

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

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

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Their contributions provide deep insights into thinking and practice.

 arefcue 



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. However, cities like Singapore 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 have organized the white paper as follows: key ideas are presented in chapters for readability and no attempt is made to integrate the chapters as each chapter is contributed and we have left each distinct to make a point and not blended or weaved them strategically.

In Chapter 1, we 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 everyday long leg containerization down to the use of smaller modular recirculating in-city boxes deployed in scenarios we paint out in Chapter 2.

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 explore this in chapters 3 and 4 and suggest that integrated and postponed delivery consolidation may be a panacea for e-commerce, remedying delivery failure rates and low asset utilization.

We need to rethink how we restructure logistics operations especially when these operations stretch across borders (see chapters 5 and 6). Orchestrated resources in e-commerce require new technologies, far beyond what is traditionally deployed today, as a catalyst. The advent of big data, analytics and automated and autonomous deliveries are the present future of fulfilment (chapters 7 and 8). However, without open standards as described in Chapter 9, interoperability would be challenged creating patchwork rather than seamless supply chains.

We, along with collaborating institutes and Institutes of Higher Learning (IHLs), were first off the mark in Singapore in designing innovative and ground-breaking collaborative urban logistics solutions. This initiative was and continues to be funded by A*STAR, since 2011, and many industry partners. It is indeed pleasing to see many of these ideas seeded today in trials not only in Singapore but also in the region, which delivers more complexity and a multi-city scenario. Several of those ideas are documented in a series of white papers (see inside back-cover). Our first platform RPM – Retail Precinct Management has evolved to include e-commerce and referred to in Chapter 10 as ELM, E-Commerce Logistics Management.

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.

We also speculate that a new and deeper understanding of demand

uncertainty based on technologies presented earlier in Chapter 7 are pertinent in ad hoc e-commerce ordering and key to successful fulfilment. We present the demand funnel concept in Chapter 11.

E-commerce, like the phoenix, has risen from its previous ashes to primetime because of its potential to decrease the cash conversion cycle (CCC) and to create and satisfy blue ocean demand. The tenet in the sharing economy is that the CCC can trend to negative, is as important as shedding fixed assets and trading of time and costs. We present how to make e-commerce financially astute in chapter 12.

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.

We thank Workforce Singapore for providing a platform to disseminate these ideas through our joint THINK Innovation series. We also acknowledge the many contributors for their sharing and documenting their ideas for the community.

This is a work-in-progress in uncharted territory and we hope that you, the reader, in turn will be as motivated as the team of authors, to share and contribute your own ideas to further the practice and alignment of business innovation making e-commerce a living platform that's future-proofed.

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E-COMMERCE LOGISTICS: OVERVIEW AND CHALLENGES

CHAPTER 1.

