Driving E-Commerce Logistics Forward

Volume 17-Mar-TF
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Driving E-Commerce Logistics Forward

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**E-Commerce Trends and Challenges: A Logistics and Supply Chain Perspective**

(Volume 16-Nov-TI)
EXECUTIVE SUMMARY

A new wave of e-commerce is upon us and lessons have been learnt, particularly in logistical support. A myriad of new business models in customer engagement and in addressing gaps in the traditional demand chain abound. However, in our view it's not just about novel business models that may wow us now, the real crux of the matter is about fulfilment matched to the needs of each unique environment it has to serve.

In many of the evident models the focus is on introducing new intermediaries and removing precious time from the ecosystem. Such may, however, rebound and increase true business costs for other partners or within the whole supply chain. It must be about concurrently removing time and costs, or put another way, about increasing responsiveness and efficiency not only in the demand chain but also at each leg of fulfilment.

The most persistent models are those that trade-off effectively between time and cost and at the same time, work within determined service level windows - what we address as delivery postponement. Engaging the customer at every stage of the supply chain and not just the (final) consumer at the end of the chain lends itself to greater sustainability. Similarly, end-to-end fulfilment synchronization designed to respond to a drum beat lends itself to lean(er) logistics and hence, the optimum use of the factors of logistics - land, labour and capital utilization. Without such upstream integration the validity and lifespan of any business model may be severely tested.
Control and the mix of appropriate factors vary by country and sector as rents for the latter may differ quite significantly. Externalities, matter too as any impact on the public and environment may promote or hinder adoption of a new model. Sub factors such as infrastructure, access, skills, market and technology readiness compound the landscape. The complexity these contribute may create leaderlessness (anarchy) through to self-governing (autonomous) up to highly regulated supply chains or utilization of asset categories within these factors. Worse still cross border logistics may counter the value added as one traverses the supply chain to market. This means a uniform global (macro) supply chain strategy not tailored to regional (meso) or local (micro) customs may erode comparative and competitive advantage when one leaves the home market. Cases abound of short-lived innovation as the market itself evolves.

The higher the population density, the greater the potential for market penetration, or so it may seem. Some cities provide vertical as well as horizontal spatial delivery challenges. Industry fragmentation and simply perceived translation of offline to online models may result in poorly coordinated resources without a proper governing or mediating agent or system. This, in turn, creates competitive challenges as new entrant firms rush in to fill the gaps creating a downward spiral in productivity rather than the intended spur to growth in the sector at large. Singapore, as smart nation, is perhaps one of the most ready to address such challenges and does provide the key opportunities to test bed more effective and sustainable business models based on the premise that companies can and should collaborate for effective productive growth. Resource pooling and a sound regulatory environment and a requisite skills base means such risks can be mitigated and at the same time aim to retain productive differentiation in this new economy.
This white paper sets out to document the challenges, opportunities and solutions with contributions from leading players. We take a primarily logistics perspective, as this in our view, addresses the foundational aspects that, if we get right, allow us to ride the sharing economy. In many aspects this paper is another step in the journey and we consider it a work-in-progress and we hope that it's provokes further thought.

We first set up the e-commerce landscape and the logistical challenges of maintaining the economics of consolidated freight delivery postponed to the most opportune time. This leverages the concept of large every day long leg containerization down to the use of smaller modular recirculating in-city boxes deployed in scenarios we paint out.

Customers’ expectations in the e-commerce scenarios are positively correlated with increasing levels of delivery effectiveness but can be hindered by inadequate infrastructure, warehouse readiness, less than efficient last mile delivery and lack of cross border harmonization. We suggest that integrated and postponed delivery consolidation may be a panacea for e-commerce, remedying delivery failure rates and low asset utilization.

In ELM, we embed and integrate the aforementioned factors and we propose critical success factors and concepts such as dynamic delivery of consolidated freight leading to optimum asset utilization governed by performance-based contracts crafted on cut-off times.

