	90.886						
15	.414	1.970	92.856						
16	.327	1.559	94.415						
17	.297	1.414	95.829						
18	.280	1.333	97.163						
19	.247	1.175	98.338						
20	.178	.846	99.184						
21	.171	.816	100.000						

Wu (2010) suggested that if the combined interpretation of reserved factors can achieve greater than 60% after extraction, it is an ideal result for using in science. Therefore, these six factors can be extracted as the main component index affecting the development of CBEL. Moreover, factor analysis method derives factor loadings through varimax rotation, and then groups of variables that are highly interrelated tend to load on the same factor. Loading range is between -1.0 and 1.0, the higher absolute value of a loading means an observed item more closely linked to a factor. A cut-off point of 0.5 was suggested as the criteria in factor loading to determine whether an item is ignored or not (Hair et al., 2010). (Table 18)

Table 18 Rotated Component Matrix of Factor Analysis

Variables	Component					
	1	2	3	4	5	6
ICT application	.811	.134	.024	-.202	.034	.214
Warehouse and inventory mgmt.	.790	.208	.187	.144	.127	-.097
Service capability	.773	.149	.104	.283	.066	-.017
Payment	.559	.171	.258	-.284	-.202	.244
Alliance and cooperation	.120	.741	.239	-.081	.079	-.081
Outscoring strategy	.182	.612	-.165	.368	.158	.297
Real-time information sharing	.398	.567	.033	.037	.197	.041
One-stop service	.223	.495	.079	.315	-.275	.444
Sustainability	.261	.483	.227	.302	.251	-.053
Currency exchange	.291	.021	.704	.188	.064	.108
Infrastructure	.096	.469	.622	.064	-.358	.148
Tax and tariff	.076	.307	.613	.030	.153	.282
Customs clearance	-.053	-.052	.612	-.108	.321	.142
Range of commodity	.023	.035	.114	.748	-.026	.133
Property of product	-.132	.328	.129	.693	.010	.367
Nature of business	.003	.188	.196	-.068	.766	.110
Size of company	.087	.438	.263	.085	.584	-.030
Human factor	.266	-.091	.031	.486	.543	.084
Cultural difference	.089	.023	.016	.176	.033	.730
Demand variability	.019	-.013	.327	.092	.126	.718

It can be seen from table, “One-stop service” and “Sustainability” were dropped out of the analysis. For the interpretation of factors were considered two aspects:

- In the practical significance, one-stop service and sustainability are not unimportant, but the relationship with other components is weak, so cannot be grouped together;
- In the statistical significance, the burdens of 0.4 are considered important and those of 0.5 or greater are considered practically significant. So the approach that has taken for this topic was to accept loads greater than or equal to 0.5 to ensure the maximum significance of the results.

Finally, the characteristic vector corresponding to the six eigenvalues is taken as the new comprehensive index instead of the original twenty one factors. And according to

the contents and internal relationships, they were defined as: Operation (F1), Partnership (F2), Government (F3), Product (F4), Company (F5) and Market (F6).

The regression function is used to obtain the factor score which are values on new scales created for each factor. The factor score coefficients, which are not same as loadings or coefficients predicting variables from factors, can be found in the component score coefficient matrix in SPSS (Table 19). These coefficients weight the observed variable by its relative importance on a given factor in calculating the estimated value of that factor.

Table 19 Component Score Coefficient Matrix of Factor Analysis

No.	Variables	Component					
		1	2	3	4	5	6
v1	Nature of business	-.074	.054	-.021	-.162	.465	.102
v2	Size of company	-.079	.182	.012	-.059	.304	-.062
v3	Human factor	.126	-.210	-.070	.250	.295	.009
v4	Range of commodity	-.006	-.110	.039	.441	-.095	-.057
v5	Property of product	-.141	.088	-.015	.321	-.062	.098
v6	Infrastructure	-.087	.183	.295	-.020	-.320	-.046
v7	Tax and tariff	-.083	.058	.238	-.091	.025	.101
v8	Currency exchange	.072	-.178	.343	.086	-.062	-.048
v9	Customs clearance	-.079	-.120	.299	-.120	.154	.067
v10	ICT application	.355	-.061	-.105	-.183	.023	.160
v11	Law and regulation	.036	-.076	.288	.182	-.010	-.242
v12	Demand variability	-.032	-.129	.077	-.080	.081	.452
v13	Cultural difference	.023	-.083	-.099	-.024	.048	.475
v14	Payment	.214	-.004	.066	-.225	-.137	.151
v15	Warehouse and inventory mgmt.	.321	-.064	.003	.067	.006	-.136
v16	Sustainability	.009	.170	.011	.107	.069	-.141
v17	One-stop service	.007	.193	-.071	.078	-.213	.186
v18	Service capability	.331	-.108	-.037	.154	-.027	-.094
v19	Alliance and cooperation	-.103	.418	.019	-.147	-.015	-.122
v20	Outscoring strategy	-.023	.291	-.253	.080	.070	.127
v21	Real-time information sharing	.075	.256	-.125	-.080	.081	-.017

With the factor score coefficients, the linear combinations of variables for six principal components are as follows:

$$\begin{cases} F_1 = -0.074 * v_1 - 0.079 * v_2 + \mathrm{K} + 0.075 * v_{21} \\ F_2 = 0.054 * v_1 + 0.182 * v_2 + \mathrm{K} + 0.256 * v_{21} \\ \mathrm{L} \\ F_6 = 0.102 * v_1 - 0.062 * v_2 + \mathrm{K} - 0.017 * v_{21} \end{cases} \tag{2.3}$$

The proportion of the variance to the cumulative variance is taken as the factor weight of the principal component. The comprehensive factor score formula is expressed as:

$$\begin{aligned} F = & (0.13261 * F_1 + 0.12006 * F_2 + 0.11884 * F_3 + 0.09700 * F_4 + \\ & 0.08594 * F_5 + 0.08523 * F_6) / 0.63967 \\ = & 0.207 F_1 + 0.188 F_2 + 0.186 F_3 + 0.152 F_4 + 0.134 F_5 + 0.133 F_6 \end{aligned} \tag{2.4}$$

The formula 2.4 can be used as a benchmark for the development of CBEL in different enterprises or different countries.

In summary, instead of the original 21 factors, the results from the EFA indicated that 6 main factors composed of 19 indicators could impact CBE logistics developing, while 64 percent of influencing factors could be explained (Table 20).

Table 20 Index System of Developing CBEL

Destination	Primary index	Factor	Secondary index	Coefficient
Influencing the development of e-logistics in cross-border relation	Operation	.207	Application of ICT	.355
			Service capability	.331
			Warehouse and inventory mgmt.	.321
			Payment	.214
	Partnership	.188	Alliance and cooperation	.418
			Outscoring strategy	.291
			Real-time information sharing	.256
	Government	.186	Currency exchange	.343
			Customs clearance	.299
			Infrastructure	.295
			Law and regulation	.288
			Tax and tariff	.238
	Product	.152	Range of commodity	.441
			Property of product	.321
	Company	.134	Nature of business	.465
			Size of company	.304
			Human factor	.295
	Market	.133	Cultural difference	.475
			Demand variability	.452

The results of the factor analysis are similar to the classification in previous focus groups, except the following two points:

- "One-stop service" and "Sustainability" were no longer considered in key factors because of weak correlation with the rest of the index;
- "ICT Application" was incorporated into "Operation" factor, thus "Technology" was discarded.

2.4 Conceptual Framework

Based on literature review and factor analysis, a conceptual framework was constructed in Figure 25. In order to establish meaningful empirical results, the differences should be conceptualized clearly. Therefore, the key factors are further divided into external and internal factors. The external factors are the "Government" and "Market (Consumer)", which represent the social environment and determine the development direction of enterprise. The internal factors include "Company", "Product", "Operation" and "Partnership", which are organization condition and determine the strategy formulation of enterprise.

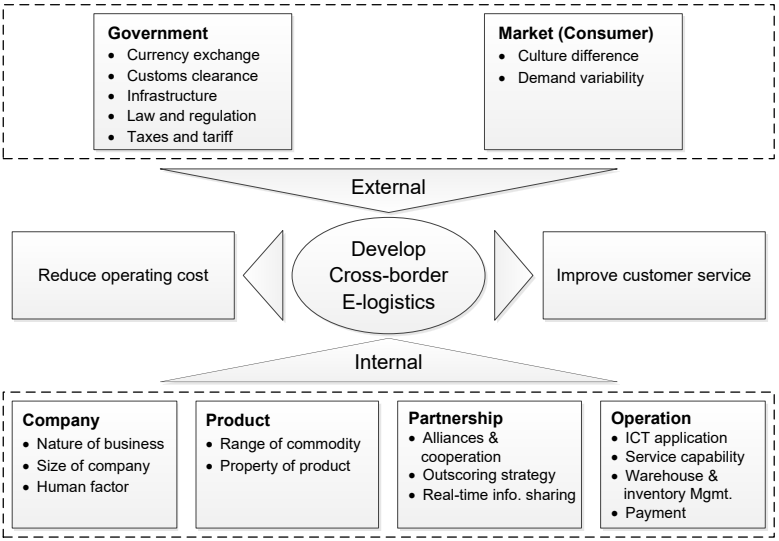

Figure 25 Conceptual Framework of Developing CBEL

These six key factors should be considered comprehensively. Before the implementation of CBEL, firms need fully understand the different culture and demand variability in target market. Conditions in a country have a very significant impact on the type of logistic system. The well infrastructure, taxes, foreign exchange, customs clearance, law and regulation supported by government can provide a good environment for CBEL developing. The nature and size of company, human factor, the range and property of online product have been indicated as important impacts on e-logistics selection and logistics costs. The advanced ICT is an indispensable tool for e-logistics developing in cross-border relations. Because it can improve the performance of the logistics operations like payment and inventory management, as well as provide the ability of real-time information sharing between suppliers and LSPs. Such cooperation improves service capacity, like increasing flexibility and delivery reliability, reducing order fulfillment times and making return more effective. Meanwhile, a well-designed outsourcing strategy is essential for CBE success in today's global supply chain world. CBEL will enhance firm's competitiveness and satisfy global customers, but only in synthetically considering the influence factors, a company can fully utilize their strength to capture the opportunities brought by the implementation of e-logistics in CBE.

It is clear that the factors affecting the development of CBEL are highly complex. Tornatzky et al. (1990) presented "Technology Organization Environment" (TOE) framework and summed up three aspects of a firm's context that influence adoption of the technology innovation, which are technological context, organizational context and environmental context. Gunasekaran et al. (2007) proposed a framework to help companies develop an e-logistics system for improving competitiveness. It contains four dimensions: strategic planning, partnership formation, inventory and information management. Wang et al. (2015) investigated independent factors affecting international logistics performance, which are laws and regulations, cross-border payments, electronic clearance and technology application level. However, previous studies provided various single factors or focused on a particular factor, but ignoring a bigger picture.

This framework contains two major extensions of the existing studies:

- The existing frameworks have only considered the effects on e-commerce or international logistics respectively. This framework enriches the studies by combine both and through the entire cross-border supply chain.
- None of the existing frameworks classified these factors and investigated the impacts between them. This framework explicitly incorporates internal and external influence factors as new antecedents for developing e-logistics in cross-border relation.

3. Game Model and Strategy between Behavior Subjects of CBEL

Based on the framework obtained in Chapter 2, “Government” and “Consumer” are external factors which represent the social environment and determine the development direction of enterprise. In this chapter, a trilateral game model was used to clearly understand the relationship between government, merchant and consumer.

3.1 Behavior Subjects of CBEL

Broadly speaking, the development of CBEL is not an isolated act of a single merchant, but a joint action by all the parties involved. In addition to the leading merchants, consumers, government, supply chain partners and even competitors are behavior subjects of CBEL. They have different status and goals in the implementation of CBEL, so that their impacts are not the same.

3.1.1 Organizer-Government

The government is an important external factor, which represents the profit of the public. The main purpose of the government’s participation in CBEL developing is to ensure the rational use of resources, and facilitate the sustainable development of social economy. From a macro point of view, the implementation of CBEL not only promotes the development of CBE, but also is the organic components of entire social and economic development. Relative to the scattered and isolated consumers, the government has more direct and mandatory influence on merchants, like a direct decision on reassignment of the interests between merchants.

As the policy maker, the society manager, the supervisor and arbitrator between merchants and consumers, the government has centralized various social forces. It has the ability and obligation to promote the development of CBEL, and regulate the irrational behavior in process, so the government plays an organization role of CBEL. On the one hand, in order to prevent the counterfeit from “gray channel” and tax evasion, the government can strengthen the supervision of merchants’ logistics activities and personal agents’ procurement by enacting laws and regulations. On the other hand, the government can make incentive policies to promote the transactions through CBEL channel, for example, give subsidy to the merchants who implemented CBEL and tax relief for the products circulated through CBEL channels. In addition,

the government should take the responsibility for infrastructure construction, standardization and popularization of CBEL.

In the process of supervising, the government also faces the problem of information asymmetry. In order to realize the cost information and CBEL implementing effort of merchants, the government usually use sample investigation, in which the typicality of the selected merchants will influence the information authenticity. It is also a matter that whether merchants are willing to provide real information even if they are representative. Moreover, the object of supervision is not only the merchants, but also their supply chain partners, competitors and even consumers. The diversification of the objects will further increase the difficulty of supervision. Therefore, under information asymmetry, how the government adopts reasonable supervision measures to promote the development of CBEL, which is the problem that needs to be solved.

In addition, for avoiding punishment or obtaining more benefits, some merchants possibly take rent-seeking on the government supervision department. The purpose is to take “free ride”. The rent-seeking action will undoubtedly affect the effective of government regulation and make the government’s decision-making process more complicated. Therefore, what strategies the government should adopt to prevent the merchants’ free-ride behavior or the corruption in government, is also the problem need to be addressed.

3.1.2 Implementer-Merchant

The production, distribution and exchange of any commodities are inseparable from the merchant, which is the most active economic subject. Any merchants engaged in physical objects production, circulation and consumption are likely to directly or indirectly take logistics activities. Therefore, the merchant is the direct implementer of CBEL, playing an irreplaceable role.

Need to be particularly stressed that the merchants here are not specifically refers to the professional logistics enterprises. Productive merchants or circulation merchants are also possible the implementer as long as they are engaged in CBE and logistics-related activities. Moreover, the subjects should consider all the merchants in the supply chain rather than a separate one due to logistics activities spanned all areas from procurement to fulfillment. And the linkage between the various subjects in the field is a necessary condition for the development of CBEL.

In the case of information asymmetry, consumer behavior may be rational or irrational. When facing the different choices of consumers, how merchants price the logistics service and generate the CBEL strategy, which are obviously not simple questions. Meanwhile, merchants have to consider the behavior of competitors. If competitors' logistics are more attractive, own market will shrink and trapped in a passive position. Therefore, when study the implementation of CBEL, it has to involve the interest conflict between merchants and the interest coordination between individual and entire supply chain.

In addition, whether the merchants choose to implement CBEL will be directly affected by government supervision. When the government supervises or don't, as well as in different regulatory efforts, the merchants are likely to take different logistics modes. In turn, the government will also take different policy measures based on merchants' logistics decision.

3.1.3 Pusher-Consumer

On the surface, the consumers are passive recipients of final products or services. However, when a variety of alternative products exist in market, consumers have more self-choice right, their value orientation and performance will directly affect the company's sales. Therefore, in the perfectly competitive market, the activities of merchant are guided by consumer behavior.

In CBE, while concerning about the product quality, consumers began to consciously choose a more secure and efficient logistics services, because the products often require long distance transport. The implementation of CBEL is becoming one of the consumer focuses. Hence, consumers participate in the development of CBEL because they want to obtain a guaranteed product and service. They can use the "currency votes" to determine the success or failure of merchants' logistics operation, so that become the impeller of CBEL.

Consumers often face a dilemma when purchasing. On the one hand, consumers are rational, and pay attention to the actual effect of purchasing, so they require the unit currency utility of the payment equal to the marginal utility of product or service. On the other hand, because of information asymmetry, consumers do not have sufficient ability to identify whether merchant implement CBEL or don't, so that they are often reluctant to take risks to choose expensive CBEL service. Therefore, the pricing

problem of CBEL service is actually a kind of dynamic game process between merchant and consumer under information asymmetry condition.

The role of pusher is also reflected in the function of its social supervision. On the one hand, the consumer's aspirations can be transmitted through the social organization, civil society or the media to the merchant, so that directly affect the merchant's logistics decision-making. On the other hand, consumer's public opinion may also affect the government's policy decision-making, and indirectly affect the merchant's implementation process of CBEL. Moreover, as the third-party, consumers play a unique supervisory role to prevent rent-seeking behavior between merchants and the government. By reporting "irrational" behavior of local government departments, the effectiveness of government work can be improved.

3.2 Bilateral Game between Subjects

In this section, through the simple game between merchants, between the consumer and merchant, the economic effects and strategy selection of merchants in CBEL implementation were dynamically analyzed.

3.2.1 Hypothesis and Parameter

In order to focus on the nature of the research problem and simplify the model calculation, the following assumptions are put forward:

- The merchants sell the same product. That is, the sales price and procurement cost are same between merchants.
- The government does not supervise. That is, the government neither punishes nor subsidizes.
- Game subjects are rational. That is, the parties pursue their own profit maximization.
- Static game under incomplete information. That is, the parties can not accurately know each other's strategy.

The parameters in the model are presented as follows (Table 21):

Table 21 Parameters in Bilateral Game Model

Notation	Representation
P	The product price.
C	The procurement cost of merchant.
L_i	The logistics cost. L_1 is the cost of merchant who implement CBEL (hereafter called merchant 1), L_2 is the cost of merchant who use traditional logistics (hereafter called merchant 2). Because the implementation of CBEL needs more investment, so $L_1 > L_2$.
U_i	The consumer utility from products purchasing. U_1 is the utility by purchasing from merchant 1, U_2 is the utility by purchasing from merchant 2. Because the implementation of CBEL can provide better service, so $U_1 > U_2$.

3.2.2 Merchant to Merchant

The game between merchants is a typical prisoner's dilemma. In the absence of government's supervision and incentives, each merchant makes own optimal strategy based on the prediction for competitors' behavior. In this way, the final Nash equilibrium is always the worst of the overall utility. The payoff matrix can be simply described as follows (Table 22):

Table 22 Payoff Matrix of Bilateral Game between Merchants

Game strategy		Merchant 1	
		CBEL	Traditional
Merchant 2	CBEL	A: $P-C-L_1, P-C-L_1$	B: $P-C-L_2, P-C-L_1$
	Traditional	C: $P-C-L_1, P-C-L_2$	D: $P-C-L_2, P-C-L_2$

The analysis of the strategy matrix is as follows:

- Scenario A: If merchant 1 implemented CBEL, and the merchant 2 implemented also with the same level. They obtained general profits $P-C-L_1$.
- Scenario B: If merchant 1 used traditional logistics, but merchant 2 implemented CBEL. At this point, consumer may not care about what kind of logistics, or they choose logistics services only based on own judgments due to information asymmetry. So the merchants obtained profit respectively, the profit of merchant 1 was $P-C-L_2$, the profit of merchant 2 was $P-C-L_1$, because of $L_1 > L_2$,

so $P-C-L_2 > P-C-L_1$. Merchant 2 obtained lower, means merchant will suffer losses due to the implementation of CBEL.

- Scenario C: Similar to scenario B.
- Scenario D: If both merchants used traditional logistics, they obtained general profit $P-C-L_2$.

The analysis of strategy selection is as follows:

- When merchant 1 implemented CBEL, if merchant 2 did the same that will get just general profit, but use traditional logistics can get excess profits higher than general level. Hence, the optimal strategy for merchant 2 is to choose traditional logistics.
- When merchant 1 used traditional logistics, if merchant 2 did the same that will get general profit, but implement CBEL will make profit below the general level. Hence, the optimal strategy for merchant 2 is also to choose traditional logistics.

Therefore, no matter how merchant 1 to choose, the optimal strategy of merchant 2 is always to use the traditional logistics. Since the relationship between merchants is symmetrical, and vice versa. In this typical prisoner's dilemma game, the Nash equilibrium between merchants is scenario D, that is, both of them choose the traditional logistics. The initial intention of implementing CBEL will have to give up due to the betrayal of other side. There are two main reasons for this result, on the one hand, information asymmetry leads to "adverse selection" of consumer; on the other hand, lack of supervisor and incentives leads to "free ride" taken by the merchant used the traditional logistics.

3.2.3 Merchant to Consumer

The logistics costs are always converted into the logistics services price. Because the implementation of CBEL needs more investment, the CBEL service price will be higher than the traditional logistics service. Consumers are willing to pay higher price for better service, but they cannot identify such differences between services due to information asymmetry. And if the price is the only signal, the merchants with the traditional logistics can change the "logistics service price" to take the "free ride". The payoff matrix can be simply described as follows (Table 23):

Table 23 Payoff Matrix of Bilateral Game between Merchant and Consumer

Game strategy		Merchant	
		CBEL	Traditional
Consumer	Purchase	A: $P-C-L_1, U_1-L_1$	B: $P-C-L_2, U_2-L_1$
	Non-purchase	C: $0, 0$	D: $P-C-L_2, U_2-L_2$

The analysis of the strategy matrix is as follows:

- Scenario A: If consumers think that the merchant have implemented CBEL, and can obtain more reliable products and better services, then they are willing to pay L_1 and obtained the utility U_1-L_1; meanwhile, the merchant is indeed implemented, so the logistics cost was L_1, the profits was $P-C-L_1$.
- Scenario B: The merchant used traditional logistics, but raised the logistics services price to L_1 by promoting false information to mislead consumers. Consumers believe this false signal due to information asymmetry, so that the merchant didn't spend any extra cost to take the "free ride". Then, the consumers obtained the utility was U_2-L_1, the merchant obtained the profit was $P-C-L_2$.
- Scenario C: The merchant implemented CBEL, the logistics service price was L_1, but the consumers do not believe and are only willing to pay L_2. In this case, the transaction will not occur, so that the interests of both sides are 0.
- Scenario D: If the consumers think that the merchant used traditional logistics, and the merchant is indeed used, then the consumers paid the price L_2 and obtained the utility U_2-L_2, the merchant invested the logistics costs L_2 and obtained the profit $P-C-L_2$.

The analysis of the strategy selection is as follows:

When the consumer chooses the "purchase" strategy, because of $L_1>L_2$, so $P-C-L_2>P-C-L_1$, the optimal strategy for the merchant is to choose the traditional logistics. And if the consumer chooses the "non-purchase" strategy, because of $P-C-L_2>0$, the optimal choice of merchant is still to choose the traditional logistics. So no matter how consumer to choose, as long as the information asymmetry exists, the optimal balance strategy for merchant is always to take the traditional logistics. Similarly, because of $L_1>L_2$, so $U_2-L_2>U_2-L_1$, the optimal

balance strategy for consumer is “non-purchase”. Therefore, the final Nash equilibrium of game between merchant and consumer is scenario D, that is, the merchant chooses traditional logistics and consumers choose “non-purchase”. So, the merchant does not have any incentive to implement CBEL, and consumers also have no reason to encourage the merchant to implement. This is further revealed that, if consumers just rely on the price signal to identify the merchant’s logistics strategy, will result in many merchants taking “free ride”.

3.3 Trilateral Game between Subjects

From the results of bilateral game in last section, it is difficult to promote the development of CBEL only by the merchants and consumers. Hence, when the market regulations are not effective, as the organizer, it is necessary for the government to supervise and motivate through some administrative or economic means. Therefore, the study on the behavior of subjects in CBEL developing should be a mixed game between government, merchant and consumer. Besides, with the development of information technology, the market is no more a completely “black box” today, consumers can lean of the merchant behavior via various channels.

3.3.1 Hypothesis and Parameter

In order to focus on the nature of the research problem and simplify the model calculation, the following assumptions are put forward:

- Game subjects are rational. That is, merchant and consumer pursue their own profit maximization, and the government pursues the greatest social profit.
- Dynamic game under complete information. That is, all parties know each other’s strategy.
- The parties engage the game in following order: “government - merchant - consumer”. That is, firstly, the government formulates the supervision policies, then the merchant determines the logistics strategy, at last, the consumer makes the purchase option.

In order to promote the development of CBEL, on the one hand, government can ratify special funds used for infrastructure construction and propaganda; one the other hand, fiscal and tax regulatory means can be introduced, such as offering tax exemption to merchant who implemented CBEL, practicing more aggressive random

inspection and tax evasion penalty on the consumers who purchased through postal parcel. In this model, the two strategies of government are respectively called active regulation a_{g1} and prudent regulation a_{g2}, so the strategy space of government is $A_g = \{a_{g1}, a_{g2}\}$, and the probability of strategy implementation is p_g and $1-p_g$. The merchant has two strategies, implement CBEL a_{m1} and use traditional logistics a_{m2}, so the strategy space of merchant is $A_m = \{a_{m1}, a_{m2}\}$, and the probability of strategy implementation is p_m and $1-p_m$. The consumer has two strategies as well, either purchase products through CBEL a_{c1} or through traditional logistics a_{c2}, so the strategy space of consumer is $A_c = \{a_{c1}, a_{c2}\}$, and the probability of strategy implementation is p_c and $1-p_c$.

In order to a present the game process more intuitively between government, merchant and consumer, the following game tree was constructed (Figure 26):

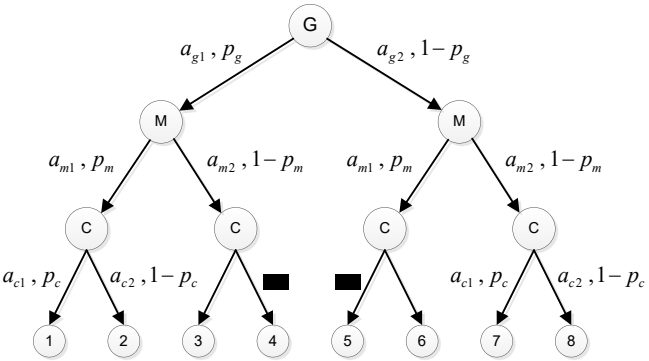

Figure 26 Trilateral Game Tree between Subjects in CBEL Developing

According to the hypothesis above, the trilateral game model was formulated as:

$$G = \langle N, (A_n), (R_n) \rangle$$

- The set of players: $N = \{g, m, c\}$, respectively represent government, merchant and consumer;
- The set of actions available to players: $A_n = \{a_{n1}, a_{n2}\}$, $n \in N$;
- The set of utility function to players: $u_n(a_j)$, $a_j \in A$, $A = \underset{n \in N}{\times} A_n$;
- The set of probability distributions, as the mixed strategy of players:

$$\Delta(A_n)=\left\{p_{n1},\ p_{n2}\,\middle|\,p_{ni}\geq 0,\ \sum_{i=1}^{2}p_{ni}=1\right\}$$

Hereinafter referred to as α;

- The expected payoff function of players: $u_n(\alpha)=\sum_{a_j\in A}(\prod_{n\in N}p_{n,a_{ni}}u_n(a_j))$

The parameters in the model are presented as follows.

Table 24 Parameters in Trilateral Game Model

Notation	Representation
T	The effective investment of government in active regulation, such as the cost of infrastructure construction and propaganda. It is equal to the total revenue of merchant and consumer from successfully implementing CBEL.
β	The proportion of the merchant's profit from the effective investment of government. Therefore, under the active regulation, the merchant can obtain the additional profit βT, and the consumer can obtain $(1-\beta)T$.
W	The increased social welfare from government successfully promoting the CBEL, such as the growth of import and export trade.
B	The government subsidy for the merchant who implemented CBEL, such as tax exemption. In order to emphasize the government's long-term deployment of the active regulation strategy, assumed $B>T$.
F	The government penalty for the consumer who purchased via traditional logistics channels, such as the tax evasion penalty.
R_i	The profit of merchant. R_1 is the profit when merchant implemented CBEL, R_2 is the benefit when merchant used traditional logistics.
C_i	The logistics cost of merchant. C_1 is the cost when merchant implemented CBEL, C_2 is the cost when merchant used traditional logistics. Because investing in new systems requires more resources, so $C_1>C_2$.
U_i	The utility of the consumer. U_1 is the utility of purchasing through CBEL, U_2 is the utility of purchasing through traditional logistics. Since CBEL provides more reliable products and better service, so $U_1>U_2$.

3.3.2 Payoff Matrix and Model Strategy

According to the game tree model, the following payoff matrix of government, merchant and consumer can be obtained (Table 25):

Table 25 Payoff Matrix of Government, Merchant and Consumer

No.(j)	Action Profile (a_{ij})	Payoff		
		$u_g(a_{gj})$	$u_m(a_{mj})$	$u_c(a_{cj})$
1	(a_{g1}, a_{m1}, a_{c1})	$W-T$	$R_1-C_1+\beta T$	$U_1+(1-\beta)T$
2	(a_{g1}, a_{m1}, a_{c2})	$-T$	$-C_1+\beta T$	0
3	(a_{g1}, a_{m2}, a_{c1})	$-T$	$-C_2$	0
4	(a_{g1}, a_{m2}, a_{c2})	$-T$	R_2-C_2	U_2
5	(a_{g2}, a_{m1}, a_{c1})	$W-B$	R_1-C_1+B	U_1
6	(a_{g2}, a_{m1}, a_{c2})	$-B$	$-C_1+B$	0
7	(a_{g2}, a_{m2}, a_{c1})	0	$-C_2$	0
8	(a_{g2}, a_{m2}, a_{c2})	F	R_2-C_2	U_2-F

Note: in different combinations of actions, the payoff function of government, merchant and consumer are respectively marked as $u_g(a_{gj})$, $u_m(a_{mj})$, $u_c(a_{cj})$

When a player's expected values of each strategy choice is equal, the mixed-strategy Nash Equilibrium is achieved, because no matter which strategy is chosen, the payoff is the same. Therefore, the mixed strategy equilibrium solution is obtained as follow:

(1) When the merchant implemented the strategy a_{m1} with the probability p_m, and the consumer implemented the strategy a_{c1} with the probability p_c. The profit of government under active regulation a_{g1} can be expressed as follow:

$$\begin{aligned} u_{g1} &= p_m p_c u_g(a_1) + p_m(1-p_c)u_g(a_2) + (1-p_m)p_c u_g(a_3) + (1-p_m)(1-p_c)u_g(a_4) \\ &= p_m p_c(W-T) + p_m(1-p_c)(-T) + (1-p_m)p_c(-T) + (1-p_m)(1-p_c)(-T) \end{aligned} \tag{3.1}$$

The profit of government under prudent regulation a_{g2} can be expressed as follow:

$$\begin{aligned} u_{g2} &= p_m p_c u_g(a_5) + p_m(1-p_c)u_g(a_6) + (1-p_m)p_c u_g(a_7) + (1-p_m)(1-p_c)u_g(a_8) \\ &= p_m p_c(W-B) + (1-p_m)p_c(-B) + (1-p_m)(1-p_c)F \end{aligned} \tag{3.2}$$

When the expected profits under two strategies are same, the game can achieve a balanced state, so due to $u_{g1} = u_{g2}$ can obtained:

$$p_c^* = \frac{T + F - p_m F - p_m B}{F - p_m F} \tag{3.3}$$

(2) When the government implemented the strategy a_{g1} with the probability p_g, and the consumer implemented the strategy a_{c1} with the probability p_c. The profit of merchant implementing CBEL strategy a_{m1} can be expressed as follow:

$$\begin{aligned} u_{m1} &= p_g p_c u_m(a_1) + p_g(1-p_c)u_m(a_2) + \\ &\quad (1-p_g)p_c u_m(a_5) + (1-p_g)(1-p_c)u_m(a_6) \\ &= p_g p_c(R_1 - C_1 + \beta T) + p_g(1-p_c)(-C_1 + \beta T) + \\ &\quad (1-p_g)p_c(R_1 - C_1 + B) + (1-p_g)(1-p_c)(-C_1 + B) \end{aligned} \tag{3.4}$$

The profit of merchant using traditional logistics a_{m2} can be expressed as follow:

$$\begin{aligned} u_{m2} &= p_g p_c u_m(a_3) + p_g(1-p_c)u_m(a_4) + \\ &\quad (1-p_g)p_c u_m(a_7) + (1-p_g)(1-p_c)u_m(a_8) \\ &= p_g p_c(-C_2) + p_g(1-p_c)(R_2 - C_2) + \\ &\quad (1-p_g)p_c(-C_2) + (1-p_g)(1-p_c)(R_2 - C_2) \end{aligned} \tag{3.5}$$

When the expected profits under two strategies are same, the game can achieve a balanced state, so due to $u_{m1} = u_{m2}$ can obtained:

$$p_g^* = \frac{B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2}{B - \beta T} \tag{3.6}$$

(3) When the government implemented the strategy a_{g1} with the probability p_g, and the merchant implemented the strategy a_{m1} with the probability p_m. The utility of consumer purchasing through CBEL strategy a_{c1} can be expressed as follow:

$$\begin{aligned} u_{c1} &= p_g p_m u_c(a_1) + p_g(1-p_m)u_c(a_3) + (1-p_g)p_m u_c(a_5) + (1-p_g)(1-p_m)u_c(a_7) \\ &= p_g p_m(U_1 + (1-\beta)T) + (1-p_g)p_m U_1 \end{aligned} \tag{3.7}$$

The utility of consumer purchasing through traditional logistics a_{c2} can be expressed as follow:

$$\begin{aligned} u_{c2} &= p_g p_m u_c(a_2) + p_g(1-p_m)u_c(a_4) + (1-p_g)p_m u_c(a_6) + (1-p_g)(1-p_m)u_c(a_8) \\ &= p_g(1-p_m)U_2 + (1-p_g)(1-p_m)(U_2 - F) \end{aligned} \tag{3.8}$$

When the expected profits under two strategies are same, the game can achieve a balanced state, so due to $u_{c1} = u_{c2}$ can obtained:

$$p_m^* = \frac{U_2 + p_g F - F}{U_1 + U_2 + p_g T - \beta p_g T + p_g F - F} \tag{3.9}$$

In summary, the mixed-strategy equilibrium solution of the trilateral game for implementing CBEL was addressed as follow:

$$\begin{cases} p_g^* = \dfrac{B + p_c R_1 - (1 - p_c) R_2 - (C_1 - C_2)}{B - \beta T} \\ p_m^* = \dfrac{U_2 - (1 - p_g) F}{U_1 + U_2 + (1 - \beta) p_g T - (1 - p_g) F} \\ p_c^* = \dfrac{T + (1 - p_m) F - p_m B}{(1 - p_m) F} \\ p_g^* , p_m^* , p_c^* \in [0 , 1] \end{cases} \tag{3.10}$$

3.3.3 The Analysis of Mixed-Strategy Equilibrium

(1) The analysis of consumer's equilibrium

The first derivative of the p_c^* versus T is:

$$\frac{\partial p_c^*}{\partial T} = \frac{1}{(1 - p_m) F} \tag{3.11}$$

Because $p_m \in [0,1]$, so $\partial p_c^* / \partial T > 0$, p_c^* is the monotonic increasing function of T. That means, consumers are more willing to purchase through CBEL channel with the increase of government's effective investment. This further proves that government's active regulation effectively motivates consumer to purchase through CBEL channel.

The first derivative of the p_c^* versus B is:

$$\frac{\partial p_c^*}{\partial B} = \frac{-p_m}{(1 - p_m) F} \tag{3.12}$$

Because $p_m \in [0,1]$, so $\partial p_c^* / \partial B < 0$, p_c^* is the monotonic decreasing function of B. That means, the government's prudent regulation cannot motivate consumers to purchase through CBEL channel. On the contrary, the consumers are more willing to

purchase through traditional logistics channel with the increase of government's subsidy for merchant.

