UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in Logistics and Transport Management

Implementing B2B platforms for industry clusters ——inspired by a case study from China

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Master Degree Project No.
Graduate School

Abstract

The ongoing development of E-commerce has changed the world dramatically. As an enabler of costs reduction and efficiency accelerator, the implementation of E-commerce is not limited to Business to Consumer (B2C) transactions but also spread to Business to Business (B2B) online transactions. This thesis focus on the implementation of B2B platforms in the concrete context of industry clusters. A case study based on a typical Chinese industry cluster has been explored in this research and two practices of platforms in the area have been described in detail, which are Electrical trading platform of China and 8m platform. Thorough discussions on these two practices are presented, including the weakness and strengths for each. In exploring the potential improvements, a new concept of Physical Internet (PI) has been introduced and discussed, including its sub-concepts of open hubs and PI-containers. Besides, regarding the trouble of attracting third party logistics to the platform, analysis on pricing strategies has been conducted to provide potential solutions.

Key words: industry cluster, B2B platform, E-commerce, SMEs, physical internet

Acknowledgement

We want to share our great thankfulness to everyone who have contributed their experience, knowledge and support to our thesis. First of all, we want to express our sincere appreciation to our supervisor, Sharon Cullinane, for giving us guidance, feedback and encouragement while writing our thesis. Second, we would like to show our thankfulness to the people in our home country, Prof Nan Liu and Ms Xianhong Li. Without them, it would be impossible for Xiaohan to get the chance of studying in University of Gothenburg. And thanks to Prof Liu, we got the inspiration of this research from him. Thirdly, we would like to thank the three interviewees in this research who gave us a good knowledge of the case study we investigate in our paper. They are Xuanlin Lin, Suilin Ye and Xiaoyan Wu. Special thanks to our classmates in Logistics, who gave us good reviews and feedback during the thesis seminar. Finally, great thanks to our families that support us and encourage us during this whole period.

Best regards,
Gothenburg, May 2017

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List of Abbreviations

B2C	Business to Consumer
B2B	Business to Business
B2D	Business to Distributor
C2C	Consumer to Consumer
CSN	China Smart Logistic Network
EDI	Electronic Data Interchange
ELP	E-commerce Logistics Problem
GFP	Generalized First-Price Auction
GSP	Generalized Second-Price Auction
IoT	Internet of Things
LTLDP	Less-Than-Truckload Dynamic Pricing
OSI	Open Systems Interconnect
OLI	Open Logistics Interconnection
PI	Physical Internet
PMI	Purchase Management Index
RQ1	Research Question 1
RQ2	Research Question 2
RFID	Radio-Frequency Identification
SMEs	Small and Medium-Sized Enterprises
UNIDO	United Nations Industrial Development Organization
VCG	Vickrey-Clark-Groves
3PL	Third Party Logistics

1. Introduction

1.1 Background

As a special organization form, industry cluster emerged in the 1990s. And the most widely-accepted theory about industry cluster was proposed by Porter (1996) and economic geography principles (Mitsui, 2003).

Enough states and regions has adopted his theory and different kind of industry clusters have sprung up worldwide. For example, Cluster of clean tech industries in Copenhagen attracted more than 300 cleantech companies, and the cluster of ceramic tile industry in Italy shares 18% of global production and 36% of global export. While in Asia, a cluster of iron and steel industry located in Japan consists of more than 6,000 factories. (The CID Group, 2009).

The clustering of clusters, no matter spontaneous generated or artificially designed, not only facilitates the sharing of public resources and collaboration within cluster, but also has positive impacts on regional economics and society. The mode of clustering industry has become the most efficient way to accelerate regional economic growth for China. According to Ali research (2015), there are more than 1300 clusters nationwide, mostly in manufacturing sector, and about 79% of them are located in Eastern China, the center of economic activity.

However, nowadays, it's a challenging task for industry clusters, especially those in manufacturing sectors, to achieve good performance. On the one hand, the pressure came from downturns of macro economy environment and the new requirements of sustainability and globalization. The growth rate of GDP has dropped down below 7% in 2015 and the Purchase Management Index (PMI) of China also struggled at the "no change line" (National Bureau of Statistics of China, 2015). Moreover, the world trend of sustainability brought new requirement for industry, while globalization deprived the advantage of cost for industry clusters in China, especially those who offers labor-intensive or resource-intensive products. For the other hand, clusters in China suffer from excess capacity and inventory pressure. Therefore, industry clusters are in urgent need of a solution that helps with this problem.

As a popular world-wide trend, E-commerce is also introduced to industry clusters (Ali research, 2015). Governmental ministries, local governments and public organizations are enthusiastically trying to apply it to seek regional innovation system, promotion of local business networking and new industrial development (Mitsui, 2003). For example,

Department of Electronic Commerce and Informatization in Ministry of Commerce of China published policies that stimulate the exploration of E-commerce for industry cluster (MOFCOM, 2015).

Business to Business platform is the most common form of E-commerce for industries. However, few previous studies have been conducted in this area. As the research is falling behind the practices, this thesis will first investigate the current practices in real world to fill the theoretical blank through a case study of Wenzhou low-voltage electric industry cluster in China as it is a pioneer in applying B2B platforms, and then provide suggestions for further improvement to guide the development of practices.

1.2 Research question

Based on the introduction, two research questions are proposed in this thesis. The major work of this paper will be focused on solving these two questions:

RQ1*: How does the B2B platform established for industry clusters operate currently?*

RQ2: *What improvements could be made for current situation?*

The first research question is proposed to investigate the current situation on B2B platform implements. As B2B platforms are introduced to industry clusters, there is no doubt that industry clusters would be changed to adapt to the new trend. Therefore, studies on the operation of cluster without B2B platform would be first explored, and then on the existing practices. Both RQ1 and RQ2 will be answered based on a typical traditional industry cluster in China, which is Wenzhou low-voltage electrical industry clusters.

1.3 Research purpose

The purpose of the paper is to analyze the current situation of B2B platforms in industry clusters and find the problems they encounter, and explore what improvements could be made to benefit the current situation, thus help the industry clusters to transform into a stronger economic area by B2B platforms. To reach the research purpose, there are two steps that has to be made. The first step is to investigate the current situation in Chinese industry clusters, especially when it is combined with E-commerce practices. Since it is a new business model for the industry clusters, not a lot of investigation has been done within this field. Therefore, it is necessary to do a thorough investigation of the industry clusters before

exploring its problems. After gaining a better understanding of how the supply chain works, possible improvements will be explored to assist the development of industry clusters.

1.4 Contribution and originality

Two pieces of contributions and originality are coming from this research. First, it conducted a thorough study on implementation of B2B platforms for industry cluster. Though other researchers has contributed a lot to the theoretical operation framework and impact of B2B platforms, few of them choose to conduct a case study on actual practices. And to the best of our knowledge, no one has ever focused their attention of studying B2B platforms on such concrete context of industry cluster. Considering the unique characteristics and importance of industry cluster, this study fills the gap. Secondly, this study introduced the concept of Physical Internet to the practices for improvement. Physical Internet is a new concept brought up within 10 years, and mostly used in delivery process for final products. However, PI concept affords two lessons that merit attention which is open hubs and PI container. This study employed the idea of open hubs and PI container to the upstream of supply chains dealing with heterogeneous products, which is original.

1.5 Delimitation

In some literatures, the authors identify the different definitions for E-commerce and e-business. For example, Rodgers and Chou (2002) stated that E-commerce mainly focus on the transactions part with its customers, but e-business encompass the interconnections among its suppliers, employees and business partners. However, in some articles, the authors did not make a difference between these two terminologies. In this research, the difference between E-commerce and E-business would not be distinguished.

In addition, for the sake of convenience, except for special statement, the term of "WenZhou cluster" is used referring to Wenzhou low-voltage electrical industry cluster.

1.6 Disposition

The disposition of this paper is shown in Figure 1. In the first chapter, it introduces the chosen topic of this paper and other relevant information of the research. Theoretical framework and Literature review about cluster industry, E-commerce, PI and pricing strategies will be presented in chapter 2 and Methodology is provided in the next chapter, which introduces how the research is conducted. A thorough investigation of the case study will be introduced in chapter four, which answers the research questions of the paper. A

conclusion is made as the last chapter of the paper.

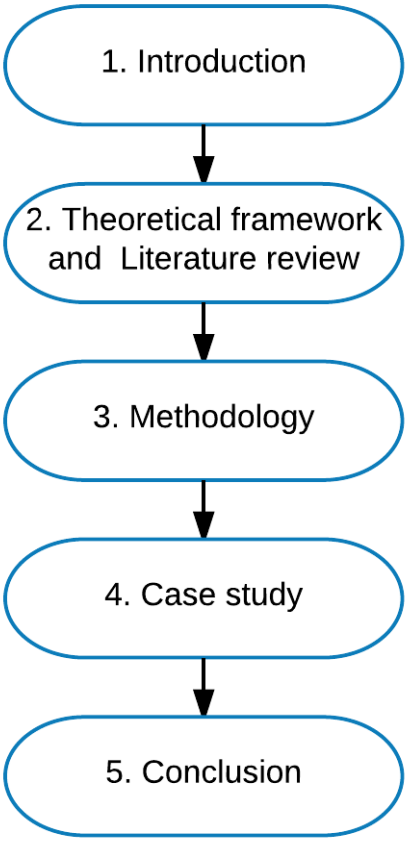

Figure 1: Thesis disposition

(Source: Compiled by authors, 2017)

2. Theoretical framework and Literature review

To the best of our knowledge, not many previous researches have been done in this specific topic, thus a literature review is conducted in this chapter. Not limited to B2B platform, theoretical support for this study includes four relevant fields that might help to explore the research questions (Figure 2).

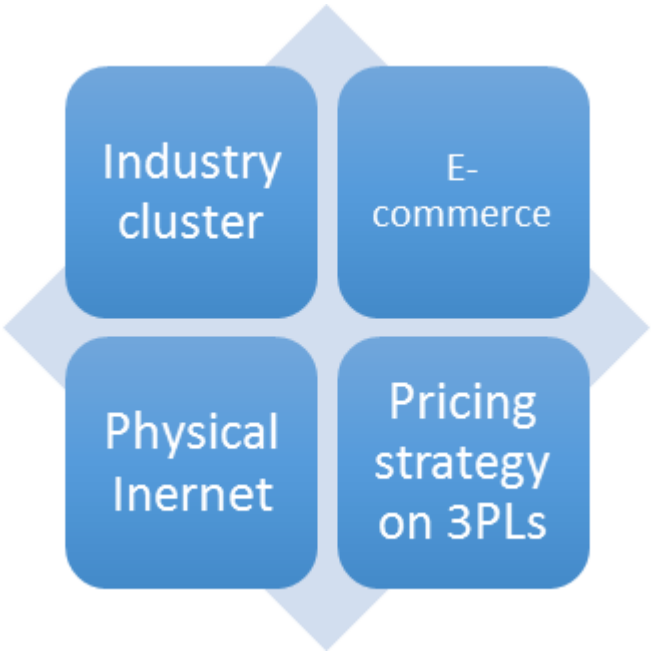

Figure 2. Literature review illustration

(Source: compiled by authors, 2017)

The first section is related to industrial cluster as our study is conducted in this special context. Its definition, origin and characteristics are presented in this part to prepare the readers without basic information. And the second section reviews previous literatures on E-commerce. Since B2B platform is a special branch of E-commerce, general backgrounds of E-commerce, such as definition, drivers and barriers, are displayed in this section to facilitate the understanding on platform implementation. And the third and fourth section of literature review are presented here as preparations to answer the second research question. The theory of Physical Internet is introduced in section 2.3, which would be used in section 4.5 as theoretical support of potential suggestion. And former studies of pricing strategy on 3PLs is discussed in section 2.4 since suggestions on pricing problem would also be presented later.

2.1 Cluster industry

2.1.1 Definition

Before the cluster theory, there were the concepts of "externalities" and "agglomeration" which eventually lead to the formation of the cluster theory (Chhetri and Corbitt 2014). Marshall (1920) introduced the externalities of specialized industrial locales and Porter and Sölvell described the agglomeration economies in 1998 (Chhetri and Corbitt 2014). Later, Porter consolidated some of the theories and brought up a definition of cluster (Chhetri and Corbitt 2014). He gave the following definition:

"Clusters are geographic concentrations of interconnected companies and institutions in a particular field."(Porter 1998)

There are two keywords in this definition. One is "Geographic", which means the companies that gather together in a specific geographic area. The other one is "interconnected", which indicates that the companies are linked industries and entities that are important for the competition. The linked industries can be suppliers for special components or providers for special infrastructure. Besides, the government and other institutions, such as some trade associations and universities, are highly interconnected with the cluster in a way.

Barkley and Henry (2002) made a similar definition for industry clusters, which is:

"An industry cluster is a loose, geographically bounded collection of similar and/or related firms that together create competitive advantages for member firms and the regional economy."(Barkley and Henry, 2002)

In this definition, the authors inherit the keyword of "Geographic" from Michael E. Porter but made an extension compared to the first definition. The authors clarified that the purpose of a cluster is to gain a competitive advantage, and emphasized the benefit of clustering for regional economy.

The United Nations Industrial Development Organization (UNIDO) also made a definition for cluster, it said:

"A cluster is understood to refer to a sectoral and geographical concentration of enterprises and/or individual producers that produce a similar range of goods or services and face

similar threats and opportunities."(UNIDO)

Unlike others that limit the scale of cluster within producers, it highlights that organizations facing similar threats and opportunities should be regarded as members of cluster, which implies that necessity of collaboration between auxiliary organizations and producers.

Overall, the basic elements of a cluster consists of geography, the role of government, entrepreneurship, small and medium-sized enterprises (SMEs), trust, cooperation and networking (Frisillo 2007).

