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E-commerce Logistics in Supply Chain Management: Practice Perspective

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Abstract

E-commerce is booming with the development of new business model and will be continuously boosted in the several decades. With large number of enterprises carrying out E-commerce, logistics driven under the background has been largely influenced. This paper presents the state-of-the-art E-commerce logistics in supply chain management from a view of practice perspective. Worldwide implementations and corresponding models together with supporting techniques are reviewed in this paper. Typical E-commerce logistics companies from North America, Europe, and Asia Pacific are comprehensively reviewed so as to get the lessons and insights from these practices. Opportunities and future perspectives are summarized from the practical implementations so that interested companies like E-commerce and logistics companies are able to get some guidance when they are contemplating the business.

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*Keywords:*E-commerce; Logistics; Supply Chain Management; Practice; Review.

1. Introduction

Based on the booming E-commerce, logistics and supply chain management (LSCM) has been greatly influenced when we are now already overwhelmed by its successes in both developed and emerging economies.In the E-commerceLSCM,there are two major types of business models. They are business to consumer (B2C) and business to business (B2B) (Bolumole, Closset al.2015). In B2C model, business website is a place where all the transactions take place between a business organization and consumer directly (Miangiaracina, Marchet et al. 2015). In this model, a consumer visits the website and places an order to buy a catalog. The business organization, after receiving the order, will dispatch the goods to the customer. Successful examples like Amazon.com and Priceline.com are B2C leaders (Rappa 2008, Ta, Esper et al. 2015). Key features of this model are heavy advertising required to attract large customers, high investment of hardware and software, and good customer care service (Nica 2015). B2B refers to a situation where one business makes a commercial transaction with another, thus, the transaction volume of B2B is much higher than the volume of B2C. In a typical supply chain there will be many B2B transactions involving sub components or raw materials, and only one B2C transaction, specifically sale of the finished product to the end customer. The purchase of B2B products is much riskier than B2C products. Thatis because purchasing the wrong product or quantity, or at the wrong terms, can put the entire purchasing business at risk (Sila 2013).

The modern logistics have become the most important means to improve the efficiency of material flow, reduce distribution costs in various industries; at the same time, the recent development of E-commerce also contributed to the expansion of the logistics market, promote the development of technologies related to logistics. Large numbers of practices have been carried out in the E-commerce logistics (Bask, Lipponen et al. 2012, Masmoudi, Benaissa et al. 2014, Ramanathan, George et al. 2014). In order to figure out current movement of E-commerce logistics, this paper gives a comprehensive state-of-the-art review of E-commerce logistics in supply chain management from a practice perspective so as to get the lessons and insights from various practices for guiding future implementations. This paper summarizes the logistics models and supporting techniques for the E-commerce logistics and highlights the challenges, opportunities, and future perspectives.

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The rest of this paper is organized as follows. Section 2 presents the worldwide implementations in various practices from the real-life company. Section 3 highlights the challenges and future directions. Section 4 concludes this paper.

2. Worldwide implementation

2.1. North America

2.1.1. Home Depot

Home Depot is an American retailer company selling home improvement, construction products and service. Until 2014, it has more than 355,000 employees, and runs more than 2,000 superstores that are located in America, Canada, Mexico, China, and so on. In the year of 2006, in order to adapt to the dramatically increased E-commerce market, Home Depot decided to remodel its traditional supply chain into omni-channel supply chain and upgrade its logistics service network (Maloney 2009).

In the traditional model, each retailer store has a logistics management department, and this department is in charge of the store's replenishment, storage management, in/out products flow controlling and any other relative issues. When suppliers receive the stores' replenishment orders, they have two ways to deliver orders to retailers, of which one is directly sending products to the store, the other is using Home Depot's distribution center to ensure cost effective transportation. However, in real situation, 80% of the orders are sent to the retailers directly, because each store has its unique replenishment cycle and requirement so that it is hard for suppliers to realize full truckload during one piece of set time. The company's legacy network of distribution network is also hard to achieve customers' service expect, for the E-commerce orders are increased at dramatic speed.