The first derivative of the p_c^* versus F is:

$$\frac{\partial p_c^*}{\partial F} = \frac{p_m B - T}{(1 - p_m)F^2} \tag{3.13}$$

When $p_m B - T > 0$, so $\partial p_c^* / \partial F > 0$, p_c^* is the monotonic increasing function of F; when $p_m B - T < 0$, so $\partial p_c^* / \partial F < 0$, p_c^* is the monotonic decreasing function of F. Hence, there is no strict monotony between p_c^* and F, their relationship depends on the effective investment T under government's active regulation and the government's subsidies for merchant B under government's prudent regulation. This further proves that, when government's effective investment is insufficient while the incentive mechanism is still imperfect, increase the penalty for consumers cannot effectively motivate them to purchase through CBEL channel.

In summary, for government, by improving the tax policies, such as appropriate subsidies B for the merchants, and by increasing the effective investment T, such as infrastructure construction, can motivate consumers to purchase via CBEL channel. Further analysis can obtain $\left|\partial p_c^* / \partial T\right| > \left|\partial p_c^* / \partial B\right|$, which shows that T has more influence on consumer's decision making.

(2) The analysis of merchant's equilibrium

The first derivative of the p_m^* versus F is:

$$\frac{\partial p_m^*}{\partial F} = \frac{-(1 - p_g)[U_1 + (1 - \beta) p_g T]}{(U_1 + U_2 + p_g T - \beta p_g T + p_g F - F)^2} \tag{3.14}$$

Because $\beta \in [0,1]$, $p_g \in [0,1]$, so $\partial p_m^* / \partial F < 0$, p_m^* is the monotonic decreasing function of F. That means, the government's prudent regulation cannot produce positive incentives to the merchant. On the contrary, the merchant is more willing to use traditional logistics with the increase of government's penalty for consumer.

The first derivative of the p_m^* versus T is:

$$\frac{\partial p_m^*}{\partial T} = \frac{(1 - \beta)[U_2 + (1 - p_g)F]}{(U_1 + U_2 + p_g T - \beta p_g T + p_g F - F)^2} \tag{3.15}$$

Because $\beta \in [0,1]$, $p_g \in [0,1]$, so $\partial p_m^* / \partial T > 0$, p_m^* is the monotonic increasing function of T. That means, the merchant is more willing to implement CBEL with the increase of the effective investment under government's active regulation.

The first derivative of the p_m^* versus β is:

$$\frac{\partial p_m^*}{\partial \beta} = \frac{p_g T[U_2 + (1 - p_g)F]}{(U_1 + U_2 + p_g T - \beta p_g T + p_g F - F)^2} \tag{3.16}$$

Because $p_g \in [0,1]$, so $\partial p_m^* / \partial \beta > 0$, p_m^* is the monotonic increasing function of β. That means, if the government increases the proportion of the merchant's profit in the effective investment, which can promote the merchant to implement CBEL.

In summary, if the merchants can obtain more extra profit from government, they are more willing to implement CBEL. On the one hand, the government should improve infrastructure to reduce the operation cost of merchant; on the other hand, the government should strengthen the promotion efforts to motivate consumers to purchase through CBEL channels.

(3) The analysis of government's equilibrium

The first derivative of the p_g^* versus T is:

$$\frac{\partial p_g^*}{\partial T} = \frac{b(B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2)}{(B - \beta T)^2} \tag{3.17}$$

Because $\beta < 1$, $B > T$, so $B - \beta T > 0$; $p_g^* = (B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2)/(B - \beta T) > 0$, so $B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2 > 0$, then $\partial p_g^* / \partial T > 0$, p_g^* is the monotonic increasing function of T. That means, with the growth of the effective investment, the government is more willing to implement the active regulation.

The first derivative of the p_g^* versus β is:

$$\frac{\partial p_g^*}{\partial \beta} = \frac{(B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2)T}{(B - \beta T)^2} \tag{3.18}$$

Because $B - C_1 + C_2 + p_c R_1 - R_2 + p_c R_2 > 0$, so $\partial p_g^* / \partial \beta > 0$, p_g^* is the monotonic increasing function of β. That means, the government offers more profit for merchant from effective investment, which will increase the probability of active regulation implementation.

In summary, if the merchant can obtain more extra profit, they will actively implement the CBEL, and then the successful implementation will increase the social welfare, so the government will invest more on infrastructure construction to promote the development of CBEL. Thus, the active regulation creates a positive circulation.

3.3.4 Recommendation

Based on the mixed-strategy equilibrium solution of trilateral game, the following suggestions need to be taken into consideration when promote the implementation of CBEL, so that the effectiveness of the government regulation can be improved:

(1) Form and prefect the incentive mechanism.

Raise the subsidies B for merchants who implemented CBEL; strengthen the supervision and the punishment F for consumers who purchased via traditional logistics channel, which will not increase the efficiency of the government regulation. When a proper incentive mechanism is absent (i.e. $p_m B - T < 0$), even if the government increases the investment to develop infrastructure construction and motivate consumers to purchase via CBEL channel, the actual result will be counterproductive.

(2) Emphasize the sustainability development of CBEL.

The prudent regulation could promote the development of CBEL but just in a short term, the sustainable development cannot solely rely on the subsidies and penalty. Relatively, by the equilibrium solution analysis, the active regulation could effectively increase the merchant's implementing probability p_m^* and the consumers' purchasing probability p_c^*. Therefore, the focus of the government regulation should be shifted to infrastructure construction, propaganda and popularization.

(3) Priority to improve the infrastructure construction of CBEL.

In the case of the effective investment F unchanged, if government increases the proportion of the merchant's profit β, so that can motivate the merchant to implement CBEL. Therefore, in order to reduce the operation cost for the merchants, the government should prioritize to perfect the infrastructure construction. This has proved to be a good way to improve the efficiency of government regulation.

4. A Decision Model of E-logistics Strategy in CBE

In addition to the government's active guidance and support, merchants should also actively seek effective approach for resolving the problems encountered in the development of CBEL. In this chapter, based on the survey data of case enterprises, considering internal factors "Company" and "Product", a general normative decision model was presented, which can help merchants adapt the "logistics strategy" to possible forms of the "logistics problem" in CBE.

4.1 Logistics Problem in Cross-border Relation

As asserted by many studies in the field of supply chain network design, the logistics problem can be described on the basis of two main groups of factors whose values affect the choice of logistics strategy (Ghezzi, et al. 2012).

(1) Product factors.

Drivers of product complexity are those factors of physical goods which most impact on logistical performance. They were selected on the importance ascribed to them in Chapter 2 literature review, including product range, value density, durability and product-specific needs.

(2) Service factors.

These factors represent the complexity of the logistics problem in terms of service level expectations. They were also selected from literature review in Chapter 2, including order fulfillment time, punctuality, flexibility and returns rates.

Referring the rating approach of Ghezzi et al. (2012, P.6), a five-level scale was used to assess the level of the complexity of each factor (L = Low, L/M = Low/Medium, M = Medium, M/H = Medium/High, H = High). The objective is to assess the complexity of the logistics problem as a combination of the complexity of eight factors. (Table 26)

Table 26 Logistics Problem Evaluation in Five-Level Scale

Group	Factor	Level of complexity				
		L	L/M	M	M/H	H
Product features	Product range [#items]	0<x≤1000	1000<x ≤10000	10000<x ≤20000	20000<x <100000	x>100000
	Value density [€/kg]	x≤10	10<x≤20	20<x≤100	100<x≤200	x>200
	Durability [months]	x>24	12<x≤24	6<x≤12	1<x≤6	x≤1
	Product specific needs [qualitative]	L	L/M	M	M/H	H
Logistics service	Order fulfillment time [days]	x>35	21<x≤35	14<x≤21	7<x≤14	x≤7
	Flexibility [qualitative]	L	L/M	M	M/H	H
	Delivery Reliability [%]	x≤80	80%<x≤85%	85%<x≤90%	90%<x≤95%	x>95%
	Returns rate [%]	x≤5%	5%<x≤10%	10%<x≤20%	20%<x≤40%	x>40%

According to the overall complexity of the two groups' factors, the logistics problems can be classified in four main clusters on the matrix, "Product-Side Complexity", "Service-Side Complexity", "High-Complexity" and "Relatively Easy", where the levels of the complexity of the different drivers were combined. (Figure 27)

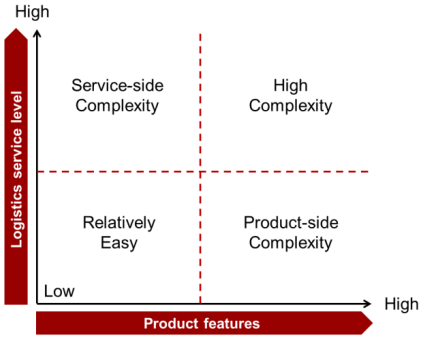

Figure 27 Classification of Logistics' Problems

- "Product-Side Complexity". In this cluster, the product complexity is higher than the service complexity.
- "Service-Side Complexity". In this cluster, the service complexity is higher than the product complexity.

- "High-Complexity". In this cluster, both the product complexity and the service complexity are high.
- "Relatively Easy". In this cluster, both the product complexity and the service complexity are low.

4.2 Logistics Strategy in Cross-border Relation

Consistent with the definition in Chapter 1, an e-logistics system consists of e-procurement and e-fulfillment process and can be expressed as following (Figure 28), wherein, e-procurement only considered logistics actives in purchasing.

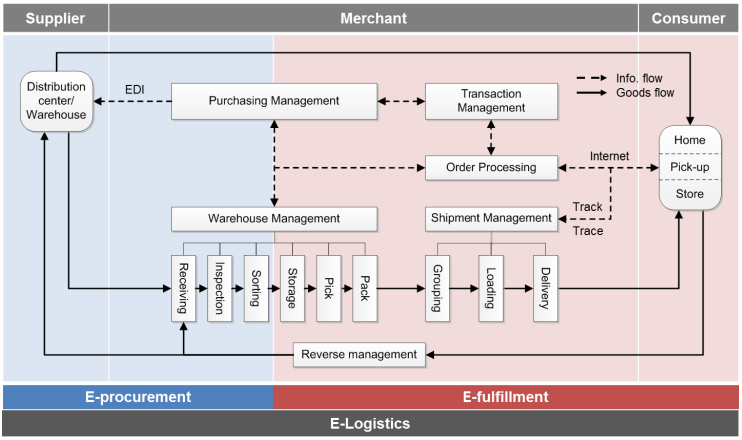

Figure 28 Structure of E-logistics System in Thesis

Referred to Lummus and Vokurka (2002, P.51), six e-logistics strategies in CBE were identified based on who is in charge of which part of logistics' activities. (Figure 29)

	Full in-house			Merchant managed			Supplier managed		
	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP
Purchasing		x			x		x		
Warehousing		x			x		x	x	
Order processing		x			x		x	x	
Shipping		x			x	x			x
Reverse		x	x			x			x

	Drop-shipping			LSP managed			Full outsourced		
	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP
Purchasing	x					x			x
Warehousing	x			x		x			x
Order processing		x			x			x	x
Shipping	x		x			x			x
Reverse			x			x			x

Figure 29 Six E-logistics Strategies in CBE

"Merchant" mentioned in strategy is the enterprise that sells products directly to end consumers. It can be a manufacturer, a retailer, and even a service provider.

(1) "Full in-house" strategy.

This strategy is the most integrated model from the logistics point of view. The overall process is managed internally by the merchants, even the overseas warehouse, international transportation and reverse logistics. The enterprises use this strategy in order to guarantee the reliability of the supply and delivery efficiency, but should have strong operational capacity and financial strength.

(2) "Merchant managed" strategy.

In this strategy, the merchants purchase or produce products and carry out all other activities by themselves except international logistics and reverse, which is outsourced to LSP. Some merchants are also responsible for end delivery within a certain scope under their capacity. This strategy is suitable for the enterprises who do not own international transportation capacity.

(3) "Supplier managed" strategy.

In this strategy, suppliers maintain a majority of inventory, while the merchants carry storage for a limited number of items (usually a few hundred) in order to sell them at a very competitive price or to increase the service level (reduce the response time). Some items are managed according to the consignment stock policy (i.e., products are at the merchant warehouse and are managed through the "payment-upon-sales" formula). Whereas, shipping and reverse are carried out by LSPs.

(4) "Drop-shipping" strategy.

In this strategy, the merchants do not own products and have no inventory (and no warehouse). They collect consumer orders from own websites and then issue large aggregated replenishment orders to suppliers (ordering-upon-sales formula). All the warehousing activities (e.g. storing, picking, preparation and assembly) are fulfilled at the supplier's warehouse when receiving orders from merchant. Most of the marketplaces use this strategy. The difference with respect to the "Supplier-managed" model is that the picking and assembling of orders are carried out by the supplier rather than by the merchant.

(5) “LSP managed” strategy.

In this strategy, the merchants just play as a messenger of information, and only participate in order processing. It will commission the LSPs to purchase products and aggregated replenishment from suppliers. LSPs are involved in all physical logistics activities. If the merchants receive a multi-supplier order (i.e., an order made up of items provided by different suppliers), then the orders are assembled at LSP’s transit point in order to deliver them together. SMEs and marketplaces can use this strategy to significantly reduce fixed costs and operating costs.

(6) “Full outsourced” strategy.

All other activities are carried out by the LSPs, with the exception of order processing which is shared by merchant. This strategy will be used in specific situation, for example, the LSPs launch online market and operate by themselves, or enterprises have their own logistics subsidiary.

Among these strategies, “Merchant managed”, “Supplier managed” and “LSP managed” belong to Hybrid mode. The biggest difference is the ownership of stock, and the model of “Supplier managed” can be taken as a variant of VMI.

In conclusion, the strategies are based on two dimensions: the structure of logistics and the operation of logistics. On the structure dimension, the strategies are classified as centralized or decentralized. In a centralized structure, all e-logistics processes are operated in a central site, usually a distribution or fulfillment center. In a decentralized structure, e-logistics components are located at different sites. On the operation dimension, the strategies are either self-operated when the enterprises have ability to control the whole logistics process, or outsourced to third parties or partners.

4.3 Case Analysis Based on Survey Data

In this section, use the survey results to present how case enterprises adopt logistics strategy to solve logistics problem in CBE. The introduction already elaborated that, China and Germany, as the representative of developing and developed countries, their experience and achievements in CBE hold a leading position in the world. Therefore, the high-level managers in 71 leading CBE merchants who have built their success by implementing efficient and effective logistics strategies were survived, wherein, 43 retailers and 6 manufacturers in China, 21 retailers and 1 manufacture in Germany (Appendix 3). The case enterprises cover the main product industries - i.e.,

fashion, consumer electronics, groceries, beauty and care, and include two major types of e-commerce business: pure player and click-and-mortar. Their complexity levels of each driver in product features and logistics services were reported in Appendix 4.

4.3.1 Logistics Problem Matrix

In order to display more intuitive, the logistics problems of all cases were plotted on the matrix based on complexity of Product features-Logistics service (Figure 30).

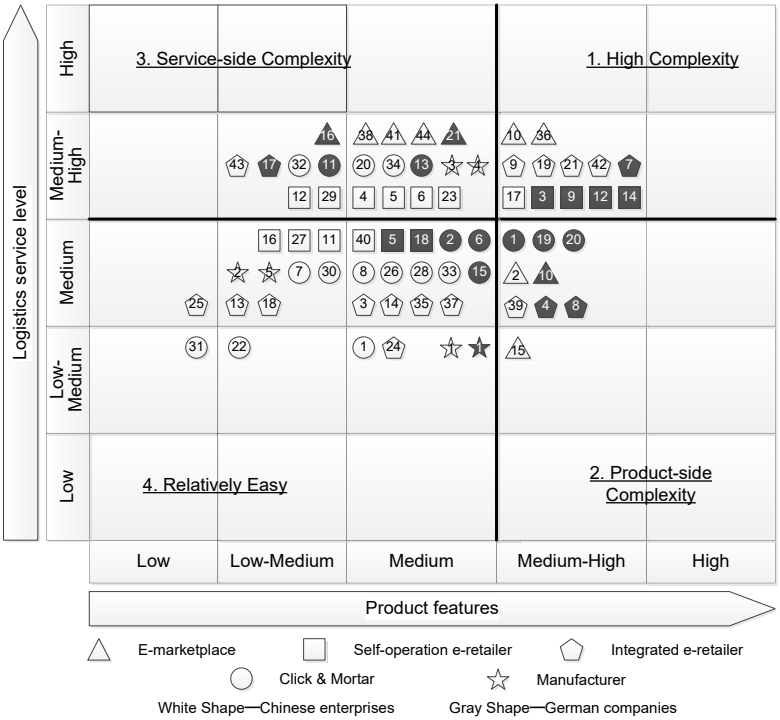

Figure 30 Problem Matrix of Case Enterprises

The similarities and differences among each cluster were elaborated in following.

(1) Cluster 1: “High complexity”

In this cluster, both German and Chinese enterprises are faced with Medium/high product complexity and service complexity.

For German enterprises, this cluster describes the logistics problem for e-commerce vendors in the fashion industry. The product-side complexity is high due to a broad product range (tens of thousands of items) and a high value density (up to a few thousand Euros per kg for the luxury brand of apparel) and short-lived durability (fashion effect). With regard to the logistics service level, European consumers are demanding for short fulfillment time because of the convenient transportation and trade in EU, and the acceptable time is usually within one week. In addition, the high return rate of the fashion industry has also contributed to the service complexity, due to size mismatches or consumers just changing their minds.

For Chinese enterprises, besides fashion, groceries and baby products also have complex characteristics as well. The most obvious aspects are numerous consumer goods categories and perishable foods. The special needs in warehousing and transportation for them are very high, such as temperature and humidity. As for the logistics service level, in addition to the expectations of the short fulfillment time, Chinese consumers have very high demand for delivery reliability due to the inconvenience of exchange and return in cross-border transport.

(2) Cluster 2: “product-side complexity”

In this cluster, the complexity of product is greater than the complexity of the service. There are more German enterprises in this field than in China.

For German enterprises, the Medium/High product complexity is the result of a broad product range, high value goods and a short of durability. For example, the case of consumer electronics industry, who offers more than 50000 different items, the value of which can reach thousands of Euros per kg; some kinds of organic care products face a potentially high risk of obsolescence. With regard to the customer service level, although consumers still have a high demand for short fulfillment time and high flexibility, the return rate of such products (< 5%) is far lower than fashion (> 40%), thus the service complexity is decreased.

For Chinese enterprises, most of the products in this cluster are luxury and jewelry which belong to fashion industry. Not as for groceries, Chinese consumers are ready to accept comparatively long delivery time if they find exactly and valuable products they are looking for. Some products are even in anti-season promotions, which no hurry to use.

(3) Cluster 3: “service-side complexity”

In this cluster, the distribution of enterprises is relatively concentrated. The number of enterprises has increased. The product complexity is below medium level.

For German enterprises, the complexity of the logistics problems is still due to fashion industry, challenging service requirements in terms of short fulfillment time, high flexibility and return. The product complexity is usually medium or low since some items (e.g., accessories and luggage) might have not wide range, or not high requirement for storage and transportation, while the lifetime can be long.

For Chinese enterprises, the complexity of the product features is not high, baby products and personal care products account a large proportion of sales in this cluster, which have relatively long using time and easy storage environment. Some of them are highly targeted products in a small scope, such as baby nutrition and cosmeceuticals. In contrast, the requirement for cross-border transportation is still the main reason of the high complexity of the service. For example, many Chinese consumers have high willingness to buy milk powder and baby nappies from overseas. Fast and reliable delivery is their expectation.

(4) Cluster 4: “Relatively easy”

Because this cluster has a variety of combinations where gathered a large number of enterprises, the induction is in accordance with product features rather than the country. It contains most of the commodities mentioned before, but the logistics problems are less critical than in other cluster due to a comparatively narrower product range (e.g. fashion industry, consumer electronic industry), a comparatively longer durability (e.g. groceries) and average service level requirements (e.g. beauty and care industry). So the complexity is Medium in both the product and service aspects. For the household and housewares industry, the service requirements are not demanding (a return rate is lower than 10% and no specific requirements for other performance). For OTC drugs and dietary supplements industry, the product feature complexity has been rated as Low/Medium because the complexity is related to only a few drivers (e.g., the high value density). This is a comparative judgment and does not mean that these problems are trivial in an absolute sense.

In conclusion, through the statistics and analysis of case studies, the logistics problem in cross-border e-commerce can be generalized and discriminated from the following three perspectives:

(1) Condition of Nation

From the Table 27 can be obtained, German enterprises have higher product and service complexity. On the one hand, German merchants could manage broader products and perishable items because of predominant geological environment in the EU. On the other hand, with the well-developed logistics technology, German merchants could provide faster transport, more flexible delivery and more convenient return to consumer. In contrast, China's CBE often needs to take long distances, especially for imports from Europe and North America. Therefore, Chinese consumers can accept longer delivery period, generally within 2-weeks (iResearch, 2016). Meanwhile, Chinese customers are demanding on high delivery reliability due to the uncertainty and time-consuming in long-distance transport. For the same reason, very few Chinese merchants' sale perishable products and accept the return of CBE products.

Table 27 Proportion of "M/H" and "H" Logistics Problems in Case Enterprises

Cases	Product complexity				Service complexity			
	Product range	Value density	Durability	Specific needs	Fulfillm-ent time	Flexibility	Delivery reliability	Return rates
Germany	45%	32%	55%	18%	95%	68%	14%	32%
China	27%	31%	16%	35%	82%	43%	73%	2%

(2) Nature of Company

From the Table 28 can be obtained, for e-marketplace, either the product features or the logistics service is not easy, because a wide range of merchants settled in the platform, it is difficult to control the quality of product and service. On the contrary, click-and-mortar has sufficient supply, can leverage synergies with the offline channel (since it is a traditional player), so the logistics problem is not complex except the outsourced delivery needed to pay attention. For self-operation enterprises, which are in charge of inventory and delivery by themselves, can achieve a high demand of logistics services and respond quickly to customer needs. But on the other hand, the risk of managing the inventory internally could be high. Finally, for integrated enterprises, because they have both characteristics of marketplace and self-operation, the complexity of logistics problems is varied and depends on the product sales and the company size.

Table 28 Number of Case Enterprises in Different Logistics Problem

Cases	High complexity	Product-side complexity	Service-side complexity	Relatively easy
E-marketplace	2	3	5	0
Self-operation e-retailer	5	0	6	6
Integrated e-retailer	5	3	2	8
Click-and-Mortar	0	3	5	12
Manufacturer	0	0	2	4

(3) Property of Commodity

From the Table 29 can be obtained, because of short-lived durability (seasonality) and high return rate (more than 40%), fashion industry contributed to both product-and service complexity. Meanwhile, groceries were in a “high complexity” due to the risk of obsolescence, so that they require for special needs in logistics (such as temperature and humidity) and short fulfillment time. As the same, fast and reliable delivery is customers’ expectation for baby products in CBE, but their characteristics were comparatively simple, thus the “service-side complexity” is more serious. On the contrary, customers can accept longer delivery time for consumer electronics while their return rate is much lower, so that most of them concentrated in “product-side complexity” because of broad product range (tens of thousands) and high value density (up to a few thousand Euros per kg). By contrast, in “Relatively easy”, the logistics problems are less critical due to narrower product range, longer durability and lower service requirements, such as beauty and personal care, housewares and home furnishings.

Table 29 Number of Commodity in Different Logistics Problem

Cases	High complexity	Product-side complexity	Service-side complexity	Relatively easy
Fashion	5	4	5	3
Groceries	4	2	2	2
Baby products	2	1	7	1
Consumer electronics	1	5	1	3
Beauty and personal care	1	2	4	7
Housewares and home furnishings	1	1	2	5

4.3.2 Logistics Strategy Matrix

In order to better represent the relationships between logistics problems and the logistics strategies, a matrix was used to group the 71 case studies according to the type of problem and strategy (Figure 31).

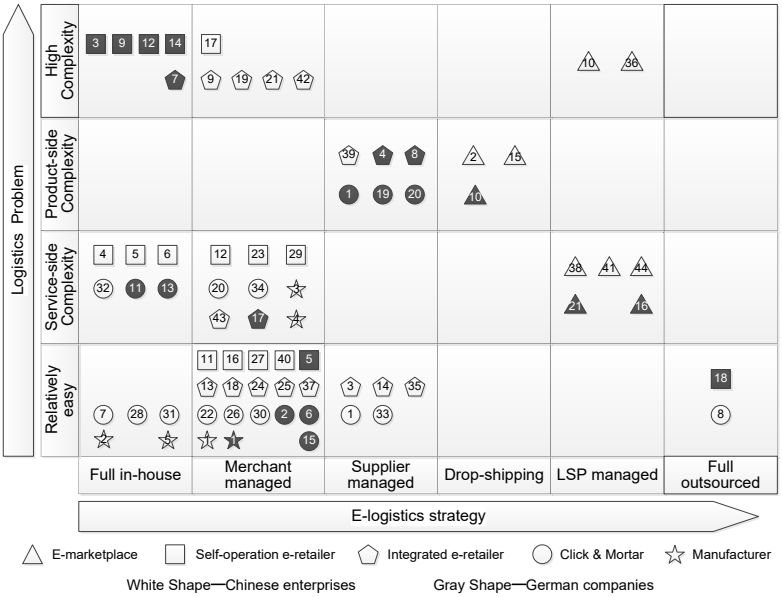

Figure 31 Logistics Problem – Logistics Strategy Matrix of Case Enterprises

Some general observations can be made upon an examination of the figure.

(1) For "High complexity" problem

The logistics strategy is straightforward for logistics problem with significant complexity in both product and service. In view of the high complexity problem, the "Self-operation" enterprise and "Integrated" enterprise will operate procurement and delivery by themselves in order to ensure product quality and efficient fulfillment. Chinese enterprises adopted "Merchant managed" to control all logistics activities except reverse, meanwhile outscored international transportation to LSP. In contrast, Germany enterprises are also responsible for reverse reflecting the attention on the sustainability and developed transportation technology in Europe, that's "Full in-house" strategy. Because of without products owning, when facing complex

logistics problems (e.g. perishable product storage and cold chain transport), the e-marketplace will commission a professional LSP to operate warehousing and shipping (even pre-purchase and replenishment), so that increase the service level.

(2) For "Product-side complexity"

The adoption of the strategy for "product-side complex" is obviously. Two strategies have been used, which are the "Supplier managed" and the "Drop-shipping". In these strategies, the supplier carries out main warehouse activities and outsources delivery to LSP. As platform without product owning, the e-marketplace should focus on all those critical success factors that provide the customer with an excellent online shopping experience (i.e., the design of the website, online marketing, the design of the ordering process, etc.). The integrated enterprise and click-and-mortar may carry storage for a limited number of items in order to sell them at a very competitive price and ensure a quick response to customer needs.

(3) For "Service-side complexity"

For logistics problems with significant complexity in service, the choice of the logistics strategy is not as straightforward as the two previous types. But the "LSP managed" strategy seems to be still the best fit for e-marketplace, just as the analysis in "High complexity". Most Chinese enterprises still adopt "Merchant managed". Others with strong financial and operational capacity might also want to manage the international logistics and reverse process internally, so they use "Full in-house" model for a selection of customers who are willing to pay for the additional service, for example, consumers can purchase online and return offline in click-and-mortar.

(4) For "Relatively easy"

In the other cases, there is no single best logistics strategy for "Relatively easy" problem. The merchant has many degrees of freedom in designing the best solution (reasonable service at the lowest possible cost). The product features and services level will play a key role in determining the logistics strategy. On the one hand, when service side is more complex, most critical activities should be managed by the merchant. "Full in-house" and "Merchant managed" strategies (the most used) have been adopted. If merchant's bargaining power is strong, suppliers even own the inventory at the merchant's warehouse in order to reduce the risk for the seller. On the other hand, the risk of managing the inventory internally could be high because product side is more complex. Then the merchant should focus on all those critical

success factors that provide an excellent online shopping experience to consumer. Thus, it is appropriate to outsource logistics activities and inventory ownership to the supplier in order to mitigate all inventory-related risks ("Supplier managed"). There are two special cases using "Full-outsourced", LSP launched their online market, and enterprises have own logistics subsidiary, therefore, all of the logistics actives will be operated (or "outsourced") by themselves.

4.4 Decision Model for Strategy Selection Process

Based on the experience of the most successful CBE enterprises in China and Germany, a decision model was developed to support the merchants who want to join in CBE but don't know how to choose an appropriate logistics strategy (Figure 32).

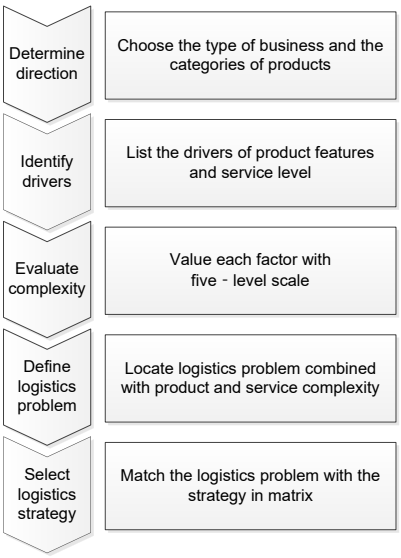

Figure 32 Decision Model for Strategy Selection Process

The model consists of 5 steps:

(1) Determine direction

The enterprise should understand what type you belong to (i.e., e-marketplace, self-operation, integrated, click-and-mortar), and what kind of product you intend to sell (e.g., fashion, consumer electronic, groceries, etc.), because these will determine the following problem positioning and strategy selecting.

(2) Identify drivers

Collect the data in terms of the product features (i.e., range, value density, durability, special needs) and the logistics service (i.e., fulfillment time, flexibility, reliability, return) according to the list of drivers proposed before. These factors will directly affect what kind of logistics problems you are facing, so the data need to be as realistic and objective as possible.

(3) Evaluate complexity:

Value the complexity of each factor according to the five-level scale (L = Low, L/M = Medium/Low, M = Medium, M/H = Medium/High, H = High). As some of the assignments are subjective evaluations, this step should involve the experts from different departments (e.g., operations department, logistics department, product department, etc.) to avoid deviations.

(4) Define logistics problem:

Assess the combined complexity values of product features and logistics service, then plotted them on the problem-matrix. According to their position on the matrix, find your logistics problem belongs to which cluster (i.e., “High-Complexity”, “Product-side Complexity”, “Service-side Complexity” and “Relatively Easy”).

(5) Select logistics strategy:

In final stage, integrate the nature of business and the type of the logistics problem, then match the reasonable logistics strategies in accordance with the relations identified in problem-strategy matrix. For instance, if the problem is “Service-side Complexity” and it is e-marketplace, a suitable logistics strategy is the “LSP managed”. If the logistics problem is “Relatively Easy”, thus the operation capability of the enterprise has to be taken into account in order to make the best choice between the “Full in-house”, “Merchant managed” and “Supplier managed”.

The function of the first 4 is to accurately address logistics problems, whereas the aim of the fifth is to support the identification of the best logistics strategy. Moreover, the following table can be used as a quick reference standard (Table 30). The gray cell is on behalf of this situation does not appear in the analysis, but can-do inference according to the similar circumstances.

Table 30 Benchmark for CBEL Strategy Selection

Case	High complexity		Product-side complexity	Service-side complexity	Relatively easy	
	Product-side higher	Service-side higher			Product-side higher	Service-side higher
Marketplace	Drop-shipping	LSP-managed	Drop-shipping	LSP-managed	Drop-shipping	LSP-managed
Self-operation	Merchant managed/ Full in-house	Merchant managed/ Full in-house	Merchant managed/ Full in-house	Merchant managed/ Full in-house	Merchant managed/ Full in-house	Merchant managed/ Full in-house
Integrated	Supplier managed	Merchant managed	Supplier managed	Merchant managed	Supplier managed	Merchant managed
Click&Mortar	Supplier managed	Merchant managed/ Full in-house	Supplier managed	Merchant managed/ Full in-house	Supplier managed	Merchant managed/ Full in-house

The model proposed a guideline to decide when to in-source or outsource the logistics processes, and which part should be outsourced. When the merchants face "Service-side complexity", they should manage the whole logistics process internally, while outsource them seems an effective and efficient solutions for "Product-side complexity". Moreover, the merchant should be aware that despite being a very appealing solution (no inventory and no operations), the "LSP managed" model might be critical when the customer service level is crucial. The "Full in-house" model increases control in terms of service level, but it might be costly.

5. Competitive Strategy Based on Product and Service Differentiation

When formulate the logistics strategy, in addition to the logistics problems encountered by self, merchants should also take into account the increasingly fierce competition between each other. Although the commodity is a factor influencing the selection of logistics strategy, consumers are also increasingly demanding good logistics services due to long-distance transportation in CBE. Therefore, only those merchants that stand out in the dual competition of "Product" and "Operation", can attract more consumers. In this chapter, a game model was used to analyze how product and logistics service differentiation impact the formulation of competitive strategy, the optimal pricing and service level in centralized and decentralized decision were obtained after model solved.

5.1 Study Premises and Theoretical Basis

5.1.1 Differentiation Strategy

Differentiation has been widely concerned in the early studies, especially the product differentiation. Hotelling (1929) and Chamberlin (1965) revealed how the companies choose their own position in the product space to buffer the impact from the price competition. Porter (1980) made the concept of product differentiation more and more widely accepted by scholars, he thought the cost advantage and the differential operation are two forms of competitive advantage, and proposed a general competitive strategy, including cost leadership, differentiation and focus. In fact, the three components are not absolutely isolated, such as the "cost leadership" can also achieve the differentiation of product performance, price, brand and other aspects in the enterprise competition; and the "differentiation" can also control and reduce the cost through providing different levels of products or services; and the "focus" is specific implementation of above two strategies. Therefore, the "cost leadership" and the "focus" can be regarded as an extension of the "differentiation" strategy.

The utility of the product is reflected in meeting the specific needs of the consumer. The consumer demand is not only the product itself, but also includes the services provided by the merchant. Therefore, in a broad sense, the goods in the market are a binary combined of product and service. Merchants should also pay attention to the

quality of service. The impeccable services not only provide an additional value for customers, but also bring a good reputation for merchants thereby enhancing the market competitiveness. And the service differentiation competition can influence the consumer preferences thereby impacting the market demand, especially when merchants sell homogeneous products, a slight improvement in services sometimes lead to customer's higher willingness-to-pay. Existing studies indicated that consumers are willing to pay for the promotions of services, such as higher price for faster delivery. Hence, combined with product, service will inevitably become an important way to obtain the advantage in differentiation competition. Moreover, the service differentiation can be formed through the implementation of CBEL, which is also treated as strategic thinking and become an important component of competitive strategy. Therefore, the CBE merchants are facing the dual-competition consists of product and service quality. But not as a clearer definition of product value, the service value is often a complex concept, since in which consumer can obtain multi-attribute, including core and certain ancillary services.

Because CBE usually needs to take long-distance transport, consumers often expect the products can be delivered to the destination at the right time with the lowest cost. Therefore, the role of logistics services in the competition is gradually valued by CBE merchants. In order to focus on the impact of CBEL on the formulation of competitive strategy, in the following analysis, the services provided by CBE merchants only consider the logistics service.

5.1.2 Consumer Utility

The difference in the product and the service is essentially the difference of consumer feeling, when consumers perceive the price or service different from other competing products, the differentiation is achieved. Thus, the differentiation is a function of consumer preferences. The study on differentiation strategy can be carried out from the consumer utility.

