



E-Commerce as a Driver for City Logistics in China

Year: 2015

Researcher: Dr. Jean-Paul Rodrigue

**MetroFreight Center of Excellence
Dept. of Global Studies & Geography, Hofstra University, Hempstead,
New York, USA**

Title: E-Commerce as a Driver for City Logistics in China

The Challenges of E-commerce in China

E-commerce (also known as B2C; business to consumer or e-retailing) has experienced a sharp growth in the last decade in many markets around the world. However, no market has seen such an extensive growth as China. As of 2015, e-commerce accounted for about 10% of retail sales in China, a figure that remains difficult to assess because of the large size of the informal retail economy¹. Comparatively, online sales account for 7% of retail sales in the United States, but the size of the informal retail sector is much smaller. Online penetration in China has grown at a spectacular rate with close to 50% of the population having online access, mostly through mobile devices. As of 2014, mobile devices accounted for more than a third of all online purchases in China.

In this context of sharp growth, the development of e-commerce in China is facing three major challenges:

- Limited access to credit (particularly credit cards) from the general population. A core component to e-commerce is the ability for consumers to settle transactions, a purpose for which credit cards are commonly used. However, the level of credit card penetration in China is only about 10% of adults, stemming from a tradition of limited trust in financial institutions and a willingness to hold cash as a precaution. Banking cards are however more readily available and consumers have traditionally preferred to pay cash for their retail purchases (COD²). In such a setting, third party payment platforms have emerged to fill a void. The most significant is Alipay (a parent company of China's largest online retailer, Alibaba), which accounted for about half the online payment transactions in China.
- Limited presence of third party logistics providers specializing in parcel deliveries. There are few companies able to offer comprehensive (covering several markets / cities) and dedicated parcel delivery services since such a market was nonexistent in China until recently. This is radically different from other advanced economies where parcel delivery services have been available for decades (as B2B) and as a result have been able to adapt to B2C flows resulting from e-commerce. The existing Third Party Logistics Providers (3PLs) in China are mostly focusing on international distribution.
- Highly congested setting for urban deliveries. The large majority of the urban population is living in apartment complexes where home deliveries are complex. Individual home deliveries are thus not a very effective commercial option due to the lack of parking and access to individual addresses.

Online marketplace services account for 90% of e-commerce in China and enable smaller e-retailing firms to access retailing platforms that would otherwise be prohibitive to establish. However, an important additional advantage of marketplaces is the distribution capabilities that are offered. Therefore, any large scale online B2C strategy has to take control of the distribution aspect of e-commerce. This means that e-commerce in China involves a fulfillment strategy as well as establishing distribution systems (from distribution centers to fleets of delivery vehicles), mostly in large metropolitan areas. These fundamentally different characteristics are inciting unique development strategies from online retailers.

E-commerce and the Setting of Logistical Facilities

The growth of web based retail sales triggered the development of new logistics structures through a process of functional specialization, particularly since e-commerce is based on parcel deliveries. This

¹ Forrester (2015) China Online Retail Forecast, 2014 To 2019.

² McKinsey & Company (2013) China's E-tail Revolution: Online Shopping as a Catalyst for Growth.

implies the setting of four particular types of facilities, each addressing the freight distribution of parcels at a specific scale and scope.

- E-fulfillment centers are large facilities assembling individual online orders. Due to the high number of items that are held in inventory, such centers tend to have high racks storage. In recent years, many of these facilities have become partially or fully automated, with robots able to quickly assemble orders and place them into parcels (envelopes or boxes of different sizes). The mere size of these facilities relies on site selection in low land cost locations that remain accessible to highways. Since orders are shipped through parcel services, access to a major parcel hub is an important locational attribute.
- Parcel hubs and sortation centers arrange shipments by their regional/local destinations. Due to their sortation function, these facilities rely on the cross-docking model where inbound flows arrive on one side and outbound flows on the other. Further, depending on the strategy of the online retailer, they could also act as e-fulfillment centers, particularly for goods that are in high and regular demand. Like e-fulfillment centers, low land cost is an important locational attribute, but the facility is located with the aim of maximizing accessibility to a regional distribution system.
- Parcel delivery centers and urban logistics depots are medium-sized cross-docking facilities used mostly to sort parcels on specific local delivery routes. Since the deliveries are taking place within an urban setting, the parcels are usually loaded into delivery vans or other specialized urban delivery vehicles (electric vans and even cargo bicycles). These facilities are usually in the immediate periphery of a metropolitan area.
- Pickup locations and freight stations are used when deliveries are not made directly to the customers' residences. These small scale facilities, located at accessible high density locations, are serviced with urban adapted vehicles. In most cases, a store-like facility is used, but an emerging trend has been the usage of freight stations composed of locker banks where customers can pick up their parcels by using a code (e.g. credit card, a QR code).