Time and cost trade-off is key to optimization of multi-party delivery consolidation. We postulate that such consolidation must be based on freeing oneself from the burden of servicing owned fixed costs towards adoption of
a variable cost ecosystem by adopting new models that marginally load parallel or independent resources of non-related parties – in a grid-like fashion down even to crowd logistics. Here, we refer to the “4th Party Milk Run” and “Collection and Delivery Points” as exemplars that allow much greater economies of scale and scope.

In summary, we have attempted to layout, from a logistics and supply chain perspective, the current landscape of e-commerce trends and challenges and present some thought provoking concepts, technologies and solutions that we have researched that could benefit the community of practice.
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An e-commerce journey map of the new wave is not as simple as setting up a website and selling products online. Beyond the technology investment of setting up an online platform for business, the move into e-commerce entails significant preparation and consideration such as product configuration, suitable infrastructure, logistics automation and supply chain preparedness. A well thought through business strategy is essential.

Logistics plays a very important role in e-commerce. It refers not just to the last mile delivery of parcels to customers, but also the overall e-fulfillment strategies, as illustrated in Figure 1.1. Figure 1.1 illustrates how goods would reach the customer in an e-commerce scenario. The customer can either be a business consumers or an individual (consumer).

Today, customers want their goods to be delivered rapidly and at their convenience. They have an expectation with regards to delivery and may consider the speed and convenience of delivery as important as product price and quality. At the same time, the volume of packages that need to be picked, packed and shipped is growing, albeit being in smaller package sizes. Therefore, when it comes to e-commerce logistics, companies need to deliver large volumes of packages fast, sometimes even within a specific or narrow delivery time window. Furthermore, with a higher volume of e-commerce transactions, e-businesses also need to manage a corresponding volume of returned, exchanged and damaged goods. Hence, the delivery and operational costs of e-commerce logistics can be significant. This is further exacerbated possible last-mile delivery failures.
Not all e-commerce businesses can survive the impact of high delivery cost and high operational cost for delivery to their end customers. The companies often cannot fully absorb the cost and thus pass these costs to their customers. Unfortunately, this may result in potential ecommerce customers baulking.
Figure 1.1. E-commerce logistics activities

(Adapted from: Robinson, A., E-Commerce Logistics: The Evolution of Logistics and Supply Chains from Direct to Store Models to E-Commerce, available in http://cerasis.com/2014/04/30/e-commerce-logistics/)
Based on their e-commerce logistics strategies, we identify three broad business model categories, namely the online retailer model, the aggregator business model and the Business to Business (B2B) marketplace model as illustrated in Figure 2.1. Many other models may exist as the e-commerce world evolves and some may blur these boundaries. However, for an ease of discussion, we propose this framework.

The main difference between these business models is in the handling of inventory and logistics. In the online retailer model, most of the e-commerce businesses hold their own inventories and control their own deliveries. Inventory and delivery costs would contribute to the cost that the companies or their customers must absorb.

For the aggregator business model, the companies would serve as integrators without owning their own inventories or controlling deliveries. They would however have general guidelines on inventory and delivery for all the suppliers that list their products on their platform. The inventory and delivery cost would be borne by the individual suppliers or their customers.
Lastly, the B2B marketplace model would connect buyers and suppliers normally through an online platform. Add-on services for warehouse and logistics solutions can also be offered to provide more value-added services to the suppliers.

There are also companies that may choose to have a hybrid business model. For example, an e-commerce platform that combines both the online retail model, with the aggregator model. Other than selling its own products, this e-commerce platform also lists products from other retailers on its website. This increases the transaction volumes and enables cost effective deliveries.
<table>
<thead>
<tr>
<th>Short Description</th>
<th>Online Retail Model</th>
<th>Aggregator Business Model</th>
<th>B2B Marketplace Model</th>
</tr>
</thead>
</table>
| **Online Retail Model** | • Sells own products and services to customers  
• Products can be manufactured in-house or purchased from suppliers. | • Serves as a integrator without owning inventories or controlling deliveries. | • Connects buyers and suppliers through an online platform. |
| **Logistics Management** | Logistics ✔️  
Warehouses ✔️ | Logistics ✗  
Warehouses ✗ | Logistics $  
Warehouses $ |
| Fully controlled by the company | Holds inventory on its own | Does not control the logistics | Does not hold any inventory | May offer add-on services for logistics solutions |

Figure 2.1. Possible E-Commerce Logistics Business Model Framework
CHAPTER 3.