Some consumers have a higher sensitivity on price, the changes of product price have a greater impact on their effectiveness; rather, other consumers are more sensitive on service, changes in service level have a greater impact on their utility. Hence, the consumers in CBE market can be classified as: price-sensitive and service-sensitive, the differences are reflected in the perception of product price and service level. The same product or service brings different utility to different consumers, so the utility

function should have a parameter represent the consumer type. Meanwhile, the different products or services also bring different effects to the same consumer, so the utility function should also have a parameter that reflects a degree of differentiation of products and services. In the following sections, the completive strategy was divided into product differentiation model and service differentiation model.

Based on the principle of maximizing utility, consumers make purchase decision according to the sum of the positive effects of the product and the service. Consumers are willing to buy the product if and only if the total utility of purchase behavior is greater than the negative effect of the payment. Therefore, the market demand is affected by both competitor's product pricing and service strategy. In order to maximize profits, merchants should optimize the price-service decision in this dual-competition environment. However, the provision of high-quality products or high-level services requires merchants to invest more costs. In the market price competition, the excessive pursuit of increasing products quality and services level will bring the profit falling risk to merchants. So in the real business activities, the merchants should balance the value-added creation and the increasing cost, and trade-off the use of product differentiation and service differentiation in competitive strategy formulation.

5.2 Competitive Strategy under Product Differentiation

5.2.1 Hypothesis and Parameter

Consider a dual-channel cross-border supply chain consists of one overseas supplier and two CBE merchants, one implemented CBEL (Hereinafter referred to as merchant 1), another used traditional logistics (Hereinafter referred to as merchant 2). In order to focus on the price and service competition and simplify the model calculation, the following assumptions are put forward:

- Two merchants order a certain degree of difference products from the supplier, that is, the products sold by two merchants have a certain degree of substitutability.
- Consumers are rational, they will buy products from the merchant where they feel can get more utility.
- Without loss of generality, both merchants face the unit market demand and only consider the logistics service cost, other costs are assumed to be zero.

The parameters in the model are presented as follows (Table 31):

Table 31 Parameters in Product Differentiation Model

Notation	Representation
p_i	The product price of merchant. p_1 is the price of merchant 1, p_2 is the price of merchant 2.
v	The basic product valuation of consumer, and $v \in [0,1]$.
s_i	The logistics service level provided by merchant. s_1 is the service level of merchant 1, s_2 is the service level of merchant 2.
$C(s_i)$	The costs function of logistics service. Refer the definition of cost function in economic principles, $C(s_i) = (\eta/2)s_i^2$, η is the service cost coefficient. C_1 is the service cost of merchant 1, C_2 is the service cost of merchant 2.
θ	The degree of product differentiation between merchants, and $\theta \in [0,1]$. When $\theta = 0$, represents the products completely different, there is no alternative; when $\theta = 1$, represents the products completely homogeneous.
α	The sensitivity of the consumer on the product price, and $\alpha \in [0,1]$.
β	The sensitivity of the consumer on the service level, and $\beta \in [0,1]$.
D_i	The market demand function. D_1 is the market demand of merchant 1, D_2 is the market demand of merchant 2.
π_i	The profit function. π_1 is the profit of merchant 1, π_2 is the profit of merchant 2.
U_i	The consumer utility from product purchasing. U_1 is the utility of purchasing from merchant 1, U_2 is the utility of purchasing from merchant 2.

This kind of cross-border supply chain can be constructed as follow (Figure 33):

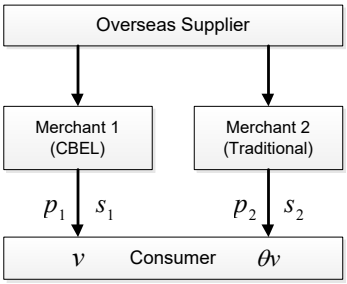

Figure 33 Supply Chain Structure in Product Differentiation Model

Referring to the model of Chen and Yang (2014, P.287), the utility of consumer purchasing from the merchant 1 is:

$$U_1 = v - \alpha p_1 + \beta s_1 \tag{5.1}$$

The utility of consumer purchasing from the merchant 2 is:

$$U_2 = \theta v - \alpha p_2 + \beta s_2 \tag{5.2}$$

Consumers are rational. They decide to purchase if the utility is greater than zero. When facing two different channels, they will choose the channel where can obtain more utility, that is, the consumer behavior follows $\max(U_1, U_2, 0)$. Defined the product valuation as v_1, v_2, v_3 under three critical conditions $U_1=0$, $U_2=0$, $U_1=U_2$:

$$\begin{aligned} v_1 &= \alpha p_1 - \beta s_1 \\ v_2 &= \frac{\alpha p_2 - \beta s_2}{\theta} \\ v_3 &= \frac{\alpha(p_1 - p_2) - \beta(s_1 - s_2)}{1-\theta} \end{aligned} \tag{5.3}$$

Defined the differences between the critical values as:

$$\begin{aligned} \Delta v_1 &= v_1 - v_2 = \frac{\alpha(\theta p_1 - p_2) - \beta(\theta s_1 - s_2)}{\theta} \\ \Delta v_2 &= v_3 - v_1 = \frac{\alpha(\theta p_1 - p_2) - \beta(\theta s_1 - s_2)}{1-\theta} \end{aligned} \tag{5.4}$$

When $v_1 \geq v_2$, so $\Delta v_1 \geq 0$, get $\alpha(\theta p_1 - p_2) - \beta(\theta s_1 - s_2) \geq 0$, so $\Delta v_2 \geq 0$, obtain $v_3 \geq v_1 \geq v_2$; when $v_1 \leq v_2$, so $\Delta v_1 \leq 0$, get $\alpha(\theta p_1 - p_2) - \beta(\theta s_1 - s_2) \leq 0$, so $\Delta v_2 \leq 0$, obtain $v_3 \leq v_1 \leq v_2$.

There are four situations:

(1) When $U_1 < 0$ or $U_2 < 0$, means $v < v_1$ or $v < v_2$, the consumers don't make purchase either in merchant 1 or in merchant 2, because the utility is below zero;

(2) When $U_1 > U_2$ and $U_1 \geq 0$, means $v > v_3$ and $v \geq v_1$, the consumers tend to purchase from merchant 1, because can obtain higher utility, while no one purchase from merchant 2;

(3) When $U_1 < U_2$ and $U_2 \geq 0$, means $v < v_3$ and $v \geq v_2$, the consumers tend to purchase from merchant 2, because can obtain higher utility, while no one purchase from merchant 1;

(4) When $U_1 = U_2 \geq 0$, means $v=v_3$ and $v \geq \max\{v_1, v_2\}$, purchasing from merchant 1 or merchant 2 makes no difference, because the utilities are same.

Therefore, under different product valuation, the demand of merchants in various price ranges can be expressed as follow three scenarios (Figure 34):

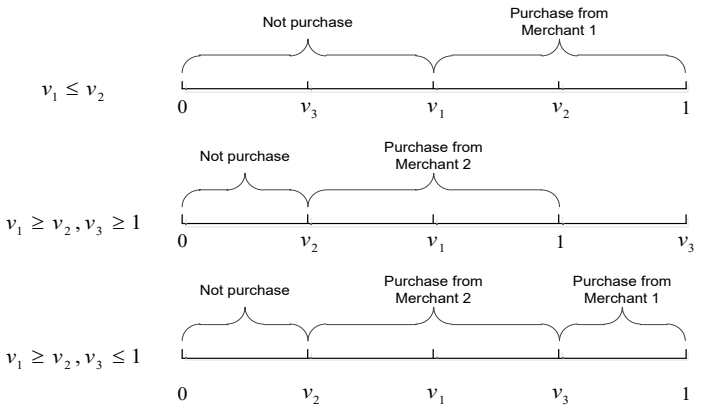

Figure 34 Demand within Various Price Range under Different Product Valuation

(1) If $v_1 \le v_2$, so $v_3 \le v_1$, no one purchase from merchant 2, the demand is $D_2 = 0$. When $v \in [v_1, 1]$, consumers purchase from merchant 1, the demand is $D_1 = 1 - v_1$; when $v \in [0, v_1]$, no purchase behavior. Therefore, the price range meets the following conditions:

$$p_1 \le \frac{\alpha p_2 + \beta(\theta s_1 - s_2)}{\alpha\theta} \tag{5.5}$$

(2) If $v_1 \ge v_2$ and $v_3 \ge 1$, no one purchase from merchant 1, the demand is $D_1 = 0$. When $v \in [v_2, 1]$, consumers purchase from merchant 2, the demand is $D_2 = 1 - v_2$; when $v \in [0, v_2]$, no purchase behavior. Therefore, the price range meets the following conditions:

$$p_1 \ge p_2 + \frac{1 - \theta + \beta(s_1 - s_2)}{\alpha} \tag{5.6}$$

(3) If $v_1 \ge v_2$ and $v_3 \le 1$. When $v \in [v_3, 1]$, consumers purchase from merchant 1, the demand is $D_1 = 1 - v_3$; when $v \in [v_2, v_3]$, consumers purchase from merchant 2, the demand is $D_2 = v_3 - v_2$. Therefore, the price range meets the following conditions:

$$\frac{\alpha p_2 + \beta(\theta s_1 - s_2)}{\alpha\theta} \le p_1 \le p_2 + \frac{1 - \theta + \beta(s_1 - s_2)}{\alpha} \tag{5.7}$$

The aim of this study is to formulate the competitive strategies under the differentiation of products and services. Therefore, the first two scenarios will not be included in the following discussion because they are single channel problem. To sum up, in the third scenario, the demand function of merchant 1 and merchant 2 are:

$$\begin{aligned} D_1 &= 1-\frac{\alpha(p_1-p_2)-\beta(s_1-s_2)}{1-\theta} \\ D_2 &= \frac{\alpha(\theta p_1-p_2)-\beta(\theta s_1-s_2)}{\theta(1-\theta)} \end{aligned} \tag{5.8}$$

In order to explore the competitive strategy under product differentiation, assumed that merchants provide the same level of service, that is, the logistics services including fulfillment time, reliability, flexibility, after-sales service provided by merchant 2 have no difference with merchant 1, so $s_1 = s_2 = s$. The utility of consumer purchasing from merchants respectively are:

$$U_{1s} = v-\alpha p_1+\beta s \ , \ U_{2s} = \theta v-\alpha p_2+\beta s \tag{5.9}$$

The demand functions of merchants respectively are:

$$D_{1s} = 1-\frac{\alpha(p_1-p_2)}{1-\theta} \ , \ D_{2s} = \frac{\alpha(\theta p_1-p_2)+\beta s(1-\theta)}{\theta(1-\theta)} \tag{5.10}$$

The profits of merchants respectively are:

$$\begin{aligned} \pi_{1s} &= p_1 D_{1s}-C_1 = p_1-\frac{\alpha p_1(p_1-p_2)}{1-\theta}-\frac{1}{2}\eta s^2 \\ \pi_{2s} &= p_2 D_{2s}-C_2 = \frac{\alpha p_1(\theta p_1-p_2)+\beta p_1 s(1-\theta)}{\theta(1-\theta)}-\frac{1}{2}\eta s^2 \end{aligned} \tag{5.11}$$

The total profit of CBE merchants is:

$$\pi_s = \pi_{1s}+\pi_{2s} = \frac{p_1(1-\theta-\alpha p_1+\alpha p_2)}{1-\theta}+\frac{\alpha p_1(\theta p_1-p_2)+\beta p_1 s(1-\theta)}{\theta(1-\theta)}-\eta s^2 \tag{5.12}$$

5.2.2 Optimal Strategy in Centralized Decision

In centralized decision (Hereinafter referred to as CD), CBE merchants aim to maximize the total profit of cross-border supply chain π_s, they cooperated with each other closely and develop sales strategies together.

The first derivative of the π_s versus p_1, p_2 are:

$$\frac{\partial \pi_s}{\partial p_1} = 1 - \frac{2\alpha(p_1 - p_2)}{1-\theta} \quad , \quad \frac{\partial \pi_s}{\partial p_2} = \frac{2\alpha(\theta p_1 - p_2)}{\theta(1-\theta)} + \frac{\beta s}{\theta} \tag{5.13}$$

Then the Hessian Matrix of this optimal problem under second-order conditions is:

$$H = \begin{pmatrix} \frac{-2\alpha}{1-\theta} & \frac{2\alpha}{1-\theta} \\ \frac{2\alpha}{1-\theta} & \frac{-2\alpha}{\theta(1-\theta)} \end{pmatrix} \tag{5.14}$$

The order principal minor determinant can be solved as:

$$|H_1| = \frac{-2\alpha}{1-\theta} \quad , \quad |H_2| = \frac{4\alpha^2}{\theta(1-\theta)} \tag{5.15}$$

Because $\theta \in [0,1]$, so $|H_1| < 0$, $|H_2| > 0$, the Hessian Matrix is negative-definite. Thus, exist an optimal pricing strategy (p_1^*, p_2^*), can make the total profit of CBE merchants to the maximum. Their value can be obtained by simultaneous solution of $\partial \pi_s / \partial p_1 = 0$, $\partial \pi_s / \partial p_2 = 0$.

Therefore, the optimal pricing strategies of merchants respectively are:

$$p_1^* = \frac{1+\beta s}{2\alpha} \quad , \quad p_2^* = \frac{\theta + \beta s}{2\alpha} \tag{5.16}$$

Put p_1^*, p_2^* into π_{1s}, π_{2s}, π_s, can obtain the profit of merchant 1, merchant 2 and the total in CD with homogeneous services:

$$\begin{aligned} \pi_{1s}^c &= \frac{1+\beta \mathrm{s} - 2\alpha\eta s^2}{4\alpha} \\ \pi_{2s}^c &= \frac{\theta\beta s + (\beta^2 - 2\alpha\eta\theta)s^2}{4\alpha\theta} \\ \pi_s^c &= \frac{\theta(1+2\beta \mathrm{s}) + (\beta^2 - 4\alpha\eta\theta)s^2}{4\alpha\theta} \end{aligned} \tag{5.17}$$

Solving the first order equation $\partial \pi_s^c / \partial s = 0$, can obtain the service strategy in CD with homogeneous services:

$$s^c = \frac{\beta\theta}{4\alpha\eta\theta - \beta^2} \tag{5.18}$$

5.2.3 Optimal Strategy in Decentralized Decision

In decentralized decision (Hereinafter referred to as DD), the merchants develop strategies respectively aim to maximize own profit. It is a dynamic game in oligopoly market, or called Stackelberg game. As the assumption in Chapter 3, the merchant 1 implemented CBEL is leader, the merchant 2 used traditional logistics is follower. The parties engage the game in following order: firstly, the merchant 1 makes strategy to maximize own profit, and then the merchant 2 makes profit level according to the pricing of merchant 1. However, the merchant 1 knows the behavior of merchant 2, so the merchant 1 will make final strategy according to the merchant 2's reaction function based on own pricing. The inverse-deducing method was used to calculate the optimal solution of the model.

Solving the first order equation $\partial \pi_{2s} / \partial p_2 = 0$, can obtain the pricing that maximize the profit of merchant 2:

$$p_2 = \frac{\alpha\theta p_1 + \beta s(1-\theta)}{2\alpha} \tag{5.19}$$

Then, put p_2 into the profit function of merchant 1, can obtain:

$$\pi_{1s} = \frac{\alpha p_1^2(\theta-2) + p_1(2+\beta s)(1-\theta)}{2(1-\theta)} - \frac{1}{2}\eta s^2 \tag{5.20}$$

Solving the first order equation $\partial \pi_{1s} / \partial p_1 = 0$, can obtain the optimal pricing p_1^* that maximize the profit of merchant 1:

$$p_1^* = \frac{(2+\beta s)(1-\theta)}{2\alpha(2-\theta)} \tag{5.21}$$

Then, put p_1^* into p_2, can obtain the optimal pricing p_2^* of merchant 2:

$$p_2^* = \frac{[\beta s(4-\theta) + 2\theta](1-\theta)}{4\alpha(2-\theta)} \tag{5.22}$$

Finally, put p_1^*, p_2^* into π_{1s}, π_{2s}, π_s, can obtain the profit of merchant 1, merchant 2 and the total in DD with homogeneous services:

$$\pi_{1s}^{d}=\frac{8\theta(1+s\beta)A_1+s^2(2\beta\theta A_1-\alpha\eta A_5)]}{2\alpha A_5}$$
$$\pi_{2s}^{d}=\frac{4\theta^2(1-\theta)+4s\beta\theta A_2+s^2[\beta^2(4-\theta)A_2-\alpha\eta A_5]}{2\alpha A_5} \quad (5.23)$$
$$\pi_{s}^{d}=\frac{4\theta A_2+4s\beta\theta A_3+s^2(\beta^2 A_4-2\eta\alpha A_5)}{2\alpha A_5}$$

In the formula 5.23,

$$\begin{aligned} A_1&=(1-\theta)(2-\theta)\\ A_2&=(1-\theta)(4-\theta)\\ A_3&=(1-\theta)(8-3\theta)\\ A_4&=(1-\theta)(16-4\theta-\theta^2)\\ A_5&=8\theta(2-\theta)^2 \end{aligned} \quad (5.24)$$

Because $\theta\in[0,1]$, so $A_1 \sim A_5$ are all greater than 0.

Solving the first order equation $\partial\pi_s^d/\partial s=0$, can obtain the optimal service in DD with homogeneous services:

$$s^d=\frac{2\beta\theta A_3}{2\alpha\eta A_5-\beta^2 A_4} \quad (5.24)$$

5.2.4 Comparative Analysis

5.2.4.1 The impacts on the service level

When the merchants provide homogeneous services, the deference of service level between CD and DD can be expressed as:

$$\Delta s=s^c-s^d=\frac{\beta\theta^2[8\alpha\eta\theta(3-\theta)-\beta^2 A_1]}{(4\alpha\eta\theta-\beta^2)(2\alpha\eta A_5-\beta^2 A_4)} \quad (5.25)$$

Because $\theta\in[0,1]$, $s^c>0$, $s^d>0$, so $4\alpha\eta\theta-\beta^2>0$, $2\alpha\eta A_5-\beta^2 A_4>0$. When $8\alpha\eta\theta(3-\theta)-\beta^2 A_1>0$, thus $s^c>s^d$, means that the service level in CD is higher than in DD; when $8\alpha\eta\theta(3-\theta)-\beta^2 A_1<0$, thus $s^c<s^d$, means that the logistics service in DD has higher level. Therefore, when merchants provide the same logistics service in CBE, the service level will be affected by consumer behavior (α, β), operation cost (η) and product attribute (θ). This further proves that the CBE merchants should consider these factors synthetically when generate service strategy.

In CD, the first derivatives of the s^c versus $\alpha, \beta, \eta, \theta$ are:

$$\begin{aligned} \frac{\partial s^c}{\partial \alpha} &= \frac{-4\beta\eta\theta^2}{(4\alpha\eta\theta-\beta^2)^2}, \quad \frac{\partial s^c}{\partial \beta} = \frac{\theta(4\alpha\eta\theta+\beta^2)}{(4\alpha\eta\theta-\beta^2)^2}, \\ \frac{\partial s^c}{\partial \eta} &= \frac{-4\beta\eta\theta^2}{(4\alpha\eta\theta-\beta^2)^2}, \quad \frac{\partial s^c}{\partial \theta} = \frac{-\beta^3}{(4\alpha\eta\theta-\beta^2)^2} \end{aligned} \tag{5.26}$$

In DD, the first derivatives of the s^d versus $\alpha, \beta, \eta, \theta$ are:

$$\begin{aligned} \frac{\partial s^d}{\partial \alpha} &= \frac{-4\beta\eta\theta A_3 A_5}{(2\alpha\eta A_5-\beta^2 A_4)^2}, \quad \frac{\partial s^d}{\partial \beta} = \frac{2\theta A_3(\beta^2 A_4+2\alpha\eta A_5)}{(2\alpha\eta A_5-\beta^2 A_4)^2}, \\ \frac{\partial s^d}{\partial \eta} &= \frac{-4\alpha\beta\theta A_3 A_5}{(2\alpha\eta A_5-\beta^2 A_4)^2}, \quad \frac{\partial s^d}{\partial \theta} = \frac{-8\beta(4\alpha\eta\theta^2 A_6+\beta^2 A_7)}{(2\alpha\eta A_5-\beta^2 A_4)^2} \end{aligned} \tag{5.27}$$

In the formula 5.27,

$$\begin{aligned} A_6 &= (2-\theta)(6-\theta) \\ A_7 &= (1-\theta)^2(32-24\theta+5\theta^2) \end{aligned} \tag{5.28}$$

Because $\theta \in [0,1]$, so $A_6 > 0$, $A_7 > 0$.

The following conclusions can be drawn:

(1) $\partial s^c / \partial \alpha < 0$, $\partial s^d / \partial \alpha < 0$

Whether in CD or DD, the service level s will decrease with the increase of consumer's price-sensitivity α. This is because when consumers are more sensitive to the product price, they will be attracted by lower prices. Thus, no matter implemented CBEL or traditional logistics, the merchant tends to take low price competition strategy thereby ignored service. The reduction of investment in logistics service eventually leads to a decline in service level.

(2) $\partial s^c / \partial \beta > 0$, $\partial s^d / \partial \beta > 0$

Whether in CD or DD, the service level s will increase with the increase of consumer's service-sensitivity β. This is because when consumers are more sensitive to the service level, they will pay attention to the utility from service. Thus, no matter implemented CBEL or traditional logistics, the merchant tends to improve the service level in order to attract more consumers.

(3) $\partial s^c / \partial \eta < 0$, $\partial s^d / \partial \eta < 0$

Whether in CD or DD, the service level s will decrease with the increase of the service cost coefficient η. This is because when the service cost coefficient is high

(i.e. the input-output ratio of service cost is low), means the merchants need to invest more to maintain the same service level. Therefore, the service level is bound to be decreased when the merchant reduces the investment in logistics services.

(4) $\partial s^c/\partial\theta<0$, $\partial s^d/\partial\theta<0$

Whether in CD or DD, the service level s will increase with the decrease of product differentiation θ. This shows that when merchants' product converge in the market, the product price is not enough to determine the consumer's purchase behavior. The consumers will choose the merchant with higher service level, so the service differentiation can provide more competitive advantages for CBE merchants.

5.2.4.2 The impacts on the total profit of CBE merchants

When the merchants provide homogeneous services, the deference of total profit between CD and DD can be expressed as:

$$\Delta\pi_s=\pi_s^c-\pi_s^d=\frac{4\theta+4s\beta\theta(3-\theta)+s^2\beta^2(4+\theta-\theta^2)}{16\alpha(2-\theta)^2} \tag{5.29}$$

Because $\theta\in[0,1]$, so $\Delta\pi_s>0$. This means that the total profit of CBE merchants in CD is greater than in DD. It proves that, when the merchants form alliance and generate the sales strategy together, that will bring bigger profits for the entire cross-border supply chain.

In centralized model, the first derivatives of the π_s^c versus α,β,η,θ are:

$$\frac{\partial\pi_s^c}{\partial\alpha}=\frac{-(s^2\beta^2+2s\beta\theta+\theta)}{4\alpha^2\theta},\ \frac{\partial\pi_s^c}{\partial\beta}=\frac{s^2\beta+s\theta}{2\alpha\theta},\ \frac{\partial\pi_s^c}{\partial\eta}=-s^2,\ \frac{\partial\pi_s^c}{\partial\theta}=\frac{-s^2\beta^2}{4\alpha\theta^2} \tag{5.30}$$

In decentralized model, the first derivatives of the π_s^d versus α,β,η,θ are:

$$\begin{aligned}&\frac{\partial\pi_s^d}{\partial\alpha}=\frac{-(4\theta A_2+4s\beta\theta A_3+s^2\beta^2A_4)}{2\alpha^2A_5},\ \frac{\partial\pi_s^d}{\partial\beta}=\frac{s(2\theta A_3+s\beta A_4)}{\alpha A_5}\\&\frac{\partial\pi_s^d}{\partial\eta}=-s^2,\ \frac{\partial\pi_s^d}{\partial\theta}=\frac{-4(4\theta^2s\beta A_6+4\theta^2A_8+s^2\beta^2A_9)}{\alpha A_5^2}\end{aligned} \tag{5.31}$$

In the formula 5.31,

$$\begin{aligned}A_8&=(2-\theta)(2+\theta)\\A_9&=(2-\theta)(32-48\theta+34\theta^2-7\theta^3)\end{aligned} \tag{5.32}$$

Because $\theta\in[0,1]$, so $A_8>0$, $A_9>0$.

The following conclusions can be drawn:

(1) $\partial \pi_s^c / \partial \alpha < 0$, $\partial \pi_s^d / \partial \alpha < 0$

Whether in CD or DD, the total profit of CBE merchants π_s will decrease with the increase of consumer's price-sensitivity α. This is because when consumers are more sensitive to the product price, they will be attracted by lower prices. Thus no matter implemented CBEL or traditional logistics, the merchant tends to take low price competition strategy, which will result in a decline in the total profit. Therefore, both government and merchant should actively guide consumers to pay more attention to the quality of services, in order to avoid the adverse "price war".

(2) $\partial \pi_s^c / \partial \beta > 0$, $\partial \pi_s^d / \partial \beta > 0$

Whether in CD or DD, the total profit of CBE merchants π_s will increase with the increase of consumer's service-sensitivity β. This is because when consumers are more sensitive to the service level, they will pay attention to the utility from service. Thus no matter implemented CBEL or traditional logistics, the merchant tends to improve the service level in order to attract more consumers, which lead to a rise in the total profit.

(3) $\partial \pi_s^c / \partial \eta = \partial \pi_s^d / \partial \eta < 0$

Whether in CD or DD, the total profit of CBE merchants π_s will decrease with the increase of the service cost coefficient η. This is because when the input-output ratio of service cost is low, merchants need invested more to maintain the same service level, which will result in a decline in the total profits. Therefore, in order to help merchant reduce the cost, government should provide merchants a certain amount of subsidies and improve the infrastructure construction, which can promote the sustainable development of CBEL.

(4) $\partial \pi_s^c / \partial \theta < 0$, $\partial \pi_s^d / \partial \theta < 0$

Whether in CD or DD, the total profit of CBE merchants π_s will increase with the decrease of product differentiation θ. Therefore, in order to improve profits, merchants should actively narrow the product differences with competitor. In reality, more and more vertical e-retailers expand the category and gradually become the integrated e-retailer. However, when the product homogenization becomes increasing serious in CBE, the advantage of service differentiation will be highlighted for merchants, who provide a better logistics services can stand out from the competition.

5.3 Competitive Strategy under Service Differentiation

5.3.1 Hypothesis and Parameter

Consider a dual-channel cross-border supply chain consists of one overseas supplier and two CBE merchants, one is self-operation (Hereinafter referred to as merchant 1), and another is marketplace (Hereinafter referred to as merchant 2). Because merchant 2 only provide service, it also can be regarded as the direct sale channel of overseas supplier. In order to explore the competitive strategy under service differentiation and simplify the model calculation, proposed the following:

- The products in dual-channel are homogeneous. This means the product sold by merchant 1 is same as sold through merchant 2.
- Consumers are rational, they will buy products from the merchant where they feel can get more utility.
- Without loss of generality, both merchants face the unit market demand and only consider the logistics service cost, other costs are assumed to be zero.

The parameters in the model are presented as follows (Table 32):

Table 32 Parameters in Service Differentiation Model

Notation	Representation
p_i	The product price of merchant. p_1 is the price of merchant 1, p_2 is the price of merchant 2.
v	The basic product valuation of consumer, and $v \in [0,1]$
s_i	The logistics service level provided by merchant. s_1 is the service level of merchant 1, s_2 is the service level of merchant 2.
$C(s_i)$	The costs function of logistics service. Refer the definition of cost function in economic principles, $C(s_i) = (\eta/2)s_i^2$, η is the service cost coefficient. C_1 is the service cost of merchant 1, C_2 is the service cost of merchant 2.
μ_i	The channel preference (loyalty) of consumers. μ_1 is probability of purchasing from merchant 1, μ_2 is the probability of purchasing from merchant 2, without loss of generality, assume $\mu_1 > \mu_2$.
α	The sensitivity of the consumer on the product price, and $\alpha \in [0,1]$
β	The sensitivity of the consumer on the service level, and $\beta \in [0,1]$
D_i	The market demand function. D_1 is the market demand of merchant 1, D_2 is the market demand of merchant 2.

Notation	Representation
π_i	The profit function. π_1 is the profit of merchant 1, π_2 is the profit of merchant 2.
U_i	The consumer utility from product purchasing. U_1 is the utility of purchasing from merchant 1, U_2 is the utility of purchasing from merchant 2.

This kind of cross-border supply chain can be constructed as follow (Figure 35):

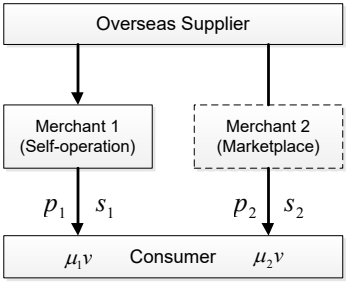

Figure 35 Supply Chain Structure in Service Differentiation Model

The utility of consumer purchasing from the merchant 1 is:

$$U_1 = \mu_1 v - \alpha p_1 + \beta s_1 \tag{5.33}$$

The utility of consumer purchasing from the merchant 2 is:

$$U_2 = \mu_2 v - \alpha p_2 + \beta s_2 \tag{5.34}$$

Consumers are rational. They decide to purchase if the utility is greater than zero. When facing two different channels, they will choose the channel where can obtain more utility, that is, the consumer behavior follows $\max(U_1, U_2, 0)$. Using the same path in last section, defined the product valuation as v_1, v_2, v_3 under three critical conditions $U_1=0$, $U_2=0$, $U_1=U_2$:

$$\begin{aligned} v_1 &= \frac{\alpha p_1 - \beta s_1}{\mu_1} \\ v_2 &= \frac{\alpha p_2 - \beta s_2}{\mu_2} \\ v_3 &= \frac{\alpha(p_1 - p_2) - \beta(s_1 - s_2)}{\mu_1 - \mu_2} \end{aligned} \tag{5.35}$$

Defined the differences between the critical values as:

$$\begin{aligned}\Delta v_1 &= v_1 - v_2 = \frac{\alpha(\mu_2 p_1 - \mu_1 p_2) - \beta(\mu_2 s_1 - \mu_1 s_2)}{\mu_1 \mu_2} \\ \Delta v_2 &= v_3 - v_1 = \frac{\alpha(\mu_2 p_1 - \mu_1 p_2) - \beta(\mu_2 s_1 - \mu_1 s_2)}{\mu_1(\mu_1 - \mu_2)}\end{aligned} \tag{5.36}$$

When $v_1 \geq v_2$, so $\Delta v_1 \geq 0$, get $\alpha(\mu_2 p_1 - \mu_1 p_2) - \beta(\mu_2 s_1 - \mu_1 s_2) \geq 0$, so $\Delta v_2 \geq 0$, obtain $v_3 \geq v_1 \geq v_2$; when $v_1 \leq v_2$, so $\Delta v_1 \leq 0$, get $\alpha(\mu_2 p_1 - \mu_1 p_2) - \beta(\mu_2 s_1 - \mu_1 s_2) \leq 0$, so $\Delta v_2 \leq 0$, obtain $v_3 \leq v_1 \leq v_2$.

Under different product valuation, the demand of merchants in various price ranges can be expressed as follow three scenarios:

(1) If $v_1 \leq v_2$, so $v_3 \leq v_1$, no one purchase from merchant 2, the demand is $D_2 = 0$. When $v \in [v_1, 1]$, consumer purchases from merchant 1, the demand is $D_1 = 1 - v_1$; when $v \in [0, v_1]$, no purchase behavior. Therefore, the price range meets the following conditions:

$$p_1 \leq \frac{\alpha\mu_1 p_2 + \beta(\mu_2 s_1 - \mu_1 s_2)}{\alpha\mu_2} \tag{5.37}$$

(2) If $v_1 \geq v_2$ and $v_3 \geq 1$, no one purchase from merchant 1, the demand is $D_1 = 0$. When $v \in [v_2, 1]$, consumer purchases from merchant 2, the demand is $D_2 = 1 - v_2$; when $v \in [0, v_2]$, no purchase behavior. Therefore, the price range meets the following conditions:

$$p_1 \geq p_2 + \frac{\mu_1 - \mu_2 + \beta(s_1 - s_2)}{\alpha} \tag{5.38}$$

(3) If $v_1 \geq v_2$ and $v_3 \leq 1$. When $v \in [v_3, 1]$, consumer purchases from merchant 1, the demand is $D_1 = 1 - v_3$; when $v \in [v_2, v_3]$, consumer purchases from merchant 2, the demand is $D_2 = v_3 - v_2$. Therefore, the price range meets the following conditions:

$$\frac{\alpha\mu_1 p_2 + \beta(\mu_2 s_1 - \mu_1 s_2)}{\alpha\mu_2} \leq p_1 \leq p_2 + \frac{\mu_1 - \mu_2 + \beta(s_1 - s_2)}{\alpha} \tag{5.39}$$

The aim of this study is to formulate the competitive strategies under the differentiation of products and services. So the first two scenarios will not be included in the following discussion because they are single channel problem. To sum up, in the third scenario, the demand function of merchant 1 and merchant 2 can be respectively expressed as:

$$\begin{aligned} D_1 &= 1 - \frac{\alpha(p_1 - p_2) - \beta(s_1 - s_2)}{\mu_1 - \mu_2} \\ D_2 &= \frac{\alpha(\mu_2 p_1 - \mu_1 p_2) - \beta(\mu_2 s_1 - \mu_1 s_2)}{\mu_2(\mu_1 - \mu_2)} \end{aligned} \tag{5.40}$$

Because self-operation merchant is possible to control own logistics, compared to the marketplace can provide a higher service level, so $s_1 > s_2$. The degree of service differentiation between merchants is $\Delta s = s_1 - s_2$. In order to facilitate the calculation and highlight the impact of service differentiation, assumed that the logistics service of merchant 2 is the industry average, consumers can only perceive the increased service utility from services differentiation Δs provided by the merchant 1. Therefore, the utility of consumer purchasing from merchants respectively are:

$$U_{1g} = \mu_1 v - \alpha p_1 + \beta \Delta s \ , \ U_{2g} = \mu_2 v - \alpha p_2 \tag{5.41}$$

The demand functions of merchants respectively are:

$$D_{1g} = 1 - \frac{\alpha(p_1 - p_2) - \beta \Delta s}{\mu_1 - \mu_2} \ , \ D_{2g} = \frac{\alpha(\mu_2 p_1 - \mu_1 p_2) - \mu_2 \beta \Delta s}{\mu_2(\mu_1 - \mu_2)} \tag{5.42}$$

The profits of merchants respectively are:

$$\begin{aligned} \pi_{1g} &= p_1 D_{1g} - C_1 = p_1 - \frac{\alpha p_1(p_1 - p_2) - p_1 \beta \Delta s}{\mu_1 - \mu_2} - \frac{\eta}{2}(\Delta s)^2 \\ \pi_{2g} &= p_2 D_{2g} - C_2 = \frac{\alpha p_2(\mu_2 p_1 - \mu_1 p_2) - \mu_2 p_2 \beta \Delta s}{\mu_2(\mu_1 - \mu_2)} \end{aligned} \tag{5.43}$$

The total profit of CBE merchants is:

$$\pi_g = \pi_{1g} + \pi_{2g} = \frac{p_1(\Delta\mu - \alpha \Delta p + \beta \Delta s)}{\Delta \mu} + \frac{\alpha p_2(\mu_2 p_1 - \mu_1 p_2) - \mu_2 p_2 \beta \Delta s}{\mu_2 \Delta \mu} - \frac{\eta}{2}(\Delta s)^2 \tag{5.44}$$

In the formula 5.44, $\Delta p = p_1 - p_2$, $\Delta \mu = \mu_1 - \mu_2$.