In standard e-commerce distribution chains, e-fulfillment facilities are usually owned by the online retailer while parcel hubs, sortation centers and parcel delivery centers are usually owned by third party logistics providers.

Table 1: Logistics Facilities Supporting E-commerce³

| Facility Type | Facility Attributes | Locational Attributes |
|-------------------------------|---|---|
| E-Fulfillment Center | Large-sized facility (half a million to one million square foot). Cross-docking configuration common. High racks storage. Push towards automation. | Low land costs. Proximity to highway. Access to a major parcel hub. |
| Parcel Hub / Sortation Center | Large-sized facility (half a million square foot). | Low land costs. Accessibility to regional distribution. |

³ Source: Adapted from: Jones Lang Lassalle (2013) E-commerce boom triggers transformation in retail logistics: Driving a global wave of demand for new logistics facilities.

Cross-docking configuration for handling trucks.
Automated and semi-automated sortation.

| | | |
|--|---|--------------------------------------|
| Parcel Delivery Center / Urban Logistics Depot | Medium-sized facility. Cross-docking configuration for loading vans. | Periphery of metropolitan areas. |
| Freight Station / Pickup Location | Small or micro-sized facility. Store-like facility (pickup location). Locker banks (freight station). | High density neighborhood locations. |

The following sections will look at how and to what extent such facilities are used for e-commerce deliveries in China.

JingDong: The Value Proposition of a Chinese Online Retailer

JingDong (JD) is the second largest online retailer in China after Alibaba, specializing in B2C services and operating 97 distribution centers across the country. An important advantage of JD (and many online retailers) is the trust it has established due to its reputation of selling only original goods. China is notorious for the production of fake goods and by buying online, customers are ensured that the goods they acquire are not counterfeit or substandard. Providing guaranteed genuine goods has thus become a competitive factor that Chinese online retailers have over standard retailers, particularly small businesses. JD commits substantial procurement diligence so that the goods it purchases are genuine and this commitment is well known by consumers. This is the main reason why a large amount of standard consumer products such as diapers and infant formula are bought online in China. Recent years have revealed several scandals and controversies. For example, the melamine contamination of milk products and infant formula (to fake protein levels) resulted in a scandal in 2010 with a declining trust by consumers of Chinese brands, in the dairy industry in particular.

Like many online retailers, JD buys from a large number of suppliers, many of them domestic, but specific online stores are being developed for European, Japanese and Korean imported goods. There is thus a growing import-based retail logistics emerging.

Considering their sale volumes and the scale at which they operate enables online retailers like JingDong to collect large amounts of market and consumer data. This data enables them to pre-position orders before they have taken place since demand can be forecasted more reliably. In addition to the benefit of further consolidating orders and using transportation assets outside peak demand, pre-positioning considerably reduces lead time.

The Chongqing Parcel Sortation Center

In 2014, JD opened a distribution center to service the metropolitan area of Chongqing (Figure 1), a major city of about 17 million people and a provincial level municipality that used to be part of the province of Sichuan. This distribution center is located in a newly developed logistics zone named "Chongqing Highway Logistics Base", a 30 square km real estate project developed by the government of the Municipality of Chongqing. This logistics zone is located about 40 km from the central business district along the major ring road surrounding the metropolitan area and thus provides a good level of

regional road access, including smaller urban centers. The JD facility employs 200 people working in two shifts.



Figure 1: JingDong Distribution Center, Chongqing, China

The Chongqing distribution center is a sorting and cross-docking facility where orders are grouped according to the destination. Most goods are stored on racks with a high level of inventory turnover, but the center also acts as an e-fulfillment center, in part due to the delays involved in moving cargo over long distances in China. On one side of the facility are receiving docks where inbound orders are received, deconsolidated to be stored and eventually distributed (Figure 2).



Figure 2: Receiving Dock Bays

The Two Channels of E-fulfilment

The consolidation of deliveries in the distribution center takes place over two main channels. The first channel involves light and small orders that are consolidated into plastic delivery bins used to carry items with minimal packaging (Figure 3).