E-COMMERCE LOGISTICS

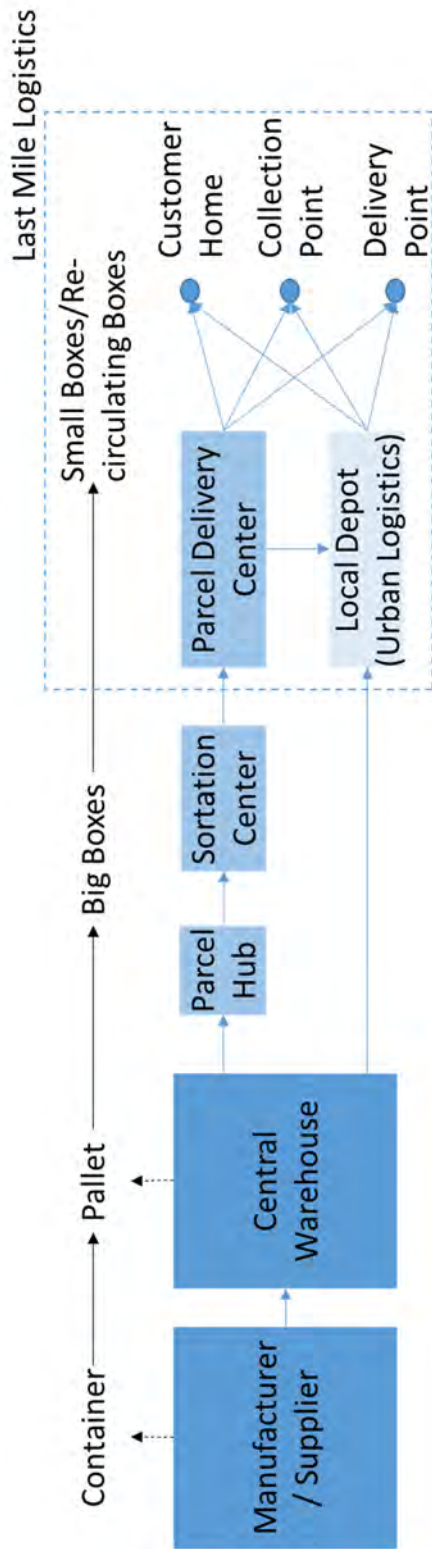
An e-commerce journey map of the new wave is not as simple as setting up a website and selling products online. Beyond the technology investment of setting up an online platform for business, the move into e-commerce entails significant preparation and consideration such as product configuration, suitable infrastructure, logistics automation and supply chain preparedness. A well-thought through business strategy is essential.

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.

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-fulfilment 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 e-commerce customers baulking.



(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/>)

Figure 1.1. E-commerce logistics activities

CHAPTER 2.

E-COMMERCE LOGISTICS: BUSINESS MODEL FRAMEWORK

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.

*There are three
business model
categories:*

(1)

Online retailer model

(2)

*Aggregator business
model*

(3)

*Business to Business
(B2B) marketplace*

*There is also a hybrid
business model that
combine the three
business models.*

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. An example of a company with the B2B marketplace model is shown in Box 1, and a survey about the Singapore freight procurement landscape is shown in Box 2.

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.







	Online Retail Model	Aggregator Business Model	B2B Marketplace model
Short Description	<ul style="list-style-type: none"> Sells own products and services to customers Products can be manufactured in-house or purchased from suppliers. 	<ul style="list-style-type: none"> Serves as an integrator without owning inventories or controlling deliveries. 	<ul style="list-style-type: none"> Connects buyers and suppliers through an online platform.
Logistics Management	 Logistics  Warehouses	 Logistics  Warehouses	 Logistics  Warehouses
	Fully controlled by the company	Does not control the logistics	May offer add-on services for logistics solutions
	Holds inventory on its own	Does not hold any inventory	

Figure 2.1. Possible E-Commerce Logistics Business Model Framework

Box 1: Arefcue - A Singapore Freight Procurement Platform¹

Arefcue (pronounced RFQ) is a freight marketplace that allows businesses to source, procure, market and sell their freight services online.