E-COMMERCE LOGISTICS: CHALLENGES AND ROOT CAUSES

A gap still exists today between e-commerce logistics performance and customers’ expectations. The higher costs do not align with the improvement of reliable and good logistics services.

In ASEAN, a relatively small share of online shoppers (less than 30% on average) in the Vela Asia Online Shopper Survey in August 2013 said that they received free delivery in the previous year\(^1\). This indicates that logistics costs are too high for many e-commerce businesses, who end up passing the costs on to their customers. Cost management becomes one of the biggest challenges to efficient e-commerce logistics. The root causes of this challenge are illustrated in Figure 3.1.

3.1 Poor Transport Infrastructure

The assessment of transport infrastructure in ASEAN is summarized in Figure 3.2. Efficient road networks are required in order to ensure efficient last-mile delivery. According to real estate firm Jones Lang La Salle, upgrading roads and reducing bottlenecks in the region are the highest priority to improve logistics in ASEAN.

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\(^1\) AT Kearney, Lifting the Barriers to e-commerce in ASEAN, 2015, available in https://www.atkearney.com/documents/10192/5540871/Lifting+the+Barriers+to+E-Commerce+in+ASEAN.pdf
Compared to other countries in ASEAN, Singapore has the best transport infrastructure as transport infrastructure in several countries in ASEAN is still underdeveloped. Hence, poor transport infrastructure is not specifically a root cause for e-commerce logistics challenges in Singapore. However, being a city state, Singapore has a different problem – urban congestion, which results in inefficient last mile delivery as elaborated later in the article.

### 3.2 Lack of Warehouse Readiness

Outside Singapore and Thailand, warehouse capacity has not kept pace with economic growth\(^2\). The warehouse may be below international standard or cannot be utilized effectively. In addition, investment in automation is sometimes insufficient and online companies struggle to meet logistics players’ volume requirements.

In a small city state like Singapore, land scarcity poses a great challenge when establishing dedicated warehouses for e-commerce activities. Different kinds of needs never cease to compete against each other for land use, such as business, industry, housing, education, green land and defense. Despite the land scarcity, warehouse utilization is quite low. Many industries operate their own warehouses.
at less-than-full capacity and some warehouses remain vacant every year, which accounts for on average 7.7% of the total available warehouse space (as shown in Figure 3.3).

<table>
<thead>
<tr>
<th></th>
<th>Road network</th>
<th>Rail network</th>
<th>Port quality</th>
<th>Air transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>Bad</td>
<td>Bad</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Philippines</td>
<td>Fair</td>
<td>Bad</td>
<td>Bad</td>
<td>Good</td>
</tr>
<tr>
<td>Singapore</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Thailand</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Fair</td>
<td>Fair</td>
<td>Bad</td>
<td>Bad</td>
</tr>
</tbody>
</table>

Source: Jones Lang LaSalle; A.T. Kearney Analysis

Figure 3.2. A qualitative assessment of transport infrastructure in ASEAN

<table>
<thead>
<tr>
<th>Year</th>
<th>Warehouse space in Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5000</td>
</tr>
<tr>
<td>2012</td>
<td>5000</td>
</tr>
<tr>
<td>2013</td>
<td>5000</td>
</tr>
<tr>
<td>2014</td>
<td>5000</td>
</tr>
<tr>
<td>2015</td>
<td>5000</td>
</tr>
</tbody>
</table>

Source: Singapore Department of Statistics, 2016

Figure 3.3. Warehouse space in Singapore 2011-2015

![Vehicle Growth*](chart.png)

*: for Goods and Other Vehicles

Source: Land Transport Authority, Singapore

Figure 3.4. Vehicle Growth in Singapore
3.3  Inefficient Last Mile Delivery

ASEAN logistics companies are still familiarizing themselves with cash-on-deliveries and other services in e-commerce. They need further refinements in their processes to suit e-commerce. For example, local post office operators find that they are often not able to meet retailers’ and consumers’ expectations.