For the Line-Haul phase, the Home Depot sets centralized inventory and replenishment (I&R) department in the corporate's headquarters, develops and deploys of a new network of distribution centers for store replenishment. The new I&R department takes place of the individual stores' replenishment teams, and is responsible for all the stores' inventory management. The centralized replenishment improves the demand forecast accuracy, gains more power for Home depot while negotiating with suppliers as the single order is much larger than before and it also brings benefits of transportation cost effective, high top-selling SKUs (Stock Keeping Units) availability which can achieve 99% and so on.

2.1.2. Lowe's

Lowe's is the second largest home improvement retailer company in the North America. Until the year 2011, there are 1840 Lowe's retailer stores all over the world. Most of them are located in North America, and some are located in Austria. Lowe's is recognized as the top service provider in home improvement industry.

Lowe's business model is very similar as the one used by Home Depot. Although Home Depot has larger market shares which improve its supply chain management continuously to save cost, Lowe's has to explore in other ways to keep increasing in the home improvement market (Gukeisen 2005). First, instead of quick expansion in metropolis, Lowe's chooses to explore the consumption potential in small and medium size cities. Second, Lowe's adds the categories of products, invests for store decoration, redesigns the layout of retailer stores, and finally attracts a lot of women customers shopping in Lowe's (Fogel 2002). Third, Lowe's builds its own service team to cover logistics service, sales guidance, installation service, design service and so on. Lowe's also transfers part of do-it-yourself (DIY) products into only buy-it-yourself (BIY) products, and offers special service to different types of customers.

In Lowe's case, customer service is the first priority. The good shopping and service experience they provide to customers is the breakthrough point to gain market share under Home Depot's intensified competition pressure. It ensures Lowe's sales keep increasing steadily every year (Timothy Thacher 2007). However, the product diversity, personized service, quick expansion in smaller cities and other characteristics that bring by self-support logistics service team all lead to the serious problem of cost control, as the E-commerce order emerges, this problem will become more and more serious. Lowe's has to find a balanced way between high customer service and cost effective supply chain management.

2.1.3. Amazon

Amazon is an E-commerce and cloud computing company. It's the biggest Internet Retailer in the America. It began as an on-line bookstore but its current business scope covers DVD, blue ray, CD, video game, electronic, furniture, food, toys, jewellery and so on. Amazon has independent sales website facing different countries and areas, including America, the U.K. and Ireland, France, Canada, Germany, Italy, Spain, Netherlands, Australia, Brazil, Japan, China, India and Mexico.

Amazon saves a lot of storage costs by integrating the inventories in DC (Distribution Center) and the warehouses of partners. Then there is no need for Amazon to keep a high level of inventory like physical retail stores (Chiles 2005). The determinants for locating DCs consist of distance from customer intensive places and level of taxes. Within the DC, Amazon has different processing procedure and equipment when dealing with various product groups. Those products which are easily classified and transported are stored in highly automated equipment (Hays, Keskinocak et al. 2005), while those irregularly shaped products are handled by equipment of low-level automation.

When dealing with inter-city transportation, Amazon sets some injection points, i.e. transportation hubs (Cronin 2014). They are located in the districts where customers are highly concentrated to save cost. Orders are integrated in the distribution centres first. After that, the less than truckload

shippers or truckload shippers will supply the long-haul shipment service, carrying them from DCs (Distribution Centers) to injection points. As the unit mile costs for LTL (Less than truckload) and TL (Truckload) shippers are relatively low, the overall transportation costs could be saved in this way (Oti 2013).

2.2. Europe

Ikea is a furniture company from Sweden, it is famous for flat design and low price furniture products. Until the year 2014, Ikea has 349 stores which are located in 43 countries over the world, most of which are in Europe, and the rest are dispersed in America, Canada, Austria and Asia (Bai 2011).

The successful story of IKEA's logistics cost control should start from the product design. IKEA's design department is located in the enterprise's headquarters in Sweden. Every year thousands of new products' blueprints are sent out from this department to IKEA's suppliers. All of these new products are enable to be packed in flat packages, and all those packages are standardized (Hou and Ji, 2011). Those flat standardized design plays an important role in logistics efficiency and cost saving.