2.1.2. Categories

Markusen (1994) described 4 different categories of industry clusters, which are Marshallian, hub and spoke, satellite platforms and state-anchored clusters basically based on due to the members of the cluster and the attribute of member firms. Marshallian industry clusters are comprised of small and medium sized locally owned firms supported by strong institutions and government policies to gain its competitiveness. The hub and spoke cluster is dominated by one or a few large firms and surrounded by a lot of smaller suppliers and service firms. The small firms depend highly on the hub firm but the cooperation between small firms is lacking. While satellite platforms industry clusters consist of medium and large sized branch plants. In state-anchored industry cluster, a large non-profit or public entity, like a military base, usually dominates the cluster.

However, Held(1996) categorized the clusters into 3 categories based on the relationship between firms. The classic vertically-integrated cluster emphasized the cooperation between members along the supply chain; the horizontally-integrated industry clusters implies the sharing of common resources on cluster members; and emerging clusters are those who might have a linkage or common resource, but has not been established yet.

Industry clusters can also be divided into traditional industry clusters and high-tech industry cluster. The differences between these two industry clusters are revealed from three perspectives, which are the members, the structure and the interaction between them. In a traditional industry clusters, the involvement of public research institutions and universities are much less prominent than that in a high-tech industry cluster. Regarding to the structures, the research of key technologies, which are outsourced to SMEs for high-tech industry clusters, are performed only by a few core companies in the traditional industry cluster. The interactions between members are in long-term relationships for the traditional industry cluster, but a rather short and temporary cooperation for high-tech industry cluster (Xu and

Ying, 2012).

2.1.3. Characteristics

Anderson (1994) mentioned that one of the important characteristics of an industry cluster is that the companies rely on an active set of relationships among them. These relationships can be classified into 3 categories: buyer and supplier relationships; competitor and collaborator relationships and shared resource relationships. The benefits of these relationships can be enhanced by another characteristic of industry clusters, which is geographic proximity. When the participants are gathered together, the physical movement of products will be more efficient and time saving. The geographic proximity is also convenient for applying just-in-time management and reduce the time-to-market responsiveness, which are vital for competitiveness and productivity of companies. (Anderson, 1994)

DeWitt et al. (2006) also did research in their article about the characteristics of an industry cluster. They described the characteristics of a cluster as physical proximity, core competencies, and relationships. The proximity of companies in the cluster and the repeated transactions between them cultivate communication, coordination, innovation, interdependence and trust. "Physical proximity" as a core characteristic of clusters also got addressed by Adebanjo and Michaelides (2010). In this area, Huang and Xue (2012) also made a similar statement about the characteristics of industry clusters, which are physical adjacency, core competencies and relationships.

2.1.4. Benefits and Shortcomings

Barkley and Henry (2002) described the advantages of industry clusters in their report. The advantages of the industry clusters are that they boost the local economies, facilitate the industrial reorganization, permit greater focusing of public resources and shape the firms into a connected network. Porter (2000) summarized three competitive benefits that clusters can gain, which are "increasing the current productivity for firms or industries, promoting the innovation and productivity growth and stimulating new business formation that encourage innovation and expand the cluster.

According to Shi(2015), the competitive benefits of a cluster is a result of the professionalization and big scale of industry. An industry cluster is concentrated to one special area which improves efficiency and technical innovation. In addition, due to the industry clusters aggregation in one place with many enterprises, it could use the economies of scale to reduce the cost. (Shi, 2015)

The empirical studies also reveals the benefit of clustering. The restructuring of local industry changed the network of relationships among local companies, stimulating better collaboration and strengthening localization economies. Moreover, clustering process permits greater focus of public resources (Barkley and Henry, 1997) and solves the employment problem of local worker. For example, the European hotspots of emerging industries account for 37% of Europe's total GDP and they cover more than 45 million employees in Europe, which corresponds to 22% of all European population and 35% of its payroll (Ketels and Protsiv, 2014). Other successful practices of industry cluster, such as Silicon Valley and bio-tech clusters in San Diego, also has shown great positive influence to regional economics and society.

Frisillo (2007) asserted that one of the vital benefits of clusters is the demand that produces economies of scale on the external side. Firms can co-locate, co-market and co-produce in the same geographic area. Companies together achieve external economies. Another obvious advantage is that clusters attract better qualified suppliers, customers and also more sophisticated employees. (Frisillo, 2007) Porter (2000) believed that the effect of a cluster as a whole is more than the simple sum of its parts.

Barkley and Henry (2002) also argued the shortcomings of industry clusters. It discussed that the newcomers may have a difficult time to compete with the other firms in the area, it is difficult to pick a winner in the cluster area and supportive institutions are difficult to establish. Frisillo (2007) discussed that some firms in clusters are afraid of sharing technology and lacks of trust, which are some of the disadvantages of clusters. Perry (1999) also stated that just because the firms are close to each other doesn't necessary mean that they will form relationships together. However, the disadvantages of clusters are far fewer compared to the benefits, stated by Frisillo (2007).

2.1.5 Section summary

After decades of exploration, industry cluster is no longer a unfamiliar territory for researchers. A review on its definition, categories and characteristics from different point views are presented in this section, following the discussion on its pros and cons. The object of most previous researches is traditional cluster which is also the focus of our study. However, as the high-tech clusters rise, the niche of traditional clusters changes. Analysis on this new background could be carried in-depth. Besides, few previous researches have studied the attitudes of large core companies, who usually dominate traditional clusters, to clustering and other new changes.

2.2 E-commerce

This section aims at providing the theoretical bases for E-commerce. E-commerce Platforms are becoming ever increasingly popular. Many B2C platforms are well known by people, but few B2B platforms are recognizable by people. In this section, B2B platforms will be introduced. At the end, a literature review of the drivers and barriers of E-commerce will be given.

2.2.1 Definition

Pavic and Koh (2007) argued that there isn't a definition of E-commerce that has been accepted by all and the understanding of this concept varies according to different people. To give E-commerce a clear definition,Van Hooft and Stegwee (2001) adopted the definition used by IBM, which is:

"A secure, flexible and integrated approach to delivering differentiated business value by combining the systems and processes that run core business operations with the simplicity and reach made possible by Internet technology." (Van Hooft and Stegwee, 2001)

In this definition, it implies that E-commerce is more than an internet shop. It can be an enabler for integrate all the operations in the organization.

Rodgers and Chou (2002) believed that the most important function of E-commerce is for the extended organization to be connected. All the supply chain members are interconnected by E-commerce, including all the employees, customers, suppliers and of course some other stakeholders.

E-commerce as the new way of doing business already penetrate into people's life. Water (2000) said that "e-business has become an inescapable fact of life, nearly as essential to commerce as telephone." Without E-commerce, the company couldn't compete with others in nowadays (Rodgers and Chou 2002). King and Clift (2000) argued that the "e" will soon be dropped and that E-commerce will be business as it comes to be generally understood.

2.2.2 Drivers

E-commerce become to a new way of doing business in the whole world. There are numerous reasons for companies to adopt this new technology in their business.

Jeffcoate et al. (2002) stated that adopting to E-commerce was driven by better communication and the need of management. It is a cheap way of accessing to the global market. Hoffman and Novak (1996) argued that E-commerce is a more efficient way of advertising, communication and marketing. Pavic and Koh (2007) also addressed that using internet is a cheaper way to do marketing than traditional marketing and SMEs are relatively flexible and can easily make changes due to their company size, which can be the drivers for them to adopt E-commerce.

Kian Chong et al.,(2010) stated that E-commerce not only lower the operating and marketing cost for SMEs but also offers better opportunity to promote their products or services. Other benefits also promoted by other authors, for example, Petersen et al.,(2007) described that E-commerce promoted the interactive referring to services marketing communication and Laudon and Laudon (2002) stated that E-commerce facilitates the global presence of the companies.

2.2.3 Barriers

There are a lot of articles that argue about the barriers for the SMEs to adopt E-commerce.
Pavic and Koh (2007) discuss the factors that affect the business to adopt an advanced internet include organizational size, structure,mix of available human and so on. Debrik and Kraemer (2001) discovered that the barriers for Chinese to adopt E-commerce are lack of information system and applications to link with sales, productions, finance and service. Without these applications, it is difficult to have transactions online.

Cloete (2002) reported that the barrier of adopting E-commerce is mistrust the IT industry as some IT industry exaggerate the benefits of new technologies and mis-informing the SMEs owners. Another barrier is that the SMEs lack of the time to investigate in the new technologies due to the quick evolution time of internet. Chapman et al. (2000) interpret the barries as lack of the understanding on how to implement the new technology and absence the professional personnel to use the new technology and also the price of the technology is relatively high. Kaynak (2005) list the barriers of adopting E-commerce, which are ranked as follows: 1. Limited number of internet users; 2. Efficiency reduction by unnecessary internet use; 3. Lack of legal regulations 4. Suppliers and/or customers being offline; 5. Risk of dissipation of company -specific knowledge and so on. MacGregor and Vrazalic (2005) also make a long list for the barriers of adopting E-commerce in SMEs, which category the barriers into two sections, “too difficult” or “unsuitable” for the SMEs business.

2.2.4 A special branch- Platform

Generally, implementation of E-commerce shows itself in two perspectives. One is the application of new information technologies, such as Electronic data interchange (EDI) and Radio-frequency identification (RFID), both of which smooth the operation of supply chain and thereby improve its efficiency and effectiveness. The other perspective is the E-commerce platforms, based on technologies mentioned above, such as Business to Consumer (B2C) platforms and Business to Business (B2B) platforms.

Phan (2003) classifies E-commerce due to the different trading partners, which are Business to Business (B2B); Business to Consumer (B2C); Consumer to Consumer (C2C) etc.

When referring to B2B, the transaction volume is usually higher than B2C business. Like B2C platforms, B2B platforms aim to break the geographical distance for its users, where business companies are the clients and buy through the website instead of individual customers. Additionally it includes the business processes of B2B negotiation and ordering(Besimi and Dika, 2013). A good B2B platform can simplify the complex procurement process for its buyers and offer them reliable suppliers, and can expand the market for its sellers and increase their sales volume.

Li and Penard (2013) defined B2B platform as Internet-based organization that enable direct transactions between suppliers and customers. They further explained that B2B platform gathers the sellers and buyers together and offering them with matching and trading services to promote the exchange between them. Popovic (2002) classify B2B platform in line with two criteria, which are vertical or horizontal, neutral or non-neutral. Vertical platform congregates the suppliers and buyers for a special industry, for instance steel and automobile industries. While horizontal platforms gather up suppliers and buyers for many industries. As stated in Yoo and Mukhopadhyay (2007), A platform is neutral when it is operated by a third party, whereas it is non-neutral when it is runned by either suppliers or buyers.

B2B platforms especially vertical and neutral ones are the typical examples of “two-sided markets” (Belleflamme and Toulemonde, 2004). Jullien (2004) stated the concept of “two-sided market”. It is a market which refers to the situations that one or a few competing platforms provide services that are used by two types of trading partners to interact and operate an exchange. Evan (2003) described the characteristic of two-sided market as the utility derived by members on one side depends on the number of members on the other side. There are four areas that productivity could gain from B2B E-commerce, which are “*possible*

efficiencies from automation of transactions, potential economic advantages of new market intermediaries, consolidation of demand and supply through organized exchanges, and changes in the extent of vertical integration of companies". The third area appears to be dominant when it comes to some special B2B platform case (Lucking-Reiley and Spulber, 2001).

The implementation of B2B platforms get more and more popular in China. The most famous B2B platform in China is 1688.com, which is a B2B platform under Alibaba group, focusing on online trading and attracts many companies from both supplier and buyer side.

2.2.5 Section summary

This section provides some basic informations of E-commerce by reviewing previous literatures. Although the topic of this study concerns with a specific branch, that is the B2B platform, an overview on E-commerce could also help. Thus, definitions, drivers and barriers of E-commerce are presented in this section. In addition, a brief review of platform is provided though not many studies could be referred. Most studies on platform concentrated on B2C platforms, which implies the blank of B2B platform. And the effect of implementing B2B platforms for industry cluster remains unexplored.

2.3 Physical Internet

In this section, a new concept "Physical Internet" will be described in detail. Physical Internet is a complex and rather new concept, which includes the subconcepts of Open Hubs and Internet of Thing (LoT). The implementation of PI concept is introduced after the definition. The Auction Mechanism is discussed in the final part of this section.

2.3.1 Definition

Physical Internet (PI) was first introduced by Montrueil (2009) to offer a solution to the Global Logistics Sustainability Grand Challenge by improving the economic, environmental and social efficiency and sustainability of the way (Montrueil et al., 2012). As a metaphor of Digital Internet, the Physical Internet is defined as follows:

"An open global logistics system founded on physical, digital and operational interconnectivity through encapsulation, interfaces and protocols."

There are several key words that consist of this new concept. First, it's an "open logistics system", which implies all of its actors have to make themselves in an open way that others in

the system can access and use its service. In the meantime, new actors are free to be added to the PI as long as certain criterions are met. “Interconnectivity” means the ability of seamlessly interaction among its actors by physical, digital and operational dimensions (Montrueil, 2011; Montrueil et al., 2012), which is the key to establish an efficient and sustainable system.

An illustration of Physical Internet is presented in Figure 3. The left side of this figure shows a classical structure of overlapping network, in which products are transported following a certain hierarchical route. While the right side illustrated how the Physical Internet changes the classical one into an interconnected network. By turning warehouses into open hubs, the transportation routes of products in interconnected network are not fixed anymore and exchange between different open hubs happens more freely. Although detours in interconnected network might influence the transport and handling efficiency, this drawback is overcome by handling PI-containers of larger sizes and other benefits such as stock reduction and better transport vehicle fill rate (Montreuil et al., 2010).