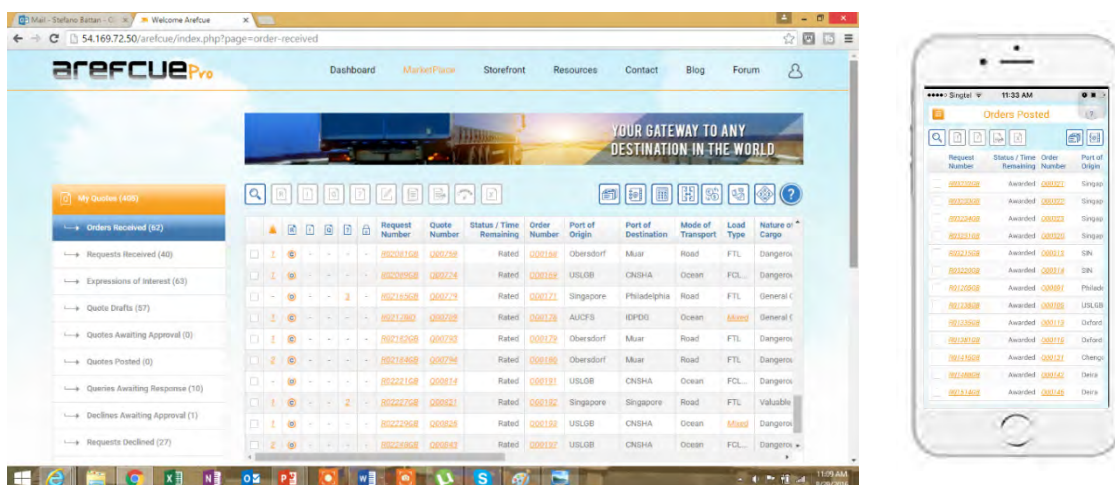
A Software as a Service (SaaS) available both as a web and mobile application, Arefcue provides shippers and logistics companies with a 'one-stop shop' where they can post their service inquiries (aka RFQs), quotes and orders for freight services, encompassing all types of trade (i.e. import, export, cross-trade and domestic) and modes of transport (i.e. road, air, ocean).

Arefcue endeavors to upset the status quo in the logistics industry and champion the adoption of e-Procurement toward enabling significant efficiency and competitiveness gains in businesses of all sizes.

e-Procurement (Electronic Procurement), encompasses the sourcing, requisitioning, ordering and purchasing of goods and services through enterprise or internet-based applications. e-Procurement platforms automate the procure-to-pay process and streamline the procurement workflow thereby making it more efficient, faster and cost effective. It also removes low and/or non-value-adding tasks, allowing companies to reallocate their resources to core and higher value-adding activities.

e-Procurement can produce significant benefits for the organizations that implement it. It can lower transactional costs, improve visibility of procurement metrics (KPIs) and control of freight spend. It can also help to reduce or eliminate “maverick” spending, which happens when employees deviate from established procurement guidelines or contractual terms.

From a vendor’s perspective, freight marketplaces provide logistics companies with an additional sales channel they can use to effectively engage the SMEs (Small and Medium-sized Enterprises) whereas the traditional field sales and account management approach would not be practical, let alone viable.



Arefcue Pte Ltd is a Singapore-based company that provides freight management services and solutions for businesses. For more information, visit our company website at www.arefcue.com.

¹ This section is contributed by Arefcue Pte. Ltd.

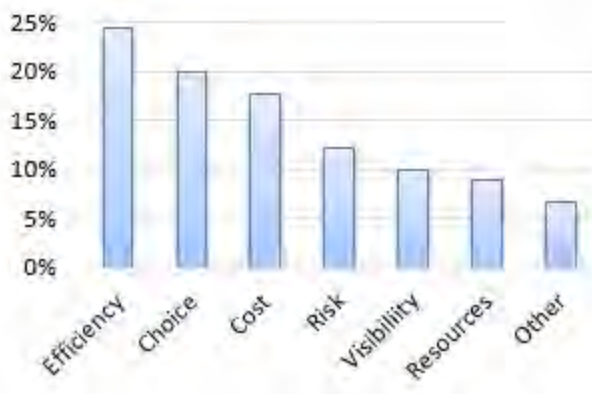
Box 2: The Singapore Freight Procurement Landscape²

In April 2016, Arefcue conducted a survey of more than 200 Singapore businesses, aimed at identifying prevailing trends in freight procurement behavior and practices. We interviewed decision makers and influencers from companies all of sizes, 80% of respondents were from SMEs (per the Singapore definition < 200 employees, revenues < SGD 100M), while large companies accounted for the remainder 20%.

Respondent companies hailed mainly from the manufacturing and trade sectors, across the entire spectrum of industries, i.e. consumer goods, high-tech, automotive, oil & gas, industrial machinery and equipment, furniture, fashion, food & beverage, etc.