IKEA has more than 2,000 suppliers all over the world. In order to transport products from suppliers to retailer stores, the company operates 31 centralized distribution centers in 16 countries. In this Line-Haul phase, IKEA chooses to deliver products by boat/ truck/ rail to control transportation cost. Only less than 10% products are sent by air. In the future, IKEA will buy more rail lines in Europe and more Line-Haul deliveries will be completed by train.

Because most of IKEA's SKUs (Stock Keeping Units) are in standardized packages (only three kinds of pallets are used in IKEA's warehouse) (Ikea, 2013), the distribution center of IKEA can realize high automation, around 20% of the SKUs but account for 80% of volume are supported by automatic storage and retrieval facilities (Automated Storage/Retrieval System, Conveyors, High bay pallet rack, Conventional pallet rack, Warehouse management system), and the rest 80% SKUs which only account for 20% of volume are handled by operators in distribution centers(Liu and Hou 2011). Those high automation distribution centers help IKEA to achieve fast and effective transshipment (each stacker extracts goods from distribution center can be done in 10 seconds to 2 minutes).

The location of each IKEA's distribution center has been demonstrated so that the replenishment route from distribution center to stores is optimized (Trebilcock 2011). The principle of deciding the location is that if the distribution center is response to the fast moving consumer goods (FMCG), it should be near the relative stores to ensure the goods' availability. Whereas for slow product flows, the location of relevant distribution center should be considered the distribution cost as first priority. The final objective is to minimize the total cost (Trebilcock 2011).

During the last mile distribution phase, IKEA encourages customers to DIY. E-commerce orders are suggested to be picked up by customers in the nearby store. For those who still requires for delivery, IKEA will charge a considerable distribution fee (Ikea, 2016). In IKEA store's storage areas, the shelves are well designed for customers to get their products easily, and helpers are available in the picking area in case customers need assistances (Banker 2009). Since most of IKEA's products are flat packed, most customers can transport their orders by car. IKEA always provides large car parking areas for customers near the store. What's more, packaged service is offered near the exit of the store, and well trained packers will help customers to make their goods easy to handle (Ikea, 2016).

2.3. Asia Pacific

2.3.1. JingDong

JingDong is the second largest E-commerce company in China, it sales millions of products on its platform. According to the company's latest annual report, in the second season of 2015, the total trading amount is 11.45 billion RMB and the number of orders is more than 0.3 billion.

Even though the company has to deal with enormous number of orders every day, JingDong is famous for its fast and reliable logistics service. There are various logistics services provided by JingDong, such as "211 program", "next day delivery", "3 hours delivery" (Cui 2014). As the E-commerce business is increasing dramatically in recent years in China, many companies has the big problem of logistics service, while JingDong achieves more than 95% of positive feedback rate and zero complain from customers.

Until 30th June 2015, JingDong has built 166 big warehouses in 44 cities, and 7 logistics centers as its own supply network to cover the whole country. Those logistics centers are located in Beijing, Shanghai, Wuhan, Xi'an, Chengdu, Shenyang and Guangzhou. What's more, JingDong also cooperates with other companies, attracts high quality suppliers to open their own online shops on JingDong's platform, and JingDong provides logistics service for them (Guo 2011). When a customer place an order on JingDong, the order might be picked up in JingDong's warehouse or other supplier's warehouse, and be transported by JingDong's fleet or supplier's large truck for Line-Haul phase.

In the second phase, no matter whether the products are from the suppliers or JingDong's logistics centers, they all arrived at JingDong's distribution center for transshipment. Starting from this phase, JingDong takes over all the products' logistics service (Wei Guo 2013).

In the last mile distribution phase, JingDong employs deliverers who dressed in the company's uniform and trains them to provide standardized service. For those customers failing to receive their orders, JingDong also provides other ways, such as PUDOs where customer can pick up his order from specific cabinet after typing in a group of password (Xu, Hong et al. 2011). Customers can also choose to pick up their orders in nearby convenience stores which are called self-pickup points. There are 4142 self-pickup points all over the

country, covering more than 2043 towns and districts in China.

2.3.2. GuoMei

GuoMei is the largest household appliance retailer in China. It operates more than 1,200 stores with more than 300,000 staffs in China and its annual sales amount can achieve 100 billion RMB. GuoMei was founded in 1984, and launched its E-commerce platform in 2011. As the first company to try the B2C plus physical store model, GuoMei started to improve its supported logistics system in the same year.