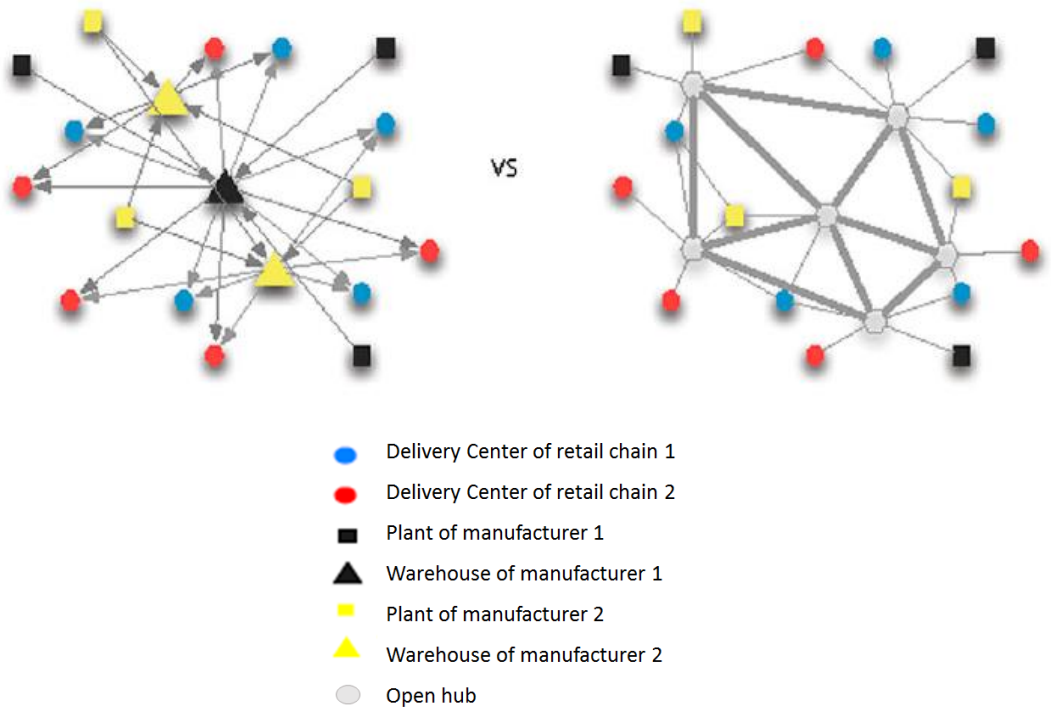

Figure 3. Overlapping networks vs. interconnected network
(Source: Sarraj et al., 2014)

Except from different network structure, the openness and interconnectivity of PI are also ensured by “encapsulation, interfaces and protocols”. In the design of this logistics system, a new PI-containers are exploited based on the Internet of Things (IoT) technology in its design,

while standard smart interfaces and standard coordination protocols are proposed as a suite.

PI container has several different size, and the modularity and the interlocking capabilities of π-containers combine to allow the easy composition of composite π-containers from sets of smaller π-containers (Shown as Figure 5) (Montreuil et al., 2010). And the application of IoT on PI containers could not only facilitate real-time track, which thereby ensures the security of products, but also improve operation efficiency of logistics since the exchange of delivery information is smart and quick.

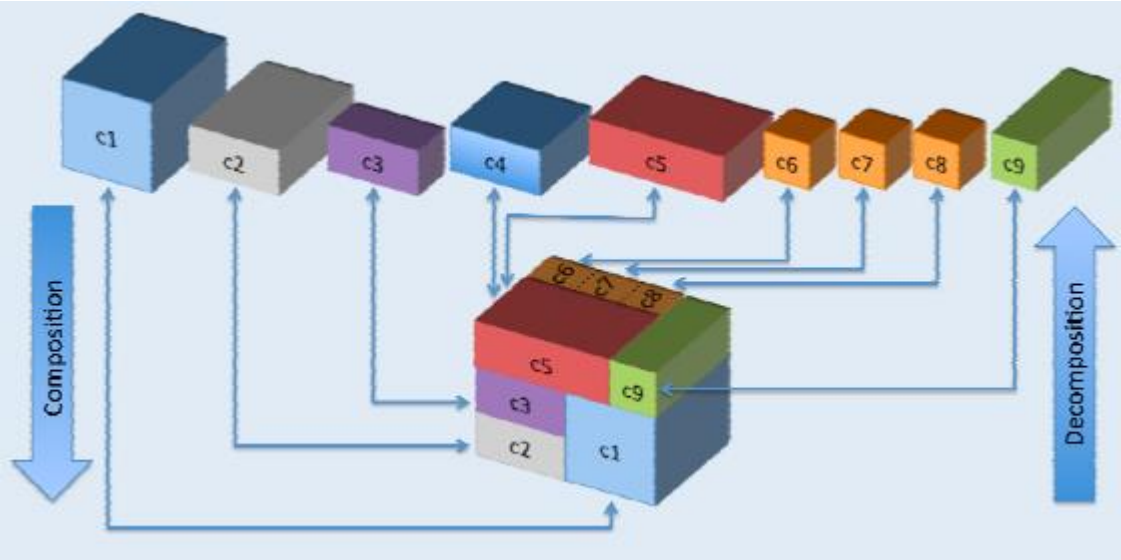

Figure 4: Illustration of PI containers

(Source: Montreuil et al., 2010)

Many for the studies on Physical Internet have been conducted around these keywords for further discussion, even though they differed in focus point, methodologies and other designs.

To detail the framework of Physical Internet, some qualitative studies made great contributions. For example, Montreuil et al. (2012) adapted the Open Systems Interconnect (OSI) model to a seven-layer Open Logistics Interconnection (OLI) model that supported by Protocol suite as a complete set to solve the lack of interconnectivity within logistics system. And the role of actors in the system is identified as the PI-Enablers and the PI-Enabled (Montreuil et al., 2012). Sarraj et al. (2014) explained how to comprehend the Physical Internet as the metaphor of Digital Internet, and compared the potential of PI network to the current one to illustrate its advantages. The PI idea was also introduced to Logistics sub-areas, such as Humanitarian Logistics and City Logistics, new models aroused combining two concepts to make up a more efficient and sustainable logistics system (Montreuil et al., 2010; Crainic and Montreuil, 2015; Goyal et al., 2016; Ben Mohamed et al., 2017).

2.3.2 Implementation

As Physical Internet was proposed as a logistics system, its implementation was explored in depth combining the supply chain concept by researchers. For example, Augenstein and Ludwig (2013) took the perspective of fourth party and lead logistics, and presented how to accomplish a bottom-up construction of a comprehensive service model. Analysis on the benefits of interconnected models was also presented to confirm their points. Same perspective also attracted other researchers. Rouges and Montreuil (2014) focused on the emerging logistics industry: Crowdsourcing delivery, and investigated how to apply the interlaced layers of PI, especially its Mobility Web, to overcome the limits of current paradigm, whereas, Simmer et al. (2017) choose to conduct semi-structured interviews among 16 traditional Austrian logistics service providers to detect their attitude, thereby further revealing the obstacles and opportunities to implement PI.

Different inventory replenishment strategies were developed exploiting the PI and their positive effects on vendor level and cost are revealed with the simulation approach compared with current centralized inventory control policy, (Pan et al., 2014; Yang et al., 2015; Yao, 2017). The resilience concept of inventory models from supply chain management was also investigated under the context of PI (Yang et al., 2016b).

Moreover, delivery scheduling problem, which is a well-developed topic in supply chain research, has once again attracted attentions due to the use of new container and IoT. An experimental study on packing solution applying PI-container provided evidence on efficiency of PI based on a simulation model (Sarraj et al. 2014). Similarly, a one-stop delivery scheduling mode based on the application of PI-container was proposed by Yao (2016). The author separated deal and physical distribution under the online shopping environment, especially under B2C transaction, and came up with a redistribution and recombination of PI container to improve the efficiency of delivery process. Wang et al. (2016) compared passive and initiative scheduling frameworks, which actually refers to centralized and decentralized decision-making mode. This study emphasized the exploration of IoT in Physical Internet manufacturing system to achieve the initiative operation mode.
Pricing problem in the context of PI is not so popular, but related works can still be found. For example, Qiao et al. (2016) analyzed the difference between dynamic pricing problem and less-than-truckload dynamic pricing (LTLDP) in a specific PI context. The reason why PI will change the current pricing models was also explored. An experimental study was conducted based on the new price auction model proposed by authors for the discussion of optimal price decision.

2.3.3 Section summary

Although the concept of Physical Internet is rather new, research on it and its applications reveals the direction of revolution for logistics system. However, there are also drawbacks of current research. First, most researches that used a simulation method didn't make application for real data, which may detached from the operation reality. Second, the applications of PI mainly focus on the distribution side, and extensions on the supplier-network are worth trying.

2.4 Pricing strategy on 3PLs

Third Party Logistics (3PL) is no longer an unfamiliar word for researchers in recent year. As the 3PL provides takes an important role in supply chain, thorough studies on its evolution history (Selviaridis and Spring, 2007), selection criterion (Göl and Çatay, 2007; Aguezzoul, 2007; Aguezzoul, 2014), relationship with other members (Sinkovics and Roath, 2004; Ali et al., 2014; Kareem, 2015) and performance evaluation (Knemeyer and Murphy, 2004; Zhang and Okoroafo, 2015; Chu et al, 2016), has been carried out. However, there is not so many existing research about the operational practices on pricing policy for 3PL.

The pricing practice for 3PLs can be divided as two categories. The first one, in which the 3PLs or the clients take the driving seat and determine the price offered to the other side are grouped as "One-sided pricing". To explore such practice that only one side of the participants have the power to determine the price, Cheng and Qi (2011) proposed an optimal pricing decision model for a 3PL provider to a manufacturer under uncertain demand. Lindsey et al. (2015) established a real-time decision support system (DSS) which helps third-party logistics to maximize its expected profit while improving the matching loads with carriers. A discrete choice models that predict the acceptance or rejection of an offer and a profit model consist of this DSS, and the application of this system in a real world case proved its value for 3PL companies. Moreover, Tran et al. (2014) presented two analytical models that differs in payment options are developed, and theoretical explanations on how payment option changes other parameters are made which offers a managerial implication for shippers.

And the second one, in which the 3PLs interact with their clients and in most cases the price is decided by auction mechanism, are grouped as "Auction pricing". Su Xiu Xu and George Huang have made great efforts in this aspect. For example, the auction mechanism was designed for multi-unit transportation procurement in logistics e-marketplaces to realize the maximal social welfare (Huang and Xu, 2013). And an extension of basic auction model was carried out for transportation service provider considering the manufacturers as a make-to-

order type (Xu and Huang, 2015). Later, Xu and Huang (2016) take the mode of transportation into consideration and developed an auction mechanism in the context of intermodal transportation and B2B E-commerce logistics. Xu and Huang (2017) extended the E-commerce Logistics Problem (ELP) into multi-items and a new auction model is designed which reveals the underlying link not only between single-attribute and multi-attribute auctions, but between static and dynamic auctions in a multi-attribute setting.

3. Methodology

In this chapter, the method and methodology used by this thesis will be discussed. The research philosophy is described and discussed in four aspects, which are the type of theory, epistemological considerations, ontological considerations and research strategy. After this section, the method of case study is introduced. For our case study, we used all three methods for case studies, namely explanatory, descriptive and exploratory. Finally, how the data was collected for this paper is presented.

3.1 Research philosophy

Based on the research purpose, this subsection illustrate how to categorize our thesis in terms of research philosophy. The discussion is carried out in four dimensions according to Bryman and Bell (2007): type of theory, epistemological considerations, ontological considerations, and research strategy.

3.1.1 Type of theory

This part discussed whether a study is deductive or inductive based on the way it deals with theories. A deductive study refers to texting an existing theory using observations and empirical findings, thus particular instances are deduced from the general inferences. Whereas an inductive one is to generate theories based on observations and empirical findings, thus general inferences are induced from particular cases. (Bryman and Bell, 2007 & Collis and Hussey, 2013). Therefore, in this sense, we prefer to say that the process of this study is inductive, as this paper using an empirical case study (Wenzhou low-voltage electric industry cluster case) to analyze how the B2B platforms operate in industry clusters.

3.1.2 Epistemological considerations

Positivism tries to operationalize all the concepts that has been used and describes them in a way that they can be measured. Therefore, positivism tends to use quantitative data. Interpretivist examines a small sample and seeks to understand what is happening in a

situation and tries to look for patterns that may be repeated in other similar situations, which tends to use qualitative data in the research (Collis and Hussey, 2013, p49). In the issue of positivism or interpretivism, this research is considered as interpretivist. A lot of qualitative analysis were conducted by the authors based on a case study, tring to find patterns in it to generalize it to other cases, which shows the characteristics of interpretivist paradigm.

3.1.3 Ontological considerations

This issue concerned with the nature of social entities. Objectivism takes by researchers who believe "social phenomena and their meanings have an existence that is dependent of the social actors" (Bryman and Bell, 2007). This study belongs to this category, because operations mode of B2B platform is determined once it is established and external to the researcher.

3.1.4 Research strategy

Research strategy refers to whether a study is qualitative or quantitative according to Bryman and Bell (2007). In our research, qualitative approaches is employed. The case study is conducted based the information obtained from interviews and other documents, using qualitative description to draw the framework of platform operation.

3.2 Interview

Defined as a qualitative research technique, in-depth interviews refer to "conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program or situation" (Boyce and Neale, 2006).

Generally, three type of interviews can be employed in qualitative research based on the extent to which questions are pre-determined, including structured, semi-structured and unstructured interviews. Semi-structured interviews are employed in this research, in which interviewer need to prepare a set of questions for interviewees and also raise additional questions during interviews to clarify or expand certain issues.