Figure 3: Empty Bins Storage and Preparation Area

In addition to be a convenient load unit, storage bins also protect the cargo they carry. Each delivery bin can include multiple orders from several customers, but who have all in common a specific delivery point (Figure 4).



Figure 4: A Delivery Bin Full of Mixed Orders

JD is mostly relying on manual sorting due to low labor costs, but if needed the system can be further automated. Light orders are sorted on baskets, verified and then put in delivery bins (Figure 5). Each bin has a unique number so when deliveries are assembled, batches bins are assigned according to the size of the delivery to a specific location.



Figure 5: Sorting of Light Orders into Delivery Bins

The second distribution channel involves larger parcels, mostly packaged boxes or large bags (e.g. a bag of diapers, a computer printer, a chair ready for assembly) that cannot be handled in bins. These orders are sorted separately (Figure 6).

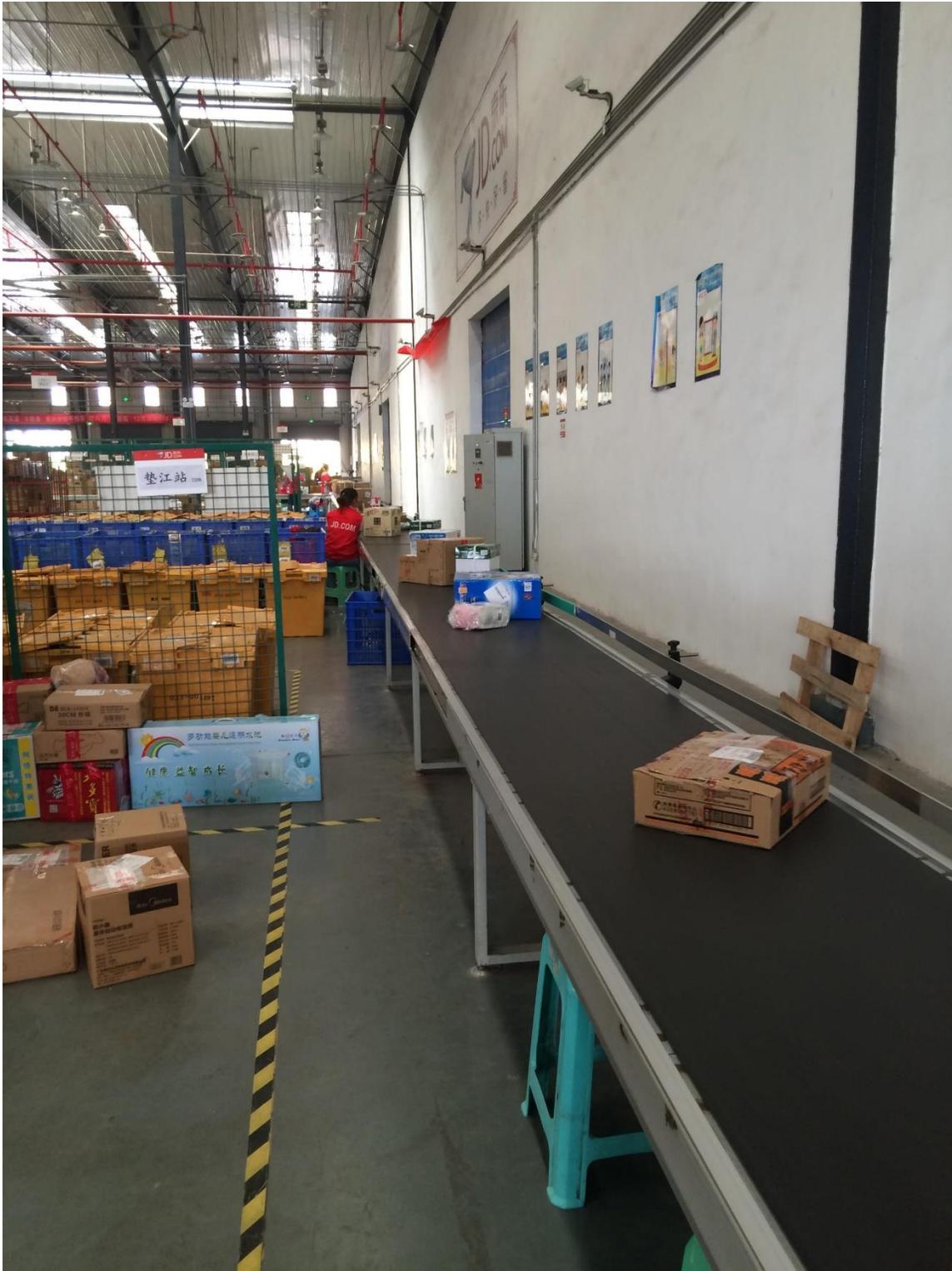


Figure 6: Sorting of Boxed Orders

The boxed orders are then assembled by point of delivery, each represented as a separate storage lane (Figure 7).