Another main issue in last mile delivery is the growth in number of vehicles\(^3\) (see Figure 3.4 for the vehicle growth in Singapore). Rising transportation demands for goods or by people may produce uncontrolled growth in the number of vehicles, which result in traffic congestion. In contrast to the growing number of vehicles, the utilization of those vehicles, especially commodity vehicles, is not optimal most of the time. Most Logistics Service Providers (LSPs) are missing the benefits of loading trucks to their most efficient weight and volume capacity by participating in the sharing economy mechanism.

3.4  Inconsistent and time-consuming customs & excise processes

In limited domestic markets, cross-border e-commerce becomes necessary, deliveries may be subject to import duties. These import duties vary widely among countries as illustrated in Figure 3.5, which hampers the region wide e-commerce market and consumer adoption. Limit, VAT and duties also differ for different product types. In some counties, importing certain product categories also requires import permits.

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Figure 3.5. Total Customs value of a $100 dress

Source: Duty Calculator; A.T. Kearney analysis
CHAPTER 4.
LAST MILE E-COMMERCE DELIVERY

One of the key challenges in e-commerce logistics we observe is that the current practice for last-mile e-commerce logistics is mostly inefficient. The main factors contributing to the inefficiency are summarized in Figure 4.1.

4.1 Unconsolidated Deliveries

From observations and discussions with e-commerce businesses, it is derived that there is limited delivery consolidation between retailers. For different online retailers, customers need to go to the respective sites to place separate orders, and deliveries are scheduled separately. Customers are not able to consolidate online purchases across different retailers, so that there can be a single delivery for orders from different retailers. Because of this, customers often need to spend a lot of time waiting to receive separate deliveries.

There is also limited delivery consolidation for different customers ordering from the same e-commerce company. For example, an e-grocery store in Singapore may need to do several deliveries to the same residential building for different customers. This creates un-necessary trips that increase the logistics costs.
4.2 High Delivery Failure Rate

From interviews with several LSPs in Singapore, it is revealed that delivery failure rates hover at more than 15%. The main causes for failed deliveries – no one was around to receive the deliveries or incorrect addresses were indicated. For each failed delivery, the delivery company may need to make (an)other trip(s), which incurs additional delivery cost. To avoid the unnecessary return trip(s) and incurrence of additional cost, some companies may require customers to self-collect the undelivered parcels from designated locations, such as at main offices or parcel lockers. This may create inconvenience for customers.

4.3 Low Utilization of Critical Logistics Resources

E-commerce deliveries may contain packages that are smaller in size, but are often higher in volumes. The current practice to deliver a parcel to a customer (whether in an office or residential building) would require the delivery staff to park the vehicle, unload the package, and deliver it to a specific location using the building’s facilities or shared elevator. The delivery staff will often need to wait for an available elevator and for the recipient to receive the goods. This imposes additional waiting time, during which the vehicle occupies the parking lot. For a single delivery,
this inefficiency seems insignificant. However, without consolidation and coordination, this inefficiency would occur for all deliveries and be made worse by multiple delivery vendors, wasting logistics resources such as vehicle idle time, manpower cost, elevator usage and parking lots. For cities like Singapore which are vertically and horizontally dense, this creates unique challenges.
With consideration of the abovementioned concerns for re-thinking the last mile logistics for e-commerce, the concept of E-Commerce Logistics Management (ELM) is proposed to tackle last-mile logistics inefficiency. ELM aims to encourage different stakeholders to collaborate for cost-effective deliveries, not only for the customers but also for the companies that serve the e-commerce last mile deliveries.