3.3 Case study

There are five major research methods, which are experiments, surveys, archival analyses, history and case study(Yin, 2014, P9). Compared to other research methods, case study often get disdained and has been seen as a less desirable form of inquiry than either an experiment or a survey. There are often some concerns about the Case Study method, for example,

whether it is rigorous enough and whether a case study can be used to generalize. Certainly, a case study might not be rigorous enough because there is no systematic procedures for researchers to follow compared to other research methods. What the researchers could do is to keep the evidence unequivocal, and thus get a clear direction of the conclusion. (Yin, 2014, P19-20) Generalization is not only a problem for the case study method, but also for others too. It is hard to generalize from a single case but it is also hard to generalize from a single experiment or survey. The main point of case study is to generalize to theoretical propositions and not to populations or universes. (Yin, 2014, P20-21) Even though the case study has its limitations, the other research methods also have their own inevitable shortcomings. For example, a survey's ability to investigate the context is limited and usually constrained by the number of respondents and who they are doing the survey with. (Yin, 2014, P16)

In this paper, a case study methodology will be used. First, for gaining a better understanding of the case study method, here is a definition, according to Yin:

"A case study is an empirical inquiry that Investigates a contemporary phenomenon (the case) in depth and within its real-world context, especially when The boundaries between phenomenon and context may not be clearly evident." (Yin, 2014, P16)

Generally, there are three types of case studies used for research purposes, which are explanatory, descriptive and exploratory. When the research question is "How" and "Why", it is likely an explanatory research to reveal how things work. When it refers to a "What" question, it is possible of a more exploratory research to explore what can be done for certain issues(Yin, 2014, P10-11).

Referring to our case study, our research question is "How the B2B platform works in industry clusters and what improvements could be done to improve the industry clusters". We want to gain a depth knowledge about the real practice of B2B platforms, especially under the context of industry clusters, and to discuss the future potential of platform. Thus, a case study that combining descriptive (to answer the first question) and exploratory (to answer the second question) method are conducted in this research.

Benbasat et al. (1987) concluded the advantages of using a case study methodology. It shows that by using the case study, "the current situation can be understood in a natural and un-manipulated environment, theories can be derived from actual observations and it is easier to understand the essence and complexity of the process".

When employing a case study methodology, two issues should be considered. One is, if the case is typical and the other is, the feasibility of the data collection. In this paper, the Wenzhou low-voltage electrical industry cluster case is deemed to be a typical case because it is one of the most well-known industry clusters in China and the characteristics of this industry cluster is really typical. Also the data collection was rather feasible because one of the authors is born and lived in the same province where the industry cluster is located and is very familiar with the situation there. Moreover, one of the authors did a few deep interviews with some of the main players in the industry cluster. Which makes the report more reliable and gives it a sense of validity.

Overall, the case study methodology is suitable for this research paper due to the advantages of a case study and it is an appropriate way of answering the research question. Moreover, the preliminary data of the case study has already been done by one of the authors in 2016. This gave us the motivation to apply this case study in the paper.

3.4 Data collection

The purpose of conducting case study is to get full background information about operations of B2B platform. Therefore, in this research, two main ways of data collection are employed, which are face-to-face interviews and secondary data collection from official documentary sources.

Three semi-structured interviews were conducted with the most important B2B platform players in Wenzhou industry cluster, which are Electrical Trading Platform of China, 8m platform and the biggest player in the cluster, namely CHINT Electric Co., Ltd. To carry them out, semi-questions are prepared for all three companies and some following questions are asked during the interviews according to the conversations. The summary of the interviews can be found in Appendix. All of the interviews are conducted in 2016, since the authors did some pre-research before.

In addition, secondary data from documentary is also used as complement. The secondary data are mainly from academic papers and some official documents from the companies websites and government websites.

4. Case study

In this chapter, the case study on Wenzhou low-voltage electrical industry cluster will be conducted.

Wenzhou low-voltage electrical industry cluster is selected for case study with following reasons. First, the Wenzhou low-voltage electrical industry cluster owns 60% of nationwide market shares in low-voltage electrical industry (Science Technology Department of Zhejiang province, 2015) and takes an important role in the development of Chinese light industries. It's worthy to explore the current situation and future of this cluster to unveil the potential of Chinese light industries.

Secondly, located in Zhejiang province, this cluster was established with a long history as a traditional manufacture industry cluster. Manufacture industry is pretty important for Zhejiang province. There was more than 58000 manufacturing companies contributing to 3795 billion of Yuan in terms of total value of output in 2008 (Zhejiang provincial Bureau of statistics, 2014a).

In addition, the industrial development of Zhejiang is cluster-based. In 2004, there were 839 industrial clusters in Zhejiang with total output exceeding 100 million Yuan (Zhejiang provincial Bureau of statistics, 2014b).Thus, the result of case study is likely to be generalized to other manufacture clusters in Zhejiang.

Last but not least, the E-commerce development went on quite well in Zhejiang province. According to the report from Ali research (2015), Zhejiang ranks first for its e-commercialization rate.

This chapter is organized as follows. To begin with, a thorough background information is displayed, including the structure, the supply chain process, the logistics performance and the network structure of this cluster. Five general platform functions are presented in the second section, which are followed by two representative B2B platform practices in the cluster - Electrical trading platform of China and 8m platform. A comparison between these two practices is conducted in the next section. Finally, the chapter finished with the suggestions to improve the performance of 8m platform and the industry cluster.

4.1 Background of case study

4.1.1 Low-voltage electrical industry

Low-voltage electrical industry is characterized with low entry barriers. Most products in this industry are small in size, low in value and relatively low-tech, however, with complicated design parameters. Its labor intensive, just requiring less education background of most workers. And due to its characteristics of products, homogeneous competition between manufactures, especially for SMEs, is quite tough in this industry.

Low-voltage electrical industry belongs to electrical industry, which is regarded as one of China's largest export earners (ZNNES, 2010). And in 2010, the companies in electrical industry formed 6.08% of the total manufacturers and contributed 6.2% of the gross industrial output value in China (NBSC, 2010).

Clustering is an obvious characteristics of electrical industry. According to the research of Zhang et al. (2014), electrical industry clusters scatters in China's eastern provinces along the coastline, such as Guangdong, Zhejiang, Jiangsu, Shandong and Fujian provinces as displayed in Figure 5. The total products output of electrical industry from these five provinces has reached up to 80% of nationwide output (Zhang et al., 2014).

Figure 5: Cluster map of electrical industry

(Source:Zhang et al., 2014)

The emergence of Wenzhou low-voltage electrical industry in Zhejiang province started in 1960s. Beginning with gathering of several family-owned small businesses which were quite success in that time, this cluster developed very fast during the 80s to 90s, while its structure also changed at the same time. Several small-sized companies within the cluster merged into bigger ones to gain higher competitiveness and thereby became the core companies that

dominate the cluster. For example, CHINT, a family-owned company founded in 1984, merged, acquired and achieved joint venture with 48 companies, then regrouped as the CHINT Business Group, who takes more than 50% market shares in this cluster (Interview by authors, 2016, see Appendix C). Except for CHINT, another leading manufacturer DELIXI almost follows a similar pattern in its development history. As the main products in low-voltage electrical industry are not high-tech, other smaller companies with homogeneous products either died out as core companies get a better access to resources, or turned themselves into upstream suppliers or specialized service providers to support the core companies.

4.1.2 Business model of Wenzhou cluster

As shown in Figure 6, the business model of Wenzhou cluster is core-companies-centered. On the whole, there are more than 4000 manufactures in producing related low-voltage products or offering relevant service (Yang, 2016). A few of large companies owns core technologies and is in the upstream of value chain. They are also responsible for the final assembly of the devices and the final quality control before final products are shipped to customers. Although these core companies has invested a great amount of money on research and development, and master core technologies within cluster, they still suffer from their low-status in global value chain (Interview by authors, 2016, see Appendix C).

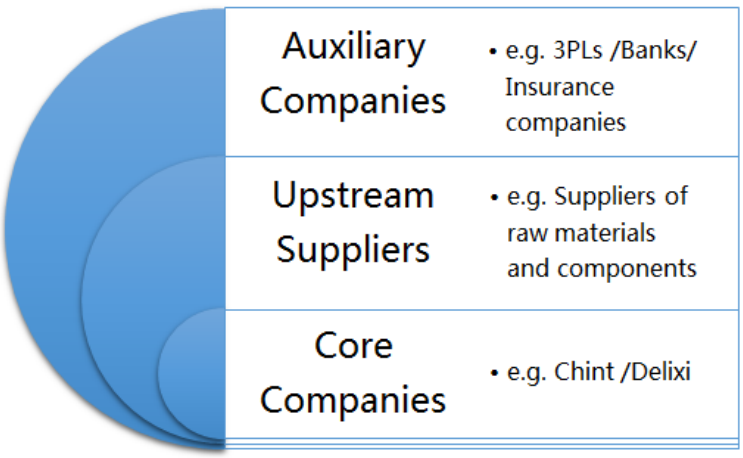

Figure 6: Structure of Wenzhou low-voltage electrical Industry Cluster

(Source: Compiled by authors,2017)

Small and medium sized manufacturers surround outside the core companies with high specialization. They choose to either produce components for final products or manufacture special products beyond the business scope of industry leaders. Most of these small

enterprises are usually family-own factories, with a few employees and relatively low capacity(Interview by authors, 2016, see Appendix A&B).

And the auxiliary companies locate at outermost layer of cluster, including logistics services providers, banks, insurance companies, training agencies and so on. Taking the logistics service provider as an example, there are more than 200 logistics companies in the cluster, whereas, most of which are too limited in logistics capacity to serve several client at the same time. And manufacturers usually choose their logistics partner out of convenience (Interview by authors, 2016, see Appendix A&B).

Therefore, according to the description in section 2.1.2, Wenzhou cluster can be categorized as a vertically-integrated industry clusters, following the operation mode of hub and spoke. Even though the relationship between cluster members are not as stable as expected, it could still be regarded as a typical traditional industry cluster, since the core companies take control of key technologies and public research institution plays a less prominent few in the cluster.

4.1.3 Supply chain in Wenzhou cluster

To obtain better understanding of this supply network, a dividing line is set in the position of core companies, and their distributors and retailers are regarded as downstream of supply chain, with the other side as upstream.

The downstream structure is quite clear and hierarchical. Final products flow from core manufactures to a series of layered distributors, and then to end customer. Unlike consumer products, the end customer of industrial products is not individuals but companies or other organization that is real-estate enterprises and State Grid Corporation of China in this case.

In the beginning of the supply chain, raw materials or product components are offered by small and medium-sized suppliers in the cluster. While the upstream suppliers are multi-tiered, but the relationships among them are not clearly hierarchical. Their supply relationships are not simply linear, instead, they are rather complicated. For instance, as illustrated in Figure 7, supplier A not only supply raw materials to B but also to C, as well as to the core company directly. And similarly, supplier B also connects to both supplier C and the core companies directly. According to the Interview with CHINT, 80% of its raw material suppliers are located around the company in the cluster (Interview by authors, 2016, see Appendix C).

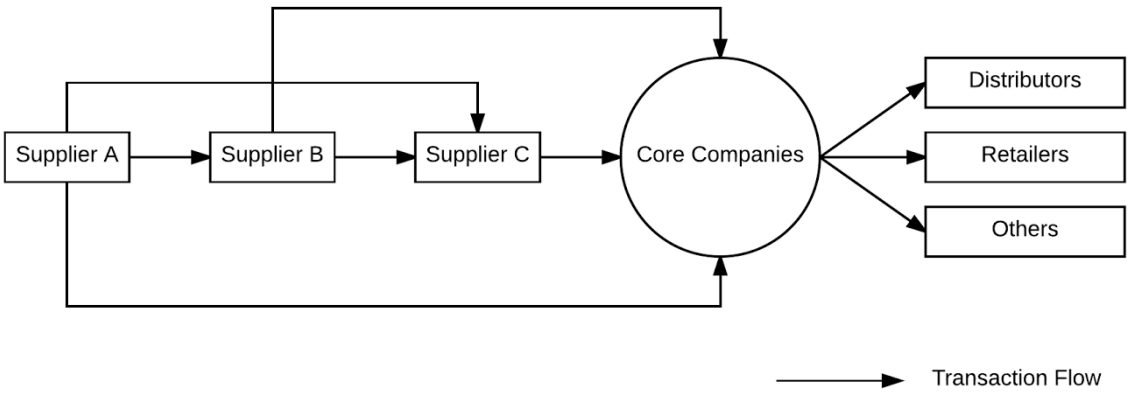

Figure 7: Depicting the Supply chain process for Industry Cluster

(Source: compiled by authors)

4.1.4 Logistics performance in Wenzhou cluster

Subject to the productivity and complex relationships between suppliers, the upstream logistics is characterized by high frequency but small quantity. Therefore, as mentioned before, small logistics service providers are popular within cluster due to its flexibility. However, their performance are a little patchy in terms of capacity and service quality. Real-time tracking service is not available and the absence of insurance could do harm to their clients.

Compared to upstream logistics, the downstream logistics are more organized and regulated. For example, one of the core companies, CHINT, started its own logistics company in 2015 to offer a better logistics service for its customers. Since downstream logistics have evolved into fixed patterns and the relationship between core manufacturers and distributors is quite stable, it's not easy to set foot in this side.

It is not surprising that the logistics performance of the supply chain has an obvious divergence between the upstream and downstream logistics, considering the small suppliers have limited capital and resources to invest in logistics. Thus, in order to improve logistics performance of whole supply chain, more attention need to be paid towards upstream. Therefore, the general logistics scope is inside the area, which makes it more urgent to optimize the upstream supply chain for the industry cluster.