Figure 7: Consolidation of Boxed Orders by Urban Delivery Point

The Chinese Urban Last Mile

Boxed orders and storage bins are then assembled on docks and loaded into delivery trucks bound for urban logistics depots (deconsolidation centers) covering a specific market area (Figure 8).



Figure 8: Consolidation of Delivery Bins and Boxes for Urban Delivery Vehicle Loading

Depending on the size of the urban logistics depot, full truck loads are assembled (Figure 9). To maximize the load factor, trucks are usually floor loaded. Such vehicles are not adapted for city logistics, but designed to be used on highways between the main metropolitan distribution center and local / urban logistics depots.



Figure 9: Delivery Truck bound to an Urban Logistics Depot

At the urban logistics depot, loads will be broken down for urban delivery routes usually covering a neighborhood or an urban district. Depending on the destination and the condition for the delivery (availability of parking), JD is using adapted urban delivery vehicles such as small trucks or motorized cargo cycles (Figure 10). These vehicles are more suitable for the density and complexity of urban deliveries in Chinese cities. Due to the geography of the city of Chongqing, cargo cycles are not used.



Figure 10: JD Urban Delivery Vehicle

The Urban Delivery Point

Direct home deliveries are complex in China. In large recently built apartment complexes, home deliveries are the norm because of the consolidation potential they offer for single point deliveries. However, many cities have complex central areas and compounds (administrative, universities, factories) that are not suitable for home deliveries. In such a context, orders are usually routed to a neighborhood pickup location, which is owned or leased by the retailer. Delivery at a pickup location enables a consumer to pay cash for the purchase (COD), which accounts for about 40% of online transactions, with another 50% assumed by the Alipay transaction platform. The pickup outlet shown on the photo below (Figure 11) is located on a university campus where many students do not have an address for a delivery. Therefore, the prevalence of urban pickup outlets combines the benefit of a consolidated pickup location and the unique transactional (importance of COD) characteristics of the Chinese consumer market.



Figure 11: JD Urban Pickup Location

Like its North American, Japanese and European counterparts, JD is installing pick up lockers at specific locations (Figure 12). Customers are informed on their mobile devices when a parcel is ready to be picked up and are given a code (or a QR code to be scanned from their mobile device) to access their

delivery. Such a system is still in its infancy in China, but is expected to grow substantially with lockers to be installed in new residential complexes in peripheral locations.



Figure 12: JD Pickup Locker Station

Driving City Logistics

Because of the urban setting and the timeliness of their deliveries, large Chinese online retailers such as JD are driving city logistics innovations from scratch. Freight distribution systems are being established in a context where no or few alternatives were previously available. As such, Chinese online retailers are among the dominant adopters and innovators of city logistics practices because of their involvement in the distribution aspect of B2C. Distribution becomes a competitive and market servicing strategy. This is much less the case for online retailers in markets such as North America, Europe and Japan, that rely on established parcel delivery companies and as such are much less directly involved in city logistics. However, limited (and retailer specific) B2C distribution systems creates significant barriers to entry for smaller e-commerce enterprises. This has led established online retailers to offer “marketplace” services where their online platform and distribution capabilities are made available to third parties, which constitutes a further source of revenue. This could also eventually lead to the separation of the logistics / distribution branches from online retailers either as a commercial decision or by regulation. While several elements of city logistics are still in their infancy in China, the rapid diffusion of online retailing has promoted the rapid diffusion of city logistics practices. These practices are going to lead to unique forms of urban distribution adapted to the geographical, commercial and regulatory reality of Chinese cities.

Acknowledgment

This research is supported by the Volvo Research and Education Foundations through the MetroFreight Center of Excellence. The background information was collected during a field trip to the JingDong distribution center in Chongqing, China. The author would like to thank Zeng Su for organizing the visit. All errors and omissions are the responsibility of the author.