GuoMeiconcentrates logistics investment on building centralized distribution centers. Since 2002 when the company's logistics management department was set, GuoMei has already built 25 distribution centers, and the total warehousing area is 232,000 square meters(Wang 2005, Xie 2012). In order to keep pace with the expansion of retailer network and sharp increase E-commerce market, GuoMei decided to build 7 large central distribution centers (CDC) in first-tier cities, 40 distinct regional distribution centers (RDC)in primary markets, and small distribution centers (DC) to cover the secondary markets. Many advanced techniques are applied in those CDCs, such as AS/RS system, AGV (Automated Guided Vehicle), RFID (Radio Frequency Identification), information management system like WMS, ERP and so on (Gao 2007). Around 300 suppliers of GuoMei are responsible to the Line-Haul transportation, and products are sent from manufacturer's warehouses to GuoMei's distribution centers.

In the last mile distribution phase, GuoMei outsources most part of logistics service. It owns only 186 trucks and the rest 4,800 trucks belonged to third party logistics companies. In addition to this, GuoMei's 11,000 deliverers and most logistics service providers are from outsourcing companies (Jiang 2007).

3. Challenges and future directions

3.1. Challenges in logistics model

The relationship between logistics performance and E-commerce customer loyalty is much closer in E-commerce business than in any other industries (Ramanathan 2010). E-commerce orders are always small but the shipment of these orders is rather complex, so the scope requirement for the role of logistics is much larger, and the logistics service is directly provided to the final customer who always has high expectation on the logistics service level. Many studies show that customers consider the logistics performance as an important factor of E-commerce, especially the last mile distribution (Esper, Jensen et al. 2003, Agatz, Fleischmann et al. 2008). And company's logistics capacity has significant and positive effects on logistics performance in E-commerce market (Joong-Kun Cho, Ozment et al. 2008). Future logistics model should focus on controlling the last mile distribution service quality, as mentioned in section 3, companies have self-support logistics team such as JingDong, Lowe's and Amazon, they provide really good logistics service experience to customers, and the rates of customer satisfaction of these companies are high.

However, considering the cost and revenue, operational flexibility, investment, core competency and other factors, companies find that outsourcing is the most effective and reasonable way to fulfil all customers' logistics service requirement (Wilding and Juriado 2004). But outsourcing should not be a simple decision as "no or nothing " (Millen, Sohal et al. 1997). (Joong-Kun Cho, Ozment et al. 2008) showed that outsourcing has different effect on different companies, for those companies with low logistics capacity, outsourcing has significant positive effect on company's performance especially on sales growth, but it has negative coefficient for high logistics capacity companies. It is suggested that those companies should avoid overlapping investment on the same logistics service part.

According to recent successful implementation cases and relative research works (Rao and Young 1994, Rabinovich, Windle et al. 1999, Bolumole 2001, Knemeyer, Corsi et al. 2003, Wilding and Juriado 2004, Highfield 2014), the future development of E-commerce logistics should consider to classify logistics service first based on the specified company's situation. For IKEA, it divides its products into high-flow and low-flow categories based on the circulation of products, while Home Depot designs different delivery channels for its products based on the circulation and size of products. JingDong classifies its service categories mainly based on regions not characteristics of products, and Amazon likes to divide customers into different service groups.

3.2. Challenges in Technologies

With the globalization of the company, the design of logistics model becomes much more complex. Taking Home Depot for example, it is really hard to enter successfully into Chilean and Chinese market(Bianchi 2006). Firstly, it is because the consumer behaviour is different in these countries from North America. Customers in these countries have to work for a long time, so they do not have time to read instruction to assemble or repair furniture, and women decide what to buy for house decoration. DIY market is very small in these countries. Home Depot thus can only achieve around 5% of the market share in Chile. Secondly, Home Depot still uses the same supply management strategy in Chile and China, even when the market situation has changed a lot. Suppliers reject to coordinate with Home Depot when they find the sales volume is small while the coordinate terms are harsh. Thirdly, Home Depot has strong local competitors who know the local customers' requirement well (Bianchi and Ostale 2006). As a result, Home Depot had to close all its retailer stores after entering Chilean and Chinese market for around three years. The lesson from Home Depot in Chile and China is not only about the market research, but also includes that during different company development period, different

supply chain management strategy and supported logistics model should be applied. In the early stage of providing the logistics service network, outsourcing transportation, rent warehouse can be applied first, because it is the most cost effective way and it is positive for sales performance(Li and Ding 2014).