4.2 Platform Functions

In this section, five functions of platform are described and discussed. Two types of function are grouped based on whether it's endogenous or exogenous. Basic function is endogenous, which refers to a function generated due to the nature of platform as a multi-sided market. While auxiliary ones are exogenous. It's up to the platform operators to choose whether auxiliary functions are offered to users. Auxiliary functions usually related to value-added services and thereby become highlights to attract users. However, it always requires investment and cooperation with other organizations for platform operators to achieve auxiliary functions. The clarification of platform functions could help readers to have a better understanding about how platform works and how it facilitate trades.

4.2.1 Basic Function: Aggregation

As an organization that attracts member companies in cluster, the basic function of B2B platforms is aggregation. Benefitting from development and application of information techniques, B2B platforms gather and compile offerings from suppliers and demands from buyers. And then, supply and demand information are most commonly aggregated and cataloged according to different criteria, for example, technology parameters, quantities and price.

Considering the externality of platforms, the information aggregation of one side can obviously contributes to attract new users in other sides.

As been stated by Dai and Kauffman (2002), B2B platforms use two types of cataloging, public and private. Public cataloging refers to the situation in which all the same information of supply and demand is offered to all potential buyers in the platform. Under this circumstance, buyer in platform should not only consider their own demands, but also the competition with other buyers. And the other type of cataloging, which offers customized information to buyers or suppliers, are private cataloging. As a result, a process of pre-selection is needed before developing any relationships between buyers and suppliers. In another word, only pre-qualified business partners are able to get further opportunity to negotiate a deal. However, due to this pre-selection process, buyers with private cataloging can't get access to all sellers, and thereby can't enjoy as much of a reduction in search cost comparing with those who use public cataloging (Dai and Kauffman, 2002).

4.2.2 Basic Function: Matching

The second function of platforms is matching, which enables buyers and sellers to negotiate

more efficiently when certain constraints are set.

Similar to the aggregation function, either public or private matching works in matching process. In public matching, requirements of users are open to all participant, which enables them to access as many business relationships as possible. For buyers whose requirement for products is hard-to-achieve or in small batches, this trading mechanism may be especially beneficial (Dai and Kauffman, 2002).

Motivated by the same reason of private cataloging, private matching actually means the matching process happens only in pre-selected partners, which ensures the privacy and preference of trade.

Except for buyers and sellers, other players, such as logistics service providers, financial service providers and even education organizations that offers professional training to industry workers, could also make use of matching function. For example, matching logistics service providers with users who has settled an order is an indispensable process to facilitate the physical movement of products.

4.2.3 Basic Function: Marketing

Traditionally, the offline transaction between suppliers and buyers is confined to many restrictions, such as the geographical distance and inconvenience on instant communication. B2B platform provides them a new channel to enable transaction without these limits. Except from enjoying a second saling channel, users is also able to offer promotion in platform as a strategy of marketing.

Moreover, the pageview of websites that belong to platform also implies another practice of marketing. Users, as well as other auxiliary actors such as 3PLs, microfinance lenders and exhibition organizers, are entitled to online advertising with payment. The most commonly used bidding mechanisms for online advertising payment includes following choices:

- Generalized first-price auction (GFP)
- Generalized second-price auction (GSP)
- Vickrey-Clark-Groves (VCG)

Generalized First Price (GFP) is a simple auction mechanism where the bidder pays the price they bid for. The one who pay the highest get the top position of the advertisement and the second highest get the second position. The problem of the GFP is that it is naturally unstable.

Due to the bidders can adjust their bid frequently according to other bidder's behavior and will not display their true valuations. A bidder can bid up or bid down the price according to the highest bid and lowest bid which will contribute to a cycling indefinitely. (Edelman and Ostrovsky, 2007)

There is another auction mechanism, Generalized Second Price (GSP) auction, which is used by Google and Yahoo! It contributed to a big part of their revenues. In GSP, the advertisers submit their bids which are stating their maximum willingness to pay for a click on their advertisement for a specific keyword. The advertiser who bid highest will get their ad shown on the top of the results and the one with second highest bid is displayed in the second position, and so on. For the top position advertiser, they are charged by the second highest bid. And the second highest advertiser is charged based on the third highest bid, and so on. (Edelman et al, 2007)

Vickrey–Clarke–Groves (VCG) mechanism is a dominant strategy for advertisers to bid truthfully. Unlike GSP, which considers only the bid next to it, VCG considers all the players' negative externality it imposes on others. The method of calculating the price for the top advertiser is to compute the maximum ad valuations with the top bidder involved and the maximum valuation without the top bidder, the difference between these two numbers is the price that the top advertiser should pay. The interest of VCG auction is that the advertisers bid the price honestly and the whole system is stable. (Edelman and Ostrovsky, 2007).

4.2.4 Auxiliary Function: Logistics

Although the logistics function is an option for platforms, the adoption of it can enhance the appeal of platforms to users. If logistics service is provided, the extent of integration takes a great step forward, which not only contributes to convenience for users but also increases user stickiness and explores the potential of platforms.

Logistics service can be provided directly by the operators of platforms, which means the sponsor of platforms may spend a large amount of initial capital on infrastructures and vehicles. If this option is adopted by biased platforms, it may be inevitable that logistics service tilted toward the biased-side.

However, given the cost and professionality, partnering with one or several independent logistics providers could be another option. The relationship between independent logistics providers can be short-term and long-term based on how they cooperate with platform operators, and these two ways of cooperation are different in several aspects. For example,

short-term partners in logistics are usually small or medium-sized companies, and they are patchy in terms of service quality. They are selected by users of platform almost randomly and just for that once. The income from logistics are shared with platform operators based on how many times they provide the service.

Whereas, long-term are preferred by large third party logistics providers (3PLs) and the number of choices of 3PLs are usually limited. The cooperation between platform operators and 3PLs are stable, thereby the service of logistics should be prequalified by platforms. And in this case, users of platforms would also be guided to develop a stable relationships with 3PLs to increase user stickiness.

4.2.5 Auxiliary function: Financial service

Financial service of platform involves online payment and financial support based on supply chain.

Without the support of online payment service, users could be bothered with two issues. First, if payment process can only be achieved offline, it's inconvenient for users to purchase products. Second, users might encounter scams or after-sale disputes, and online payment ensures the security of products as well as capital. In practice, most payment service provider would keep the money under their watch until the deal is close. Currently, due to strict regulations on financial service permission, the most realistic way to offer online payment service to users is cooperating with legal financial service providers, for instance, banks.

Supply-chain finance,which refers to the set of solutions available for financing specific goods and/or products as they move along the supply chain (Hofmann, 2005), has rather short history in Chinese market as researches on supply chain finance in their infancy. However, vertical platforms have the advantage to offer this service as their users spread along the supply chain. Setting foot in the field of supply chain financial service contributes to users' loyalty for platform, especially the loyalty from SMEs.

4.3 Practices of B2B platform in low-voltage electrical industry

The case study in this paper is based on low-voltage electrical industry cluster in Wenzhou. As a typical industry cluster in China, its supply chain business process, which need to be studied first, is quite conventional and primary. According to the general platform functions that discussed in last section, details on how the B2B platform works for a specific cluster is presented in this section.

4.3.1 Practice 1

Electrical trading platform of China is a vertical B2B platform that established only for low-voltage electrical industries, and the development of this platform mainly relies on the local Wenzhou cluster. It's sponsored by a electric company in 2012, and operated by an independent platform operator that serves both downstream and upstream companies, and not tilt to any side.

As it shares the member resources with another platform, more than 8 million companies can get access to its trading market. However, most the members shared with another platform are not within low-voltage electrical industries. Every link of supply chain in low-voltage electrical industry can be covered by this platform, which means this platform achieved basic function of aggregation with public cataloging.

Online advertising as well as offline exhibitions are popular in the platform, by which the platform operator has made great efforts on marketing activities to improve the rate of successful matching. And the matching process happens when users, no matter buyers or sellers, search for partners who can satisfy their requirements. However, the platform organizes auction not only on the advertising space, but also the rankings of searching result to profit, which may leads to morality issues. And if satisfying offers can't be found, one side users can submit their requirements, and users from the other side would offer it in private.

The specialization on technique parameters of this platform enables precise searching. And the result of searching is determined not only how close it meets the requirement, but also based on how much companies on the other side are willing to pay to improve its ranking on the searching list.

When the requirement is met and certain business partner is chosen, the cash flow in the payment process can be finished under the support of third party financial organization. The payment system of Electrical trading platform of China is another highlight in its operation that facilitates the cash flow of online trade. As online payment system in China is dominated by banks, Alipay, and Tenpay, this platform provides access to all these payment systems for users.

However, the logistics of physical products through this platform still stick to the conventional ways. As mentioned in section 4.2.4, users seeks to logistics service by their own, that is the trading process between users and logistics providers would not involves this

platform. No doubt that it relieves the burden of platforms on logistics responsibility, but the old way in logistics also leads to inefficiency on seeking and delivery, especially when the trade of each time is in small batches.

The platform profits from three perspectives, agency service, marketing and matching service. Agency service is provided for those who just started to join the B2B platform or too occupied to maintain its business in platform. And marketing service mainly refers to advertising space and ranking auction. As for matching service, revenue is made out of becoming a membership instead of each order.

4.3.2 Discussion on practice 1

Apparently, Electrical trading platform of China achieved basic functions of aggregation and matching. Taking advantage of sharing customers with other platforms for industrial commodities and its launch-up based on Wenzhou cluster, it performs well in aggregation. And by specializing in low-voltage electrical industry, it attracts more client in related industries than those horizontal platforms.

However, there are something worth noting given its performance in matching function. The matching process can happen in both initiative and passive ways. For example, for a buyer, it can either submit its demand waiting for buyers to bid in private or search for supplier who declare their offer.

Both ways require well-investigated pre-qualification of users from platform, specially when it comes to the first way. Because the first way always happens when trading products with large quantity. And partner's reliability and qualification are of major concern, possibly even more important than achieving the lowest price. Although users can benefit from private negotiation, bad business integrity could destroy business partner as well as the reputation of platform. And if users choose the second way to find a business partner, the searching result can be accurate due to its endeavor on technique parameter cataloging. However, the ranking list of searching result could be influenced by ranking auction, which may leads to dissatisfying matching for users and unhealthy competition that breaks the balance of market. Therefore, operators of this platform should be cautious of its pre-qualification work and keep their bottom line when make a tradeoff between its incomes from ranking auction and its ranking rules.

Homogeneous competition is another severe problem for Electrical trading platform of China

as most of platforms in low-electric electrical industry have similar functions. Therefore, for companies in this industry, there is no big difference to choose a particular platform to join, and joining several similar platforms to maximize its potential as much as possible could be the best option. In this circumstance, this platform is thrown into a passive position, and transactions that go through it has the characteristics of randomness though it currently owns a great proportion of whole online trade volume. In a long run, how to make itself stand out of homogeneous platforms remains as a great challenge.

4.3.3 Practice 2

Another platform which also plays a significant role in Wenzhou industry cluster is called "8m" platform. 8m Platform is a vertical and neutral platform established and run by a third party operator officially started in 2015. It covers all the process of supply chain in electrical industry. And similar to the platform discussed before, most of its users belong to the cluster in Wenzhou, where its operation company is located.

8m declares to have created a new business model specific for Business to Distributor (B2D). In this new model, distributors are regarded as buyers of 8m, and sellers refer to suppliers in each link of supply chain. However, its actual operation doesn't strictly follow the design. Since the distribution process takes place only in the final links between core companies and its distributors, small and medium-size enterprises in front end of supply chain essentially apply this platform as a B2B platform.

Even though its history is not as long as other competitors, it attracted approximately 2000 electrical manufactures and 4000 distributors after only 3 months of launching. Also, its trading value had reached 16 million RMB during this short period. (8m news, 2015a)

As shown in Figure 8, the business model of 8m combines both virtual and physical services.

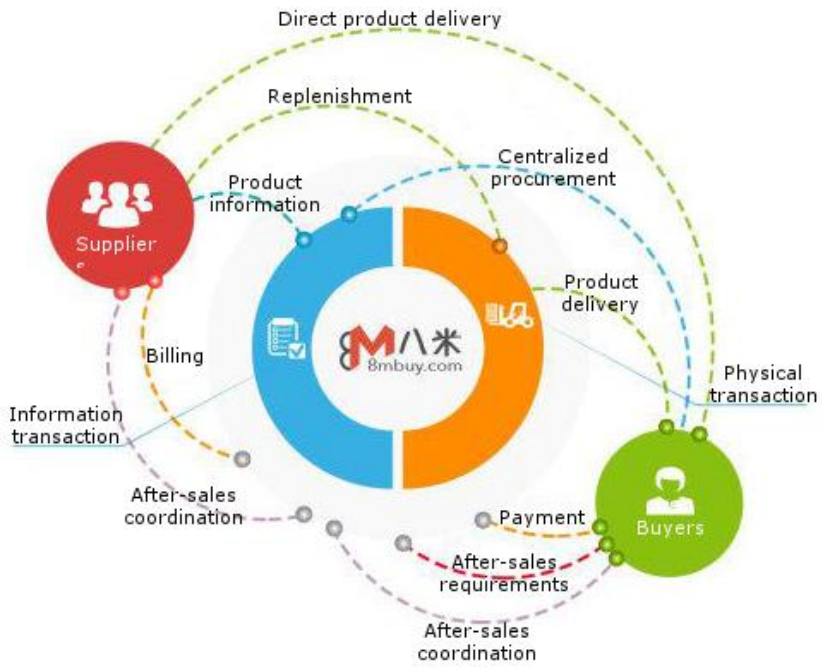

Figure 8: 8m platform

(Source: 8m news, 2016)

In the virtual part, aggregation function lies on the nature of platform—multi-sided market. To ease concerns about security, 8m requires real information and identification of users to ensure the security and trackability of transactions. Only users that pass its audit can publish its requirement or approach potential clients on the platform. Matching function has been updated in March 2017, which simplifies the commodity data structure and improves the efficiency of searching.