5.3.2 Optimal Strategy in Centralized Decision

In centralized decision, the CBE merchants aim to maximize the total profit of cross-border supply chain π_g, they cooperated with each other closely and develop sales strategies together.

The first derivative of the π_g versus p_1, p_2 are:

$$\frac{\partial \pi_g}{\partial p_1} = 1 - \frac{2\alpha\Delta p - \beta\Delta s}{\Delta\mu}, \quad \frac{\partial \pi_g}{\partial p_2} = \frac{2\alpha(\mu_2 p_1 - \mu_1 p_2) - \mu_2\beta\Delta s}{\mu_2\Delta\mu} \tag{5.45}$$

Then the Hessian Matrix of this optimal problem under second-order conditions is:

$$H = \begin{pmatrix} \dfrac{-2\alpha}{\Delta\mu} & \dfrac{2\alpha}{\Delta\mu} \\ \dfrac{2\alpha}{\Delta\mu} & \dfrac{-2\alpha\mu_1}{\mu_2\Delta\mu} \end{pmatrix} \tag{5.46}$$

The order principal minor determinant can be solved as:

$$|H_1| = \frac{-2\alpha}{\Delta\mu}, \quad |H_2| = \frac{4\alpha^2}{\mu_2\Delta\mu} \tag{5.47}$$

Because $\mu_1 > \mu_2$, so $\Delta\mu > 0$, then $|H_1| < 0, |H_2| > 0$, the Hessian Matrix is negative-definite. Thus, exist an optimal pricing strategy (p_1^*, p_2^*), can make the total profit of CBE merchants to the maximum. Their value can be obtained by simultaneous solution of $\partial\pi_g / \partial p_1 = 0$, $\partial\pi_g / \partial p_2 = 0$.

Therefore, the optimal pricing strategy of merchants respectively are:

$$p_1^* = \frac{\beta\Delta s + \mu_1}{2\alpha}, \quad p_2^* = \frac{\mu_2}{2\alpha} \tag{5.48}$$

Put p_1^*, p_2^* into π_{1g}, π_{2g}, π_g, can obtain the profit of merchant 1, merchant 2 and the total in CD:

$$\begin{aligned} \pi_{1g}^c &= \frac{\mu_1\Delta\mu + \beta(2\mu_1 - \mu_2)\Delta s - (2\alpha\eta\Delta\mu - \beta^2)(\Delta s)^2}{4\alpha\Delta\mu} \\ \pi_{2g}^c &= \frac{-\mu_2\beta\Delta s}{4\alpha\Delta\mu} \\ \pi_g^c &= \frac{(2\beta\Delta s + \mu_1)\Delta\mu - (2\alpha\eta\Delta\mu - \beta^2)(\Delta s)^2}{4\alpha\Delta\mu} \end{aligned} \tag{5.49}$$

Solving the first order equation $\partial\pi_g^c / \partial\Delta s = 0$, can obtain the optimal service differentiation in CD:

$$\Delta s^c = \frac{\beta\Delta\mu}{2\alpha\eta\Delta\mu - \beta^2} \tag{5.50}$$

5.3.3 Optimal Strategy in Decentralized Decision

In decentralized model, assumed that merchant 2 is the leader in game, merchant 1 is follower, which is consistent with the actual situation. Many self-operation retailers struggled to obtain official authorization of some brands, while some brands are hardly to be settled in large platform. The parties engage the game in following order: firstly, the merchant 2 makes strategy to maximize owns profit, and then the merchant 1 makes profit level according to the pricing of merchant 2. However, the merchant 2 knows the behavior of merchant 1, so the merchant 2 will make final strategy according to the merchant 1's reaction function based on own pricing. The inverse-deducing method was used to calculate the optimal solution of the model.

Solving the first order equation $\partial \pi_{1g} / \partial p_1 = 0$, can obtain the pricing that maximize the profit of merchant 1:

$$p_1 = \frac{\alpha p_2 + \beta \Delta s + \Delta \mu}{2\alpha} \tag{5.51}$$

Then, put p_1 into the profit function of merchant 2, can obtain:

$$\pi_{2g} = \frac{\mu_2 p_2 (\Delta \mu - \beta \Delta s) - \alpha p_2^2 (2\mu_1 - \mu_2)}{2\mu_2 \Delta \mu} \tag{5.52}$$

Solving the first order equation $\partial \pi_{2g} / \partial p_2 = 0$, can obtain the optimal pricing p_2^* that maximize the profit of merchant 2:

$$p_2^* = \frac{\mu_2 (\Delta \mu - \beta \Delta s)}{2\alpha (2\mu_1 - \mu_2)} \tag{5.53}$$

Then, put p_2^* into p_1, can obtain the optimal pricing p_1^* of merchant 1:

$$p_1^* = \frac{\beta (4\mu_1 - 3\mu_2) \Delta s + (4\mu_1 - \mu_2) \Delta \mu}{4\alpha (2\mu_1 - \mu_2)} \tag{5.54}$$

Finally, put p_1^*, p_2^* into π_{1g}, π_{2g}, π_g, can obtain the profit of merchant 1, merchant 2 and the total in DD:

$$\pi_{1g}^{d}=\frac{(B_2\Delta\mu)^2+2\beta B_2B_3\Delta\mu\Delta s+(\beta^2B_3^2-8\alpha\eta B_1^2\Delta\mu)(\Delta s)^2}{16\alpha B_1^2\Delta\mu}$$
$$\pi_{2g}^{d}=\frac{\mu_2(\beta\Delta s-\Delta\mu)^2}{8\alpha B_1\Delta\mu} \tag{5.55}$$
$$\pi_{g}^{d}=\frac{B_4(\Delta\mu)^2+2\beta B_5\Delta\mu\Delta s+(\beta^2B_6-8\alpha\eta B_1^2\Delta\mu)(\Delta s)^2}{16\alpha B_1^2\Delta\mu}$$

In the formula 5.55,

$$\begin{aligned}
B_1&=2\mu_1-\mu_2\\
B_2&=4\mu_1-\mu_2\\
B_3&=4\mu_1-3\mu_2\\
B_4&=16\mu_1^2-4\mu_1\mu_2-\mu_2^2\\
B_5&=16\mu_1^2-20\mu_1\mu_2+5\mu_2^2\\
B_6&=16\mu_1^2-20\mu_1\mu_2+7\mu_2^2
\end{aligned} \tag{5.56}$$

Because $\mu_1>\mu_2$, so B_1~B_6 are all greater than 0.

Solving the first order equation $\partial\pi_g^d/\partial\Delta s=0$, can obtain the optimal service differentiation in DD:

$$\Delta s^d=\frac{\beta B_5\Delta\mu}{8\alpha\eta B_1^2\Delta\mu-\beta^2B_6} \tag{5.57}$$

5.3.4 Comparative Analysis

5.3.4.1 The impacts on the service level

When the merchants provide homogeneous services, the deference of service differentiation between CD and DD can be expressed as:

$$\Delta s^c-\Delta s^d=\frac{2(\alpha\eta B_2\Delta\mu-\beta^2\mu_2)\beta\mu_2\Delta\mu}{B_7B_8} \tag{5.58}$$

In the formula 5.58,

$$\begin{aligned}
B_7&=2\alpha\eta\Delta\mu-\beta^2\\
B_8&=8\alpha\eta B_1^2\Delta\mu-\beta^2B_6
\end{aligned} \tag{5.59}$$

Because $\mu_1>\mu_2$, $\Delta s^c>0$, $\Delta s^d>0$, so $B_7>0$, $B_8>0$. When $\alpha\eta B_2\Delta\mu-\beta^2\mu_2>0$, thus $\Delta s^c>\Delta s^d$, means that the service differentiation in CD is larger than in DD; When $\alpha\eta B_2\Delta\mu-\beta^2\mu_2<0$, thus $\Delta s^c<\Delta s^d$, means that the service level in DD has larger differentiation. Therefore, the service differentiation will be affected by

consumer behavior ($\mu_1, \mu_2, \alpha, \beta$) and operation cost ($\eta$). This further proves that the CBE merchants should consider these factors synthetically when generate service strategy.

In CD, the first derivatives of the Δs^c versus $\mu_1, \mu_1, \alpha, \beta, \eta$ are:

$$\begin{aligned} &\frac{\partial \Delta s^c}{\partial \mu_1} = \frac{-\beta^3}{B_7^2}, \quad \frac{\partial \Delta s^c}{\partial \mu_2} = \frac{\beta^3}{B_7^2}, \quad \frac{\partial \Delta s^c}{\partial \alpha} = \frac{-2\beta\eta(\Delta\mu)^2}{B_7^2}, \\ &\frac{\partial \Delta s^c}{\partial \beta} = \frac{(2\alpha\eta\Delta\mu+\beta^2)\Delta\mu}{B_7^2}, \quad \frac{\partial \Delta s^c}{\partial \eta} = \frac{-2\alpha\beta(\Delta\mu)^2}{B_7^2} \end{aligned} \tag{5.60}$$

In DD, the first derivatives of the Δs^d versus $\mu_1, \mu_1, \alpha, \beta, \eta$ are:

$$\begin{aligned} &\frac{\partial \Delta s^d}{\partial \mu_1} = \frac{-\beta(\beta^2 B_9 - 64\alpha\eta B_1\mu_1\mu_2(\Delta\mu)^2)}{B_8^2}, \quad \frac{\partial \Delta s^d}{\partial \mu_2} = \frac{\beta(\beta^2 B_{10} - 64\alpha\eta B_1\mu_1^2(\Delta\mu)^2)}{B_8^2} \\ &\frac{\partial \Delta s^d}{\partial \alpha} = \frac{-8\beta\eta B_1^2 B_5(\Delta\mu)^2}{B_8^2}, \quad \frac{\partial \Delta s^d}{\partial \beta} = \frac{B_5(8\alpha\eta B_1^2\Delta\mu + \beta^2 B_6)\Delta\mu}{B_8^2}, \quad \frac{\partial \Delta s^d}{\partial \eta} = \frac{-8\alpha\beta B_1^2 B_5(\Delta\mu)^2}{B_8^2} \end{aligned} \tag{5.61}$$

In the formula 5.61:

$$\begin{aligned} B_9 &= B_3^4 + 2\mu_2[B_3^3 + 8\mu_2(5\mu_1 - 3\mu_2)\Delta\mu] \\ B_{10} &= B_3^4 + 2\mu_2(24\mu_1 - 23\mu_2)B_1^2 \end{aligned} \tag{5.62}$$

Because $\mu_1 > \mu_2$, so $B_9 > 0$, $B_{10} > 0$.

The following conclusions can be drawn:

(1) $\partial \Delta s^c / \partial \mu_1 < 0$, $\partial \Delta s^d / \partial \mu_1$ uncertainty

In CD, the service differentiation Δs will decrease with the increase of the consumer preference μ_1 for merchant 1. This means that, when consumers prefer to buy products from self-operation merchant, who don't need to provide higher differentiated services, while advertising and brand power are the key to attract consumers and maintain their loyalty. But in DD, the positive or negative of $\partial \Delta s^d / \partial \mu_1$ is according to $\beta^2 B_9 - 64\alpha\eta B_1\mu_1\mu_2(\Delta\mu)^2$. This proves that, the relationship between Δs and μ_1 is affected by the comprehensive factors, merely increase the degree of service differentiation is not necessarily able to improve own competitiveness.

(2) $\partial \Delta s^c / \partial \mu_2 > 0$, $\partial \Delta s^d / \partial \mu_2$ uncertainty

In CD, the service differentiation Δs will increase with the increase of the consumer preference μ_2 for merchant 2. This means that, when consumers prefer to buy

products through marketplace merchant, in order to avoid the price competition, the self-operation merchant can get competitive advantage only by providing better service. But in DD, the positive or negative of $\partial s^d / \partial \mu_2$ is according to $\beta^2 B_{10} - 64\alpha\eta B_1 \mu_1^2 (\Delta\mu)^2$. This also proves that, the relationship between Δs and μ_2 is affected by the comprehensive factors, merely increase the degree of service differentiation is not necessarily able to improve own competitiveness.

(3) $\partial \Delta s^c / \partial \alpha < 0$, $\partial \Delta s^d / \partial \alpha < 0$

Whether in CD or DD, the service differentiation Δs will decrease with the increase of consumer's price-sensitivity α. This is because when consumers are more sensitive to the product price, they will be attracted by lower prices. Both self-operation and marketplace tend to take low price competition strategy thereby ignored service quality, which is bound to result in convergence of service level.

(4) $\partial \Delta s^c / \partial \beta > 0$, $\partial \Delta s^d / \partial \beta > 0$

Whether in CD or DD, the service differentiation Δs will increase with the increase of consumer's service-sensitivity β. This is because when consumers are more sensitive to the service level, they will pay attention to the utility from service. Therefore, the merchants can attract more consumers by adopting service differentiation, which is also an effective way to avoid price competition.

(5) $\partial \Delta s^c / \partial \eta < 0$, $\partial \Delta s^d / \partial \eta < 0$

Whether in CD or DD, the service differentiation Δs will decrease with the increase of the service cost coefficient η. This is because when the input-output ratio of service cost is low, the merchants need invested more to maintain the same service level. Therefore, the logistics service will gradually converge as merchants reduce the cost of service input.

5.3.4.2 The impacts on the total profit of CBE merchants

When the merchants provide homogeneous product, the deference of total profit between CD and DD can be expressed as:

$$\Delta\pi_g = \pi_g^c - \pi_g^d = \frac{\mu_2[(4\mu_1^2 + \mu_1\mu_2 - \mu_2^2)\Delta\mu + 2\beta B_2 \Delta\mu\Delta s + \beta^2 B_3 (\Delta s)^2]}{16\alpha B_1^2 \Delta\mu} \quad (5.63)$$

Because $\mu_1 > \mu_2$, so $\Delta\pi_g > 0$. This means that the total profit of CBE merchants in CD is greater than in DD. It proves that, when the merchants form alliance and

generate the sales strategy together, that will bring bigger profits for the entire cross-border supply chain.

In CD, the first derivatives of the π_g^c versus $\alpha, \beta, \eta, \Delta s$ are:

$$\begin{aligned} &\frac{\partial \pi_g^c}{\partial \alpha} = \frac{-[(\beta \Delta s + \Delta \mu)^2 + \mu_2 \Delta \mu]}{4\alpha^2 \Delta \mu}, \quad \frac{\partial \pi_g^c}{\partial \beta} = \frac{(\beta \Delta s + \Delta \mu)\Delta s}{2\alpha \Delta \mu} \\ &\frac{\partial \pi_g^c}{\partial \eta} = -\frac{(\Delta s)^2}{2}, \quad \frac{\partial \pi_g^c}{\partial \Delta s} = \frac{\beta \Delta \mu - B_7 \Delta s}{2\alpha \Delta \mu} \end{aligned} \tag{5.64}$$

In DD, the first derivatives of the π_g^c versus $\alpha, \beta, \eta, \Delta s$ are:

$$\begin{aligned} &\frac{\partial \pi_g^d}{\partial \alpha} = \frac{-[B_6(\beta \Delta s)^2 + 2\beta B_5 \Delta \mu \Delta s + (B_2^2 + 2\mu_2 B_1)(\Delta \mu)^2]}{16\alpha^2 B_1^2 \Delta \mu} \\ &\frac{\partial \pi_g^d}{\partial \beta} = \frac{\Delta s(B_5 \Delta \mu + B_6 \beta \Delta s)}{8\alpha B_1^2 \Delta \mu}, \quad \frac{\partial \pi_g^d}{\partial \eta} = -\frac{(\Delta s)^2}{2}, \quad \frac{\partial \pi_g^d}{\partial \Delta s} = \frac{\beta B_5 \Delta \mu - B_8 \Delta s}{8\alpha B_1^2 \Delta \mu} \end{aligned} \tag{5.65}$$

Because $\mu_1 > \mu_2, s_1 > s_2$, so $\Delta \mu > 0, \Delta s > 0$.

The following conclusions can be drawn:

(1) $\partial \pi_g^c / \partial \alpha < 0$, $\partial \pi_g^d / \partial \alpha < 0$

Whether in CD or DD, the total profit of CBE merchants π_g will decrease with the increase of consumer's price-sensitivity α. This is because when consumers are more sensitive to the product price, they will be attracted by lower prices. Thus no matter self-operation merchant or marketplace tends to take low price competition strategy, which will result in a decline in the total profit. Therefore, both government and merchant should actively guide consumers to pay more attention to the quality of services, in order to avoid the adverse "price war".

(2) $\partial \pi_g^c / \partial \beta > 0$, $\partial \pi_g^d / \partial \beta > 0$

Whether in CD or DD, the total profit of CBE merchants π_g will increase with the increase of consumer's service-sensitivity β. This is because when consumers are more sensitive to the service level, they will pay attention to the utility from service. Thus, no matter implemented CBEL or traditional logistics, the merchant tends to improve the service level in order to attract more consumers, which lead to a rise in the total profit.

(3) $\partial\pi_g^c/\partial\eta = \partial\pi_g^d/\partial\eta < 0$

Whether in CD or DD, the total profit of CBE merchants π_g will decrease with the increase of the service cost coefficient η. This is because when the input-output ratio of service cost is low, the merchants need invested more to maintain the same service level, which will result in a decline in the total profits. Therefore, in order to help merchant reduce the cost, government should provide merchants a certain amount of subsidies and improve the infrastructure construction, which can promote the sustainable development of CBEL.

(4) $\partial\pi_g^c/\partial\Delta s$ uncertainty, $\partial\pi_g^d/\partial\Delta s$ uncertainty

In CD, the positive or negative of $\partial\pi_g^c/\partial\Delta s$ is according to $\beta\Delta\mu - B_7\Delta s$; In DD, the positive or negative of $\partial\pi_g^d/\partial\Delta s$ is according to $\beta B_5\Delta\mu - B_8\Delta s$. This proves that, no matter in CD or DD, the relationship between π_g and Δs is affected by consumer behavior (μ_1, μ_2, α, β) and operation cost (η). Therefore, the CBE merchants should consider these factors synthetically when generate service strategy, merely increase the degree of service differentiation is not necessarily beneficial to cross-border supply chain, and even bring negative effects.

5.4 Numerical Analysis

In order to display the impact of product differentiation and service differentiation on cross-border supply chain intuitively, the parameters are assigned with a certain value.

5.4.1 Product Differentiation

(1) Assign $\alpha = 0.5$, $\beta = 0.5$, $\eta = 0.6$, $s = 1$, the impact of product differentiation on the total profits of cross-border supply chain is shown in Figure 36:

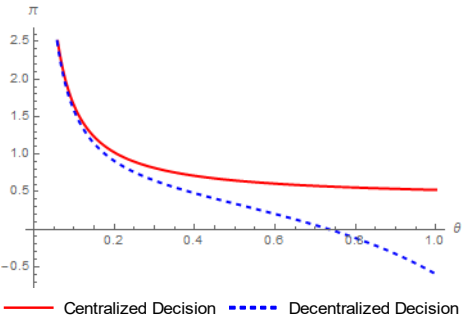

Figure 36 Impact of Product Differentiation on Total Profits under Same Service

Whether in CD or DD, the total profit will decrease with the increase of product differentiation, and the profit attenuation in CD is less than in DD. In addition, keep the product differentiation unchanged, cross-border supply chain has more profits in CD.

(2) Assign $\alpha = 0.5, \beta = 0.5, \eta = 0.6, s = \{0.3, 0.7\}$, in CD, the impact of product differentiation on the total profits of cross-border supply chain is shown in Figure 37:

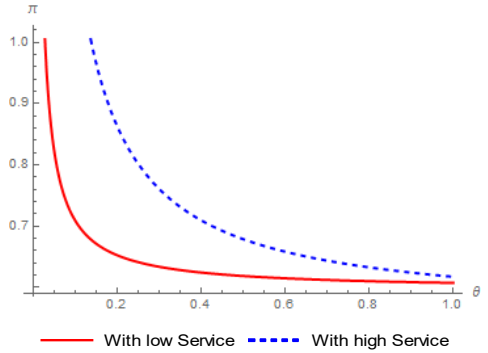

Figure 37 Impact of Product Differentiation on Total Profits under Different Service in CD

In CD, the total profit will decrease with the increase of product differentiation, and the profit attenuation at low service level is less than at high service level. In addition, keep the product differentiation unchanged, cross-border supply chain has more profits at high service level.

(3) Assign $\alpha = 0.5, \beta = 0.5, \eta = 0.6, s = \{0.3, 0.7\}$, in DD, the impact of product differentiation on the total profits of cross-border supply chain is shown in Figure 38:

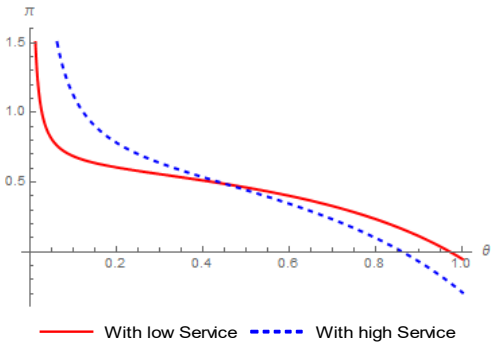

Figure 38 Impact of Product Differentiation on Total Profits under Different Service in DD

In DD, the total profit will decrease with the increase of product differentiation, and the profit attenuation at low service level is less than that at high service level. The product differentiation at the intersection of the two curves is set as θ^*, when $\theta \in [0, \theta^*]$, the supply chain with the higher service level can obtain more profit; when $\theta \in [\theta^*, 1]$, on the contrary, the supply chain with the lower service level can obtain more profit.

5.4.2 Service Differentiation

(1) Assign $\mu_1 = 0.7, \mu_2 = 0.3, \alpha = 0.6, \beta = 0.4, \eta = 1$, the impact of service differentiation on the total profits of cross-border supply chain is shown in Figure 39:

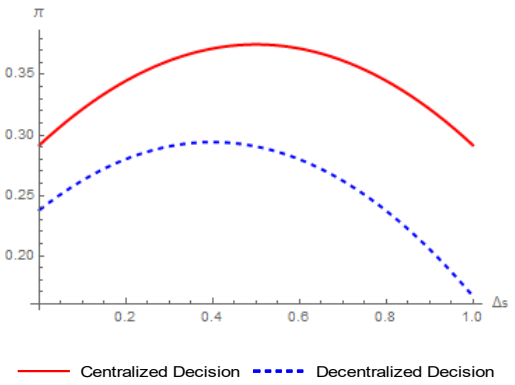

Figure 39 Impact of Service Differentiation on Total Profits

Whether in CD or DD, the total profit function has a inflection point Δs^*. When $\Delta s < \Delta s^*$, the total profit will increase with the increase of service differentiation; when $\Delta s > \Delta s^*$, the total profit will decrease with the increase of service differentiation. In addition, keep the service differentiation unchanged, cross-border supply chain obtains more profits in CD.

(2) Assign $\mu_1 = 0.7, \mu_2 = 0.3, \alpha = 0.5, \beta = 0.5, s = \{0.3, 0.7\}$, the impact of service cost coefficient on the total profits of cross-border supply chain in CD is shown in Figure 40, in DD is shown in Figure 41:

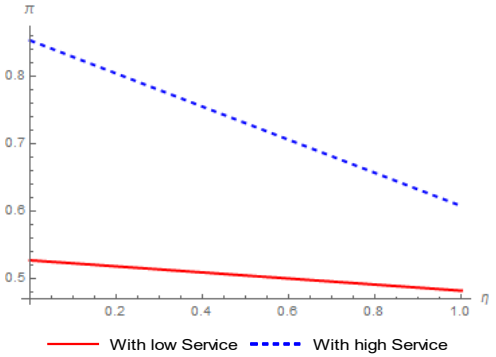

Figure 40 Impact of Service Cost Coefficient on Total Profits under Different Service in CD

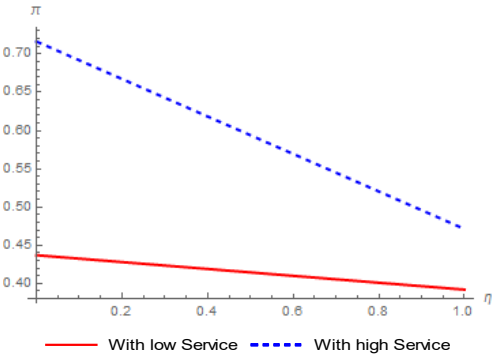

Figure 41 Impact of Service Cost Coefficient on Total Profits under Different Service in DD

Whether in CD or DD, the total profit will decrease with the increase of service cost coefficient, and the profit attenuation at low service differentiation is less than at high service differentiation. In addition, keep the service cost coefficient unchanged, cross-border supply chain obtain more profits at high service differentiation.

6. Competitive Strategy for Inventory and Transportation in CBE

In Chapter 4 can be obtained, the classification of logistics strategy is based on who is in charge of inventory and transportation, which are the main components of e-logistics. However, the complexity of CBEL is difficult to attain for a single enterprise, it requires cooperation between members in cross-border supply chain. Nowadays, more and more enterprises assign their logistics demand to LSP (Cho, et al, 2008), wherein, warehousing and transportation are the most frequently outsourced logistics activities (Landmark global, 2015b). In this chapter, internal factors "Operation" and "Partnership" were considered for balancing the relationship between supplier, retailer and LSP. The optimal inventory strategy in centralized and decentralized managed, the optimal transportation strategy under LSPs cooperation and non-cooperation were formulated in cross-border relation.

6.1 Inventory Strategy

6.1.1 Hypothesis and Parameter

As mentioned in Chapter 1, the bonded import and the direct mail are two main CBEL models. Considering a cross-border supply chain consists of one overseas supplier and one CBE retailer, there are two kinds of inventory operation modes:

(1) Centralized Managed Inventory (Hereinafter referred to as CMI).

In this mode, only the retailer has inventory and it orders from the supplier to meet the demand for both bonded channel and direct channel, that is, the retailer implements a duel-channel strategy.

(2) Decentralized Managed Inventory (Hereinafter referred to as DMI).

In this mode, retailer and supplier hold inventory independently, the demand of bonded channel is met by retailer, and the supplier meets the direct channel needs.

In order to focus on the competitive strategy of inventory and simplify the model calculation, the following assumptions are put forward:

- There are two types of consumers in the market: one is time-sensitive, who prefer to buy products from bonded channel for shorter receipt times; another is quality-sensitive, who prefer to buy products from direct channel for more reliable product source.

- There is no channel transfer in the market. Consumers are loyal and choose to wait when out of stock in channel.
- Homogeneous products are sold in two channels. Consumers face the same product price, so that the price will no longer decide the consumer preference. According to the differentiated competitive strategy formulated in Chapter 5, the channel's competitive advantage reflected by the level of service.

The parameters in the model are presented as follows (Table 33):

Table 33 Parameters in Inventory Strategy Model

Notation	Representation
D_i	The market demand function. D_1 is the market demand of bonded channel, D_2 is the market demand of direct channel, D_1 and D_2 are independent random variables. The total demand of cross-border supply chain is $D = D_1 + D_2$.
$f_i(\cdot)$	The distribution density functions of demand. $f_1(\cdot)$ is the distribution density function of bonded channel, $f_2(\cdot)$ is the distribution density function of direct channel.
$F_i(\cdot)$	The cumulative distribution functions of demand. $F_1(\cdot)$ is the cumulative distribution function of bonded channel, $F_2(\cdot)$ is the cumulative distribution function of direct channel. The inverse function of both exist and monotonically increasing, which can be express as $F_i^{-1}(\cdot)$.
p	The retail price per unit product.
w	The wholesale price per unit product.
c	The production or purchase cost per unit product in supplier.
v	The residual value of the unsold product, and meet the conditions: $w > c > v$.
g_i	The shortage cost per unit product. g_1 is the shortage cost of bonded channel, g_2 is the shortage cost of direct channel.
h_i	The inventory holding cost per unit product. h_1 is the inventory cost of bonded channel, h_2 is the inventory cost of direct channel.
t_i	The order fulfillment cost per unit. t_1 is the fulfillment cost of bonded channel，t_2 is the fulfillment cost of direct channel. Because the bonded channel can use ocean shipping for advancing stock with scale advantages, so $t_1 < t_2$.
Q_i	The product inventory. Q_1 is the inventory of bonded channel, Q_2 is the inventory of direct channel. The total inventory of cross-border supply chain is $Q = Q_1 + Q_2$.
R_i^j	The total revenue in different models. In CMI: R_r^c and R_r^d is the revenue of retailer in CMI and DMI, R_s^c and R_s^d is the revenue of supplier in CMI and DMI.

Notation	Representation
K_i^j	The total cost in different models. In CMI, K_r^c is the cost of retailer, K_s^c is the cost of supplier; In DMI: K_r^d is the cost of retailer, K_s^d is the cost of supplier.
π_i^j	The profit function, equals to $\pi_i^j = R_i^j - K_i^j$.

In the following, based on the profit maximization, the optimal inventory was conducted in two kinds of inventory managed mode.

6.1.2 Centralized Managed Inventory

In this mode, the supplier is just as product source, the demand for bonded channel is met by the retailer's FTZ warehouse, and the demand for direct channel is met by the retailer's overseas warehouse. Therefore, only the retailer makes stock decision, then the supplier produces or purchases according to the retailer's order needs. This kind of cross-border supply chain can be constructed as follow (Figure 42):

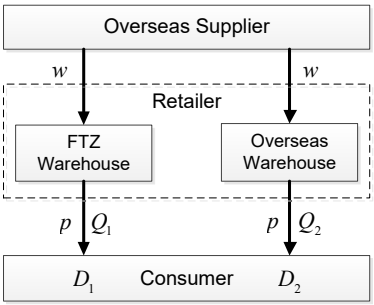

Figure 42 Supply Chain Structure in Centralized Managed Inventory Mode

In CMI, the total revenues of retailer include the sales revenue through dual-channel and the residual value of the unsold products. It can be expressed as:

$$R_r^c = p \cdot (\min[Q_1, D_1] + \min[Q_2, D_2]) + v \cdot (\max[Q_1 - D_1, 0] + \max[Q_2 - D_2, 0]) \quad (6.1)$$

The total cost of the retailer include the ordering cost of the dual-channel, the inventory holding cost, the shortage cost and the order fulfillment cost. It can be expressed as:

$$\begin{aligned} K_r^c = {} & w \cdot Q + h_1 \cdot \max[Q_1 - D_1, 0] + h_2 \cdot \max[Q_2 - D_2, 0] + g_1 \cdot \max[D_1 - Q_1, 0] + \\ & g_2 \cdot \max[D_2 - Q_2, 0] + t_1 \cdot \min[Q_1, D_1] + t_2 \cdot \min[Q_2, D_2] \end{aligned} \quad (6.2)$$

Therefore, the profit of retailer can be expressed as:

$$\begin{aligned}\pi_r^c &= R_r^c - K_r^c \\ &= (p-t_1)\cdot\min[Q_1, D_1] + (p-t_2)\cdot\min[Q_2, D_2] + (v-h_1)\cdot\max[Q_1 - D_1, 0] + \\ &\quad (v-h_2)\cdot\max[Q_2 - D_2, 0] - g_1\cdot\max[D_1 - Q_1, 0] - g_2\cdot\max[D_2 - Q_2, 0] - w\cdot Q\end{aligned} \tag{6.3}$$

The profit of the supplier is the difference between the wholesale revenues and the cost of production or purchase. It can be expressed as:

$$\pi_s^c = R_s^c - K_s^c = (w-c)\cdot Q \tag{6.4}$$

Then, put the distribution density of demand into π_r^c, can obtain the retailer's profit function are:

$$\begin{aligned}\pi_r^c &= (p-t_1)[\int_0^{Q_1} x f_1(x)dx + \int_{Q_1}^{\infty} Q_1 f_1(x)dx] + (p-t_2)[\int_0^{Q_2} x f_2(x)dx + \int_{Q_2}^{\infty} Q_2 f_2(x)dx] + \\ &\quad (v-h_1)\int_0^{Q_1}(Q_1 - x) f_1(x)dx + (v-h_2)\int_0^{Q_2}(Q_2 - x) f_2(x)dx - \\ &\quad g_1\int_{Q_1}^{\infty}(x - Q_1) f_1(x)dx - g_2\int_{Q_2}^{\infty}(x - Q_2) f_2(x)dx - w\cdot Q\end{aligned} \tag{6.5}$$

The retailer's optimal inventory should meet the first-order conditions:

$$\begin{aligned}\frac{\partial \pi_r^c}{\partial Q_1} &= (p-t_1)[1 - F_1(Q_1)] + (v-h_1)F_1(Q_1) - g_1[F_1(Q_1) - 1] - w = 0 \\ \frac{\partial \pi_r^c}{\partial Q_2} &= (p-t_2)[1 - F_2(Q_2)] + (v-h_2)F_2(Q_2) - g_2[F_2(Q_2) - 1] - w = 0\end{aligned} \tag{6.6}$$

Solving the above equation can obtain the optimal inventory strategy of the bonded channel and the direct channel, they are expressed separately as:

$$\begin{aligned}F_1(Q_1^*) &= \frac{p + g_1 - t_1 - w}{p + g_1 + h_1 - t_1 - v} \\ F_2(Q_2^*) &= \frac{p + g_2 - t_2 - w}{p + g_2 + h_2 - t_2 - v}\end{aligned} \tag{6.7}$$

Therefore, in CMI, the optimal inventory of retailer is:

$$Q_r^c = F_1^{-1}\left(\frac{p + g_1 - t_1 - w}{p + g_1 + h_1 - t_1 - v}\right) + F_2^{-2}\left(\frac{p + g_2 - t_2 - w}{p + g_2 + h_2 - t_2 - v}\right) \tag{6.8}$$

The optimal production or purchase volume for supplier is: $Q_s^c = Q_r^c$

6.1.3 Decentralized Managed Inventory

In this mode, retailer and supplier hold inventory to satisfy the consumers in different channels. The retailer orders from supplier to meet the demand of the bonded channel. For direct channel, the retailer is just responsible for "customer acquisition". Once the orders are generated, the retailer delivers the order information to the supplier, which is responsible for online order fulfillment. The both sides obtain their respective income through the revenue generated by online orders, assumed that the retailer can get a benefit from the supplier with the distribution ratio λ $(0<\lambda<1)$. This kind of cross-border supply chain can be constructed as follow (Figure 43):

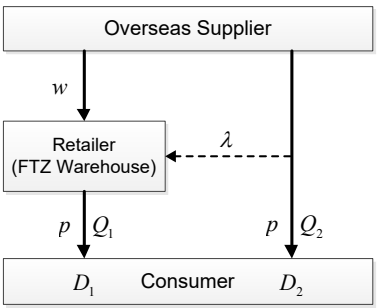

Figure 43 Supply Chain Structure in Decentralized Managed Inventory Mode

In DMI, the total revenues of retailer include the sales revenue through bonded channel, the distributed benefit from supplier's sales in direct channel and the residual value of the unsold products. It can be expressed as:

$$R_r^d = p \cdot \min[Q_1, D_1] + \lambda \cdot p \cdot \min[Q_2, D_2] + v \cdot \max[Q_1 - D_1, 0] \tag{6.9}$$

The total cost of the retailer include the ordering cost of the bonded channel, the inventory holding cost, the shortage cost and the order fulfillment cost of bonded channel. It can be expressed as:

$$K_r^d = w \cdot Q_1 + h_1 \cdot \max[Q_1 - D_1, 0] + t_1 \cdot \min[Q_1, D_1] + g_1 \cdot \max[D_1 - Q_1, 0] \tag{6.10}$$

Therefore, the profit of retailer can be expressed as:

$$\begin{aligned} \pi_r^d = R_r^d - K_r^d = {} & (p - t_1) \cdot \min[Q_1, D_1] + \lambda \cdot p \cdot \min[Q_2, D_2] + (v - h_1) \cdot \max[Q_1 - D_1, 0] \\ & - g_1 \cdot \max[D_1 - Q_1, 0] - w \cdot Q_1 \end{aligned} \tag{6.11}$$

The total revenues of supplier include the wholesale revenues of bonded channel, the distributed revenue of sales in direct channel and the residual value of the unsold products. It can be expressed as:

$$R_s^d = (1-\lambda)\cdot p\cdot \min[Q_2, D_2] + w\cdot Q_1 + v\cdot \max[Q_2 - D_2, 0] \tag{6.12}$$

The total cost of the supplier includes the production or purchase cost, the inventory holding cost, the shortage cost and the order fulfillment cost of direct channel. It can be expressed as:

$$K_s^d = c\cdot Q + h_2\cdot \max[Q_2 - D_2, 0] + t_2\cdot \min[Q_2, D_2] + g_2\cdot \max[D_2 - Q_2, 0] \tag{6.13}$$

Therefore, the profit of supplier can be expressed as:

$$\begin{aligned}\pi_s^d = R_s^d - K_s^d = {} & [(1-\lambda)p - t_2]\cdot \min[Q_2, D_2] + (w-c)\cdot Q_1 + (v-h_2)\cdot \max[Q_2 - D_2, 0] \\ & - g_2\cdot \max[D_2 - Q_2, 0] - c\cdot Q_2\end{aligned} \tag{6.14}$$

Then, put the distribution density of demand into π_r^d and π_s^d, can obtain the profit function of retailer and supplier respectively are:

$$\begin{aligned}\pi_r^d = {} & (p-t_1)[\int_0^{Q_1} x f_1(x)dx + \int_{Q_1}^{\infty} Q_1 f_1(x)dx] + \lambda p[\int_0^{Q_2} x f_2(x)dx + \int_{Q_2}^{\infty} Q_2 f_2(x)dx] + \\ & (v-h_1)\int_0^{Q_1}(Q_1 - x) f_1(x)dx - g_1\int_{Q_1}^{\infty}(x - Q_1) f_1(x)dx - w\cdot Q_1 \\ \pi_s^d = {} & [(1-\lambda)p - t_2]\cdot[\int_0^{Q_2} x f_2(x)dx + \int_{Q_2}^{\infty} Q_2 f_2(x)dx] + (w-c)Q_1 \\ & (v-h_2)\int_0^{Q_2}(Q_2 - x) f_2(x)dx - g_2\int_{Q_2}^{\infty}(x - Q_2) f_2(x)dx - cQ_2\end{aligned} \tag{6.15}$$

The optimal inventory of retailer and supplier should meet the first-order conditions:

$$\begin{aligned}\frac{\partial \pi_r^d}{\partial Q_1} &= (p-t_1)[1 - F_1(Q_1)] + (v-h_1)F_1(Q_1) - g_1[F_1(Q_1) - 1] - w = 0 \\ \frac{\partial \pi_s^d}{\partial Q_2} &= [(1-\lambda)p - t_2]\cdot[1 - F_2(Q_2)] + (v-h_2)F_2(Q_2) - g_2[F_2(Q_2) - 1] - c = 0\end{aligned} \tag{6.16}$$

Solving the above equation can obtain the optimal inventory strategy of retailer and supplier, they are expressed separately as:

$$\begin{aligned}F_1(Q_1^*) &= \frac{p + g_1 - t_1 - w}{p + g_1 + h_1 - t_1 - v} \\ F_2(Q_2^*) &= \frac{(1-\lambda)p + g_2 - t_2 - c}{(1-\lambda)p + g_2 + h_2 - t_2 - v}\end{aligned} \tag{6.17}$$

Therefore, in DMI, the optimal inventory of retailer is:

$$Q_r^d = F_1^{-1}\left(\frac{p+g_1-t_1-w}{p+g_1+h_1-t_1-v}\right) \tag{6.18}$$

The optimal inventory of supplier is:

$$Q_s^d = Q_r^d + F_2^{-1}(Q_2^*) \tag{6.19}$$

6.1.4 Numerical Analysis

Because the optimal inventory is the form of implicit function, it is difficult to observe the influence of parameters on the inventory strategy. In order to obtain more intuitive results, the parameters are assigned with a certain value (Table 34). The purpose of numerical analysis is to study the optimal inventory and the profit under the different variance, that is, under the different demand uncertainty environment.