The ELM concept is inspired by our Retail Precinct Management (RPM) concept that consolidates deliveries, optimizes the delivery routes and utilizes the loading docks while provides a dynamic visualization and analytics to help tracking and monitoring of deliveries and traffic flow in a retail precinct, such as Jurong Lake District⁴. RPM consists of four features, where one of it, real-time precinct delivery, can be adjusted for e-commerce delivery environment in ELM.

The stakeholders included in ELM concept are:

1) e-commerce customers
2) e-commerce platform owners

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3) suppliers

4) logistics assets providers

5) delivery recipients

Depending on the e-commerce business model discussed previously, the e-commerce platform owners and suppliers can refer to the same company or different companies. Logistics assets providers, which could be freelance providers or LSPs, provide an additional pool of available resources, such as manpower, vehicles, storage space.

ELM covers the process from the time the order is made by the customer until the delivery is received by the customer. The processes involved in ELM are illustrated in Figure 5.1. The main features are described in more detail below.

5.1. ELM FEATURE: E-Commerce Delivery Consolidation

As e-commerce deliveries are usually higher in volumes but smaller in package sizes, there are opportunities for delivery consolidation within the same or different e-commerce companies as illustrated in Figure 5.2. The consolidation can be from the same e-commerce shops for different customers within a cluster, or different e-commerce shops within a cluster to the same customer or even different e-commerce shops to different customers. In this way, multiple deliveries can be done at the same time to reduce the transportation cost and optimize the truck load. This strategy reduces the logistics cost while maintaining the delivery fulfilment. Figure 5.3 describes two strategies to be used in consolidation: performance-based contract and delivery postponement.
Figure 5.1. E-Commerce Logistics Management (ELM) Concept

Figure 5.2. Delivery Consolidation
5.1.1 Performance-Based Contract (PBC)

In delivery consolidation, one delivery route can be shared by different customers and companies. Instead of using traditional cost calculation such as fixed logistics assets or fixed outsource/lease price contracts, a Performance-Based Contract (PBC) may be established, where the companies only need to pay for the amount of logistics resources used. PBCs can be based on the distance traveled, time or even space required to perform the deliveries. PBCs improve logistics service availability and reduce the cost of logistics resources ownership. An on-demand contract with PBC translates fixed cost to a variable cost.

5.1.2 Delivery Postponement

A cut-off time for accepting orders and to start delivery is required for delivery consolidation. Some customers may want to have their goods immediately, while others may be willing to wait. To optimize the cost and truckload, the latest possible time to send each delivery can be determined using a delivery postponement strategy of truck departures. This strategy would temporarily hold the incoming delivery orders for a specific duration. Using such
a strategy enables more deliveries to be consolidated. The strategy tries to balance between cost and efficiency while still considering the customers’ preferred time windows. The postponement strategy can be developed using analytic models to determine the latest possible time to send the delivery trucks, by investigating the risk associated with late deliveries and its impact on operating costs and delays in deliveries\(^5\). An analytical result for the impacts of postponement strategy on delivery performance is shown in Figure 5.4.

![Figure 5.4. Example of delivery postponement impacts on delivery performance](source: The Logistics Institute – Asia Pacific, Challenges and Opportunities in Clustered Urban Logistics: The Jurong Gateway Precinct, 2014)
5.2. **ELM FEATURE: Dynamic Delivery Scheduling and Real-Time Tracking**

To optimize last-mile e-commerce deliveries, dynamic scheduling and routing is needed. Dynamic scheduling and routing helps to optimize the fleet travel time while fulfilling customers' demands and requirements (such as time windows), minimize traffic congestion and ultimately reduce logistics cost. Real-time traffic information, such as traffic congestion and accidents, is incorporated to allow for dynamic re-routing or re-scheduling of the delivery if needed.

When coupled with GIS (geographic information system) visualization (as illustrated in Figure 5.5), different stakeholders will also be able to track the order and delivery in real time.