Comparing with similar platforms, 8m makes a breakthrough in logistics. Unlike other platforms that is reluctant to set foot in the logistics function, 8m offers its users online access to public warehouse and third party logistics companies.

Manufactures can send their products directly to the 8m's warehouse after manufacturing. The quantity of products in public warehouse should be ensured to cover the requirement of next transaction. And replenishment are conducted reminded by 8m based on the data from transaction record. In a word, 8m platform performs as an inventory manager for these users. Once the transaction settled, products will get consolidated there by 8m and get sent to their buyer directly.

As for transportation service, 8m offers another different option that distinct from traditional

ways that directly deliver products as mentioned before. No matter users apply the public warehouse or not, products of each order made through the platform can be transported by 3PLs that cooperated with 8m. Currently, two type of 3PLs would be considered as business partner, professional line companies with good reputation and leading 3PL companies in the market. Most 3PLs that enter the platform has developed long-term relationships with 8m and provide trackable service, which ensures their reliability. By this way, users may not bother with cumbersome negotiation to find a suitable 3PL or spend large cost to transport by their own. Therefore, it's actually a multi-sided platform, in which sellers, buyers and 3PLs mutually attract and benefit each other.

The payment process consists of two parts. The first one involves with cash flow between buyers and sellers, and the second one is about logistics service if users apply what the platform offers. As purchase of industrial products is particularly complex, 8m platform makes it possible for users to consolidate payments of several orders into one, which improves transaction efficiency.

Except for convenient payment, 8m also facilitates supply chain financial, especially for SMEs (Figure 9). Users that pay for the warehouse service of 8m platform are able to enjoy the superiority of loaning from banks (8m news, 2015b). Instead of requesting traditional collaterals, banks that cooperates with 8m platform agree to make loans based on their transaction records in the platform.

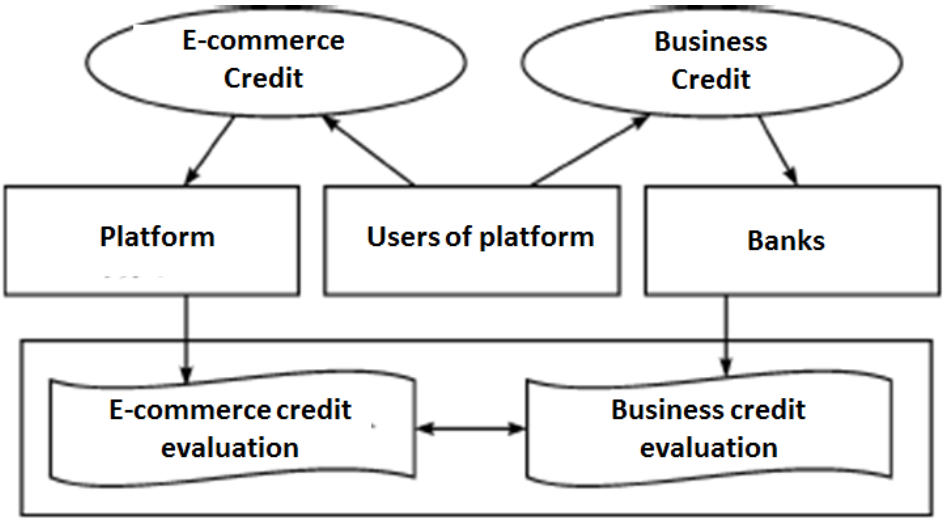

Figure 9: Illustration on credit evaluation

(Source: compiled by authors)

If any after-sale problems happen, this platform operated as an intermediary. It has its own quality inspection department who deals with products that not satisfy users. Therefore, to some extent, 8m has achieved a one-stop service for companies in this industry.

To compete with similar platforms, 8m provides most of its value-added service, such as loaning and warehousing, to users for free. It's acceptable for a platform in its initial stage to attract more customers from both sides, but not for a long-run. Thus, its future plans of profit model consist of following parts once the platform become more mature and stable: membership fee from users and 3PLs, commission for each order, logistics service, commission for obtaining a loan.

4.3.4 Discussion on practice 2

The initial planned role of 8m platform is to build a bridge between manufacturers and the distributors by skipping all the intermediates tiers among them. However, considering the reality of supplier network, it functions more close to a B2B platform.

Its innovation on logistics service fills the blank to achieve one-stop service, and assists 8m platform to become more attractive compared with other vertical platforms in electric industry. The logistics service benefit two sides of players that involves with transaction. Specifically speaking, they can take advantage of logistics service provided by 8m from following perspectives.

For sellers, especially for SMEs, the warehousing service alleviates the capital pressure of building large warehouse as well as the pressure to manage inventory.

And as the purchase of industrial products is rather complex that may involve with several types of raw materials or components, if these suppliers choose to rent 8m's public warehouse, different orders can be consolidated into one and delivered together directly from the warehouse, which decreases the cost on transportation as loading rate get increased and number of vehicles used for this order get decreased. Besides, transportation service can be tracked that improves the reliability and security of transaction.

One latent benefit for sellers lies on the statistics analysis of transactions. As 8m platform owns large amounts of order and inventory data, the potential value brought by platform through data mining is considerable. For example, analysis on number of orders in 8m platform can be expected to forecast the market trends and serve the suppliers to schedule

their production plan.

For buyers, 8m facilitates to decrease the lead time in a way. If all suppliers are matched through this platform and all of them employ the public warehouse of 8m, orders from each supplier can be consolidated in the warehouse and delivered at the same time to buyers. And lack of spot goods can be solved through coordination of suppliers by the platform as it takes control of inventory information of all suppliers.

Financial support from 8m platform also appeals to users. The most attractive one is employment of supply chain finance. Difficulty of lending always troubles companies, especially SMEs. To solve this problem, cooperating with a state owned bank, Agricultural Bank of China, 8m platform performs as a guarantor and provides users more convenient access to loan. On the one hand, products of users are actually under the supervision of 8m platform, which reduces the risk of loaning for banks or other lenders. And on the other hand, instead of using traditional collateral, users of 8m are entitled to looser credit terms and lower loan interest based on their credit rating that is determined combining transaction records in platform and bank credit. With the coordination among 8m platform, users and banks, capital security are ensured and loaning efficiency are improved.

In spite of all the innovations and virtues of 8m platform, there are several flaws in the operation of platform. For example, its warehouse is located in Wenzhou, which means only local users can be served. However, users of 8m is not confined to the geographic location. To attract companies from outside of the cluster not only contribute to the development of supply chain network, but also conforms to the trend of globalized market. For those companies from outside, passions to join the platform could get hurt as they can't share the benefit, thereby limiting the potential of 8m platform and future development of cluster. However, the current way that applies a local warehouse as consolidation center is especially applicable for industry clusters instead of larger scale business, which calls for a new logistics mode. Thus, it's a dilemma for 8m to make the trade-off between pleasing users outside the cluster and maintaining its logistics mode.

Moreover, the cost to build a new warehouse in Wenzhou is also a great burden for a platform at its initial stage. Besides, resilience and robustness of logistics should be paid more attention. Since the platform only owns one warehouse, any unexpected emergency, for example, fires, could cause damage to the cluster as well as whole supply chain.

Apart from discussion on gains and concerns for users on logistics service, thinking from

3PLs also matters. For 3PLs, cooperating with 8m platform means higher service specifications challenges to ensure the traceability and security, and it also implies relatively stable source of clients and higher efficiency of truck loading since the warehouse also works as a consolidation center. The quality and capacity of logistics service of 3PLs varies widely. Therefore, for large 3PLs, it's a hard choice to make, while for those one-truck logistics companies, it's a hard hit. However, to say at least, it's a great chance to integrate and improve transportation industry that mainly serves Wenzhou cluster. The question for 8m platform is how to drive reliable 3PLs to cooperate with it given their capacity and pricing strategy on users.

Speaking of pricing strategy, 8m also faces the challenge to build a future profit model. To attract users, 8m doesn't charge a commission from both logistics service and financial service for now. How to design its pricing is well worth exploration.

Although 8m employs big data to manage the inventory of cluster, and thereby to coordinate output of each link in supply chain, the nature of make-to-stock production for upstream manufacturers remains to be changed when considering the over capacity problem.

For the buyers, complicated procurement processes always take a lot of time, labor and cost. Handling with 8m platform simplify the procurement process enormously, the process get rid of all the intermediate parties between suppliers and distributors. Instead of handling logistics from different suppliers, the products get consolidated in one or a few full-load vehicles, which simplify the logistics handling process for the buyers too.

4.4 Comparison of two practices

The competition in B2B platforms is cruel as there are a lot of B2B platforms in electrical industry. How to make itself a distinguished one from competitors and survive in the competition are the main concerns of all platforms. Although both Electrical trading platform of China and 8m platform are B2B platforms based on the Wenzhou industry and managed by local third party operators. Their strategies and performances are of great difference.

Electrical trading platform of China is conservative but conducts basic functions pretty well to aggregate and match buyers and sellers, and actively facilitate channel expansion for users. However, its inaction on auxiliary functions means leaving the risks and inconvenience to users themselves in transaction.

While 8m performs more aggressive and ambitious by devoting more to value-added services. It takes the initiative to undertake the responsibility for logistics to relieve the logistics risk for both seller and buyer. 8m can take the advantage of economies of scale to negotiate with big logistics providers, while small suppliers are passive in logistics negotiation due to its scale. From a financial perspective, 8m platform doesn't limit itself to online payment system. It also focus on solving financial problems for its customers.

Regarding the relationship between users and platform, Electrical trading platform of China holds a larger amount of users by sharing users with other platforms while 8m enjoys a tighter relationship with users by working as a manager of "chores".

Efforts are made by both platforms to employ data from users. Electrical trading platform of China values the breadth of information, which leads to its passions on exhibition and advertising. It prefers to make the exchange of information. For 8m platform, depth of information is more important, and thereby they endeavors in digging data from transaction records to coordinate the production of supply chain.

Overall, both platforms make a huge contribution to the trading of electrical products for Wenzhou cluster. Electrical trading platform of China has a longer history of operating on a B2B platform and attracted a lot of users. Even though 8m platform is a latecomer in this competition, it overthrows the traditional operation framework, stressing the competitiveness of whole supply chain. Compared to the elder generation, 8m platform has tried to upgrade its operation in electrical industry to achieve sustainability.

4.5 Potential Suggestions from logistics perspective

Without B2B platform, Wenzhou industry cluster has already been completed as an system after several years of evolution and development, with local auxiliary organizations assisting manufacturers in supply chain by geographic proximity. However, the performance of each player appeared to be rudderless. They ran the business only for their own benefits, which might disrupt the market order and destroy sustainability of cluster. Thus, the question is how to integrate different players to achieve a win-win situation with the cluster could develop at the same time.

The introduction of B2B platform to clusters helps a lot. It can perform as the coordinator to avoid problems, such as disorder of logistics market and uncoordinated production. After the discussion and comparison about two case study concerning B2B platform implementation in

low-voltage electrical industry, it's clear that current operation can be perfected, especially from the logistics perspective as it remains at the initial phase of application. Therefore, several suggestions are proposed from logistics perspective to gain potential improvement regarding the practice of 8m platform as a prototype.

Currently, the warehousing service of 8m is a highlight to interest users within local cluster. Users are supposed to transport part of inventories to 8m's warehouse to ensure that enough products can be delivered once the deal is made. In other words, 8m is the inventory manager for users. As for transport service, 8m has it outsourced to local leading 3PLs who join its platform. In short, 8m runs the inventory management while 3PLs are responsible for transport service.

4.5.1 Suggestion on organizing logistics

Even though logistics partners of 8m perform quite well in terms of current trade volume, hidden troubles would hit the platform in a long run. For example, none of cooperators of 8m has achieved advanced IT system and complete service network nationwide. Once the business of 8m extends to the outside of local cluster, local 3PLs might come to short. In addition, the capital pressure on building warehouses could also break the platform.

Given globalization and over capacity of local industry, the "go out" trend for companies within local cluster is unstoppable, and thereby planning ahead for platforms is quite necessary. Then what about cooperating with leading 3PLs nationwide? The most competitive service provider is Cainiao Network which is also called China Smart logistic Network (CSN) launched by Chinese E-commerce giant Alibaba Group in 2013 with the goal of creating a UPS-style backbone to enable deliveries across China and international markets while tapping into big-data and other technology to increase efficiency (Russell, 2016). In its early days, CSN focused on deliveries within the world's second-largest economy - China. As Alibaba began to spread its reach to other countries, CSN has been working with global partners to reach 217 countries and areas worldwide to enable delivery service for cross-border online transaction as well, which could definitely help with globalization of local cluster. As a matter of fact, CSN serves more like a coalition of logistics companies. It was formed by a consortium of existing logistics players to give the project a running start with resources and customer bases. Alibaba itself took a 48 percent stake but it isn't clear how the business of that is panning out (Russell, 2016).

However, two obstacles makes it difficult for CSN to become the perfect facilitator of other

B2B platform. First, Alibaba has established its own B2B platform focusing on clusters which is called Online Industry Belt. In a sense, other B2B platforms maybe competition for this Alibaba-based platform, and the negotiation for logistics service between other B2B platforms and Alibaba-based CSN might be rough. Secondly, CSN mainly focuses on the express delivery service for B2C transaction. As the products of transaction, service requirement and network are quite different in B2B and B2C, it might took a while to make the adaption.

Although it's not impossible for 8m to cooperate with CSN, another option is also accessible. As mentioned in Section 3.3.1, the physical internet (PI) is an open global logistics system founded on physical, digital and operational interconnectivity through encapsulation, interfaces and protocols (Montrueil et al., 2012). An important idea of PI is application of open hubs. Specifically speaking, hierarchical structure of logistics chain are broken, and existing warehouses of members that located in different tiers of supply chain are turned into open hubs, which facilitate the interconnectivity of hubs. All the members in PI could make use of these hubs and the transport between hubs could achieve seamless operation if well-organized. This idea happen to hold a similar view with CSN that logistics infrastructure and network in China already exist and it should be shared instead of being rebuilt.