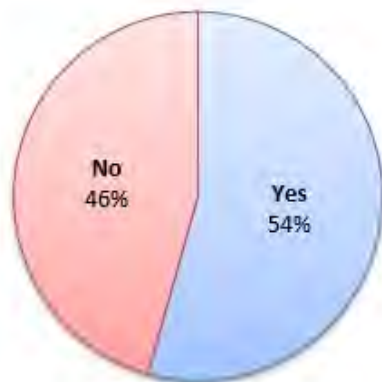
Key Findings - Excerpts from the survey

Q1: What are your company’s most compelling challenges with regard to freight procurement?



Efficiency: tendering process, tools, systems
Choice: viable options and alternatives
Cost: rates competitiveness
Risk: change management, liabilities
Visibility: freight spend, market benchmarks
Resources: staff competencies and skills

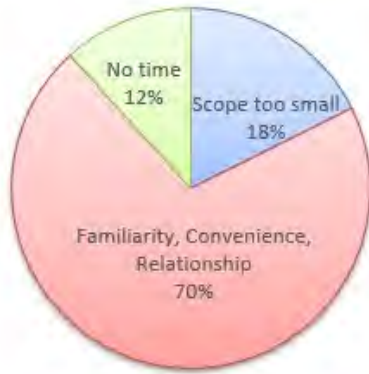
Q2: Does your company tender for freight services?



60% of companies that answered “No” named freight cost as their primary concern and decision making criterion, thus highlighting that no real actions were deployed to achieve desired spend reductions.

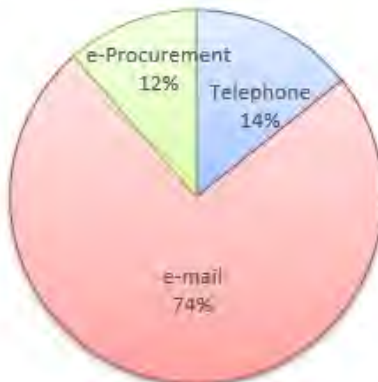
² This section is contributed by Arefcue Pte. Ltd.

Q3: Companies that don't tender, why don't they?



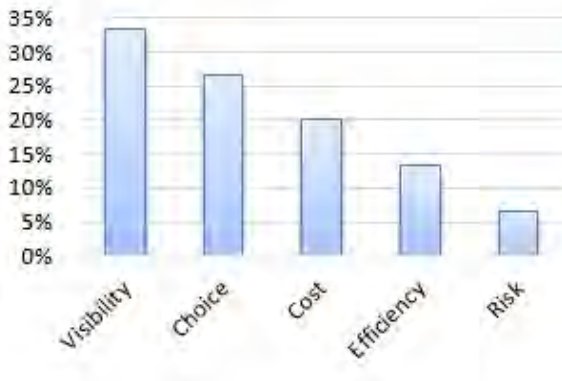
70% of companies forego opportunity cost, the impact on their freight spend and/or sales margin runs into double digits.

Q4: Companies that tender, what tools do they use?



Just 12% of companies interviewed have ever used e-Procurement, all of them MNCs. e-Mail remains by far and large the main (only) tool used for tendering, thus the high level of inefficiency generally noted.

Q5: Companies that used e-Procurement, what benefits did they derive?



e-Procurement effectively addresses the challenges outlined by companies in Q1 and significantly improves their efficiency and competitiveness.

Conclusions - Excerpts from the survey

Where e-Commerce is concerned, the rate of adoption in B2B has been lagging behind B2C but is finally catching on. After all, if as consumers we've become accustomed to searching for the best deals and making travel reservations online, why should we act any different (as businesses) when it comes to buying freight?

2016 will be a pivotal year for the freight industry, spurred by the demand from shippers for ever greater service and cost efficiencies, logistics companies are moving online. We all know that change takes time, more so in relationship-centric industries, but the process has been engaged and gaining momentum as we speak.

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 year³. 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.

The higher logistics costs do not align with the improvement of reliable and good logistics services.

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.