Other than GIS, big data analysis can also be implemented for this feature to help stakeholders to understand the delivery flow in complex environment where different elements and status (such as road and traffic status) keep changing overtime. This helps to identify hidden patterns, trends and correlations that might go undetected in text-based data or by using manual processes.
5.2.1 Time-Cost-Disruption GIS Visualization for Dynamic Scheduling and Tracking

With advancement in today’s communication and software technology, it is possible to extend this dynamic delivery scheduling and tracking feature beyond the city. A time-cost-disruption GIS visualization of logistics data (routes, locations, travel times, cost, real-time disruptions, etc.) can be developed to support dynamic scheduling and tracking, as illustrated in Figure 5.6. Key insights from the tool can be shown in a dashboard as illustrated in Figure 5.7.

The tool is not only able to support delivery scheduling but also able to support supply chain operation and management by displaying and analyzing supply chain and logistics data (routes, locations, travel times, cost, real-time disruptions, etc.). It is developed to help decision makers to find not only the best time and cost effective...
solution but also to identify potential risks in three granularity levels, namely: micro (city level), meso (regional level) and macro (global/international level).

1) Micro View

The micro view visualizes the last-mile delivery routes within the city, between logistics facilities (such as warehouses) and the end customers (such as retail shops or customers’ home). Delivery routes are generated taking into consideration pick-up locations, pick-up time windows, delivery locations and delivery time windows. The possibility for a milk-run for different end customer locations will also be considered.

Figure 5.6. 3-View of Dynamic Scheduling and Tracking
In the micro view, the tool may allow the users to indicate different nodes (such as logistics facilities or retail area or customers) of interest in the city level. The deliveries are then conducted to or from these nodes.

Using the aforementioned algorithms and further analytics, the best routes that may fulfil the areas of interest are then computed and visualized on the map (as illustrated in Figure 5.8.). The details, including the risk score, are also shown. By default, the tool displays the best optimized routes based on the computed score index.
2) Meso View

Zooming out from the micro view, the meso view connects supply chain and logistics nodes in several small areas covered by micro view. The meso view focuses on the long haul transportation from one area to another area by utilizing highway or domestic corridors between these areas. The routes can be served by one or more LSPs.

The flows in meso view are similar to the micro view. The tool will allow the users to select nodes and deliveries between those nodes. For example, the meso view can visualize possible routes from a warehouse in Singapore to a hub in Malacca using different LSPs. It can further compare the time and cost required for the routes. It would also display possible disruption along the routes and suggest the best mitigation strategies.
3) Macro View

The last aggregated view in the time-cost-disruption visualization is the macro view, which focuses on cross-border transportation via existing trade lanes. The trade lanes may be managed by different companies that act as the freight forwarders. This macro view would visualize and analyze the existing trade lanes between the source and destination location (including the transit points required) and propose the best route in terms of cost, time and disruption. As disruptions are unplanned and unanticipated events, it can severely disrupt the normal flow of goods and materials. Modelling it in the **time-cost-disruption GIS visualization** would help the preparation and mitigation of the disruption.

5.3. **ELM FEATURE: Multi-Party Delivery Coordination**

To optimize logistics cost for delivery, e-commerce businesses can explore different options as illustrated in Figure 5.7. Traditionally, single or multiple LSPs are engaged to do the deliveries, which may incur a fixed cost to the e-commerce business. E-commerce businesses may wish to translate the fixed cost to marginal cost through other options such as an “Uber-like” model or a “4th Party Milk Run”.

5.3.1 **“Uber-like” Model**

The “Uber-like” model is a crowd-sourcing delivery mechanism which involves at least three stakeholders: an e-commerce platform owner or the supplier, the customer or the recipient and the on-demand logistics assets provider. The on-demand logistics assets provider supplies delivery resources to the supplier when requested. The delivery request should indicate essential information such as the start and end points, weight and dimensions of the
parcel, customers’ delivery time windows, etc., so that available and suitable on-demand logistics assets providers can take up the delivery job. With this model, deliveries can be made based on customers’ delivery time windows, and the parcel can be tracked. This mechanism is used not only as an alternative transportation solution but also as a temporary storage solution.