Table 34 Parameter Assignment in Inventory Model

c	w	v	p	λ	h_1	h_2	g_1	g_2	t_1	t_2
4	5	3	10	0.2	2	1	2	1	0.5	1

Refer to the parameter assignment from Xia and Huang (2007, P.73), assumed that the bonded channel demand, the direct channel demand and the total demand respectively follow the normal distribution with a mean of 200， 200 and 400, expressed as:

$$D_1 \sim N(200, \sigma_1^2),\ D_2 \sim N(200, \sigma_2^2),\ D \sim N(400, \sigma_1^2+\sigma_2^2)$$

6.1.4.1 The Impact of Demand Uncertainty on Inventory

(1) In centralized managed inventory mode (Figure 44)

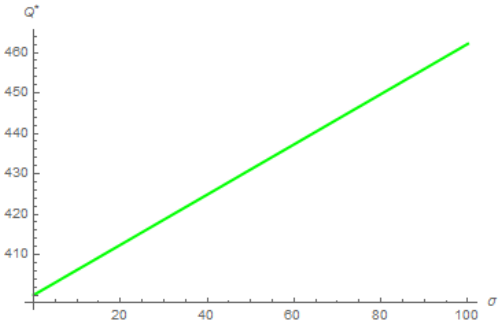

Figure 44 Impact of Demand Uncertainty on Inventory in CMI

With the increase of demand uncertainty, the retailer tends to increase inventory in order to prevent out of stock, which leads to more inventory costs. Therefore, retailer is required to accurately forecast market demand before ordering products from suppliers.

(2) In decentralized managed inventory mode (Figure 45)

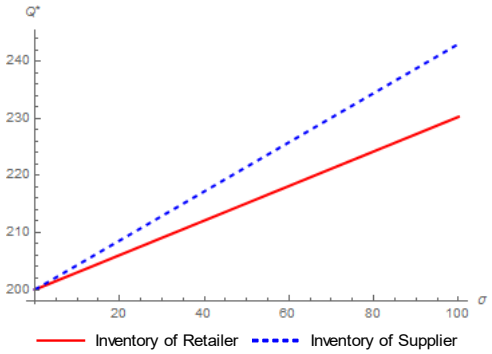

Figure 45 Impact of Demand Uncertainty on Inventory in DMI

With the increase of demand uncertainty, both retailer and supplier tend to increase inventory in order to prevent out of stock, wherein, supplier's inventory increases more than retailer's, because supplier needs to invest more cost for information collection, product promotion and order fulfillment in direct channel due to away from the target market. As in CMI, both retailer and supplier need to accurately predict the market demand before determining their inventory level.

(3) The total inventory of cross-border supply chain (Figure 46)

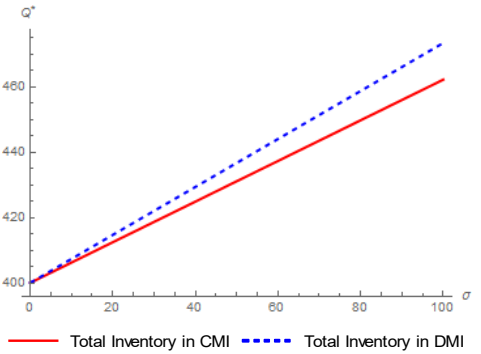

Figure 46 Comparison of Total Inventory between CMI and DMI

Under the same demand uncertainty level, because centralized management has stronger risk resilience, the total inventory of the cross-border supply chain in CMI is lower than in DMI. Therefore, if supplier wants to launch a direct mail channel, it should align with the retailer to jointly manage the inventory, and share the benefits and risks of the entire cross-border supply chain.

6.1.4.2 The Impact of Demand Uncertainty on Profit

(1) In centralized managed inventory mode (Figure 47)

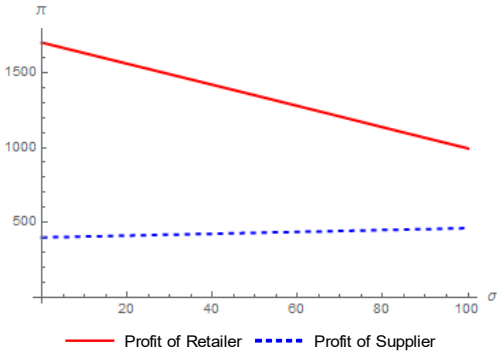

Figure 47 Impact of Demand Uncertainty on Profit in CMI

With the increase of demand uncertainty, the retailer's profits decreased while the supplier's profits increased. The reason is that the retailer operated the total inventory for the dual-channel, so more stock is required under higher demand uncertainty. It increases the retailer's inventory cost while provides supplier more orders.

(2) In decentralized managed inventory mode (Figure 48)

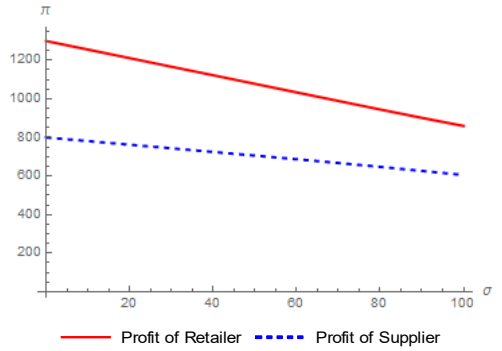

Figure 48 Impact of Demand Uncertainty on Profit in DMI

With the increase of demand uncertainty, the profits of both retailer and supplier are reduced, because the growth of inventory will inevitably lead to increased inventory costs. And the retailer is more affected by the demand uncertainty, because the FTZ warehouse is far away from the product origin, resulting in higher inventory holding cost and shortage cost.

(3) The total profit of cross-border supply chain (Figure 49)

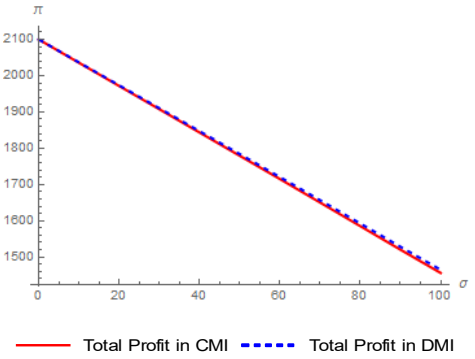

Figure 49 Comparison of Total Profit between CMI and DMI

The total profit of cross-border supply chain has no significantly difference between CMI mode and DMI mode. But comparatively, the supplier can obtain more profit in DMI mode, because some consumers move from retailer to direct channel, which increased supplier's profit significantly. Therefore, in order to avoid price competition, an appropriate contract should be formulated between supplier and retailer to share the benefits and risks of the entire cross-border supply chain.

6.2 Transportation Strategy

The transportation referred here includes two parts: international transportation and local distribution. A great physical distance in CBE needs efficient and stable flow of goods. But this is difficult to attain for a single enterprise, and requires merchants to cooperate with LSPs, especially for SMEs. As an integrator between players in the global distribution and delivery, the importance of the LSPs has increased. With the advancements of global players in the logistics service, a well-designed outsourcing strategy is essential for CBE success in today's global supply chain world.

Based on the survey result, "quality and reliability", "service performance" and "price" are top three criteria, which are most need to be considered for selecting LSPs. The

price is always a key factor in choosing a partner, because the logistics cost will be added in the final commodity prices and affect the customer's choice. A high logistics price will reduce the purchase intention of price-sensitive consumers. And compare with the simple cost reduction, CBE merchants also need to concern a more complex service competition. As the goods need to go through long distance, the reliability and effectiveness of transportation is also important or even more for CBE.

Gronroos (1996, P.30) considered the quality of service as a measure of the degree and the success of outsourcing, and validated it by empirical evidence. Wilding and Juriado (2004, P.628) also found that the most important factor in logistics outsourcing strategies is service-related business through survey and interview with more than 300 consumer goods companies in Europe. Dumrongsiria et al. (2008, P.718) believe that the price and the service are the determinants of consumer shopping options.

Most of the previous research used questionnaire survey and other empirical methods to explore the impact of logistics services on outsourcing strategy, but lack of systematic combing and mathematical proof for the relationship between cost and service. In this section, based on the revenue management theory, the influence of logistics service on pricing and profit will be analyzed by game model. The optimal transportation outsourcing strategy in CBE under service and cost competition will be conducted. The results will help merchants to develop a reasonable logistics outsourcing strategy and improve the service level of CBEL.

6.2.1 Hypothesis and Parameter

Consider a dual-channel cross-border supply chain consists of one CBE merchant and two logistics service providers. The merchant sells the same product by two LSPs' service. In order to focus on the price and service competition and simplify the model calculation, the following assumptions are put forward:

- The market is open and transparent, the competition under the complete information.
- Merchant and LSPs are rational and pursue profit maximization.
- In addition to the logistics service costs, other costs are zero.
- Merchant is the leader of this Stackelberg game, who makes decision according to the LSPs' response function.

The parameters in the model are presented as follows (Table 35):

Table 35 Parameters in Transportation Strategy Model

Notation	Representation
p	The product price of merchant.
t_i	The service price quoted by LSPs. t_1 is the service price of LSP 1; t_2 is the service price of LSP 2.
s_i	The service level provided by LSPs. s_1 is the service level of LSP 1; s_2 is the service level of LSP 2.
c_i	The service cost paid by LSPs. c_1 is the service cost of LSP 1; c_2 is the service cost of LSP 2. The service cost formula is $c(s)=\eta s^2/2$, means that the cost of services will accelerate rise with the improvement of service levels, which is consistent with commercial practices.
η	The service cost coefficient. Because the LSPs are in the same market, and face the same external environment, so their service cost coefficients are same.
θ	Consumer preference coefficient for LSP 1, and $\theta \in [0,1]$, so for LSP 2 is $1\text{-}\theta$. The coefficient depicts the satisfaction of the consumer to the LSP, which affected by brand awareness and service level perceived by consumer.
a	Basic market demand.
β_1	The coefficients of self-price sensitiveness of the demand, which means the reduction from the base demand per unit of self-price increase.
β_2	The coefficient of cross-price sensitivity, reflecting the degree of competition between two LSPs and the migration rate if consumers perceive that there is a difference between prices.
ϕ	The impact strength of prices on demand, equal to β_1/β_2.
γ_1	The coefficients of self-service sensitiveness of the demand, which means the reduction from the base demand per unit of self-service increase.
γ_2	The coefficient of cross-service sensitivity, reflecting the degree of competition between two LSPs and the migration rate if consumers perceive that there is a difference between services
μ	The impact strength of services on demand, equal to γ_1/γ_2.

The cross-border supply chain model was constructed as below (Figure 50):

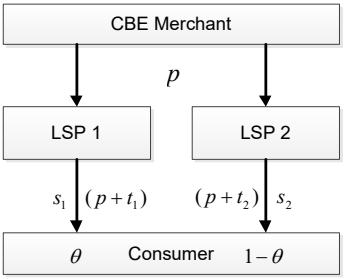

Figure 50 Supply Chain Structure in Transportation Strategy Model

Because the merchant sells the same product through two LSPs, so the demand is only related to logistics price and service level. Referred the linear demand function constructed by Giri and Maiti (2014, P.134), the market demand of two LSPs can be expressed as following:

$$\begin{aligned} D_1 &= \theta a - \beta_1 t_1 + \beta_2 t_2 + \gamma_1 s_1 - \gamma_2 s_2 \\ D_2 &= (1-\theta) a - \beta_1 t_2 + \beta_2 t_1 + \gamma_1 s_2 - \gamma_2 s_1 \end{aligned} \tag{6.20}$$

Where, $a, \beta_i, \gamma_i > 0$. As can be seen, D_i decreases with the increase of β_1 and γ_2, increases with the increase of β_2 and γ_1. That is, the demand of self-channel will decrease with the increase of self-price and rival's service level, and increase with the reducing of self-price and rival's service level. In addition, $\beta_1 > \beta_2, \gamma_1 > \gamma_2$, so $\mu > 1, \phi > 1$, means the impact from self-channel is greater than the other channels. These are consistent with the real situation.

The profit function of CBE merchant is:

$$\pi_m = p(D_1 + D_2) \tag{6.21}$$

The profit function of LSPs is:

$$\pi_i = t_i D_i - c_i \tag{6.22}$$

The profit function of whole cross-border supply chain is:

$$\pi = \pi_m + \sum_{i=1}^{2} \pi_i = \sum_{i=1}^{2} [(p_i + t_i) D_i - c_i] \tag{6.23}$$

Next, under prices and services competition, the case of LSPs in cooperation (Hereinafter referred to as LC) and non-cooperation (Hereinafter referred to as LN) condition will be analyzed separately.

6.2.2 Cooperation between LSPs (LC)

If LSP1 choose to cooperate with LSP 2, which can be considered that two LSPs form an alliance in order to obtain greater benefits in cross-border supply chain, where the total profit of the LSPs is:

$$\pi_s = \sum_{i=1}^{2} (t_i D_i - c_i) \tag{6.24}$$

Firstly, consider the LSPs' logistics price decision, solve the first derivative of t_i:

$$\begin{cases} \dfrac{\partial \pi_s}{\partial t_1} = \theta a - 2\beta_1 t_1 + 2\beta_2 t_2 + \gamma_1 s_1 - \gamma_2 s_2 \\ \dfrac{\partial \pi_s}{\partial t_2} = (1-\theta) a - 2\beta_1 t_2 + 2\beta_2 t_1 + \gamma_1 s_2 - \gamma_2 s_1 \end{cases} \tag{6.25}$$

In order to maximize the profits, let $\partial \pi_s / \partial t_i = 0$, solve the simultaneous equations can obtain the optimal logistics prices in LC scenario:

$$\begin{aligned} t_{1c}^* &= \frac{s_1 K_1 + s_2 K_2 + a(\beta_2 + \theta \Delta\beta)}{2\Delta\beta^2} \\ t_{2c}^* &= \frac{s_1 K_2 + s_2 K_1 + a(\beta_1 - \theta \Delta\beta)}{2\Delta\beta^2} \end{aligned} \tag{6.26}$$

In formula 6.26,

$$\begin{aligned} \Delta\beta &= \beta_1 - \beta_2 \\ \Delta\beta^2 &= \beta_1^2 - \beta_2^2 \\ K_1 &= \beta_1 \gamma_1 - \beta_2 \gamma_2 \\ K_2 &= \beta_2 \gamma_1 - \beta_1 \gamma_2 \end{aligned} \tag{6.27}$$

Put t_{ic}^* into D_i can get optimal demand D_{ic}^*:

$$\begin{aligned} D_{1c}^* &= \frac{\theta a + s_1 \gamma_1 - s_2 \gamma_2}{2} \\ D_{2c}^* &= \frac{(1-\theta) a + s_2 \gamma_1 - s_1 \gamma_2}{2} \end{aligned} \tag{6.28}$$

Then put D_{ic}^{*} into π_m , can obtain the profit of the merchant in LC scenario:

$$\pi_m^c = \frac{p[a + (s_1 + s_2)\Delta\gamma]}{2} \tag{6.29}$$

In formula 6.29, $\Delta\gamma = \gamma_1 - \gamma_2$.

6.2.3 Non-cooperation between LSPs (LN)

In this scenario, there is no cooperation between LSPs, they make decision independently. Merchant and LSPs maximize their own interests respectively.

Firstly, consider the LSPs' logistics price decision, solve the first derivative of t_i :

$$\begin{aligned} \frac{\partial \pi_1}{\partial t_1} &= \theta a - 2\beta_1 t_1 + \beta_2 t_2 + \gamma_1 s_1 - \gamma_2 s_2 \\ \frac{\partial \pi_2}{\partial t_2} &= (1-\theta)a - 2\beta_1 t_2 + \beta_2 t_1 + \gamma_1 s_2 - \gamma_2 s_1 \end{aligned} \tag{6.30}$$

In order to maximize the profits, let $\partial \pi_i / \partial t_i = 0$, solve the simultaneous equations can obtain the optimal logistics prices in LN scenario:

$$\begin{aligned} t_{1n}^{*} &= \frac{s_1 K_3 + s_2 K_4 + a(\beta_2 + \theta K_5)}{4\beta_1^2 - \beta_2^2} \\ t_{2n}^{*} &= \frac{s_1 K_4 + s_2 K_3 + a(2\beta_1 - \theta K_5)}{4\beta_1^2 - \beta_2^2} \end{aligned} \tag{6.31}$$

In formula 6.32,

$$\begin{aligned} K_3 &= 2\beta_1\gamma_1 - \beta_2\gamma_2 \\ K_4 &= \beta_2\gamma_1 - 2\beta_1\gamma_2 \\ K_5 &= 2\beta_1 - \beta_2 \end{aligned} \tag{6.32}$$

Put t_{in}^{*} into D_i can get optimal demand D_{in}^{*} :

$$\begin{aligned} D_{1n}^{*} &= \frac{\beta_1[s_1 K_3 + s_2 K_4 + a(\beta_2 + \theta K_5)]}{4\beta_1^2 - \beta_2^2} \\ D_{2n}^{*} &= \frac{\beta_1[s_1 K_4 + s_2 K_3 + a(2\beta_1 - \theta K_5)]}{4\beta_1^2 - \beta_2^2} \end{aligned} \tag{6.33}$$

Then put D_{in}^{*} into π_m , can obtain the profit of the merchant in LN scenario:

$$\pi_m^n = \frac{\beta_1 p[a + (s_1 + s_2)\Delta\gamma]}{2\beta_1 - \beta_2} \tag{6.34}$$

6.2.4 Equilibrium Analysis and Inference

Proposition 1 There is a positive correlation between logistics price t_i and services level s_i provided by self-channel.

Demonstration:

The first derivatives of the self-price versus self-service in LC scenario are:

$$\frac{\partial t_{1c}^*}{\partial s_1} = \frac{\partial t_{2c}^*}{\partial s_2} = \frac{\beta_1\gamma_1 - \beta_2\gamma_2}{2(\beta_1^2 - \beta_2^2)} \tag{6.35}$$

The first derivatives of the self-price versus self-service in LN scenario are:

$$\frac{\partial t_{1n}^*}{\partial s_1} = \frac{\partial t_{2n}^*}{\partial s_2} = \frac{2\beta_1\gamma_1 - \beta_2\gamma_2}{4\beta_1^2 - \beta_2^2} \tag{6.36}$$

Because $\beta_1 > \beta_2 > 0, \gamma_1 > \gamma_2 > 0$, so $\partial t_i^* / \partial s_i > 0$, no matter in LC or LN scenario, t_i^* increase as s_i increase, QED.

Proposition 2 Service level s_j of competitor will produce spillover effects on own logistics price t_i, and the effect depends on μ and ϕ.

Demonstration:

(1) In LC scenario

The first derivatives of the self-price versus competitor-service are as following:

$$\frac{\partial t_{1c}^*}{\partial s_2} = \frac{\partial t_{2c}^*}{\partial s_1} = \frac{\beta_2\gamma_1 - \beta_1\gamma_2}{2(\beta_1^2 - \beta_2^2)} \tag{6.37}$$

The threshold value of spillover effect can be calculated: $\mu^* = \phi$, there are two cases:

When $1 < \mu_c < \mu^*$, t_i and s_j are negative correlation, because $\partial t_{1c}^* / \partial s_2 < 0, \partial t_{2c}^* / \partial s_1 < 0$;

When $1 < \mu^* < \mu_c$, t_i and s_j are positive correlation, because $\partial t_{1c}^* / \partial s_2 > 0, \partial t_{2c}^* / \partial s_1 > 0$.

(2) In LN scenario

The first derivatives of the self-price versus competitor-service are as following:

$$\frac{\partial t_{1n}^*}{\partial s_2} = \frac{\partial t_{2n}^*}{\partial s_1} = \frac{\beta_2\gamma_1 - 2\beta_1\gamma_2}{4\beta_1^2 - \beta_2^2} \tag{6.38}$$

The threshold value of spillover effect can be calculated: $\mu^* = 2\phi$, there are two cases:

When $1 < \mu_n < \mu^*$, t_i and s_j are negative correlation, because $\partial t_{1n}^* / \partial s_2 < 0, \partial t_{2n}^* / \partial s_1 < 0$;

When $1 < \mu^* < \mu_n$, t_i and s_j are positive correlation, because $\partial t_{1n}^* / \partial s_2 > 0, \partial t_{2n}^* / \partial s_1 > 0$.

QED

Proposition 3 There is a positive correlation between demand D_i and services level s_i provided by self-channel.

Demonstration:

The first derivatives of the self-demand versus self-service in LC scenario are as following:

$$\frac{\partial D_{1c}^*}{\partial s_1} = \frac{\partial D_{2c}^*}{\partial s_2} = \frac{\gamma_1}{2} \tag{6.39}$$

The first derivatives of the self-demand versus self-service in LN scenario are as following:

$$\frac{\partial D_{1n}^*}{\partial s_1} = \frac{\partial D_{2n}^*}{\partial s_2} = \frac{\beta_1(2\beta_1\gamma_1 - \beta_2\gamma_2)}{4\beta_1^2 - \beta_2^2} \tag{6.40}$$

Because $\beta_1 > \beta_2 > 0, \gamma_1 > \gamma_2 > 0$, so $\partial D_i^* / \partial s_i > 0$, no matter in LC or LN scenario, D_i^* increase as s_i increase, QED.

Proposition 4 There is a negative correlation between demand D_i and services level s_j provided by competitor-channel in LC scenario, but exist spillover effects in LN scenario, and the effect depends on μ and ϕ.

Demonstration:

(1) In LC scenario

The first derivatives of the self-price versus competitor-service are as following:

$$\frac{\partial D_{1c}^*}{\partial s_2} = \frac{\partial D_{2c}^*}{\partial s_1} = \frac{-\gamma_2}{2} \tag{6.41}$$

Because $\gamma_2 > 0$, so $\partial D_i^* / \partial s_j < 0$, D_i decrease as s_j increase, QED.

(2) In LN scenario

The first derivatives of the self-price versus competitor-service are as following:

$$\frac{\partial D_{1n}^*}{\partial s_2} = \frac{\partial D_{2n}^*}{\partial s_1} = \frac{\beta_1(\beta_2\gamma_1 - 2\beta_1\gamma_2)}{4\beta_1^2 - \beta_2^2} \tag{6.42}$$

The threshold value of spillover effect can be calculated: $\mu^* = 2\phi$, there are two cases:

When $1 < \mu_n < \mu^*$, D_i and s_j are negative correlation, because $\partial D_{1n}^* / \partial s_2 < 0, \partial D_{2n}^* / \partial s_1 < 0$;

When $1 < \mu^* < \mu_n$, D_i and s_j are positive correlation, because $\partial D_{1n}^* / \partial s_2 > 0, \partial D_{2n}^* / \partial s_1 > 0$.

QED

Proposition 5 The merchant's profit π_m is positively related to the LSPs' service level s_i.

Demonstration:

The first derivatives of the merchant's profit versus LSPs' service in LC scenario are:

$$\frac{\partial \pi_m^c}{\partial s_1} = \frac{\partial \pi_m^c}{\partial s_2} = \frac{p(\gamma_1 - \gamma_2)}{2} \tag{6.43}$$

The first derivatives of the merchant's profit versus LSPs' service in LN scenario are:

$$\frac{\partial \pi_m^n}{\partial s_1} = \frac{\partial \pi_m^n}{\partial s_2} = \frac{p\beta_1(\gamma_1 - \gamma_2)}{2\beta_1 - \beta_2} \tag{6.44}$$

Because $\beta_1 > \beta_2 > 0, \gamma_1 > \gamma_2 > 0$, so $\partial \pi_m / \partial s_i > 0$, no matter in LC or LN scenario, π_m increase as s_i increase, QED.

Proposition 6 The profit of merchant in LC scenario is lower than in LN scenario.

Demonstration:

The difference between the profit of merchant in the case of LSPs cooperation and non-cooperation are as following:

$$\Delta\pi_m = \pi_m^c - \pi_m^n = \frac{-\beta_2 p[a + (s_1 + s_2)\Delta\gamma]}{4\beta_1 - 2\beta_2} \tag{6.45}$$

Because $\beta_1 > \beta_2 > 0, \gamma_1 > \gamma_2 > 0$, so $\Delta\pi_m < 0$, QED.

6.2.5 Conclusions and Recommendations

Through the analysis of equilibrium solution, the following conclusions can be obtained.

(1) Improve service level in self-channel will attract more service-sensitive consumers, but also means more investment. It will result in the growth of logistics price, which is bound to lose the price-sensitive customers.

(2) Because it exits spillover effects, improving service level in self-channel will not necessarily decline the competitor's logistics price and market demand, it is mainly depending on the impact degree of price and service. In other words, the logistics price or service level, which one customers pay more attention to.

(3) The profit of CBE merchant will increase with the LSPs' service improved. However, when the LSPs are in alliance or transportation outsourced only to one LSP, the merchant will lose the initiative in service pricing and result in profit decline.

Therefore, when merchants and LSPs make transportation strategy in cross-border relation, the following points should be noted:

(1) "Price-war" has been unable to meet the requirement of market competition. Enterprises must strive to improve the service level, while trading off between price and service, so that it is conducive to the sustainable growth of profits.

(2) When outsourcing CBE transportation, merchants should choose different LSPs based on phases or channels. For example, when considering the international transportation or direct channel, merchants can cooperate with technologically advanced, perfect network and well-known international LSPs, such as DHL, UPS, FedEx, etc.; when considering domestic distribution, they should choose local LSPs who are more familiar with the local situation.

7. Case Study

The analysis of the previous chapters already indicated that the impacts of internal factors and external factors on the development of CBEL are various. These factors should be taken into account when enterprises formulate e-logistics strategies in cross-border relation. In this chapter, the Walmart Global Store at JD.com Worldwide in China market will be chosen as case study to evaluate the rationality and applicability of the framework proposed in this research.

7.1 The Effect of External Factors

In the framework, the external factors are "Government" and "Consumer", which represent the social environment and determine the development direction of CBEL.

7.1.1 Measures of the Chinese Government

The analysis in Chapter 3 has revealed that, the government's supports include policy formulation and infrastructure construction, which are the indispensable measures for the development of CBE and CBEL.

The development process of Chinese government's is shown in Figure 51.

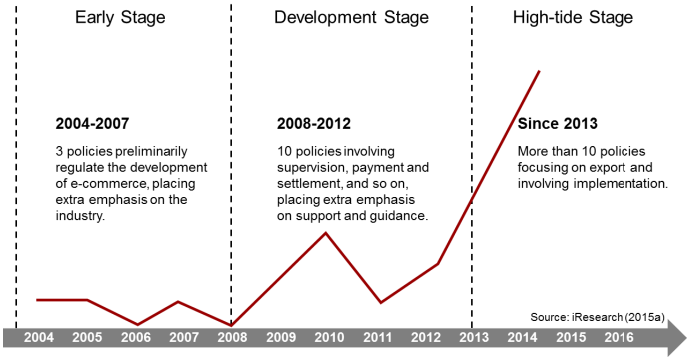

Figure 51 Development of Chinese Government's Policy for CBE

It can be seen, a series of favorable policies for CBE and CBEL have been promulgated continuously from the beginning of 2000, wherein, mainly include:

China's State Council:

- Minimize administrative intervention in the e-commerce market;
- Require to strengthen international cooperation in e-commerce;
- Cultivate a number of public platforms and foreign trade companies, which can provide comprehensive service such as customs clearance, warehousing and financing for CBE;
- Encourage CBE enterprises to expand marketing channels through overseas warehouses, experience stores, etc.

China's General Administration of Customs:

- Confirm the standard procedure of cross-border bonded imports, which is "integration of three orders" (goods order, logistics order, and payment order);
- Give the preferential tax policies for CBE, the tax on goods through bonded import is lower than the general import trade;
- Customs of all localities maintain all-work-all-the-time, and the paper declaration is gradually changed to electronic information system. For imported goods transferred via third-party, no longer required the credentials by transit customs, so that increase the efficiency of customs clearance.
- Fight against the non-standard behavior in bonded import, such as scalping and tax evasion;
- Ratify the construction of 11 FTZs (Shanghai, Tianjin, Chongqing, Fujian, Guangdong, Liaoning, Zhejiang, Henan, Hubei, Sichuan and Shaanxi) and 12 CBE comprehensive pilot cities (Shanghai, Tianjin, Chongqing, Hefei, Zhengzhou, Guangzhou, Chengdu, Dalian, Ningbo, Qingdao, Shenzhen, Suzhou) (Figure 52).

Figure 52 FTZs and CBE Comprehensive Pilots in China

China's General Administration of Quality Supervision:

- Launch "Negative list" management mode to improve import efficiency;
- Issue new policies such as construction of designated port, decentralization of authority, monitoring safety risk of product quality;
- Strengthen the regulation of cosmetics and food, especially for infant formula; require the establishment of bonded cold chain.

China's Administration of Foreign Exchange:

- CBE merchants can use domestic bank cards or Alipay to receive payment orders, and pay foreign partners through qualified third-party agencies or directly through bank with cross-border payment business;
- Increase the single transaction limit of cross-border online shopping from 10,000 to 50,000 yuan.

It is precisely because the China the government's positive initiatives on CBE and CBEL, the GMV of China's CBE import is expected to reach 1.9 trillion yuan in 2018 and contribute about 20% of total import. This confirms the role of the government as an important external factor (Chapter 2) and a powerful organizer (Chapter 3).

7.1.2 Performances of the Chinese Consumers

The consumer performance determines the market demand and the effect of CBEL implementation, which is particularly evident in competitive strategy formulation in Chapter 5 and 6.

The conditions of Chinese cross-border online shoppers are as follows:

- Product attribute: they prefer to purchase products with high security and quality requirements, such as cosmetics, mother & baby supplies, food and health care products. The Products from North America, Asia and Europe are most popular (Figure 53).