PI is most commonly applied at the end side of supply chains. It breaks the tiered-structure of logistics chain for finished products that transport from manufactures to the end-consumer through wholesalers and retailers. The existing warehouses of wholesalers and retailers are open to all of them to facilitate flow consolidation. Simulation and practices in Europe demonstrated that seamless asset sharing of PI enabled higher efficiency and is environmental friendly (Montrueil et al., 2012).

However, differing from the end side of supply chain, the physical objects transport in the upstream side are heterogeneous products.

Although the physical flow in upstream supply chain involves with different products, this idea of open hubs can adapt to the reality industry cluster. Thanks to the complex structure of supplier network and homogenous competition among SMEs, the relationships among suppliers network could only be less hierarchical than those among manufacturer, wholesaler and retailers, which provides natural applying conditions of open hubs despite the constraint of heterogeneous products. And if part of warehouses that belong to upstream manufacturers or 3PLs can be turned and open to other players, then the open hubs are feasible.

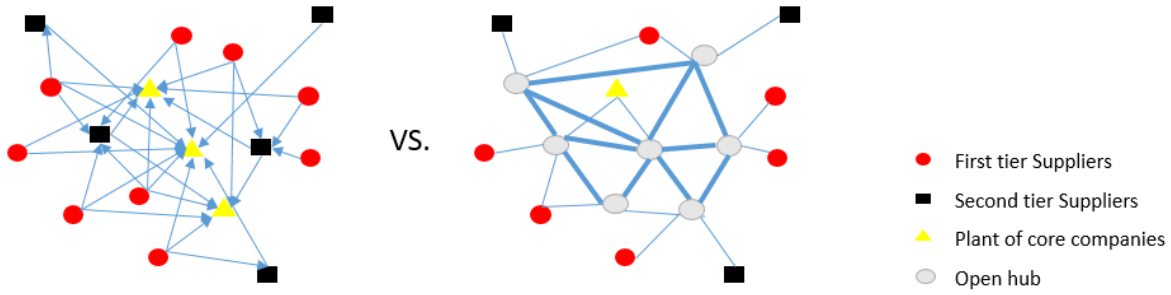

Figure 10. Illustration of PI suggestion
(Source: Compiled by authors, 2017)

To help understanding, Figure 10 shows an example on three-tiered supplier network to illustrate how to apply PI in a cluster, only considering changing the upstream manufacturers' warehouses into open hubs.

Each tier of suppliers manufacture homogeneous or similar products for downstream members. The left side reveals the complexity of upstream structure of industry cluster as described before. The first tier suppliers may not only provides production materials to the second-tires but also directly to the core companies. In addition, as the transaction volume from small suppliers is usually in small amount, the fill rate of vehicles always leads to low cost-efficiency. However, if some warehouses that belong to upstream suppliers could be turned into open hubs, the implementation of interconnected supplier network can be achieved, which might contribute to higher cost-efficiency due to higher fill rate, as well as higher efficiency.

In this way, all sides of players could benefits from it. For manufactures in the upstream supplier network, since the utilization rate of their warehouse follows the going down trend by falling demand, they would rather rent it to platform operators or 3PLs than leave it unused.

In terms of 3PLs, if they play as renters, they benefit from less investment on warehouse, and if they play as warehouse owners, sharing assets enables broader business scope for them. Platform operators also gain a lot. Firstly, capital pressure of building new warehouses released. And with the policy support (Xinhua, 2017), platform operators could save more as most raw material and components of this industry doesn't requires special storage condition. Secondly, it's a good way to spread the risk on warehousing by interconnected hubs.

From the perspective of local supply chain sustainability, the exploration of open hubs contributes to higher logistics efficiency since platform operators are able to coordinate the logistics service, as well as the production output of supply chain members based on transaction data in the platform.

Another useful concept, PI container, could also be applied to B2B platforms for low-voltage electrical industry which belongs to light industry. Considering the small size of raw materials and components in low-voltage electrical industry, the design of PI container conforms to this characteristic, and its ability to compose and decompose also contributes to integrated logistics when handling with products from different suppliers. Besides, according to PI, the exploitation of IoT would also help with better service quality by real-time tracking and higher logistics efficiency.

4.5.2 Suggestion on pricing 3PLs

As a multi-sided platform, the participation of 3PLs attracts users to join the platform and vice versa. In terms of former discussion, the convenience from value-added services lures users, however, the motivation for 3PLs to cooperate is deficient, especially for the leading ones. Join the platform or not, they could always obtain sufficient clients, and it's not necessary for users to cooperate with those 3PLs through the platform. In short, currently, the bridge built by platform between 3PLs and users is dispensable, but not vice versa. Without loyalty of users and 3PLs, competitiveness of platform is easy to be imitated and substituted by new entrants. Therefore, the critical issue confronting B2B platforms is how to motivate 3PLs to get connection with users via platform.

Before solving the problem, the role of platform in the logistics relationship needs to be clarified. If users choose 3PLs that cooperated with platform by themselves, then the platform operator plays as an intermediary. In this case, the role of platform is easy to be imitated. Then the platform should either make the decision that whether continue to provide this "matching" service on logistics, or promise other privileges to 3PLs after accurate cost calculations by mathematical models such as integer programming.

If users submit their logistics requirements to platform after the order is settled and leave the logistics process to platform, it performs as a forwarder for users and as a shipper for 3PLs. In this way, operators of platform has the upper hand in negotiation with 3PLs as they are in charge of large number of online orders. However, it's not an easy job as a forwarder, platform operators should pay attention to not only the price of logistics service, but other

factors such as delivery time, punctuality rate and delivery capacity.

One of the most commonly used approach for this situation is auction. Similar to the case of internet advertising, an auction mechanism could be used or designed to allocate orders to different 3PLs who bid for orders. As introduced in Section 4.2.4, there are three type of existing auction methods that are popular in theory research and practice. The profit of GFP mechanism is higher but quite unstable, while GSP mechanism is easy to operate and most commonly used. Compared to these two mechanisms, VCG is more stable and theoretically achieved incentive compatibility but lacks practice. As shown in Section 2.4, although previous studies have made great contribution to this B2B E-commerce logistics problem (ELP) based on auction mechanism, the adaption of existing auction mechanism is worth further research considering the reality that users concern about other logistics performance factors except for price.

4.5.3 Discussion on suggestions

As mentioned in section 2.3.1, the application of PI was previously explored in fields like humanitarian logistics and city logistics, but has never been discussed in the context of industry cluster combining the application of B2B platforms.

The potential benefits about PI suggestion for local cluster are discussed thoroughly in section 4.5.1. If viewed with a broader sight, the ideas of applying open hubs can be used for other electrical clusters outside Wenzhou, since the electrical industry in China is characterized by clustering. And as the transactions between clusters are thriving, this idea could be extended nationwide regarding the links between different clusters as a larger network.

However, the feasibility of potential suggestion in section 4.5 should also be thoroughly considered. It can't be denied that organizing open hubs and application of PI container require too much standard protocols as well as a large amount of investment. And the prevalence of IoT practice might only come with another decade or two as relevant technologies are immature. Thus, it would be better to map out plans with step-by-step goals before setting foot to practice PI concept.

As for the second potential suggestion on pricing 3PLs, though only future research directions are provided by the authors, cautions are required on the logistics policy in China. Most of 3PLs in this cluster are family-owned one-truck company, which implies low

efficiency of whole logistics industry. Recently, the Chinese government are devoting to change this underdeveloped situation, therefore, decision makers of pricing strategy should pay attention to policy directions to maximize their profit.

5. Conclusion

This thesis contributes to a comprehensive study on current practices of B2B platforms for industry clusters based on the Wenzhou case, which fills the blank and blind spots in empirical research as most previous studies focus on B2C platforms and show little concern on the context of industry clusters. Two practices of B2B platforms are thoroughly described and discussed, which are Electrical trading platform of China and 8m platform. And then, based on current practices from a logistics perspective, potential suggestions on logistics are proposed to overcome the bottleneck when implementing B2B platforms in industry clusters. The suggestion applying physical internet concept aims to achieve a better sharing of logistics resources, while the potential direction of pricing strategies on 3PLs are discussed to appeal them to get involved in a better logistics future.

The answers to research questions is summarized in section 5.1. Limitations of this research are presented in section 5.2, and potential extensions of future research are discussed in the last section.

5.1 Answers to research question

This thesis aims to get a closer view on the implementation of B2B platforms in industry clusters in China. To achieve the goals, a case study is conducted based on a typical industry cluster. Two B2B platform practices were explored in the case study through which two research questions could be answered.

RQ1*: How does the B2B platform established for industry clusters operate currently?*

Taking the case of low-voltage electrical industry, two types of B2B platforms prevails in low-voltage electrical industry clusters. The Electrical Trading Platform of China is a representative of the commonest type, and 8m Platform represents the emerging one.

Electrical Trading Platform of China

- This platform is a typical vertical B2B platform in which basic functions of aggregation, matching and marketing are integrated together, performing as a bridge between buyers and sellers to facilitate transactions.

- The most well-operated function is marketing. Advertising and ranking spaces are hot

for users to bid while the operator of platform are keen to hold exhibitions for its user. Even though the effects for transaction from exhibition are not clear, it strengthens the communication among members in industry in a way.

- Online payment system is introduced into this platform as it cooperate with dominated online payment service providers, for instance, banks, Alipay, and Tenpay, The access to third party online payment system not only makes it more convenient to control cash flow, but also ensures the security of money and products.

- Traditional type of platform has not got involved with logistics process that along with transaction, leaving it remain the same situation of backward and less developed.

- In the designed operation framework of Electrical Trading Platform of China, the main purpose is to facilitate the transactions among users, which is a pragmatic but lack of foresight. As most platforms in low-electric electrical industry have similar goals and functions, it suffers from severe homogeneous competition.

8m Platform

- As a new type of B2B platform, 8m runs its business involving not only basic functions but the logistics and financial service which provide added value to users.

- Instead of focusing only on the transaction process, 8m platform brought up the concept of "platform+logistics" with a long-term vision to coordinate and optimize whole supply chain.

- Innovations are made to facilitate efficient logistics as 8m works as a "logistics manager" for users. For warehousing service, 8m consolidates supplies from SMEs in its own warehouse and provides inventory management service. As for delivery service, 8m cooperates closely with 3PLs, enabling online deals between 3PLs and users.

- Making good use of transaction records, 8m not only coordinates the production and inventory of supply chain, but enables forecast on industry trend for users.

- This new type of platform also made attempts on supply chain financial service. Analysis on transaction data is used as support of business credit, which helps users obtain loans from banks that cooperates with 8m platform. It's a pragmatic benefit for

SMEs who could easily hit the wall when applying for business loans in a traditional way.

RQ2: *What improvements could be made for the current situation?*

Based on the analysis of comparison in Section 4.5, the type of 8m platform is regarded as a more sustainable one that represents future dominant of platform. Therefore, potential suggestions from logistics perspective are proposed regarding the 8m platform as a prototype.

Specifically, the first suggestion is about changes on logistics network. A new concept, Physical Internet, is applied as theoretical support. The idea of open hubs in PI, which refers to interconnectivity of warehouses, could be employed in industry cluster with platforms coordinating 3PLs. It's suggested by the research that existing warehouses from members in clusters can be turned to open hubs, and discussions on this suggestion in Section 4.5 reveal its potential benefits to cost, efficiency as well as environment. Except for the idea of open hubs, the PI container is also suggested to be applied in logistics process as it conforms to the characteristics of industry products. Besides, exploitation of IoT on PI container would also facilitate real-time tracking and higher logistics efficiency.

Second suggestion is proposed from the perspective of relationship with 3PLs. Considering the important role of 3PLs, it's critical to incent 3PLs to join the platform, which ensures enthusiasm of users using services from exclusive platform. As incentive strategy varies in different situations, this research discussed potential strategies according to the role of platform in the logistics deal between users and 3PLs.

5.2 Limitations

The limitation of this research are summarized as follows:

- The research result of case study has the limitation on generalizability. Practices and improvements of Wenzhou low-voltage electrical industry clusters could be only applied to other Chinese traditional industry clusters who share the same features as mentioned in Section 4.1, but absolutely not to the high-tech industry clusters.

- A quantitative analysis will be appreciated to evaluate the performance of platforms when applying the suggestions with PI concept.

- Supplement of daily operational data and annual summaries of platforms could

provide more subjective evidence on the comparison between two platforms and thereby contributes to reliability of this research. However, due to the time limits and business privacy concern from platforms, operational data and financial data is not available.

- Two limitations are related to interviews. Firstly, interviews are only conducted with core companies and B2B platform which leads to the fact that information of SMEs and 3PLs can only be obtained from others' side and previous literatures. The lack of direct interviews on SMEs and 3PLs might causes misunderstanding. Another limitation is the date of interviews. Any changes after June 2016 in cluster might influence the validity and accuracy of this research.

5.3 Future research

During the process of conducting this research, several clues on future research are found and presented in this section.

- In section 4.5, the application of open hubs is discussed as a potential suggestion for improvement. However, the feasibility of this suggestion is not guaranteed. Quantitative researches on its performance evaluation can be carried out in future research.

- As the discussions on incentive strategies in section 4.5 is only about the idea, it's a good academic topic to conduct more detailed researches on the design of strategies with mathematical models if the interviews with 3PLs are available.

- Since the study is China-cased, it's not reliable to generalize the result of this research to European clusters. Thus, a new case study can be conducted with europe and comparisons on these two study would be interesting.