Two essential components to support this mechanism are crowd-sourcing platform and crowd-sourcing contract. To facilitate crowd-sourcing, a crowd-sourcing platform which can visualize demand, manage coordination and collaboration, provide a dynamic delivery schedule, and establish an interaction space for all stakeholders is essential. This platform acts like the Uber mobile app to

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**Figure 5.7. Delivery Coordination Matrix**

<table>
<thead>
<tr>
<th>Fixed Cost</th>
<th>Marginal or Variable Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outsource to multiple companies</strong></td>
<td><strong>Uber-like model</strong></td>
</tr>
<tr>
<td>- The company has several outsourced contracts with different Logistics Service Providers (LSP).</td>
<td>- Logistics asset providers (which include freelance providers or LSPs) serve as additional pool of available resources for deliveries.</td>
</tr>
<tr>
<td>- Each contract has a fixed logistics cost (monthly or yearly).</td>
<td>- There is no fixed contract with the logistics asset providers.</td>
</tr>
<tr>
<td><strong>Outsource to one company</strong></td>
<td>- The cost varies with the delivery location and volume.</td>
</tr>
<tr>
<td>- The company has one dedicated Logistics Service Provider (LSP) for all the deliveries.</td>
<td></td>
</tr>
<tr>
<td>- The contract would guarantee a certain number of deliveries for each month or year.</td>
<td></td>
</tr>
<tr>
<td>- The contract has a fixed logistics cost.</td>
<td></td>
</tr>
</tbody>
</table>

---

6 The Logistics Institute – Asia Pacific, (2013), COLLABORATIVE URBAN LOGISTICS: Synchronized Last-Mile Logistics for Sustainable, Efficient Urban Delivery
match the demand for logistics service with the supply of available logistics assets, and enables the tracking of parcels.

Crowd-sourcing contracts are essential to document what has been agreed upon \(^7\). These contracts between stakeholders in crowd-sourcing mechanism are known to vary in nature and content from customer to customer and from product to product. However, the more similar these contracts are for a given stakeholder group, the lower the entry barriers become for the groups’ participation in the crowd-sourcing mechanism.

### 5.3.2 4th Party Milk Run

The 4th Party Milk Run concept leverages the excess capacities from a LSP that has existing routes and networks along the pick-up and delivery locations of the e-commerce deliveries. Some LSPs may have designated routes that they need to serve periodically regardless of the delivery volume, and often these deliveries are not at full capacity. E-commerce businesses can tap on the spare capacities to translate their fixed delivery cost structure to a marginal or variable cost structure. However, a potential concern with the 4th Party Milk Run concept is that the LSP may not have a direct route from the suppliers’ pick-up location to the delivery location. It may need to go through several stops/hops/transit locations before it can finally deliver the parcel to the end customer.

To minimize the time (and also cost) for the deliveries, there is a need to match the existing routes and networks

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\(^7\) The Logistics Institute – Asia Pacific, (2013), *COLLABORATIVE URBAN LOGISTICS: Foundation Pillars for effective coordination of urban freight movements*
with the delivery demands. This can be modelled as a shortest path routing problem. The shortest path routing problem is a problem of finding a path between two nodes in a graph. The graph represents the existing routes and networks and the nodes represent stops/hops/transit locations, pick-up and delivery locations. The weight can represent the time or cost or both. The objective is to find an optimum path for delivery within specified time so as to satisfy the customer delivery time windows. Further research is needed to find the best algorithm to solve the shortest path routing problem in terms of 4th Party Milk Run.