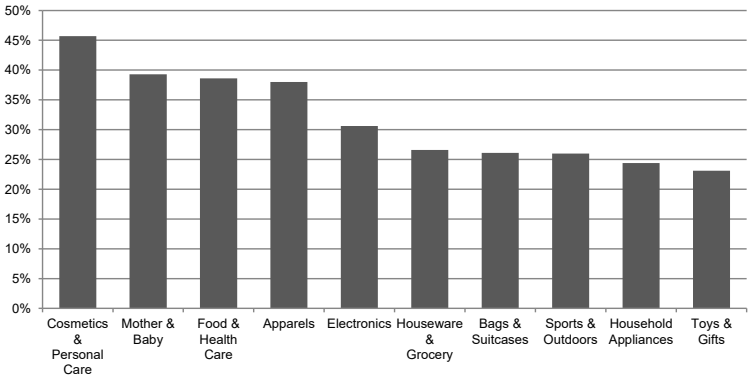

Figure 53 Top 10 Product Categories in China's CBE

- Customer attribute: they are mainly distributed at the age from 20 to 40. And 74.6% of them hold a bachelor degree or above, 25% of them earn more than 10 thousand yuan per month, 66.5% of them have kids. They are mainly concentrated in developed regions of Southeastern coastal. Guangdong and Shanghai accounted for 25% of total shoppers.
- Purchasing channel: they learn about and visit CBE sites mainly via "Shopping Guide Sites". 60.8% of them purchase from "global channel" of domestic merchants such as JD.com, because of convenient payment, easy order tracking, fast delivery and effective return. 44.9% of them purchase from global online marketplaces such as Amazon.com, due to high reputation, guaranteed goods quality and lower price.
- Purchasing reason: 60.7% of them think the quality of foreign products is more assured, 58.6% of them think the prices is lower, and 52.0% of them think the desired products are not sold interiorly.
- Satisfaction and concern: the most demand point for cross-border online shopper are the delivery speed and return convenience, which with a high degree of concern but still need to improve (Figure 54).

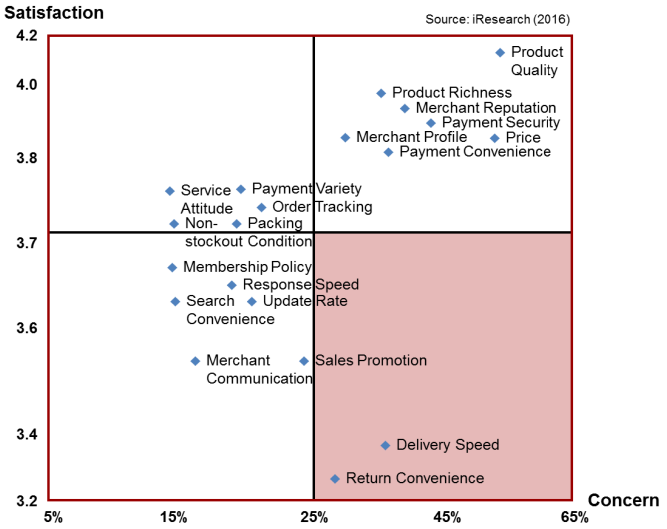

Figure 54 CBE Satisfaction and Concern Matrix of Chinese Consumer

- Payment options: 71.8% of them use third-party payment platforms, 55.7% of them use credit card, and 52.3% of them use online banking.
- Logistics options: 57.2% of them use local express company, 54.8% of them use international express company, 54.5% of them use postal parcel, and 36.6% of them use transit company. In addition, 15.6% of goods are delivered within a week, 38.5% of goods within two weeks and 26.4% within three weeks.

Consumer preferences are mainly reflected in the impact on channel demand. More consumers purchasing means more profits, which is also the purpose of competitive strategy formulation. This confirms the role of the consumer as a non-negligible external factor (Chapter 2) and a direct pusher (Chapter 3).

7.2 The Effect of Internal Factors

Besides the impact of government and consumer, the merchants are the ultimate implementer of CBEL. Under such a favorable external environment in China, considering internal factors “Company”, “Product”, “Operation” and “Partnership” how Walmart (traditional retailer) and JD.com (e-retailer) develop strategy in cross-border relation will be displayed as follows.

7.2.1 Development of Walmart

Walmart Stores, Inc. was founded by American retail legend Mr. Sam Walton in Arkansas in 1962. Over the past 50 years, the company has become one of the most recognized global brands and now the largest retailer in the world. Each week, more than 250 million customers and members visit Walmart's nearly 11,500 stores under more than 70 banners in 28 countries and e-commerce websites in 11 countries. The fiscal revenue of year 2016 is approximately $482.1billion.

In 1996, Walmart entered the Chinese market and opened its first hypermarket and Sam's Club in Shenzhen. Up to 31 Dec, 2016, Walmart has been operating 439 retail units covering 189 cities nationwide, as well as running 9 distribution centers and 11 fresh products distribution centers located in Shenzhen, Beijing, Tianjin, Jiaxing, Shanghai, Hangzhou, Guangzhou, Chengdu, Wuhan, Shenyang, Xiamen, Kunming and Taiyuan.

Since the end of 2010, Walmart began to pay attention to e-commerce and gradually become click-and-mortar retailer owned offline and online channels. In 2010, Sam's Club's online store (www.samsclub.cn) was opened and can provide direct delivery service in cities where the Sam's Club stores located. In 2011, Walmart reached an agreement with Yihaodian (hereinafter referred to as YHD) for extending online platform. In 2012, Sam's Club's online store started to provide chilled and frozen foods with same-day-delivery service in specific cities. In 2014, mobile channel is included in Walmart's multi-channel strategy, Sam's Club App was launched, "Walmart" mobile shopping APP was also launched successively in next year.

2015 is an important milestone of the development of Walmart's e-commerce, mainly in the following two aspects:

(1) Walmart strengthened the integration between the channels, opened hypermarket online-to-offline (O2O) platform "Walmart To Go" in Shenzhen, which accept multiple online and offline e-payment options. At the same year, Walmart launched CBE service "Walmart Global Shop" on its mobile App and offered over 200 items. Walmart promised to guarantee the authenticity and price advantages of these products while offer the same return and refund services at its physical stores.

(2) Walmart increased the investment in online channel, taken full ownership of YHD. However, it didn't help much to strengthen its competitive edge over players in the

e-commerce space or achieve the desired synergies between YHD and its own logistics capabilities. Since bought YHD, the company has seen growth slow. Then, in 2016, Walmart formed a strategic alliance with JD.com, which aims to provide better consumers serve across China through a powerful combination of e-commerce and retail. The development of Walmart's e-commerce in China can be briefly displayed as follows (Figure 55):

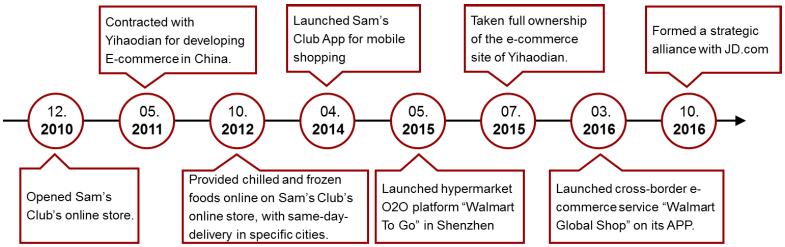

Figure 55 Development of Walmart's E-commerce in China

It can be summarized that, e-commerce is essential for traditional retailer in this information age. The advantages of Walmart are years of supply chain operating experience and low prices of centralized purchasing, but it still lacks online operating experience and the reaction speed for consumer performance. Therefore, cooperating with the e-retailer is an easy and effective way for developing online channel and improving customer service.

7.2.2 Development of JD.com

JD.com (hereinafter referred to as JD) founded in 2004 in Beijing is an overall retailer and a leading one-stop e-commerce platform in China with the 32.6% market share based on transaction volume. The revenue of 2016 reached 658.2 billion yuan. Originally, JD was pure online retailer and provided only electronic products. With the online retailing sales grew substantially, in order to expand product offerings, nowadays, JD operates two business models:

(1) Online direct sales

In this model, JD acts as a traditional retailer. It acquires the products from supplier, and then sells directly to customers through own fulfillment infrastructure. Because JD controls the total supply chain, counterfeits can be effectively prevented in this model. As of 2016, 15 product categories are offered through online direct sales.

(2) Online marketplace

In this model, third-party sellers offer products to customers over JD online marketplace and pay JD commissions on their sales. As of 2016, there are over 120,000 third-party sellers in JD marketplace, including manufacturers, distributors and resellers. Meanwhile, JD leverages own nationwide fulfillment infrastructure to offer third-party sellers additional value-added services, including delivery services or a combination of warehousing and delivery services. In order to keep away counterfeits, in this model, JD has strict criteria for merchant approval, and strict one-strike policy: any merchant found selling counterfeits will be permanently banned from the site and imposed harsh financial penalties.

In 2007, JD made a strategic decision to build and operate own nationwide fulfillment infrastructure and proprietary logistics network, due to the underdevelopment of third-party fulfillment services in China in terms of both warehousing and logistics facilities and last-mile delivery services. This strategy makes it a uniquely strong player in China's online retail industry by providing superior customer experience. The following points can help to understand the general condition of JD's logistics (all data are counted as of 31 December 2016):

- Established fulfillment centers in seven major cities in China: Shenyang, Beijing, Shanghai, Wuhan, Guangzhou, Chengdu and Xi'an (Figure 56). Each of them consists of between 11 and 32 warehouses for normal-sized items, 1 to 2 warehouses for bulky items, and associated sorting centers and related facilities.

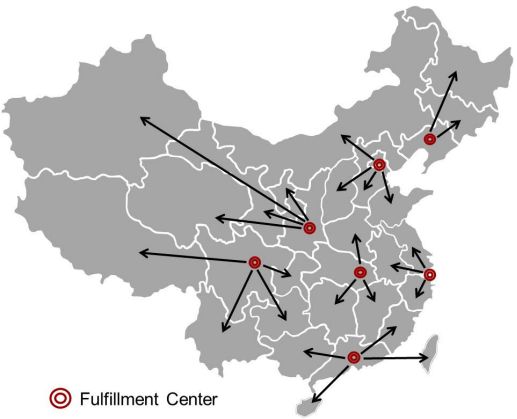

Figure 56 JD's Fulfillment Centers in China

- Established front distribution centers in another 25 major cities in China. Each of them consists of 1 to 2 warehouse stocking products that are in high demand with high turnover.
- Operate 256 warehouses with an aggregate gross floor area of approximately 5.6 million square meters in 54 cities. The annual inventory turnover days were 38.
- Operate 6,906 delivery stations and pickup stations in 2,655 counties and districts across China. Provide same-day and next-day delivery in 1,410 counties and districts across China.
- Maintain cooperation arrangements with a number of third-party couriers to deliver products to those areas not covered by JD's fulfillment infrastructure, particularly in smaller and less developed areas. And also use third-party service providers to ship products from JD's fulfillment centers or front distribution centers to delivery stations or to deliver bulky item products.
- Has 123 sea lines and 108 air lines in its international supply chain, cooperated with numbers of professional and efficient LSPs, such as DHL, Dimerco, Kuehne & Nagel, Agility, APL.
- Operated "JD self-bonded warehouse" in 7 cities: Guangzhou, Shanghai, Ningbo, Hangzhou, Tianjin, Tianjin, Chongqing.

In April 2015, JD launched a CBE platform – "JD Worldwide", which can offered authentic imported products from over 70 countries and regions, covering more than 18,400 brands. At the same time, enabled "joybuy.com" to provide exported products for foreign consumer. Various global or local payment methods can be used for sales outside of China, such as credit card, PayPal or Yandex money. Third-party courier services are used to ship to addresses outside of China, such as UPS, DHL and EMS. The cost of delivery is calculated and charged based on the shipping method, destination country/region and the combined package size and product weight.

It can be summarized that, logistics is significant for e-retailer to improve consumer satisfaction. The advantages of JD are unrivalled nationwide logistics network and sophisticated data-driven delivery technologies, but it still lacks international operating experience and extensive product range. Therefore, cooperating with third-party sellers is an easy and effective way of reducing operating costs and expanding the categories.

7.2.3 Cooperation between Walmart and JD.com

When realizing the strengths of each other, Walmart and JD.com decide to form a strategic alliance so that can expand the breadth and convenience of online shopping options for consumers across China through a powerful combination of e-commerce and retail.

Under the agreement, Walmart acquires a 5% stake of JD, while JD takes the ownership of YHD platform assets, including the brand, website and app. Walmart will continue to operate the direct sales business of YHD and serve as a seller on the YHD platform. In addition, they agreed to several strategic partnerships, including CBE and O2O services in China:

- Open exclusive Sam's Club Flagship Store on JD.com, and offer same and next day delivery through JD's nationwide warehousing and delivery network.
- Open exclusive Walmart Global Flagship Store on JD Worldwide, and expand the availability of Walmart imported products across China.
- Connect with JDDJ to provide 2-Hour grocery delivery from Walmart stores in select cities.

Both companies will leverage their supply chain to extend the range of import goods in order to meet the growing demands from increasingly affluent and quality-oriented Chinese consumers. The deal is a win-win game, especially for Walmart. The partnership with JD will definitely broaden Walmart's consumer base beyond its current city-scope and will let the company leapfrog its expansion. This is mainly manifested in two aspects: on the one hand, expand Walmar's opportunity in e-commerce by access to JD's online traffic; on the other hand, Walmart will be listed as a preferred retailer by JD, which is expected to drive traffic to its brick-and-mortar stores in China.

In summary, the alliance offers a fresh start to Walmart's struggling retail business in China, especially for CBE business. Currently, Walmart Global Store operates two models of CBEL (Figure 57):

(1) Bonded import

The popular categories, such as Mom&Baby products, cosmetics and personal care, will be pre-stock in FTZ warehouse, especially before the hot season, such as online

shopping festival at November 11 unique to China. Then the products are quickly distributed to the whole China by JD logistics. In this mode, the fulfillment time is almost the same as domestic delivery.

(2) Direct mail

The long tail products or perishable products, such as on-board equipment and fresh food, will be direct delivered from Walmart's overseas warehouse to China airport by international express FedEx. Then, local LSPs are responsible for distributing them to the whole China. In this mode, consumers usually need to wait for one or two weeks, but can obtain the products with the latest shelf life.

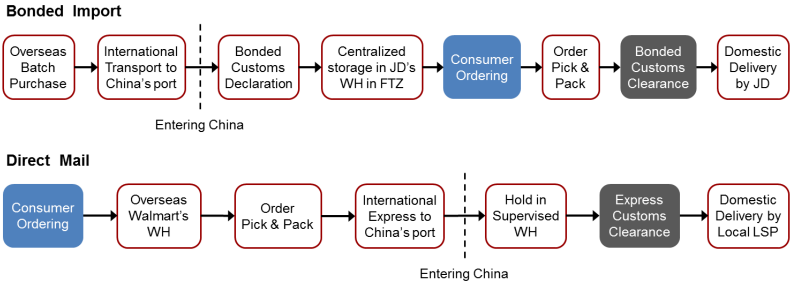

Figure 57 Walmart's CBEL model in China

Based on these two models, most of the orders come from the southeast coastal cities and districts, wherein, Guangdong, Beijing, Jiangsu, Shanghai, Zhejiang and Fujian accounted for 61.33% of the total orders. (Figure 58)

Figure 58 Order Distribution of Walmart Global in China

Considering this situation, Walmart has also developed two CBEL strategies. For bonded import channel, Walmart stock products centralized in JD's FTZ warehouse at Guangzhou, which aims to use JD's powerful e-logistics capability to improve customer service. However, Guangzhou located in China's southernmost, from where to fulfillment the whole China will result in high logistics cost. Therefore, for direct mail channel, Walmart used FedEx for international transportation and outsourced domestic distribution to local LSP in Shanghai. (Figure 59)

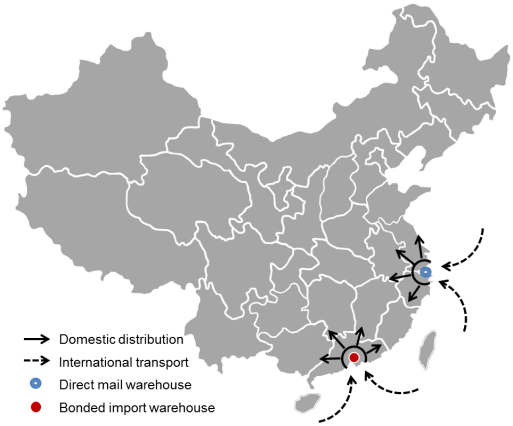

Figure 59 Walmart Global's CBEL Strategy in China

To sum up, the development of Walmart and JD.com in China and their CBEL strategy verified the rationality and applicability of the framework proposed in this research very well. Based on the vigorous support by Chinese government and the online shopping enthusiasm of Chinese consumers (External Factors), Walmart decided to turn from traditional retailer into click-and-mortar (Company Factor), and formed a strategic alliance with JD.com (Partnership Factor) for integrating online and offline (Logistics Strategy Decision) and extending category (Product Competition Strategy). Walmart Global Store operated different channels (Inventory Strategy) for different goods (Product Factor). For boned import channel, they rely on excellent JD e-logistics (Service Competition Strategy) to improve customer service. And for direct mail channel, in order to reduce logistics cost (Operation Factor), they outsourced international transportation and domestic distribution respectively to international express and local LSP (Transportation Strategy).

8. Conclusions and Prospects

In this chapter, the results of all chapters were consolidated to answer research questions presented at the beginning. Propositions and conclusions that may lead to better adoption of this new practice with more desirable implementation outcomes were identified. At last, the limitations of the study and guides the direction of future research were pointed out.

8.1 Synopsis and Contribution Value

With the booming development of CBE, the requirements for logistics services quality continue to increase. Because the products in CBE often require long distance transport, the fulfillment time, reliability and flexibility of CBEL become the focus of consumer concern. In order to improve logistics service and reduce the cost, e-logistics, the application of modern ICTs in logistics process, need to be implemented in cross-border relation.

The overall aim of this thesis is to develop a conceptual framework for answering the key question: How to develop an effective and competitive CBEL? More specifically, three sub-questions are finally answered in the end, and the corresponding chapter results are explained as follows.

(1) What is the current situation of CBE and e-logistics?

This question is the origin of this thesis. In order to map and assess the existing intellectual territory about CBE and e-logistics, 24 recent research reports were systematically reviewed in Chapter 1. The advanced technology, the growing demand and the advantageous policy, are main drivers for CBE booming globally. Meanwhile, culture and consumer behavior, laws and regulations, product and marketing issues, payment conditions and logistics limitations were identified as the main obstacles to its success.

Among these obstacles, the logistics-related issues were showed to be the strongest concern in the industry, because the products in CBE often require long distance transport, wherein, long transportation time, bad return service and high shipping cost are increasingly prominent. In order to improve logistics service and reduce operation cost, e-logistics, the application of modern ICTs in logistics process, needs to be implemented in cross-border relation, which consists of e-procurement and e-fulfillment. And based on the goods shipped from overseas warehouse or FTZ

warehouse, three main CBEL models are adopted currently: direct mail, goods collection and bonded import.

The challenge facing in CBE can't be solved unilaterally. It needs all parties perform their duties and cooperate whole heartedly. The governments and organizations should release a series of favorable policies for CBE developments, as well as the great investments in infrastructure. The merchants need take localization efforts and have cultural sensitivity, but when lack of adequate information about foreign market operations, cooperating with third party service providers who are familiar with local regulations and consumer's behavior is an effective solution.

(2) What factors affect cross-border e-logistics developing?

This question is the basis of the entire thesis. In order to find the main factors affecting the implementation of e-logistics in cross-border relation. In Chapter 2, firstly, 21 initial factors were found by systematic reviewing 582 articles; secondly, they are preliminary classified into 7 groups including company, product, country, market, technology, operation and partnership by a focus group discussion. Then a two-level hierarchy comprised of 7 high-level key dimensions and 21 detailed-level were constructed.

However, the results summed up by literature review and focus groups have strong subjectivity. In order to group the meaningful factors together and replace most of the information of the original variable with fewer independent factor variables, a questionnaire survey was designed to collect data for factor analysis and distributed to the case enterprises in China and Germany. The top ten factors scoring by Chinese and German participants are basically the same except the sequence, but Chinese enterprises think the internal influences are more important, such as human factor, while German enterprises believe that the impact of external influences more significant, such as cultural difference.

Based on the survey data, a conceptual framework was formed with the six key factors composed of nineteen indicators through an exploratory factor analysis with principal component extraction and varimax rotation. In the framework, the external factors are the "Government" and "Consumer", which represent the social environment and determine the direction of enterprise; the internal factors include "Company", "Product", "Operation" and "Partnership", which are organization condition and determine the strategy formulation of the enterprise.

(3) How to formulate a competitive strategy of cross-border e-logistics?

Firstly, Chapter 3 indicated how external factors affect enterprise strategy design. Broadly speaking, developing CBEL is not an isolated act of a single enterprise, but a joint action by all the parties involved. Thus, a trilateral game model was used to clearly understand the relationship between government, merchant and consumer. Because they have different status and goals in the implementation of CBEL, their impacts are not the same. As an organizer, the government plays a key leading role and has two main strategies: one is prudent regulation based on fiscal and tax regulatory supervision, such as offering tax exemption to merchant who implemented CBEL, taking more strict checks and tax evasion penalty on the consumers who used postal parcel; another is active regulation based on special funds investment, such as improving infrastructure construction, increasing publicity and promotion efforts.

According to the mixed-strategy equilibrium solution of the trilateral game, the following suggestions need to be taken into consideration when promote the development of CBEL, so that the effectiveness of the government regulation can be improved:

- Form and prefect the incentive mechanism. Raise the subsidies for merchants who implemented CBEL, and strengthen the supervision for consumers who purchased via traditional logistics channel, will not increase the efficiency of the government regulation. When a proper incentive mechanism is absent, even if the government increases the investment to develop infrastructure construction and motivate consumers to purchase via CBEL channel, the actual result will be counterproductive.
- Emphasize the sustainable development of CBEL. The prudent regulation can promote the development of CBEL but just in a short term, the sustainable development cannot solely rely on the subsidies and penalty. Relatively, by the equilibrium solution analysis, the active regulation could effectively increase the merchant's implementing probability and the consumers' purchasing probability. Therefore, the focus of the government regulation should be shifted to infrastructure construction, propaganda and popularization.
- Priority to improve the infrastructure construction of CBEL. In the case of the effective investment unchanged, if government increases the proportion of the merchant's profit, so that can motivate the merchant to implement CBEL.

Therefore, in order to reduce the operation cost for the merchants, the government should prioritize to perfect the infrastructure construction. This has proved to be a good way to improve the efficiency of government regulation.

Secondly, in addition to the support from the government, the merchant should also actively seek effective approach for resolving the problems encountered in the development of CBEL. In Chapter 4, based on the survey data of case enterprises, considering internal factors “Company” and “Product”, a general normative decision model was presented, which can help merchants adapt the “logistics strategy” to possible forms of the “logistics problem” in CBE.

The logistics problems were described according to two groups of factors: the product features and the logistics services. Combined the overall complexity of them, the logistics problems matrix was classified into four clusters: “Product-Side Complexity”, “Service-Side Complexity”, “High-Complexity” and “Relatively Easy”. Then, according to who will be in charge of which part of logistics’ activities, the logistics strategies were classified into “Full in-house”, “Merchant managed”, “Supplier managed”, “Drop-shipping”, “LSP managed” and “Full outsourced”. Based on “logistics problem-strategy matrix”, the decision model contains 5 steps:

- Determine direction: understand what types of enterprises you belong to, and what kind of product you intend to sell.
- Identify drivers: collect the realistic and objective data about the product features and the logistics service, referring to the list of drivers proposed before.
- Evaluate complexity: involve the experts from different departments to value the complexity of each factor according to the five-level scale.
- Define logistics problem: assess the combined complexity values of product features and logistics service and plot them on the problem-matrix. According to their position, find the logistics problem belongs to which cluster.
- Select logistics strategy: in final stage, integrate the nature of business and the type of the logistics problem, match the reasonable logistics strategies in accordance with the relations identified in problem-strategy matrix.

Thirdly, besides the logistics problems encountered by self, the merchants should also take into account the increasingly fierce competition between each other. In addition, they are also facing the dual competition of product and service in CBE. Because of

long distance transportation in CBE, the consumer demand is not only product itself, but also good logistics services. In Chapter 5, based on consumer utility, a game model was used to analyze how differentiation of internal factors “Product” and “Operation” impact the formulation of competitive strategy. Finally, the optimal pricing and service level in centralized and decentralized decision were generated. And the following conclusions can be obtained through the equilibrium solution and the numerical analysis:

- Whether in centralized or decentralized decision, the service level and total profit in cross-border supply chain are negatively related to the product price sensitivity of consumer, the service cost coefficient of merchant, the degree of product differentiation between merchants, but positively related to the service level sensitivity of consumer.
- Keeping the product differentiation unchanged, cross-border supply chain can obtain more profit in centralized decision with a higher level of service. However, there exist spillover effects in decentralized decision, when the product differentiation is great than the threshold value, the result is exactly the opposite, and the supply chain with a lower level of service can get more profits.
- Whether in centralized or decentralized decision, the degree of service differentiation between merchants are negatively related to the product price sensitivity of consumer, the service cost coefficient of merchant, but positively related to the service level sensitivity of consumer. And its relationships with the consumer channel preferences and the total profit of cross-border supply chain were affected by the combination of factors. Merely increase the degree of differentiation is not necessarily able to improve own competitiveness and benefit for cross-border supply chain, even disutility.
- Keeping the service differentiation unchanged, cross-border supply chain can obtain more profit in centralized decision. And keeping the service cost coefficient unchanged, whether in centralized or decentralized decision, higher service differentiation can create more profits for cross-border supply chain.

Fourthly, the complexity of CBEL is difficult to attain for a single enterprise, it requires cooperation between members in cross-border supply chain. Nowadays, more and more enterprises assign their logistics demand to LSP, wherein, the main components of e-logistics, warehousing and transportation are the most frequently

outsourced logistics activities. In Chapter 6, overseas supplier, CBE retailer and LSPs tradeoff between cost and service in the dual-channel supply chain, internal factors "Operation" and "Partnership" were considered for making competitive inventory and transportation strategy in cross-border relation.

The optimal inventory strategy in centralized and decentralized managed were obtained. And the following conclusions can be also generated through the equilibrium solution and the numerical analysis:

- In the centralized managed inventory mode, only the retailer own inventory and order from the supplier to meet the demand for both bonded channel and direct channel, that is, the retailer implements a duel-channel strategy. With the increase in demand uncertainty, retailer tends to add inventory in order to prevent out of stock, which leads to two consequences, on one hand, retailer loses profits due to the growth of inventory cost; on the another hand, supplier obtains more profits because of the growth of orders. So retailers are required to accurately forecast market demand before ordering products from suppliers.
- In the decentralized managed inventory mode, retailer and supplier hold inventory independently, the demand of bonded channel is met by retailer, and meantime, supplier meet the demand of direct channel. With the increase of demand uncertainty, both retailer and supplier will lose their profit due to the growth of inventory. And retailer is more affected by uncertainty, because the FTZ warehouses are always far from the products' origin, the inventory cost and shortage cost of bonded channel are higher than direct channel. As with centralized mode, both retailer and supplier need to accurately predict the market demand before determining their inventory level.
- Under the same demand uncertainty level, because centralized management has stronger risk resilience, the total inventory of the cross-border supply chain is lower than in decentralized managed inventory mode. Therefore, if suppliers want to launch a direct mail channel, they should align with the retailers to jointly manage the inventory. However, the interests of merchants will be damaged when suppliers operate direct channel, in order to avoid price competition, an appropriate contract should be formulated to ensure sharing of the benefits and the risks between suppliers and retailers.

Then, the optimal transportation strategy under LSPs cooperation and non-cooperation condition was obtained. And the following conclusions can be also generated through the equilibrium solution and the numerical analysis:

- Improve logistics service level in self-channel will attract more service-sensitive consumers, but also means more investment. It will lead to the growth of logistics prices, which is bound to drain the price-sensitive customers.
- Because of spillover effects, improving logistics service level in self-channel will not necessarily decline the competitor's logistics price and market demand, it is mainly depends on the impact degree of price and service. In other words, the logistics price or service level, which one customers pay more attention to.
- The profit of merchant's will increase as the LSPs' service level improved. However, when the LSPs are in alliance or transportation outsourced only to one LSP, the merchant will lose the initiative in service pricing and result in profit decline. Hence, when outsourcing CBE transportation, merchants should choose different LSPs based on phases or channels. For example, for international transportation or direct channel, merchants can cooperate with technologically advanced, perfect network and well-known international LSPs, such as DHL, UPS, FedEx, etc.; but when considering domestic distribution, they should choose local LSPs who are more familiar with the local situation.

Finally, the Walmart Global Store at JD.com Worldwide in China market was chosen as case study, their CBEL strategy verified the rationality and applicability of the framework proposed in this research. The analysis of the previous chapters already indicated that the impacts of internal factors and external factors on the development of CBEL are various. These factors should be taken into account when enterprises formulate e-logistics strategies in cross-border relation. Based on the vigorous support by Chinese government and the online shopping enthusiasm of Chinese consumers (External Factors), Walmart decided to turn from traditional retailer into click-and-mortar (Company Factor), and formed a strategic alliance with JD.com (Partnership Factor) for integrating online and offline (Logistics Strategy Decision) and extending category (Product Competition Strategy). Walmart Global Store operated different channels (Inventory Strategy) for different goods (Product Factor).

For boned import channel, they rely on excellent JD e-logistics (Service Competition Strategy) to improve customer service. And for direct mail channel, in order to reduce logistics cost (Operation Factor), they outsourced international transportation and domestic distribution respectively to international express and local LSP (Transportation Strategy).

So far, all the research questions were perfectly answered. And all chapters and contents are closely linked around the framework for developing e-logistics in cross-border relation (Figure 60).

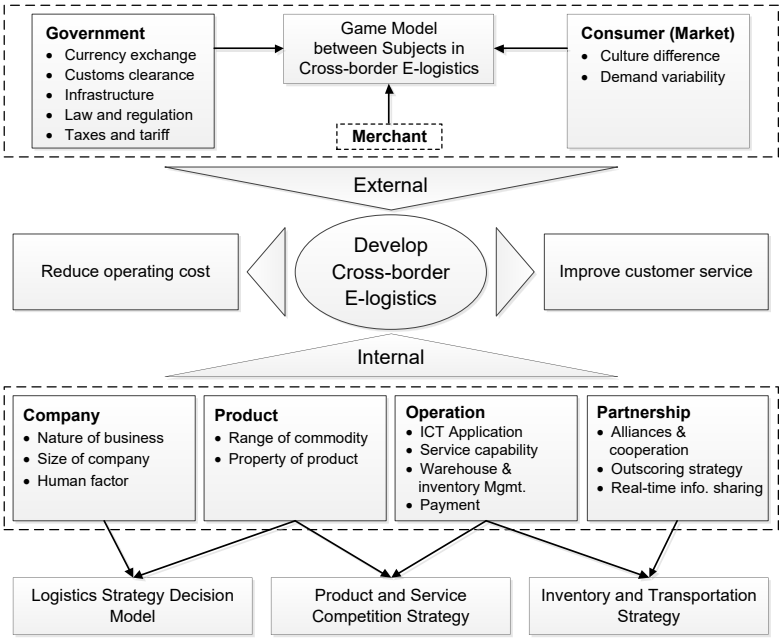

Figure 60 Overview of Thesis

The factors affecting the development of CBEL are highly complex, previous studies provided various single factor or focused on a particular factor, but ignoring the bigger picture. Meanwhile, numerous articles on e-commerce and international logistics have been published over the last two decades, none have thoroughly reviewed nor concluded to the implementation of e-logistics in cross-border e-commerce research. The framework proposed in this research contains two major extensions of the existing studies.

- The existing frameworks have only considered the effects on e-commerce or international logistics respectively. This proposed framework enriches the studies by combine both and through the entire cross-border supply chain.
- None of the existing frameworks classified these factors and investigated the impacts between them. This proposed framework explicitly incorporates internal and external influence factors as new antecedents for developing e-logistics in cross-border relation.

It provides academics a clear knowledge of where the field currently stands and the type of research that is needed to advance. In addition, the outcomes of this thesis have also practical significances.

- Revealed existing problems of CBEL developing.
- Found out the key factors affecting CBEL developing.
- Formulated the comprehensive CBEL strategy to support enterprises increase the competitive advantage in CBE.

8.2 Limitations and Future Research

As with any other piece of research, the present thesis is subject to a number of limitations, some of which can serve as extensions for future research.

- The references for literature review in Chapter 2 are limited to the articles published as of the end of 2016. E-commerce is developing rapidly, future research should base on the latest articles, which can be searched by more databases and keyword combinations.
- The questionnaire survey in Chapter 2 is limited to its range and region. Although many international merchants have been included, only German and Chinese enterprises were involved finally due to the convenient geographical environment. An extension to include other countries and more experts will be the object of future research.
- The result of factor analysis in Chapter 2 is limited to the number of samples. With the increase in the number of samples, the results of the factor analysis are more stable. In view of the limited number of participants in this survey and the hierarchy of factors, a multi criteria decision making for ranking different alternatives such as analytical hierarchy process (AHP), can be integrated with the factor analysis for more reliable results in subsequent studies.

- The definition and classification of logistics problems and logistics strategies in Chapter 4 are limited to the reference factors. Subsequent studies can expand the factors considered, or replaced by other factors with greater impact. In addition, “flash sales” enterprises can be considered in future researh, which focus on the end-of-season or unsold products offered only to club members through sale Campaigns lasting just a few days.
- The game models used for competitive strategies in Chapter 3, Chapter 5 and Chapter 6 are limited to the hypothesis. All of them were based on complete information under a single game. In the case of information asymmetry, the repeated game among the participants is the direction of future research. In addition, dual-channel model in Chapter 5 and Chapter 6 only considered two-oligopoly in cross-border supply chain. Subsequent studies can involve multi-party competition.
- The validation of the framework in Chapter 7 is limited to one case study. Whether the framework is applicable to other types of merchant in other countries remains to be verified in subsequent studies.

Reference

Accenture. (2012), *European Cross-border E-commerce: The Challenge of Achieving Profitable Growth*, Dublin: Accenture Publications.

Accenture and AliResearch. (2015), *The prospect for the global cross-border B2C e-commerce market*, Beijing: AliResearch Publications.

Adyen. (2015), *Cross-Border Payments-Opportunities and Best Practices For Going Global*, San Francisco: Adyen Publications.

Agatz, N.A.H., Fleischmann, M. and Nunen, J.A.E.E.V. (2008), "E-fulfillment and multi-channel distribution: a review", *European Journal of Operational Research*, Vol.187 No.2, pp.339-356.

Alkadi, I., Alkadi, G. and Zhu, Z. (2004), "Growth of international franchising through E-commerce", *Human Systems Management*, Vol.23, pp.269-273.

AliResearch. (2015), *"Internet +" Report*, Beijing: Alibaba group.

Analysys. (2015), *The research report of China's cross-border import e-commerce market*, Beijing: Analysys Ltd. Publications.

Angela, B., Gemma, C. and Rumona, D. (2013), *Doing a Systematic Review: A Student's Guide*, London: SAGE Publications.

Ashworth, C.J., Schmidt, R.Ä., Pioch, E.A., and Hallsworth, A. (2006), "An approach to sustainable 'fashion' e-retail: a five-stage evolutionary strategy for 'clicks-and-mortar' and 'pure-play' enterprises", *Journal of Retailing & Consumer Services*, Vol.13 No.4, pp.289-299.

Bartlett, M.S. (1951), "A further note on tests of significance in factor analysis", *British Journal of Psychology*, Vol.4, pp.1-2.

Bayles, D.L. (2002), "E-Logistics and E-Fulfillment: Beyond the Buy Button", *UNCTAD WORKSHOP*, CURAÇAO, 25-27 June 2002.

Bhuiyan, M.N.K. (2013), "Application of E-SCM Strategies to Enhance Efficiency and Effectiveness in the Clothing Retail Sector", *Industrial Engineering Letters*, Vol.3 No.10, pp.11-21.

Boer, L.D., Harink, J., and Heijboer, G. (2002), "A conceptual model for assessing the impact of electronic procurement", *European Journal of Purchasing & Supply Management*, Vol.8 No.1, pp.25-33.