There are now several popular information management systems. One of them is ERP system. ERP can help coordinate various departments of the enterprise, integrate the information system of the whole company and add new modules to satisfy new requirements. ERP system is flexible, accurate, convenient and interactive. Logistics usually demands highly in dispose of order, contract, delivery and return of goods. It should rely on data share in real time, integration of parcel flow, capital flow and information flow, remote control and various management strategies.

3.3. Future directions

Considering the advantages and disadvantages of self-built and outsourcing, usually companies have to make a decision after trade-off. The factors which need to be considered include status of fund, sales volume, management level, and informationization capability. Future technologies for supporting E-commerce include three future perspectives: Internet of Things (IoT), Big Data Analytics, and Cloud Computing. These technologies maybe able to upgrade and transform the E-commerce logistics into a wider implementation not only for giant corporations, but also for small and medium-sized enterprises (SMEs) to get the benefits from E-commerce era.IoT is a smart network of physical objects, devices, vehicles, architectures, and other items that are embedded with sensors so that these objects could communicate and exchange data within an intelligent environment (Xu, Xu et al. 2014, Qiu, Luo et al. 2015, Zhong, Huang et al. 2015a).After using vast number of digital devices in E-commerce logistics, huge number of data will be created. The large number of data from E-commerce logistics may carry rich knowledge which could be used for supporting advanced decision-makings for various enterprises. Thus, Big Data Analytics is another future perspective to lift E-commerce logistics. Big Data refers to the data sets with so huge volume or complexity that typical data processing technologies or approaches cannot deal with in an efficient and effective way (Ciobanu, Cristea et al. 2014, Tan, Zhan et al. 2015, Zhong, Huang et al. 2015, Zhong, Xu et al. 2015).

To process the large number of data with reliable approaches, Cloud Computing maybe suitable since it is a kind of Internet-based computing where resources, data, and information are shared to computers and other devices on-demand. In such model, on-demand access to a shared pool with configurable computational resources (Armbrust, Fox et al. 2010, Chaabouni, Kchaou et al. 2013, Kehoe, Patil et al. 2015). It enables ubiquitous, convenient, on-demand, and flexible network access to a shared pool with various resources like networks, servers, services, and so on (Morgan and O'Donnell 2015). (Graham, Manikas et al. 2013) highlighted the E-logistics by full use of the Cloud Computing technology and infrastructures. In the E-commerce logistics, the SCM needs a large computation ability to work out optimal solutions or decisions, thus, the distributed computing resources could be utilized to figure out the decisions locally and globally. The services models like infrastructure as a service (IaaS), Platform as a service (PaaS), and Software as a service (SaaS) could be associated with different layers of the E-commerce logistics.

Another information innovation is highly customized software applications which can link the company into its partners' system. The information such as inventory levels and product types can be shared and displayed together. It enables the company to receive orders or manage the delivery better using their supply chain business models. There are for sure other kinds of WMS or IMS. Companies having sound capital foundation usually try to develop and update their systems to match the higher and higher market needs.

4. Conclusions

This paper talks about the E-commerce logistics in supply chain management from a practice perspective. Due to the fast development and large influence of E-commerce, logistics has been greatly changed compared with several decades ago. This paper highlights the logisitcs models and supporting techniques which have improved the E-commerce logistics significantly. Worldwide implementations such as North America, Europe, and Asia Pacific are reported. Typical E-commerce companies are reviewed in this paper aiming to get the opportunities and future perspectives which may be used for guiding practitioners and academia when contemplating E-commerce logistics and supply chain management in the near future.

For the practice view of E-commerce logistics, the IT technology plays an essential role in improving the efficiency and effectiveness of supply chain management. Future technologies like Internet of Things (IoT), Big Data Analytics, and Cloud Computing would be possibly adopted to enhance the E-commerce logistics in terms of system level, operational level, and decision-making level that may be real-time and intelligent in the next decade.

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