<table>
<thead>
<tr>
<th>Private</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Locker point or communal reception box owned by a private Logistics Service Provider (LSP) company.</td>
<td>- Locker point or communal reception box is provided by the government to facilitate last-mile deliveries.</td>
</tr>
<tr>
<td>- Investment cost for this unattended CDP is covered by the company.</td>
<td>- It can be operated or managed by the government itself or by a private company.</td>
</tr>
<tr>
<td>- Customers using delivery services from that particular LSP can collect and return their goods.</td>
<td>- Any LSP company would be able to use it by paying a certain fee.</td>
</tr>
</tbody>
</table>

- Dedicated collection point (such as a store and petrol station) to collect and return the goods from a private LSP company.
- The collection point can be managed by the LSP or by other parties with specific contract with the LSP.
- The store personnel will manage the goods.

- Government offices or facilities or MRTs can be used as collection/return points for certain deliveries.
- The government staff will manage the goods.

Figure 5.8. Types of Collection-and-Delivery Points (CDPs)
5.4. ELM FEATURE: Multiple Collection and Delivery Points

A possible solution to reduce additional cost due to failed delivery is to set up multiple collection-and-delivery points (CDPs). Packages will be dropped off at the CDPs, and customers will be informed to collect their packages. This can also help save time and transportation resource, as additional trips for successful delivery will be eliminated. CDPs should be located near residential or commercial areas so that customers can collect their parcels at their convenience, which thus also reduces the need for customers to wait for parcels to be delivered.

Based on the ownership and whether the CDP is attended, there are four types of CDPs as summarized in Figure 5.8.

The CDP location is a key element in improving efficiency of e-commerce logistics while maintaining customers’ satisfaction. The CDP location needs to balance between the customers’ travelling time/distance to the CDP location as well as the cost to establish and maintain the CDP. To decide the location of a CDP (unattended or attended), several factors need to be considered such as the customers’ location and customers’ demand density. Ideally, the CDP location should be based on the flow of goods. It should also be near main amenities such as train stations, bus interchanges or (in) shopping malls. It should be a location that offers the lowest possible convenience costs with the easiest access to the greatest cluster of customers.
When establishing a network of CDPs, there is a need to consider how many CDPs should be set up, what type of CDPs should be set up, what are the costs that need to be incurred (fixed or variable cost), and what are the capacities and value added services required. As the CDPs are set up to service the customers, their cluster and density, their demand patterns and orders behavior, their expected service levels, the accessibility of the CDP, the geographical and environment characteristics has to be determined with a good business model.

The determination of locations of CDPs is not an easy task due to the aforementioned multiple factors that need to be considered. A visualization and analysis tool to cluster the demands and recommend a set of CDP locations (as illustrated in Figure 5.9) can be used to support decision-making.
makers in identifying suitable locations for these facilities. It would help to re-examine a set of alternative locations with the flexibility to analyze “what-if” scenarios.

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Setting out on the e-commerce journey needs effective logistics. In documenting this journey we came across a number of challenges and more importantly champions that went some way to address and turn these into opportunities.

E-commerce leads us to fundamentally rethink old-age logistics. We have presented key ideas that we believe may shape the future of e-commerce logistics. For your convenience we summarize the key take-away points below.

- **There are three business model categories:**
  1. Online retailer model
  2. Aggregator business model
  3. Business to Business (B2B) marketplace

- **The customer behaviour in e-commerce has high dependency on seasonality, disruption in social and behavioural norms, customer buying criteria, and disruption in supply patterns from competitors.**

- **Beyond the technology investment of setting up an online platform for business, the move into e-commerce entails significant preparation and consideration such as product reconfiguration, infrastructure readiness, automation logistics and supply chain preparedness.**

- **Having local fulfilment presence (for cross-border e-commerce) in all the countries is expensive and sometimes not necessary to meet customers’ requested delivery times.**

- **E-Commerce Logistics Management (ELM) aims to encourage different stakeholders to collaborate for cost-effective deliveries, not only for the customers but also for the companies that serve the e-commerce last mile deliveries.**

- **Without consolidation and coordination, inefficiency would occur for all deliveries and be made worse by multiple delivery vendors, wasting logistics resources such as vehicle idle time, manpower cost, elevator usage and parking lots.**
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