- Given the contribution from traditional industry clusters in China to local economy, governments expect much of their transformation and upgrading by B2B commerce even though most traditional clusters suffer the process. Therefore, researches on policy and regulation that relevant to B2B platform implementation would be pragmatic for the future development of cluster.

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Appendix: Interview summaries

The interviews were originally conducted in Chinese and the summary of the interviews were translated into English by the authors of this thesis.

Three interviews have been done for this research paper, including interviews with high-ranking managers of China Electrical Trading Network, 8m platform and CHINT Electric Co., Ltd separately .

In the summary of the interviews, a few areas are mentioned. To make it clear how these areas are related, the hierarchy of the areas will be show below:

- Zhejiang: One of the province of China
- Wenzhou: A prefectural-level municipality in Zhejiang
- Yueqing city: A county-level city in Wenzhou
- Liushi: A county-level city in Wenzhou

Appendix A

Summary of the interview with Electrical Trading Platform of China (www.zgdqjy.com)

Date: 6rd and 7rd June, 2016
Interviewee: Suilin Ye, CEO of Electrical Trading Platform of China
Interviewer: Xiaohan Ding

1. Brief introduction of the platform

Electrical Trading Platform of China is a B2B trading platform for industrial electrical, mechanical and production material products. The main function of it is to offer a platform and services for the suppliers and distributors in the industrial electrical field. The slogan of the company is: sharing, motivating, awakening, creation, achievement and responsibility.

2. Platform upgrade

During July 2015 and March 2016, the platform went through a major upgrade. Contrary to consumer products, the industrial products need not only to consider the technical parameters, such as voltage and current, but also need to keep in line with industry-orientation. Therefore, a lot of investigation and analysis about the technology and product characteristics had been conducted thoroughly. The categories of products got a detailed sorting in parameters, technologies, quality and functions, etc. For the expansion of the industry, a lot of offline work has been done too. The promotion of the industrial electrical enterprises by spreading the O2O integrated service nationwide was conducted, which helped to promote the industrial electrical industry transformation and upgrading. The B2B platform for Chinese manufactures got optimizes and added a lot of functions through the upgrade. Some examples of the added functions are: new product demonstrations, bidding, etc. The platform is planning to add cross-border trading, which need to involve international logistics. In addition, on the platform, the staff management has transformed into an institutionalized management. The main customers of the platform are some of the manufacturers, distributors and vendors in the Yueqing area. The platform offers an offline agent service and provide value-added services for the industry. In addition, the platform focus on standard management and is prepared for more standardization. For the private enterprises, the internet

investment pose a huge risk due to the huge investment. For venture capitalists, social financing and capital financing is a feasible way.

3. Current logistics

The producers store their products in their own warehouses and then publish the inventory and quotes on the platform. The platform manages the data which is offered by the manufacturers.
First, the customers publish the order information. Second there's a matching process which connects the proper producer to the customer. Third, the financial transaction is done through the platform.
In terms of the manufacturing logistics system, it is still using the traditional logistic model. For this kind of online B2B platform, the logistics has the problems of tracking and controlling. Thus, the logistics is still an urgent problem for the platform.

4. Possible solutions to solve the logistics problems

The company considered to set up a logistics center like Siemens and Schneider, which can send the information to warehouses directly. Then warehouses will notify the delivery companies directly to pick up the products. Products can be sent from the warehouses to the buyers directly. The information integration can change into one-to-many or many-to-one, instead of many-to-many. The logistics cost get reduced if the logistics activities are outsourced to third-party logistics companies. When the trading volume increase, the cost per unit will decrease. The future solution is to try to achieve an automated management in regards to the warehouse, employment, product quantity and product model.

5. Possible difficulties when applying this solution

The biggest difficulty in applying the solutions is who is going to invest in the project. A huge investment is needed when setting up a logistics center. There are also problems with design and planning. Moreover, the support from government is also important for this logistics project. Unfortunately, the government did not show a lot of attention for the logistics facilities, currently.

6. Future planning for the platform

The platform need to change its business philosophy and add more value-added services to satisfy the increased requirements from its growing customer base. A one-stop service which

combine the business flow, information flow, capital flow and logistics flow to help the company to grow and develop. The company could learn from Fast Moving Consumer Goods (FMCG) cluster, for example, learn from the China Smart Logistics Network (A logistics network project by Alibaba) and try to seek more business cooperations.

Integrating the current resource is the key for the small and scattered logistics situation. For example, around a hundred of enterprises in the cluster can build a warehouse together with the help of some leading enterprises or government. The governmental help could include policy help, supervision or some other services.
By taking the advantage of internet and technology to transform the separate supply chains into one integrated supply chain that is serving the whole cluster. This way, the logistics will be more convenient and the cost of management could get reduced for the enterprises in the cluster.

Appendix B

Summary of the interview with 8m platform (8mbuy.com)

Date: 6rd and 7rd June, 2016
Interviewee: Xuanlin Lin, CEO of 8m platform
Interviewer: Xiaohan Ding

1.Introduction of 8m platform

8m is an E-commerce trading platform for the electrical equipment industry. The transactions on the platform are between manufacturers and distributors (B2D model) and trade with distributors gives a clear focus for the platform. The problem of information mismatch between the manufacturers and distributors get solved by the platform. It combines the online transactions and offline warehouse services, which is called "platform + warehouse" model. The new business model keep the activities smooth online and offline and therefore offer a one-stop service from pre-sales, sales and after-sales. To offer a better service, 8m also created software for PC and mobile phones. For instance, an App for logistics to integrate the resource of drivers, which saves a lot of costs for the platform. The Research and Development (R&D) of 8m is located in Beijing (Haidian area). There are 28 development personnel in R&D assigned to build and optimize the system. There are no outsourced jobs in R&D and the main job for the early stage is to integrate the resource of distributors and suppliers.

2. Logistics situation in Yueqing city

There are approximately 200 logistics companies in Yueqing city with different sizes. CIMC and Bada are the biggest logistics companies in this area. Quite a considerate amount of the small logistics companies perform linear logistics services, which only deliver to specific destinations all the time. For example one of the linear logistics companies might only deliver from the cluster to a Hangzhou city. The small linear logistics companies are scattered and have a lack of management. The functions of tracking, real time report and insurance are lacking of management too, which shows the characteristics of traditional industrial road logistics. There is another type of logistics, which mainly deliver small packages on a nationwide scale. The examples of this type of logistics providers are Deppon and Hoau.

These companies can offer nationwide logistics, and the price is lower than express logistics, however, the share of Deppon logistics in the area is very small, thus it can be negligible. The main logistics provider is still CIMC in Yueqing city. For industrial products, one-time procurements may be relatively large, thus the linear logistics are relatively stable and cheap. They are able to reach the professional market directly and further deliveries will be conducted locally after they receive the delivery.

3. Logistics situation in 8m platform

Through a planned construction of a big warehouse and cooperating with large logistics providers, 8m invite the logistics providers into the platform, therefore the customers can choose a logistics provider on the platform to deliver their products. Almost all the logistics providers in Liushi Town can be found on the platform. There are two ways of conducting the logistics between the suppliers and the 8m warehouse. One way is to use the warehouse as a consolidation center, where the products will be delivered to the warehouse after customer make an order. The other way is to send the products to the warehouse directly after manufacturing, effectively using the warehouse as a storage facility, and when products are ordered by customers, products will be sent from the warehouse directly.
The specific operation process works this way:

1. An online transaction happens
2. The payments to many suppliers get unified to one payment through the platform.
3. There are two ways to manage the products. If the supplier choose to store part of their products in 8m warehouse directly after the manufacturing, the products will be sent from the warehouse directly.
   If the supplier choose to send the products to 8m warehouse after the transactions are settled, the product will be sent from the manufacturer to the warehouse and then sent to the customer. However, either way use the same concept of consolidating the products in 8m's warehouse.
4. Finally, the products get delivered to buyers unifiedly. 8m can deliver the products to the logistics providers with their own vehicles or the logistics companies come and pick them up in 8m's warehouse. Any of the transactions carried out on the platform is traceable and have GPS positioning and other insurance services.

4. Future strategies for 8m

1. Provide an internet finance service on the platform, which offers a credit insurance service for buyers.

2. Integrate the B2B platform, logistics and big data analysis to achieve a complete automation of the procurement process for the entire industrial electrical industry.

5. Future vision for 8m

When the trading volume reaches critical mass (approximately 10 billion yuan), they are going to devote to their own logistics system for the platform.

6. The demand and supply situation for logistics

Since 2013, the need for industrial electrical industry declines, the logistics demand has also a downward trend, but the supply is not declining. The contradiction between supply and demand need to get addressed urgently.

7. What is the platform profit model?

In the early stage, the platform is temporarily free, but later it will charge a certain service fee for the transactions. The platform also plans to earn profit from the finance and banking services. The offering of logistics services will also be a part of the profits for the platform.

Appendix C

Summary of the interview with CHINT Electric Co., Ltd

Date: 6rd and 7rd June, 2016
Interviewee: Xiaoyan Wu, logistics manager
Interviewer: Xiaohan Ding

1. Introduction of CHINT group

The CHINT Group was founded in 1984, which is the leading company in industrial electrical appliances and new energy. CHINT has annual sales of more than 40 billion yuan and has more than 30,000 employees. The group covers the whole industry chain of power equipments. Moreover, its activities also cover the layout of urban rail transit, the manufacturing of energy equipments, new materials for storing new energy, energy network, the investment in financing platform and business incubator, etc. The products of CHINT was sold in more than 120 countries and regions, and has entered into Europe, Asia, Middle East and Africa's main markets. CHINT group is one of the top 500 enterprises in Chinese Private Enterprises and is the biggest taxpayer in the Wenzhou cluster for many years. One of its branch companies is Zhejiang CHINT Electric Co., Ltd, which is the largest producer and seller in low-voltage electrical appliances in China, and also the first listed company in low-voltage electrical business in Shanghai A shares. CHINT electric company alone account for about 50% of the market share domestically.

2. The market situation in low-voltage electrical industry

At present, the low-voltage electrical industry in China as a whole shows a downward trend. The large enterprises take up the main market share due to its well developed supply chain, strong capital and other advantages. The small businesses are flexible, with low cost and have professional focus advantages, and are thus gradually revealed in the market. In contrast, the medium-sized enterprises received a big negative impact, because they couldn't compete against the large enterprises and the small businesses.

3. The supply chain logistics in CHINT Electric Co., Ltd

Currently, the company has not yet set up their supply chain logistics and it lacks of a uniform supply chain logistics internally. The procurement logistics and the sales logistics are separated. The customer service logistics department in the company is mainly responsible for the sale logistics and after-sale logistics service. And the procurement logistics department is mainly responsible for the procurement logistics service.

4. The procurement logistics in CHINT electric company

The raw materials that needed for the company are mainly plastic and copper. The procurement is responsible by the purchasing department, but the corresponding logistics are taken cared of by the suppliers themselves. 80% of the raw material suppliers are located around the company, therefore, the general procurement scope is inside Yueqing City. Only part of the core accessories and advanced equipments need to be purchased outside the area.

For the parts and components, the company has a small transit warehouse for them, but the inventory level is low. The suppliers can deliver the products the same day when the company need them. The quick delivery helps the company to achieve a Just-In-Time production.

5. The main functions of the customer service logistics department

The main functions of this department are to take care the customer orders, product custody, shipping and delivery, order advisory, technical consulting training, product commissioning and maintenance. By offering these services, they achieve a one-stop shopping experience for its customers.

6. The logistics situation

Currently, the logistics providers have the characteristics of “small and scattered”. Although Sitong logistics provider have a big market share in the area, it implements the affiliated partnership operation, which lead to the difficulty of monitoring the logistics in transit. As a result, CHINT didn’t cooperate with such large logistics companies.

7. The impact of E-commerce for the company

- B2B: For the raw material suppliers, there is an internal management system. By informing the production plan to suppliers, it can match the procurement demand in

the company. For the distributors, there is also an internal E-commerce system to aid the trading process.

- B2C: Using third party platforms to sell products, for example Tmall and Jingdong platforms. The main product sales on the platforms are civil electrical products.

8. Flexible production

Due to the characteristics of the industrial products, the overall production is stable. Currently, the company implements a three months rolling production plan and an APO sales forecasting system. Depending on the main dealers inventory level to make a forecast plan and the next month's scheduling plan, it gradually transforms the production into a pull strategy. If the demand increase dramatically, some special methods will be used to meet the demand. For example, an expedited production.

9. Future directions

- Investment expansion around the electrical industry (e.g. photovoltaic industry);
- Product research and development will be led by the company. In the process of upgrading, the core products will be made by the company itself, but the expired products or low-demand products will be outsourced and produced by OEMs (original equipment manufactures). The company only need to control the quality of the products before selling them.

10. Main issues

- How to solve the disadvantages of traditional logistics operations, which are low in automatization and low in informatization. (The cost of high informatization is high, it needs the support of subsidization of government);
- How to optimize the central inventory, the regional distribution centers inventories and dealers inventories;
- How to reduce the amount of vehicles in the company and outsource the logistics to 3PL completely, thus have a better focus on the core competence.
- How to connect the upstream and downstream supply chain to form an integrated supply chain logistics.

11. Zhejiang TYD Logistics and technology Co., Ltd

Zhejiang TYD Logistics Technology Co., Ltd. was established in 2015, with its headquarter located in Hangzhou city. Its registered capital was 20 million yuan. It is a logistics company that is wholly owned by CHINT Group and commit itself to offer a comprehensive logistics services for the electrical industry. At present, the company's business scope includes: warehousing and distribution, land transport, courier, international freight forwarding, logistics equipment leasing, supply chain consulting, supply chain finance and more.

TYD has seven regional logistics operation centers, more than 21 area distribution centers and more than 100 terminal service stations. It owns multi-level logistics networks in China. In addition, it developed a logistics information platform, which provides real time information and status with concern to warehousing, order processing and delivery status for the customers.