Boyer, K.K. (2001), "E-operations: a guide to streamlining with the internet", *Bus Horizon*, Vol.44 No.1, pp.47-54.

Bulger, S. (2013), "What is Order Fulfillment?", *eFulfillment Service Blog*, available at: http://www.efulfillmentservice.com/2013/01/what-is-order-fulfillment/ (accessed 15 January 2013)

Burinskiene, A. (2012), "International trade and e-commerce in the practice of enterprises activity", *European Journal of Biochemistry*, Vol.270 No.6, pp.3026-3035.

Cai, G. (2010), "Channel Selection and Coordination in Dual-Channel Supply Chains", *Journal of Retailing*, Vol.86 No.1, pp.22-36.

Carlton Mansfield. (2015), *Research on Cross-Border-E-Commerce Free Trade Zone*, Hongkong.

Chamberlin, T.C. (1965), "The method of multiple working hypotheses: with this method the dangers of parental affection for a favorite theory can be circumvented", *Science*, Vol.148 No.3671, pp.754.

Chen, L.D., Gillenson, M.L. and Sherrell, D.L. (2004), "Consumer acceptance of virtual stores: A theoretical model and critical success factors for virtual stores", *Database for Advances in information systems*, Vol.359 No.2, pp.8-31.

Chen, J. and Yang, Y. (2014), "Service Cooperation Policy in a Dual-Channel Supply Chain under Service Differentiation", *American Journal of Industrial and Business Management*, Vol.4 No.6, pp.284-294.

Child, D. (2006), *The essentials of factor analysis (3rd ed.)*, New York: Continuum International Publishing Group.

CECRC. (2016), *The monitoring report of China's e-commerce market data in 2015*, Hang Zhou: China Ecommerce Research Center.

Cho, J.J., Ozment, J. and Sink, H. (2008), "Logistics capability, logistics outsourcing and firm performance in an e-commerce market", *International Journal of Physical Distribution & Logistics Management*, Vol.38 No.5, pp.336-359.

CNNIC. (2015), *The statistic report of China Internet network development state*, Beijing: China Internet Network Information Center.

Colliers. (2015), *Crossing Borders, Changing Times:A new model for international e-commerce has strong implications for China's bonded logistics property market*, Shanghai: Colliers international Publications.

Corina, P.S. (2011), "The role of the e-procurement in the purchasing process", *Annals of the University of Oradea Economic Science*, Vol.1 No.2, pp.687-691.

CRIENGLISH. (2016), "China decides to add 7 new free trade zones", available at: http://www.scio.gov.cn/32618/Document/1489719/1489719.html (accessed 1 September 2016).

Cronbach, L.J. (1951), "Coefficient Alpha and Internal Structure of Tests", *Psychometrika*, Vol.16 No.3, pp.297-334.

Croom, S.R. (2005), "The impact of e-business on supply chain management", *International Journal of Operations & Production Management*, Vol.25 No.1, pp.55-73.

Croom, S. and Brandon-Jones, A. (2007), "Impact of e-procurement: Experiences from implementation in the UK public sector", *Journal of Purchasing & Supply Management*, Vol.13 No.4, pp.294-303.

Croxton, L.K. (2003), "The Order Fulfillment Process", *International Journal of Logistics Management*, Vol.14 No.1, pp.19-32.

Delfmann, W., Albers, S. and Gehring, M. (2002), "The impact of electronic commerce on logistics service providers", *International Journal of Physical Distribution & Logistics Management*, Vol.32 No.3, pp.203-222.

Deutsche Bank. (2014), *China-EU relations: Gearing up for growth*, Frankfurt am Main.

DHL. (2013), *Shop the world!: Consumer attitudes towards global distance selling*, Bonn: Deutsche Post AG Publications.

DHL. (2015a), *Cross border E-commerce: An operator's perspective*, Königswinter: DHL Publications.

DHL. (2015b), *Insight on E-Commerce & Collaboration*, Brussels: DHL Publications.

Dumrongsiri, A., Fan, A. and Jain, A. (2008), "A supply chain model with direct and retail channels", *European Journal of Operational Research*, Vol.187 No.3, pp.691-718.

Ecommerce Europe. (2015), *e-Logistics: A need for integrated European solutions*, Brussels: Ecommerce Europe Publications.

eCommerceMILO. (2013), "Understanding E-Commerce Fulfillment", available at: http://www.ecommercemilo.com/2013/07/understanding-e-commerce-fulfillment.html (accessed 15 July 2013).

Erickson, J. (2015), "Cross-Border E-Commerce To Reach $ 1 Trillion In 2020", *Alizila*, available at: http://www.alizila.com/cross-border-e-commerce-to-reach-1-trillion-in-2020/ (accessed 11 June 2015).

Fernie, J. and Sparks, L. (2009), *Logistics & Retail Management - Emerging issues and new challenges in the retail supply chain (3rd ed.)*, London: Kogan Page Ltd.

Forrester. (2014), *Seizing The Cross-Border Opportunity Businesses Can Go Global*, Cambridge: Forrester Publications.

Froelich, I. (2014), *Preparing your organization for cross-border ecommerce*, Amsterdam: Payvision Publications.

GTAI. (2016), "Customs and Import Arrangements", *Germany Trade & Invest*, available at: http://www.gtai.de/GTAI/Navigation/EN/Invest/Investment-guide/The-tax-system/customs.html (accessed 11 March 2016).

Ghezzi, A., Mangiaracina, R. and Perego, A. (2012), "Shaping the e-commerce logistics strategy: a decision framework", *International Journal of Engineering Business Management*, Vol.4 No.1, pp.1-13.

Giménez, C. and Lourenço, H.R. (2004), "E-Supply chain management: Review, implications and directions for future research", *UPF Economics and Business Working Paper*, No.769, pp.1-46.

Giri, B.C. and Maiti, T. (2014), "Service competition in a supply chain with two retailers under service level sensitive retail price and demand", *International Journal of Management Science and Engineering Management*, Vol.9 No.2, pp.133-146.

Gudehus, T. and Kotzab, H. (2012), *Comprehensive Logistics (2nd ed.)*, Heidelberg: Springer.

Gunasekaran, A. and Ngai, E.W.T. (2003), "The successful management of a small logistics company", *International Journal of Physical Distribution & Logistics Management*, Vol.33No.9, pp.825-842.

Gunasekaran, A., Ngai, E.W.T. and Cheng, T.C.E. (2007), "Developing an E-Logistics System: A Case Study", *International Journal of Logistics: Research & Applications*, Vol.10 No.4, pp.333-349.

Gunasekaran, A. and Kobu, B. (2007), "Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications", *International Journal of Production Research*, Vol.45 No.12, pp.2819-2840.

Gough, D., Oliver, S. and Thomas, J. (2012), *An Introduction to Systematic Reviews*, California: SAGE Publications Ltd, 2012.

Gordon, J. (2014), *EU-China E-Commerce Development*, Europe: Europe China Research and Advice Network Publications.

Grant, M.R. and Bakhru, B. (2004), "The limitations of internationalization in e-commerce", *European Business Journal*, Vol.16 No.3, pp.95-104.

Gronroos, R.A. (1996), "The Value Concept and Relationship Marketing", *European Journal of Marketing*, Vol.30 No.2, pp.19-30.

Hafeez, K.; Keoy, K.H.A.; Zairi, M.; Hanneman, R. and Koh, S.C. Lenny. (2010), "E-supply chain operational and behavioural perspectives: an empirical study of Malaysian SMEs", *International Journal of Production Research*, Vol.48 No.2, pp.525-546.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate data analysis*, Upper Saddle River: Prentice Hall.

Hesse, M. (2002), "Shipping news: the implications of electronic commerce for logistics and freight transport", *Resources, Conservation & Recycling*, Vol.36 No.3, pp.211-240.

Hernandez, R.L., Cervera, C.M., Flores, J.L.M. and Arroyo, J.C. (2014), "Critical success factors for the implementation of an e-logistics system: An exploratory study", *Journal of Strategic and International Studies*, Vol.4 No.3, pp.5-12.

Ho, G.T.S., Choy, K.L. and Lam, C.H.Y. (2012), "Factors influencing implementation of reverse logistics: a survey among Hong Kong businesses", *Measuring Business Excellence*, Vol.16 No.3, pp. 29-46.

Hotelling, H. (1929), "Stability in competition", *Economic Journal*, Vol.39 No.153, pp.41-57.

Hu, Y.C., Chiu, Y.J., Hsu, C.S. and Chang, Y.Y. (2015), "Identifying Key Factors for Introducing GPS-Based Fleet Management Systems to the Logistics Industry", *Mathematical Problems in Engineering*, Vol.8, pp.1-14.

Huang, Y.K., Kuo, Y.W. and Xu, S.W. (2009), "Applying importance-performance analysis to evaluate logistics service quality for online shopping among retailing delivery", *International Journal of Electronic Business Management*, Vol.7 No.2, pp.128-136.

Hultkrantz, O. and Lumsden, K. (2001), "E-commerce and Consequences for the Logistics Industry", In: Seminar on "The Impact of E-commerce on Transport", Paris, 5-6 June 2001, pp.1-6.

Hung, H.N. (2012), "Operations in an e-commerce company: how your operations affect your service level", available at: http://www.slideshare.net/hynohun/operations-in-an-eco mmerce-company-how-your-operation-affect-your-service-level (accessed 22.07.2012)

Hung, W.H., Lin, C.P., Tai, Y.M., Ho, C.F. and Jou, J.J. (2014), "Exploring the impact of web-based e-procurement on performance: organisational, interorganisational, and systems perspectives", *International Journal of Logistics Research & Applications*, Vol.17 No.3, pp.200-215.

Hwang, W., Jung, H.S. and Salvendy, G. (2006), "Internationalisation of e-commerce: a comparison of online shopping preferences among korean, turkish and us populations", *Behaviour & Information Technology*, Vol.25 No.1, pp.3-18.

Interlog. (2010), "Logistics Outsourcing", *Service Supply Chain Benchmark Study*, available at: http://interlog.wbresearch.com/logistics-outsourcing-ml (accessed 15 June 2010).

IPC. (2010), *Cross-Border E-Commerce Report*, Belgium: International Post Corporation Publications.

iResearch. (2015a), *2014 China CBE Report (1st ed.)*, Shanghai: iResearch Publications (05 January 2015).

iResearch. (2015b), *China Cross-border Online Shoppers Report (1st ed.)*, Shanghai: iResearch Publications (4 May 2015).

iResearch. (2016), *2016 China's Cross-border Online Shoppers Report*, Shanghai: iResearch Publications (1 April 2016).

Isac, C. (2014), "E-fulfillment-a new challenge for electronic business", *Annals of the University of Petroşani Economics*, Vol.14 No.1, pp.121-128.

Islam, D.M.Z. and Zunder, T.H. (2013), "Issues of eLogistics Applications For Varying Stakeholders: Findings From An Online Survey", *European Transport Research Review*, Vol.5, pp.65-78.

Janssens, W., Wijnen, K., Pelsmacker, P.D. and Kenhove, P.V. (2008), *Marketing Research with SPSS*, New York: Prentice Hall.

JD.com. (2015), "Annual report 2016", *Jingdong.com*, available at: https://ir.jd.com/phoenix.zhtml?c=253315&p=irol-reportsannual (accessed 1 May 2017).

JLL. (2013), *E-commerce boom triggers transformation in retail logistics*, New York: JLL Publications

Kaiser, H.F. (1974), "An index of factorial simplicity", *Psychometrika*, Vol.39 No.1, pp.31-36.

Kawa, A. and Zdrenka, W. (2016), "Conception of integrator in cross-border e-commerce", *LogForum*, Vol.12 No.1, pp.63-73.

Kehoe, D.F. and Boughton, N.J. (2001), "New paradigms in planning and control across manufacturing supply chains-the utilisation of Internet technologies", *International Journal of Operations & Production Management*, Vol.21 No.5/6, pp.582-593.

Khalid, S.K., Regina, K., Jos, K. and Gerd, A. (2003), "Five steps to conducting a systematic review", *Journal of the royal society of medicine*, Vol.96 No.3, pp.118-121.

Klumpp, M. and Jasper, A. (2008), "Success Factors for Retail Logistics in an E-Commerce-Environment", *Sineuropean Engineering Research Journal*, Vol.1, pp.163-168.

Kommerskollegium. (2012), *E-commerce-New Opportunities, New Barriers*, Sweden: Kommerskollegium Publications.

Kovács, G. and Spens K.M. (2005), "Abductive reasoning in logistics research", *International Journal of Physical Distribution & Logistics Management*, Vol.35 No.2, pp.132-144.

Lam, C.H.Y., Choy, K.L., Ho, G.T.S. and Chung, S.H. (2012), "A hybrid case-GA-based decision support model for warehouse operation in fulfilling cross-border orders", *Expert Systems with Applications*, Vol.39 No.8, pp.7015-7028.

Landmark global. (2015a), "White paper-CBE: Rethinking distribution networks", available at: http://landmarkglobal.com/trends-insights/cross-border-e-commerce-3/(accessed 13 July 2015).

Landmark global. (2015b), "Outsourcing e-commerce logistics: pros and cons", available at: http://landmarkglobal.com/trends-insights/outsourcing-e-commerce-logistics-pros-and-cons/ (accessed 20 November 2015).

Lang, G. and Bressolles, G. (2013), "Economic Performance and Customer Expectation in e-Fulfillment Systems: A Multi-Channel Retailer Perspective", *Supply Chain Forum: An International Journal*, Vol.14 No.1, pp.16-26.

Lee, C.H., Huang, S.Y., Barry, F.B. and Kao, L. (2010), "Business performance and customer relationship management: The effect of IT, organisational contingency and business process on Taiwanese manufacturers", *Total Quality Management & Business Excellence*, Vol.21 No.1, pp.43-65.

Liu, X., Chen, D. and Cai, J. (2015), "The Operation of the Cross-Border e-commerce Logistics in China", *International Journal of Intelligent Information Systems*, Vol.4 No.2, pp.15-18.

Lummus R.R. and Vokurka R.J. (2002), "Making the right e-fulfillment decision", *Production and Inventory Management Journal*, Vol.43 No.1/2, pp.50-55.

Mark, S., Philip, L. and Adrian, T. (2009), *Research methods for business students (5th ed.)*, London: Pearson Education Limited.

Masters, D. (2013), "3 E-commerce Fulfillment Options: Which One is Right for Your Bu siness?", available at: http://business.tutsplus.com/articles/3-E-commerce-fulfillment-optio ns-which-one-is-right-for-your-business--fsw-42537 (accessed 10 September 2013).

McDermott, K. (2015), *Key Business Drivers and Opportunities in Cross-Border Ecommerce*, Amsterdam: Payvision Publications.

Meng, L., Zhang, B.M. (2014), "The Development of Logistics Industry in the Cross-border E-commerce Environment", *Logistics engineering and management*, Vol.36 No.11, pp.110-113.

Muffatto, M. and Payaro, A. (2004a), "Integration of web-based procurement and fulfillment: a comparison of case studies", *International Journal of Information Management*, Vol.24 No.4, pp.295-311.

Muffatto, M. and Payaro, A. (2004b), "Implementation of e-procurement and e-fulfillment processes: a comparison of cases in the motorcycle industry", *International Journal of Production Economics*, Vol.89 No.3, pp.339-351.

Myerson, R.B. (1997), *Game Theory: Analysis of Conflict*, Cambridge: Harvard University Press.

Nielson, J. and Morris, R. (2001), "E-commerce and trade: resolving dilemmas", *OECD Observer*, Vol.224, pp.37-39.

Nunnally, J.C. (1978), *Psychometric theory (2nd ed.)*, New York: McGraw-Hill.

Okamura, J. (2006), "Worldwide via the Web", *Multichannel Merchant (Penton Media, Inc.)*, Vol.2 No.2, pp.31-32.

Osborne, M.J., Rubinstei, A. (2011), *A Course in Game Theory*, Cambridge: The MIT Press.

Pamela, B. and Susan, J. (2008), "Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers", *The Qualitative Report*, Vol.13 No.4, pp.544-559.

Panagariya, A. (2000), "E-Commerce, WTO and Developing Countries", *World Economy*, Vol.23 No.8, pp.959-978.

Pavlou, P.A., Sawy, O.A.E. (2002), "A classification scheme for B2B exchanges and implications for interorganizational eCommerce", in: *Business to Business Electronic Commerce: Challenges and Solutions*, IRM Press.

Paypal. (2013), *Modern Spice Routes-The Cultural Impact and Economic Opportunity of Cross-Border Shopping*, San Jose: Paypal Publications.

Paypal. (2014a), *Unlocking the cross-border trade opportunity*, San Jose: Paypal Publications.

Paypal. (2014b), *Cross-Border Research 2014-Global snapshot*, San Jose: Paypal Publications.

Pitney Bowes. (2010), *Time to Get Serious About Cross-Border Ecommerce*, Stamford: Pitney Bowes Publications.

Płaczek, E. (2010), "New challenges for logistics providers in the e-business era", *LogForum*, Vol.6 No.2, pp.39-47.

Porter, M.E. (1980), "Competitive strategy: techniques for analyzing industries and competitors", *Social Science Electronic Publishing*, Vol.2, pp.86-87.

Pounder, P. (2013), "A Review of Supply Chain Management and Its Main External Influential Factors in the global market economy Supply Chain", *Supply Chain Forum*, Vol.14 No.3, pp.42–50.

PRNewswire. (2015), "Global Cross-Border B2C E-Commerce 2015", available at: http://www.prnewswire.com/news-releases/global-cross-border-b2c-e-commerce-2015-300156055.html (accessed 7 October 2015).

Puschmann, T. and Alt, R. (2005), "Successful use of e-procurement in supply chains", *Supply Chain Management: An International Journal*, Vol.10 No.2, pp.122-133.

Purvis, L., Gosling, J. and Naim, M.M. (2014), "The development of a lean, agile and leagile supply network taxonomy based on differing types of flexibility", *International Journal of Production Economics*, Vol.151 No.1, pp.100-111.

PwC. (2015), *China to open up its import tariff and importation policies for consumer products*, Hong Kong: PwC Publications.

Pyke, D. F., Johnson, M. E., and Desmond, P (2001), "E-fulfillment: it's harder than it looks", *Supply Chain Management Review*, Vol.5 No.1, pp.26-32.

Rajavel, N. (2015), "E-tailing in India: opportunities and challenges", *International journal of management and social science research review*, Vol.1 No.8, pp.143-148.

Rao, K. and Young, R.R. (1994), "Global supply chains: factors influencing outsourcing of logistics functions", *International Journal of Physical Distribution & Logistics Management*, Vol.24 No.6, pp.11-19.

Rasmusen, E. (2007), *Games and Information: An Introduction to Game Theory (4th ed.)*, Hoboke: Wiley-Blackwell.

Reynolds, J. (2001), *Logistics & Fulfillment for E-business*, New York: CMP books.

Ricker, R.F. and Kalakota, R. (1999), "Order fulfillment: The Hidden Key to E-commerce Success", *Supply Chain Management Review*, Vol.11 No.30, pp.60-70.

Robson, C. (2002), *Real World Research: a resource for social scientists and practitioner-researchers (2nd ed.)*, Oxford: Blackwell.

Rodriguez, C.A. and Larsson, A. (2006), "Logistic Order-Fulfillment in E-commerce-A case study of pure-plays and click-and-mortars in the B2C market", Master thesis, Luleå University of Technology.

Ryan, G. (2010), *Guidance notes on planning a systematic review*, NUI Galway: James Hardiman Library.

Saeed, K.A., Malhotra, M.K., and Grover, V. (2005), "Examining the impact of interorganizational systems on process efficiency and sourcing leverage in buyer–supplier dyads", *Decision Sciences*, Vol.36 No.3, pp.365-396.

Sawyer, R.K. (2012), *Explaining creativity: the science of human innovation*, New York: Oxford University Press.

Shama, A. (2005), "An empirical study of the international marketing strategies of e-commerce companies", *Thunderbird International Business Review*, Vol.47 No.6, pp. 695-709.

Shapiro, C. (1989), "Theory of Business Strategy", *RAND Journal of Economics*, Vol.20 No.1, pp.125-137.

Shewmake, B. and Sapp, G. (2000), "Bringing down the international barriers", *Infoworld*. Vol.22 No.18, pp.30.

Singh, M. and Thomson, D. (2002), "eProcurement Model for B2B Exchanges: An Australian Example", in: 15th Bled Electronic Commerce Conference eReality: Constructing the eEconomy, Bled, Slovenia, June 17-19, 2002.

Sláviková, G., BoČková, K.H. and PorubČanová, D. (2015), "Use of game theory in economy and management with the focus on Czech environment". *Advances in Business and Economic Development*, Vol.1 No.1, pp.106-144.

Statista. (2015), "Domestic and cross-border B2C e-commerce sales in Europe from 2013 to 2018 (in billion euros)", available at: http://www.statista.com/statistics/292928/domestic-and-cross-border-b2c-e-commerce-sales-europe/ (accessed 31 July 2015).

Straube, F. and Lueck, A. (2000), "Strategiesfor e-fulfillment – Changes in the logistics value chain", in: B. Stanford-Smith & P.T. Kidd (Eds.), *E-business – Key issues, applications, technologies,* Amsterdam: IOS Press, pp. 436-440.

Straube, F. (2004), *e-Logistik*, Berlin-Heidelberg-New York: Spring.

Tanner, C., Wölfle, R., Schubert, P. and Quade, M. (2007), "Current trends and challenges in electronic procurement: an empirical study", *Electronic Markets*, Vol.18 No.1, pp.6-18.

Tarn,M.J., Razi, M.A., Wen, H.J. and Jr, A.A.P. (2003), "E-fulfillment: the strategy and operational requirements", *Logistics Information Management*, Vol.16 No.5, pp.350-362.

Tai, Y.M. (2011), "Exploring the performance impact of web-based direct procurement systems: from the perspective of process integration", *WSEAS Transactions on Information Science and Applications*, Vol.9 No.8, pp.380-390.

Tai, Y.M., Ho, C.F. and Wu, W.H. (2010), "The performance impact of implementing Web-based e-procurement systems", *International Journal of Production Research*, Vol.48 No.18, pp.5397-5414.

Tentinet. (2015), *2015 Chinese cross-border e-commerce report*, Shenzhen: Tentinet.

Terzi, N. (2011), "The impact of E-commerce on international trade and employment", *Procedia - Social and Behavioral Sciences*, Vol.24, pp.745-753.

Tranfield, D., Denyer, D. and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review", *British Journal of Management*, Vol.14 No.3, pp.207-222.

Turban, E., King, D., Lee, J. and Viehland, D. (2006), *Electronic Commerce A managerial perspective*, Upper Saddle River: Prentice Hall.

UNCTAD. (2015), "Information economy report 2015 - Unlocking the potential of E-commerce for Developing Countries", New York: UNCTAD Publications.

Vaidyanathan, G. and Devaraj, S. (2008), "The role of quality in e-procurement performance: An empirical analysis", *Journal of Operations Management*, Vol.26 No.3, pp.407-425.

van Heel, B., Lukic, V. and Leeuwis, E. (2014), "Cross-Border E-Commerce Makes the World Flatter", available at: https://www.bcgperspectives.com/content/articles/transportation_travel_tourism_retail_cross_border_ecommerce_makes_world_flatter/ (accessed 18 September 2014)

VendorSeek.com (2016), "What is the Fulfillment Process?", available at: http://www.vendorseek.com/supply-chain-fulfillment-warehousing/fulfillment-and-distribution/what-is-fulfillment-process (accessed 15 January 2016).

Vitkauskaitė, E. and Catautis, R. (2008), "E-procurement perspectives in construction sector SMEs", *Journal of Civil Engineering and Management*, Vol.14 No.4, pp.287-294.

Viswanadham, N. and Gaonkar, R. (2001), "E-logistics: trends and opportunities", available at: http://lcm.csa.iisc.ernet.in/nv/Download/Vis.WP4.pdf (accessed 23 March 2015).

Voyageone. (2015), *Strategies to drive cross-border E-commerce growth in China*, Shanghai: Voyageone Publications.

Wang, J. (2014), "Opportunities and Challenges of International e-Commerce in the Pilot Areas of China", *International Journal of Marketing Studies*, Vol.6 No.6, pp.141-149.

Wagner, S.M. and Essig, M. (2006), "Electronic Procurement Applications and Their Impact on Supplier Relationship Management", *International Journal of Services Technology and Management*, Vol.7 No.5/6, pp.439-462.

Wallenburg, C.M., Cahill, D.L., Knemeyer, A.M. and Goldsby, T.J. (2011), "Commitment and Trust as Drivers of Loyalty in Logistics Outsourcing Relationships: Cultural Differences Between the United States and Germany", *Journal of Business Logistics*, Vol.32 No.1, pp.83-98.

Wan, Z., Zhang, Y., Wang, X. and Chen, J. (2014), "Policy and politics behind shanghai's free trade zone program", *Journal of Transport Geography*, Vol.34, pp.1-6.

Weber logistics. (2016), "eCommerce Fulfillment Services & Warehouse in California", available at:http://www.weberlogistics.com/warehousing-distribution/ecommerce-fulfillment-warehouse (accessed 7 February 2016).

Wilding, R. and Juriado, R. (2004), "Customer perceptions on logistics outsourcing in the European consumer goods industry", *International Journal of Physical Distribution & Logistics*, Vol.34 No.8, pp.628-624.

Wu, F., Zsidisin, G.A. and Ross, A.D. (2007), "Antecedents and outcomes of e-procurement adoption: an integrative model", *IEEE Transactions on Engineering Management*, Vol.54, pp. 576-587.

Wu, H.F. and Dou, C.C. (2015), "The Innovation of CBE Logistics", *Logistics engineering and management*, Vol.37 No.9, pp.157-158.

Wu, M.L. (2010), *Questionnaire Statistical Analysis Practice-SPSS, Operation and Application*, Chongqing: Chongqing University Press.

Xia, H.Y. and Huang, P.Q. (2007), "Analysis of Supply Chain Stocking Decision in Hybrid Distribution Systems for Short Life-cycle Products", *Chinese Journal of Management Science*, Vol.15 No.2, pp.70-75.

Xing, Y. and Grant, D.B. (2006), "Developing a framework for measuring physical distribution service quality of multi-channel and 'pure player internet retailers", *International Journal of Retail & Distribution Management*, Vol.34 No.4/5, pp.278-289.

Xu, K., Wilkinson, T. And Brouthers, L.E. (2002), "The dark side of international e-commerce: logistics", *Marketing Management Journal*, Vol.12 No.2, pp.123-134.

Yin, R.K. (2013), *Case Study Research: Design and Methods (5th ed.)*, California: SAGE Publications.

Youngdahl, W.E. and Loomba, A.P.S. (2000), "Service-driven global supply chains", *International Journal of Service Industry Management*, Vol.11 No.4, pp.329-347.

Zaidah, Z. (2007), "Case study as a research method", *Jurnal Kemanusiaan*, Vol.9, pp.1-6.

Zairi, M. and Al-Mashari, M. (2002), "eCommerce-enabled Supply Chain Management: A Proposed Model Based on Retailing Experience", *Journal of King Saud University-Computer and Information Sciences*, Vol.14, pp.61-86.

ZOLL. (2016), "Consignments of negligible value", available at: http://www.zoll.de/EN/Priv-ate-individuals/Mail-Internet/Shipments-to-Germany/Duties-and-taxes/Consignments-of-neg-ligible-value/consignments-of-negligible-value_node.html (accessed 18 July 2016).

Appendix 1. Initial Influencing Factors for Developing CBEL

Classification	Factors	References	Num. of articles
Company	Nature of business	Ghezzi et al. (2012), Hafeez et al. (2010)	2
	Size of company	Kawa and Zdrenka (2016), McGloin and Grant (1998), Hafeez et al. (2010), Ho et al. (2012), Hu et al. (2015), Patterson et al. (2003)	6
	Human factor	Gunasekaran and Ngai (2004), Hernandez et al. (2014), Ho et al. (2012), Hwang and Lu (2013)	4
Product	Range of commodity	Ghezzi et al. (2012)	1
	Property of product	Fraering and Prasad (1999), Ghezzi et al. (2012), Gunasekaran and Kobu (2007), Lovell et al.(2005), Maruntelu (2008), Mason et al. (2003), Rao and Young (1994), Wanke and Zinn (2004), Van der Vorst et al. (2009)	9
Government	Infrastructure	Fraering and Prasad (1999), Ibrahim et al. (2015), Lovell et al.(2005), Murillo (2001), Ng (2009), Xu et al. (2002), Wong (2006)	7
	Tax and tariff	Boyd et al. (2003), Fraering and Prasad (1999), Hameri and Hintsa (2009), Ibrahim et al. (2015), Kawa and Zdrenka (2016), Loomba (2000), Lovell et al.(2005), Tyan et al. (2003), Youngdahl and Xu et al. (2002)	9
	Currency exchange	Boyd et al. (2003), Fraering and Prasad (1999), Ibrahim et al. (2015), Lovell et al.(2005), Tyan et al. (2003), Xu et al. (2002), Youngdahl and Loomba (2000)	7
	Customs clearance	Boyd et al. (2003), Kawa and Zdrenka (2016), Lam et al. (2012), Samiee and Walters (2006), Tyan et al. (2003), Wang et al. (2015), Yang and Shen (2015), Youngdahl and Loomba (2000)	8
	Law and regulation	Boyd et al. (2003), Hameri and Hintsa (2009), Ho et al.(2012), Hwang and Lu (2013), Ibrahim et al. (2015), Kawa and Zdrenka (2016), Lam et al. (2012), Liu et al.(2015), Lovell et al.(2005), Ng (2009), Shi and Ruan (2008), Sun et al. (2008), Wang et al. (2015), Wong (2006), Xu et al. (2002)	15

Appendix 1. Initial Influencing Factors for Developing CBEL

Classification	Factors	References	Num. of articles
Market	Demand variability	Lovell et al.(2005), Wanke and Zinn (2004)	2
	Cultural difference	Boyd et al. (2003), Fernie and Sparks (2009), Gunasekaran and Kobu (2007), Ibrahim et al. (2015), Murillo (2001), Samiee and Walters (2006), Rajaguru and Matanda (2013), Wong (2012), Youngdahl and Loomba (2000)	9
Technology	ICT application	Capineri and Leinbach (2004), Chen et al. (2009), Dey (2014), Giménez and Lourenço (2008), Gunasekaran and Kobu (2007), Gunasekaran and Ngai (2004), Gunasekaran et al. (2007), Hafeez et al. (2010), Hernandez et al. (2014), Hu et al. (2015), Hultkrantz and Lumsden (2001), Jean and Sinkovics (2010), Kawa and Zdrenka (2016), Krmac (2007), Lee et al. (2010), Maruntelu (2008), Mason et al. (2003), McGloin and Grant (1998), Murphy and Daley (2000), Pansy et al. (2015), Patterson et al. (2003), Pounder (2013), Rajaguru and Matanda (2013), Ranganathan et al. (2004), Rao (2000), Rao and Young (1994), Rodríguez (2006), Samiee and Walters (2006), So et al. (2012), Swaminathan and Tayur (2003), Tai et al. (2010), Terzi (2011), Trappey et al. (2004), Van der Vorst et al. (2009), Wang et al. (2015), Wu (2012), Xu et al. (2002), Zairi and Al-Mashari (2002), Zhang (2005), Żurek (2015)	40
Operation	Payment	Ng (2009), Wang et al. (2015), Yang and Shen (2015)	3
	Warehouse and inventory mgmt.	Gunasekaran et al. (2007), Ji et al. (2006), Lam et al. (2012), Mason et al. (2003), Tyan et al. (2003), Wanke and Zinn (2004), Xu et al. (2002), Zairi and Al-Mashari (2002)	8
	Sustainability	Alkhatib et al. (2015), Capineri and Leinbach (2004), Fernie and Sparks (2009), Hameri and Hintsa (2009), Ho et al. (2012), Ibrahim et al. (2015), So et al. (2012), Van der Vorst et al. (2009)	8
	One-stop service	Gunasekaran et al. (2007), Kawa and Zdrenka (2016)	2
	Service capacity	Capineri and Leinbach (2004), Colton et al. (2010), Ghezzi et al. (2012), Giménez and Lourenço (2008), Gunasekaran and Kobu (2007), Hsu et al. (2009), Jafari (2015), Kawa and Zdrenka (2016), Klumpp and Jaspe (2008), Murillo (2001), Rao and Young (1994), Wang (2014), Xu et al. (2002), Zhang (2005), Żurek (2015)	15

Appendix 1. Initial Influencing Factors for Developing CBEL

Classification	Factors	References	Num. of articles
Partnership	Alliance and cooperation	Colton et al. (2010), Fernie and Sparks (2009), Gong and Kan (2013), Gunasekaran et al. (2007), Hernandez et al. (2014), Ho et al. (2012), Hwang and Lu (2013), McGloin and Grant (1998), Rajaguru and Matanda (2013), Samiee (2008), Shi and Ruan (2008), Tai et al. (2010), Van der Vorst et al. (2009)	13
	Real-time info. sharing	Gong and Kan (2013), Gunasekaran et al. (2007), Hafeez (2010), Ho et al. (2012), Hsu et al. (2009), Jean and Sinkovics (2010), McGloin and Grant (1998), Patterson et al. (2003), Rajaguru and Matanda (2013), Rao (2000), Samiee and Walters (2006), Sun et al. (2008), Zhang (2005)	13
	Outscoring strategy	Alkhatib et al. (2015), Banomyong and Supatn (2011), Capineri and Leinbach (2004), Gong and Kan (2013), Gunasekaran and Kobu (2007), Gunasekaran et al. (2007), Hameri and Hintsa (2009), Hernandez et al. (2014), Hultkrantz and Lumsden (2001), Liu et al. (2015), Ji et al. (2006), Joong-Kun Cho et al. (2008), Kawa and Zdrenka (2016), Klumpp and Jaspe (2008), Murphy and Daley (2000), Rao and Young (1994), Samiee (2008), Trappey et al. (2004), Tyan et al. (2003), Wong (2012), Xu et al. (2002), Yang and Shen (2015), Ye et al. (2014)	23

Appendix 2. Questionnaire

Dear participants,

We are grateful for your participation in this survey. Hereby, your **15 minutes** to fill out this questionnaire will help us advance logistics research. We also hope you will benefit from the survey results. Please rest ensured that all your comments will be treated anonymously!

"*International ecommerce is called cross-border ecommerce, when consumers buy online from merchants, located in other countries and jurisdictions*." (Cross-Border Ecommerce Community)

In a narrow sense, cross-border e-commerce (CBE) is almost equal to cross-border electronic retailing (e-retailing) by business-to-consumer (B2C) transaction, which is the definition in this research. The following Figure shows the flow of import logistics. The export flow is just opposite to that.

Currently, long delivery time, high shipping cost, unsatisfied return service are the main challenges of CBE logistics. In order to be successful in CBE, enterprises have to seek new e-logistics solution. As such, the following survey "Developing a CBE logistics system" has been compiled to assess that how to set up an e-logistics system in cross-border relations and make it efficient.

A framework will be found in the end, which can support the members of the global supply chain in developing and evaluating their global logistics network, better understanding the main determinants for e-logistics system success and adapting the optimal "logistics strategy" in CBE.

Section 1: General information

What industry does your business belong to?

☐ Manufacturer ☐ Retailer ☐ Logistics service provider ☐ Others _____

If you are **retailer**, please choose your type.

☐ E-marketplace (as a platform, e.g. ebay)

☐ Self-operation e-retailer (as an online retail store, e.g. Zalando)

☐ Integrated e-retailer (as both a platform and a retailer, e.g. Amazon)

☐ Click-and-Mortar (own offline store and online shop, e.g. Tesco)

☐ Others _____

Please indicate the size of your company. This division is based on the definition of the European Commission.

☐ Micro size company (The number of employees < 10, and annual turnover ≤ 2 Million €)

☐ Small size company (The number of employees < 50, and annual turnover ≤ 10 Million €)

☐ Medium size company (The number of employees < 250, and annual turnover ≤ 50 Million €)

☐ Large size company (The number of employees ≥ 250, and annual turnover > 50 Million €)

☐ Others _____

What are your products' origins (Global operations)? (Multiple choice)

☐ Europe ☐ North America ☐ Latin America ☐ Asia & Oceania ☐ Africa ☐ Specific region_____

Who are your main suppliers and their proportion? (Multiple choice)

☐ Manufacturer_____ ☐ Wholesaler_____ ☐ Retailer_____ ☐ Personal seller_____ ☐ Self-produce_____

Section 2: Influencing factors

E-logistics is a holistic methodology and strategic planning of all logistics systems and processes with the application of modern information and communication technology (ICT). It comprises e-procurement and e-fulfillment, which is an interactive network from producing to delivering a final product to the consumer. Apply an e-logistics system effectively in CBE can achieve: (1) Reducing operating costs; (2) Meeting product delivery deadlines; (3) Improving customer services. The following survey is about which factors you think as important **determinants** and affecting **successful** implementation of an e-logistics system in CBE.

Please indicate the importance of each factor. The relative importance of factors is not represented by their sequence.

Factors	Not important	Slightly important	Moderately important	Important	Very important
1) Nature of business e.g. marketplace (ebay), self-operation (Amazon), click-and-mortar (Walmart).	1	2	3	4	5
2) Size of company e.g. large company and SMEs could obtain different levels of support from financial, technological and human resources.	1	2	3	4	5
3) Human factor e.g. knowledge, skills, goals and personalities of staffs; prior support from top management and across multiple organizations.	1	2	3	4	5
4) Range of commodity e.g. single commodity (Zalando, appeal), comprehensive commodity (Amazon).	1	2	3	4	5
5) Property of product e.g. category, value density, obsolescence, specific needs for logistics.	1	2	3	4	5
6) Infrastructure e.g. electronic network, transportation and communications, banking.	1	2	3	4	5
7) Tax and tariff	1	2	3	4	5
8) Currency exchange	1	2	3	4	5
9) Customs clearance e.g. the convenience and complexity of process, transparency of information, clearance fees.	1	2	3	4	5
10) Law and regulation e.g. consumer's interest, e-commerce, customs, import-export, environmental protection.	1	2	3	4	5
11) Demand variability of online product e.g. due to seasonality or consumer preferences.	1	2	3	4	5
12) Cultural difference e.g. consumer preferences on product, payment, delivery; corporate culture.	1	2	3	4	5
13) Application of information and communication technology (ICT) e.g. the type of ICT (ERP or Web-based), the cost of ICT.	1	2	3	4	5
14) Payment e.g. payment options, payment security, timeliness.	1	2	3	4	5
15) Warehouse and inventory management e.g. warehouse location (domestic, overseas, free trade zone); inventory model (centralized, decentralized, VMI).	1	2	3	4	5
16) Sustainability e.g. recyclable packaging, reverse logistics, clean energy usage.	1	2	3	4	5
17) One-stop service e.g. global online marketplaces provide integrated solutions for SMEs, such as Amazon.com and Alibaba.com.	1	2	3	4	5

18) Service capacity e.g. order fulfillment time, flexibility, reliability and return management.	1	2	3	4	5
19) Alliance and cooperation e.g. strategic alliance and cooperation with supply chain partners, such as suppliers, retailers, intermediaries and LSPs.	1	2	3	4	5
20) Real-time information sharing e.g. sharing product, technology, market with partners, sharing order and delivery status with customers in real-time.	1	2	3	4	5
21) Outscoring strategy e.g. in-house, full outsourced, drop-shipping; LSPs type and selection criteria.	1	2	3	4	5

Section 3: Product and service (If you provide products online, please fill out this section)

Which commodities are sold on your webpage? And please indicate the sorting according to the revenue.

☐ Fashion ☐ Beauty and personal care ☐ Housewares and home furnishings ☐ Consumer Electronics ☐ Toys

☐ OTC drugs and dietary supplements ☐ Groceries ☐ Household and consumer appliances ☐ Others_____

The following items about product and service performance, please select the corresponding mean. If you sell variety of commodities, please fill out the top one category.

Product	Product range [items]	□ x≤1000	□ 1000<x≤10000	□ 10000<x≤20000	□ 10000<x≤100000	□ x>100000
	Value density [€/kg]	□ x≤10	□ 10<x≤20	□ 20<x≤100	□ 100<x≤200	□ x>200
	Durability [months]	□ x>24	□ 12<x≤24	□ 6<x≤12	□ 1<x≤6	□ x≤1
	Product specific needs	□ Low	□ L/M	□ Medium	□ M/H	□ High
Service	Order fulfillment time [days]	□ x≤7	□ 7<x≤14	□ 14<x≤21	□ 21<x≤35	□ x>35
	Flexibility [qualitative]	□ Low	□ L/M	□ Medium	□ M/H	□ High
	Delivery reliability [%]	□ x>95%	□ 90%<x≤95%	□ 85%<x≤90%	□ 80%<x≤85%	□ x≤80
	Returns [%]	□ x≤5%	□ 5%<x≤10%	□ 10%<x≤20%	□ 20%<x≤40%	□ x>40%

Section 4: Technology and Operation

Which inventory management models do you use? (Multiple choice)

☐ Vendor Managed Inventory (VMI)

☐ Jointly Managed Inventory (JMI)

☐ Collaborative Planning, Forecasting and Replenishment (CPFR)

☐ Drop-shipping (doesn't keep goods in stock, transfers customer orders to supplier and has it shipped directly to the customer)

☐ Others_____

Where do you store the goods in order to fulfill foreign customers? (Multiple choice)

☐ Domestic warehouse ☐ Overseas warehouse ☐ Free trade zone warehouse ☐ Others_____

What types of cross-border transportation do you employ? (Multiple choice)

☐ Airlift ☐ Ocean shipping ☐ Railway ☐ Land transportation ☐ Others_____

Which "last mile" services do you provide to customers? (Multiple choice)

☐ Home delivery ☐ Pick at pack station ☐ Pick at store ☐ Pick at neighbor ☐ Others_____

Section 5: Partnership and Outsourcing

Which is your global logistics and supply chain strategy? (choose the closest)

	Full in-house			Merchant managed			Supplier managed			Drop-shipping			LSP managed			Full outsourced		
	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP	Supplier	Merchant	LSP
Purchasing		X			X		X			X					X			X
Warehousing		X			X		X	X		X			X		X			X
Order processing		X			X		X	X			X			X			X	X
Shipping		X			X	X			X	X		X			X			X
Reverse		X	X			X			X			X			X			X

☐ ☐ ☐ ☐ ☐ ☐

Who is responsible for your international shipping? (Multiple choice)

☐ Postal parcel ☐ International express ☐ Shipping agents ☐ Self-operation ☐ Others_____

Which criteria are used to select your partners (logistics service provider)? (Multiple choice)

☐ Global operational abilities ☐ Relationship building and integration competencies ☐ Quality and reliability

☐ Service performance ☐ Information technology ☐ Flexibility and compatibility ☐ Geographical location

☐ Financial measures ☐ Sustainability measures ☐ Management and organization ☐ Cost/price

☐ Others_____

Personal info:

What is your job title? (Choose the closest)

☐ General Manager ☐ Member of the Board ☐ Department Manager ☐ Team Manager ☐ Team Member

Where would you position your job responsibilities in your company?

☐ General Management ☐ Procurement ☐ Sales & Marketing ☐ Operation

☐ Production and R&D ☐ Logistics ☐ Human Resources ☐ Others_____

How long have you been working in this area? (Number of years) _____

If you are interested in the results of this online survey, please type your e-mail address.

_____

If you are interested in a further interview of experts, you can enter your contact details in the following line.

_____

Additional

What is the biggest challenge in today's CBE logistics operations?

Any comments on how to improve the efficiency of the logistics system in CBE?

Appendix 3. General Information of Case Enterprises in Survey

Country	Case No.	Industry	Type	Main product
GERMANY	1	Retailer	Click&Mortar	Beauty and personal care
GERMANY	2	Retailer	Click&Mortar	Consumer Electronics
GERMANY	3	Retailer	Self-operation e-retailer	Fashion
GERMANY	4	Retailer	Integrated e-retailer	Groceries
GERMANY	5	Retailer	Self-operation e-retailer	Consumer Electronics
GERMANY	6	Retailer	Click&Mortar	Fashion
GERMANY	7	Retailer	Integrated e-retailer	Consumer Electronics
GERMANY	8	Retailer	Integrated e-retailer	Fashion
GERMANY	9	Retailer	Self-operation e-retailer	Beauty and personal care
GERMANY	10	Retailer	E-marketplace	Consumer Electronics
GERMANY	11	Retailer	Click&Mortar	Fashion
GERMANY	1	Manufacturer		Household and consumer appliances
GERMANY	12	Retailer	Self-operation e-retailer	Fashion
GERMANY	13	Retailer	Click&Mortar	Fashion
GERMANY	14	Retailer	Self-operation e-retailer	Housewares and home furnishings
GERMANY	15	Retailer	Click&Mortar	Housewares and home furnishings
GERMANY	16	Retailer	E-marketplace	Housewares and home furnishings
GERMANY	17	Retailer	Integrated e-retailer	Fashion
GERMANY	18	Retailer	Self-operation e-retailer	Groceries
GERMANY	19	Retailer	Click&Mortar	Beauty and personal care
GERMANY	20	Retailer	Click&Mortar	Consumer Electronics
GERMANY	21	Retailer	E-marketplace	Fashion
CHINA	1	Retailer	Click&Mortar	Beauty and personal care
CHINA	2	Retailer	E-marketplace	Fashion
CHINA	1	Manufacturer		Household and consumer appliances
CHINA	2	Manufacturer		Housewares and home furnishings
CHINA	3	Retailer	Integrated e-retailer	Beauty and personal care
CHINA	4	Retailer	Self-operation e-retailer	Toys and baby products
CHINA	5	Retailer	Self-operation e-retailer	Housewares and home furnishings
CHINA	6	Retailer	Self-operation e-retailer	Toys and baby products
CHINA	7	Retailer	Click&Mortar	Beauty and personal care
CHINA	8	Retailer	Click&Mortar	Groceries
CHINA	3	Manufacturer		Beauty and personal care
CHINA	9	Retailer	Integrated e-retailer	Groceries
CHINA	10	Retailer	E-marketplace	Fashion
CHINA	11	Retailer	Self-operation e-retailer	OTC drugs and dietary supplements
CHINA	12	Retailer	Self-operation e-retailer	Toys and baby products

Country	Case No.	Industry	Type	Main product
CHINA	13	Retailer	Integrated e-retailer	Consumer Electronics
CHINA	14	Retailer	Integrated e-retailer	Beauty and personal care
CHINA	4	Manufacturer		Fashion
CHINA	15	Retailer	E-marketplace	Groceries
CHINA	5	Manufacturer		Household and consumer appliances
CHINA	16	Retailer	Self-operation e-retailer	Fashion
CHINA	17	Retailer	Self-operation e-retailer	Fashion
CHINA	18	Retailer	Integrated e-retailer	Books
CHINA	19	Retailer	Integrated e-retailer	Groceries
CHINA	20	Retailer	Click&Mortar	Toys and baby products
CHINA	21	Retailer	Integrated e-retailer	Toys and baby products
CHINA	22	Retailer	Click&Mortar	Beauty and personal care
CHINA	23	Retailer	Self-operation e-retailer	Beauty and personal care
CHINA	24	Retailer	Integrated e-retailer	Housewares and home furnishings
CHINA	25	Retailer	Integrated e-retailer	Housewares and home furnishings
CHINA	26	Retailer	Click&Mortar	Groceries
CHINA	27	Retailer	Self-operation e-retailer	Beauty and personal care
CHINA	28	Retailer	Click&Mortar	Beauty and personal care
CHINA	29	Retailer	Self-operation e-retailer	Beauty and personal care
CHINA	30	Retailer	Click&Mortar	OTC drugs and dietary supplements
CHINA	31	Retailer	Click&Mortar	Housewares and home furnishings
CHINA	32	Retailer	Click&Mortar	Beauty and personal care
CHINA	33	Retailer	Click&Mortar	Fashion
CHINA	34	Retailer	Click&Mortar	Toys and baby products
CHINA	35	Retailer	Integrated e-retailer	Groceries
CHINA	36	Retailer	E-marketplace	Groceries
CHINA	37	Retailer	Integrated e-retailer	Fashion
CHINA	38	Retailer	E-marketplace	Toys and baby products
CHINA	39	Retailer	Integrated e-retailer	Consumer Electronics
CHINA	40	Retailer	Self-operation e-retailer	Beauty and personal care
CHINA	41	Retailer	E-marketplace	OTC drugs and dietary supplements
CHINA	42	Retailer	Integrated e-retailer	Toys and baby products
CHINA	43	Retailer	Integrated e-retailer	Toys and baby products
CHINA	44	Retailer	E-marketplace	Toys and baby products

Appendix 4. Complexity of Logistics Problems and Strategy in Case Enterprises

Country	Case No.	Product complexity					Service complexity					Logistics problem	Logistics strategy
		Range	Value density	Durability	Specific needs	AVG	Fulfillment time	Flexibility	Delivery reliability	Return rates	AVG		
Germany	1	M/H	H	H	M	M/H	H	M/H	L/M	L	M	Product-side complexity	Supplier managed
Germany	2	M	L/M	L/M	M	M	H	M	L/M	L	M	Relatively easy	Merchant managed
Germany	3	H	M/H	H	L	M/H	H	M/H	L	H	M/H	High complexity	Full in-house
Germany	4	M/H	L/M	M/H	M/H	M/H	H	L/M	M	L	M	Product-side complexity	Supplier managed
Germany	5	M	M	H	L	M	H	M/H	M	L	M	Relatively easy	Merchant managed
Germany	6	L/M	M	M	L/M	M	H	M	L/M	M	M	Relatively easy	Merchant managed
Germany	7	H	M	M/H	L/M	M/H	H	H	M	L	M/H	High complexity	Full in-house
Germany	8	H	M	H	L	M/H	H	L/M	L	M/H	M	Product-side complexity	Supplier managed
Germany	9	M	M	H	M/H	M/H	H	M/H	M/H	L	M/H	High complexity	Full in-house
Germany	10	H	M	H	L	M/H	M/H	M/H	L/M	L	M	Product-side complexity	Drop-shipping
Germany	11	L	M	L/M	L/M	L/M	H	M/H	L	H	M/H	Service-side complexity	Full in-house
Germany	1	L	L/M	H	M	M	M	L/M	L/M	L	L/M	Relatively easy	Merchant managed
Germany	12	H	M/H	H	M	M/H	H	M/H	M	H	M/H	High complexity	Full in-house
Germany	13	M	H	L/M	L/M	M	H	H	L	M	M/H	Service-side complexity	Full in-house
Germany	14	H	M/H	M	M/H	M/H	H	M/H	M	H	M/H	High complexity	Full in-house
Germany	15	M	M	H	L	M	H	M	L/M	L/M	M	Relatively easy	Merchant managed
Germany	16	L/M	L	M	M	L/M	M/H	M/H	M/H	L/M	M/H	Service-side complexity	LSP managed
Germany	17	L/M	L/M	L/M	L	L/M	H	M/H	L	M/H	M/H	Service-side complexity	Merchant managed
Germany	18	L/M	M	M	M/H	M	H	M/H	L	M	M	Relatively easy	Full outsourced
Germany	19	M/H	H	H	M	M/H	H	M/H	L	L	M	Product-side complexity	Supplier managed
Germany	20	H	H	M	L	M/H	H	M/H	L/M	L/M	M	Product-side complexity	Supplier managed

Germany	21	M	L/M	M	L/M	M	H	M	H	M/H	M/H	Service-side complexity	LSP managed
China	1	L/M	L	M/H	M/H	M	M	M	L/M	L/M	L/M	Relatively easy	Supplier managed
China	2	H	H	L	M	M/H	H	M/H	L	L	M	Product-side complexity	Drop-shipping
China	1	L/M	M/H	L	M	M	M/H	M	L	L	L/M	Relatively easy	Merchant managed
China	2	L	L	M	L	L/M	H	H	L	L	M	Relatively easy	Full in-house
China	3	L/M	M	L/M	H	M	M/H	M/H	L/M	M	M	Relatively easy	Supplier managed
China	4	M	L/M	L/M	M/H	M	H	M/H	M/H	L/M	M/H	Service-side complexity	Full in-house
China	5	L	M	L/M	H	M	H	M/H	M/H	L/M	M/H	Service-side complexity	Full in-house
China	6	M/H	M/H	L/M	M	M	H	M/H	M/H	L	M/H	Service-side complexity	Full in-house
China	7	M	M	L/M	L	L/M	H	M	M	L	M	Relatively easy	Full in-house
China	8	M	L/M	M	M/H	M	H	L	M/H	L	M	Relatively easy	Full outsourced
China	3	M/H	H	L	M	M	H	M	H	L	M/H	Service-side complexity	Merchant managed
China	9	M	M	H	H	M/H	H	M/H	H	L	M/H	High complexity	Merchant managed
China	10	M/H	H	L/M	M	M/H	M/H	M	H	M	M/H	High complexity	LSP managed
China	11	L/M	M	L	L	L/M	M/H	M	M/H	L	M	Relatively easy	Merchant managed
China	12	L	L/M	L/M	L/M	L/M	H	H	H	L	M/H	Service-side complexity	Merchant managed
China	13	L	H	L	L/M	L/M	M	L/M	M/H	L/M	M	Relatively easy	Merchant managed
China	14	L/M	M	M	M/H	M	M/H	M	M/H	L	M	Relatively easy	Supplier managed
China	4	M	M	M/H	L	M	H	M	H	M	M/H	Service-side complexity	Merchant managed
China	15	M	L	H	H	M/H	H	L	L/M	L	L/M	Product-side complexity	Drop-shipping
China	5	L	L/M	M	M	L/M	M/H	L/M	M/H	L/M	M	Relatively easy	Full in-house
China	16	L	H	L	L/M	L/M	H	M	M	L	M	Relatively easy	Merchant managed
China	17	M/H	M/H	M/H	M/H	M/H	L/M	M/H	M/H	M/H	M/H	High complexity	Merchant managed
China	18	L	L/M	L/M	L/M	L/M	H	L/M	H	L	M	Relatively easy	Merchant managed
China	19	M/H	M/H	L/M	H	M/H	H	M/H	H	L/M	M/H	High complexity	Merchant managed

China	20	L/M	M	L/M	M/H	M	H	M	H	L	M/H	Service-side complexity	Merchant managed
China	21	M	M	M	H	M/H	M	H	M/H	L/M	M/H	High complexity	Merchant managed
China	22	L	M	L/M	L/M	L/M	M/H	L/M	L	L/M	L/M	Relatively easy	Merchant managed
China	23	L	M/H	H	L/M	M	M/H	H	H	L	M/H	Service-side complexity	Merchant managed
China	24	M	M	L/M	M	M	M	L/M	M	L	L/M	Relatively easy	Merchant managed
China	25	L	L	L	L/M	L	H	L/M	M/H	L/M	M	Relatively easy	Merchant managed
China	26	M/H	M	L/M	M	M	M/H	M	M/H	L/M	M	Relatively easy	Merchant managed
China	27	L/M	L	L/M	M/H	L/M	H	M	L/M	L	M	Relatively easy	Merchant managed
China	28	L/M	M	L/M	M/H	M	M/H	M/H	M/H	L	M	Relatively easy	Full in-house
China	29	L	M	L/M	M	L/M	H	M/H	H	L	M/H	Service-side complexity	Merchant managed
China	30	L	M	M	L/M	L/M	L/M	M/H	M/H	L	M	Relatively easy	Merchant managed
China	31	L	L	L	L	L	L/M	L	H	L	L/M	Relatively easy	Full in-house
China	32	L/M	L	L/M	M	L/M	H	M	H	L	M/H	Service-side complexity	Full in-house
China	33	H	H	L	L	M	H	M	M/H	L	M	Relatively easy	Supplier managed
China	34	L	M/H	L/M	M/H	M	H	M/H	H	L	M/H	Service-side complexity	Merchant managed
China	35	M/H	M	L/M	L	M	M	M	M	L	M	Relatively easy	Supplier managed
China	36	H	M	L/M	M/H	M/H	H	M/H	H	L	M/H	High complexity	LSP managed
China	37	L	M	H	L	M	H	L	H	L	M	Relatively easy	Merchant managed
China	38	M/H	M	M	M	M	H	M/H	H	L	M/H	Service-side complexity	LSP managed
China	39	H	M/H	M	M	M/H	M	M	M	L/M	M	Product-side complexity	Supplier managed
China	40	M/H	M/H	L	M	M	M/H	L/M	H	L	M	Relatively easy	Merchant managed
China	41	L/M	M/H	M	L/M	M	H	M	H	L	M/H	Service-side complexity	LSP managed
China	42	L	M	H	H	M/H	H	H	H	L	M/H	High complexity	Merchant managed
China	6	L	L	L/M	M	L/M	H	H	H	L	M/H	Service-side complexity	Merchant managed
China	43	M	M	M	L/M	M	M/H	H	H	L	M/H	Service-side complexity	LSP managed

Acknowledgement

The completion of thesis is attributed to many people's patient guidance and constant encouragement. It is the result of all joint efforts and would have been a far more pallid thing without the generosity and support from many members. I would like to express my gratitude to all those who help me in many ways during the writing of this thesis.

First of all, I want to extend my heartfelt gratitude to my supervisors, Professor Huo Jiazhen in Tongji University and Professor Frank Straube in Technischen Universität Berlin, whose conscientious academic spirit and modest, open-minded personality inspire me both in academic study and daily life. Without their enlightening suggestions and instructions, it would be a tough task for me to finish this thesis.

Also, I am deeply indebted to all the other tutors and teachers in both of Universities that greatly broadened my horizon and enriched my knowledge in my study. Their inspirational and conscientious teaching has provided me with a solid foundation to accomplish this paper and will always be of great value for my future career and academic research.

I own my heartfelt thanks to my friends, especially those in Germany. For the past two years' study in Berlin, I really had a fulfilling life here. Not only have I met many knowledgeable colleagues, but also truthful friends. Their persistent encouragement, gives me much help and advice during the whole process of my writing.

Sincerely thanks to the experts who participated in my survey and interview, especially those in Walmart and Jingdon, who have put considerable time and effort into their comments on the draft, which has made my accomplishments possible. My gratitude also goes to the authors and scholars whose books and articles have enlightened me in the entire process of finishing thesis.

Last but not least, I would like to express deep thanks to my beloved family for their generous love, support and patience. My parents whose care and understanding make me want to be a better person. My parents-in-law, whose all kinds of practical help and great confidence motivate me to move on. To my wife I am most indebted for her continuous encouragement and loving considerations towards my study for these years. They are a firm basis for the composing of this thesis. I love them forever.

Schriftenreihe Logistik der Technischen Universität Berlin
Hrsg.: Frank Straube, Raimund Klinkner, Helmut Baumgarten

ISSN 1865-3170 (print)
ISSN 2197-0564 (online)

01: Mayer, Axel: Modularisierung der Logistik. Ein Gestaltungsmodell zum Management von Komplexität in der industriellen Logistik. - 2007. - XVIII, 264 S., zahlr. Abb.
ISBN **978-3-7983-2054-3** vergriffen

02: Thom, Alexander: Entwicklung eines Gestaltungsmodells zum Management von Risiken in Produktionsnetzwerken. Ein Beitrag zum Risikomanagement in der Logistik. - 2008. - XX, 239 S., zahlr. Abb.
ISBN **978-3-7983-2975-8** EUR **5,00**

03: Bogatu, Christian: Smartcontainer als Antwort auf logistische und sicherheitsrelevante Herausforderungen in der Lieferkette. Auswirkungen und Handlungs-empfehlungen für die Wertschöpfungskette der Logistik. - 2008. - XXIV, 286 S., zahlr. Abb.
ISBN **978-3-7983-2074-1** EUR **5,00**

04: Beckmann, Thomas: Emerging Market Sourcing. Eine empirische Untersuchung zu Erfolgsfaktoren in der Beschaffung aus Wachstumsmärkten. - 2008. -XI, 221 S.
ISBN **978-3-7983-2096-3** EUR **5,00**

05: Dietman, Nils von: Airport Performance Measurement. Kennzahlensystem zur Analyse und Bewertung von Flughafenprozessen. - 2008. - XXI, 204 S., zahlr. Abb. u. Tab.
ISBN **978-3-7983-2103-8** EUR **5,00**

06: Hildebrand, Wolf-Christian: Management von Transportnetzwerken im containerisierten Seehafenhinterlandverkehr. - 2008. - XVI, 234 S., zahlr. Abb.
ISBN **978-3-7983-2102-1** EUR **5,00**

07: Wilmking, Niklas: Logistikmanagement in China. Eine empirische Untersuchung zur Strategieentwicklung von Logistikdienstleistern. - 2009. - VIII, 247 S., zahlr. Abb.
ISBN **978-3-7983-2130-4** EUR **5,00**

08: Vogeler, Stefan: Entwicklung eines Vorgehensmodells zur Implementierung der RFID-Technologie in logistischen Systemen am Beispiel der Bekleidungswirtschaft. - 2009. - XI, 227 S., zahlr. Abb.
ISBN **978-3-7983-2156-4** EUR **5,00**

09: Doch, Stefan Alexander: Logistische Leistungsdifferenzierung im Supply Chain Management. Theoretische und empirische Entwicklung eines Gestaltungsansatzes für die Differenzierung der logistischen Leistungserstellung produzierender Unternehmen zur Erfüllung individueller Kundenwünsche. - 2009. - X, 271 S., zahlr. Abb.
ISBN **978-3-7983-2157-1** vergriffen

10: Bensel, Philipp: Geschäftsmodelle von Logistikdienstleistern im Umfeld des Ubiquitous Computing. - 2009. - XIV, 247 S.
ISBN **978-3-7983-2166-3** EUR **5,00**

11: Bohn, Michael: Logistik im Kontext des ausländischen Markteintritts. Entwicklung von Gestaltungsempfehlungen für den ausländischen Markteintritt unter besonderer Berücksichtigung der Erfolgskomponente Logistik. - 2009. - XVIII, 334 S., zahlr. Abb. u. Tab.
ISBN **978-3-7983-2179-3** EUR **5,00**

12: Sommer-Dittrich, Thomas: Wandlungsfähige Logistiksysteme in einer nachhaltigen Kreislaufwirtschaft. - 2010. - 215 S., zahlr. Abb. u. Tab.
ISBN **978-3-7983-2200-4** EUR **5,00**

13: Kerner, Jürgen Andreas: Beschaffung im Eigenmarkengeschäft des Bekleidungshandels. Ein theoretischer und fallstudienbasierter Beitrag zur Lösung ausgewählter Probleme der Prozessplanung. - 2010. - XX, 207 S..
ISBN **978-3-7983-2212-7** EUR **5,00**

14: Fürstenberg, Frank: Der Beitrag serviceorientierter IT-Architekturen zu integrierten Kontraktlogistikdienstleistungen. - 2010. - XVIII, 244 S., zahlr. Abb.
ISBN **978-3-7983-2227-1** EUR **5,00**

15: Fendt, Thomas: Introducing Electronic Supply Chain Collaboration in China – Evidence from Manufacturing Industries. - 2010. - XII, 219, 53 S., Anh.
ISBN **978-3-7983-2243-1** EUR **5,00**

16: Franke, Peter D.: Internationalisierung der Kontraktlogistik. Entwicklung eines Instrumentariums zur Länderselektion. - 2011. - XV, 217 S., zahlr. Abb. u. Tab.
ISBN **978-3-7983-2296-7** EUR **5,00**

17: Tentrop, Friedrich: Entwicklung eines integrierten Gestaltungsansatzes der Produktionslogistik. - 2011. - XV, 227 S., zahlr. Abb.
ISBN **978-3-7983-2317-9** EUR **5,00**

18: Nagel, Arnfried: Logistik im Kontext der Nachhaltigkeit. Ökologische Nachhaltigkeit als Zielgröße bei der Gestaltung logistischer Netzwerke. - 2011. - XV, 228 S., zahlr. Abb. u. Tab.
ISBN **978-3-7983-2383-4** EUR **5,00**

19: Grig, Roman: Governance-Strukturen in der maritimen Transportkette. Agentenbasierte Modellierung des Akteursverhaltens im Extended Gate. - 2012. - XVI, 373 S.
ISBN **978-3-7983-2384-1** EUR **5,00**

20: Keßler, Martin: Gestaltung von Logistiknetzwerken für die humanitäre Versorgung in Entwicklungsländern Afrikas. - 2012. - XIV, 355 S.
ISBN **978-3-7983-2426-8** (print) EUR **5,00**
ISBN **978-3-7983-2427-5** (online)

21: Schwarz, Jennifer Rebecca: Humanitäre Logistik für die Versorgungsproblematik in Subsahara-Afrika. Aufbau von Logistikkapazität durch Wissenstransfer. - 2012. - XVIII, 336 S.
ISBN **978-3-7983-2444-2** (print) EUR **5,00**
ISBN **978-3-7983-2445-9** (online)

22: Rief, Daniel: Markteintritt in China. Flexibilität und Integration als Erfolgsfaktoren in einer dynamischen und komplexen Marktumgebung. - 2013. - XIX, 235 S.
ISBN **978-3-7983-2482-4** EUR **20,90**

23: Richter, Markus: Nutzenoptimierter RFID-Einsatz in der Logistik. Eine Handlungsempfehlung zur Lokalisierung und Bewertung der Nutzenpotenziale von RFID-Anwendungen. - 2013. - XIX, 235 S.
ISBN **978-3-7983-2523-4** (print) EUR **21,90**
ISBN **978-3-7983-2524-1** (online)

24: Huynh, Thu Hang: Beitrag zur Systematisierung von Theorien in der Logistik. - 2013. - XVII, 429 S.
ISBN 9**78-3-7983-2610-1** (print) EUR **21,90**
ISBN **978-3-7983-2611-8** (online)

25: Fontius, Jörn: Megatrends und Ihre Implikationen für die Logsitik. Ableitung von Wirkungszusammenhängen. - 2013. - XVII, 217 S.
ISBN **978-3-7983-2634-7** (print) EUR **12,50**
ISBN **978-3-7983-2635-4** (online)

26: Ouyeder, Ouelid: Strategien für eine nachhaltige Lieferantenentwicklung für die Beschaffung aus Emerging Markets. - 2013. - X, 279 S.
ISBN **978-3-7983-2658-3** EUR **21,50**

27: Steffens, Anja: Logistische Wandlungsbefähiger. Entwicklung eines kontextbasierten Gestaltungsmodells für die industrielle Logistik. - 2014. - XIII, 284 S.
ISBN **978-3-7983-2682-8** EUR **15,50**

28: Siegmann, Julian B.: Prozessinnovationen bei Logistikdienstleistungsunternehmen. - 2015. - xxxviii, 245 S.
ISBN **978-3-7983-2737-5** (print) EUR **15,50**
ISBN **978-3-7983-2738-2** (online)

29: Keitel, Sebastian: Auswirkungen disaggregierter Regulierung auf die Kapazität von Verkehrssektoren. Eine wettbewerbstheoretische und empirische Untersuchung am Beispiel des Luftverkehrssektors. - 2015. - IX, 252 S.
ISBN **978-3-7983-2749-8** (print) EUR **15,50**
ISBN **978-3-7983-2750-4** (online)

30: Campos, Juliana Kucht: Integrated Framework for Managing Sustainable Supply Chain Practices. - 2015. - xii, 121 S.
ISBN **978-3-7983-2783-2** (print) EUR **10,50**
ISBN **978-3-7983-2784-9** (online)

31: Spiegel, Timo U.:Technologieorientiertes Service Engineering in der Kontraktlogistik. Konzeption eines Gestaltungsmodells für die systematische Entwicklung technologiebasierter Logistikdienstleistungen. - 2016. - x, 295 S.
ISBN **978-3-7983-2807-5** (print) EUR **15,50**
ISBN **978-3-7983-2808-2** (online)

32: Figiel, Anna: Transportmanagement in der schnelldrehenden Konsumgüterindustrie. Entwicklung eines Gestaltungsansatzes zur Integration von Transport und Logistik. - 2016. - XVIII, 227 S.
ISBN **978-3-7983-2816-7** (print) EUR **14,50**
ISBN **978-3-7983-2817-4** (online)

33: Durach, Christian F.: A Theoretical and Practical Contribution to Supply Chain Robustness. Developing a Schema for Robustness in Dyads. - 2016. - viii, 183 S.
ISBN **978-3-7983-2812-9** (print) EUR **13,50**
ISBN **978-3-7983-2813-6** (online)

34: Blome, Hendrik: Logistische Optionen für eine nachhaltige Versorgung von Subsahara-Afrika. Ein Beitrag zur Humanitären Logistik. - 2016. - XVII, 315 S.
ISBN **978-3-7983-2840-2** (print) EUR **16,50**
ISBN **978-3-7983-2841-9** (online)

35: Kucht Campos, Juliana: A methodology for planning sustainable supply chain initiatives. - 2016. - xviii, 326 S.
ISBN **978-3-7983-2860-0** (print) EUR **16,50**
ISBN **978-3-7983-2861-7** (online)

36: Wutke, Sebastian: Entwicklung eines Gestaltungsmodells zur Berücksichtigung von Nachhaltigkeit bei der Ausschreibung und Vergabe logistischer Leistungen im Straßengüterverkehr. - 2017. - X, 299 S.
ISBN **978-3-7983-2862-4** (print) EUR **15,50**
ISBN **978-3-7983-2863-1** (online)

37: Schöder, Dustin: Technisch-wirtschaftliche Bewertung des Einsatzes von batterieelektrischen Nutzfahrzeugen in der Distribution von Konsumgütern. - 2017. - XV, 287 S.
ISBN **978-3-7983-2920-1** (print) EUR **15,50**
ISBN **978-3-7983-2921-8** (online)

38: Roy, Daniel Thomas: Industrie 4.0 – Gestaltung cyber-physischer Logistiksysteme zur Unterstützung des Logistikmanagements in der Smart Factory. - 2017. - XVI, 204 S.
ISBN **978-3-7983-2944-7** (print) EUR **14,50**
ISBN **978-3-7983-2945-4** (online)

Universitätsverlag der TU Berlin

Developing E-commerce Logistics in Cross-border Relation

Through a structured literature review and an exploratory factor analysis, this thesis presents a conceptual framework with 6 key factors composed of 19 indicators, including government, consumer, company, product, operation and partnership, which affecting the development of e-logistics in cross-border relation. Then, a comprehensive competitive strategy is generated based on the framework, including government policy, logistics strategy selection, differentiated product, dual-channel inventory and transport. Finally, Walmart and JD.com in China market are chosen as case study, the development of their cross-border e-logistics strategy verify the rationality and applicability of the framework found in this thesis.

ISBN 978-3-7983-2972-0 (print)
ISBN 978-3-7983-2973-7 (online)

ISBN 978-3-7983-2972-0

http://verlag.tu-berlin.de