Cross-border	Domestic
Heterogeneous and time-consuming custom processes	Inefficient last mile delivery
Poor-transport infrastructure	
Warehouse readiness for e-commerce	

Figure 3.1. Root causes of e-commerce logistics challenges

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

³ 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>

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 growth⁴. 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.

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).

	Road network	Rail network	Port quality	Air transport
Indonesia	Bad	Bad	Fair	Fair
Malaysia	Good	Good	Good	Good
Philippines	Fair	Bad	Bad	Bad
Singapore	Good	Good	Good	Good
Thailand	Good	Good	Good	Good
Vietnam	Fair	Fair	Bad	Bad

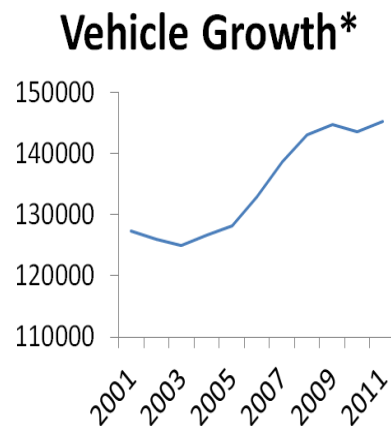
Source: Jones Lang LaSalle; A.T. Kearney Analysis

Figure 3.2. A qualitative assessment of transport infrastructure in ASEAN

⁴ Ibid. Page 16. Note 3



Source: Singapore Department of Statistics, 2016
 Figure 3.3. Warehouse space in Singapore 2011-2015



*: 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.

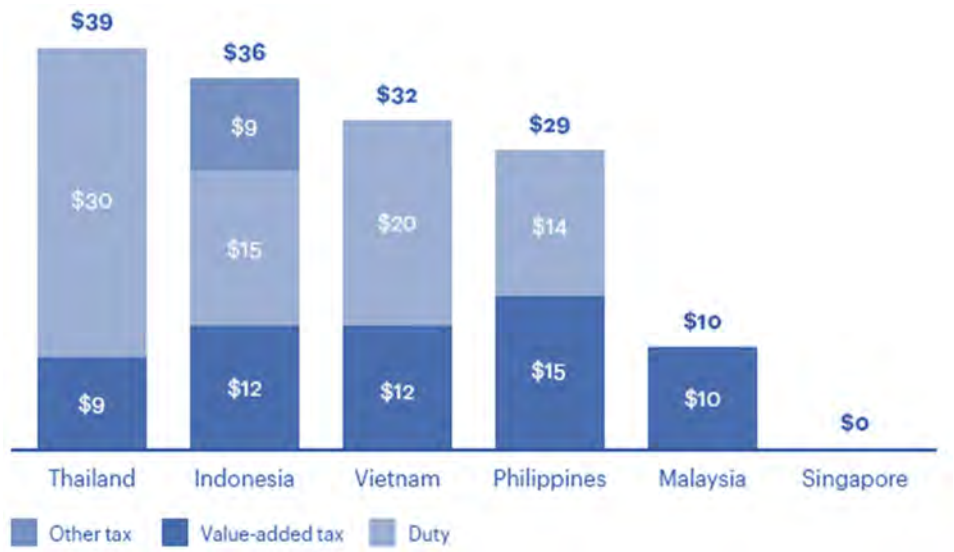
Rising transportation demands for goods or by people may produce uncontrolled growth in the number of vehicles, which result in traffic congestion.

Another main issue in last mile delivery is the growth in number of vehicles⁵ (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.

⁵ de Souza, R., Lindawati, Xing, Z., Goh, M., (2014), *Supply Chain and Logistics Challenges and Opportunities in Asia: Innovative Urban Logistics Concept*, Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management Bali, Indonesia, January 7 – 9



Source: Duty Calculator; A.T. Kearney analysis

Figure 3.5. Total Customs value of a \$100 dress

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.

Unconsolidated and uncoordinated deliveries would waste a lot of logistics resources including vehicle, manpower (i.e. the driver), and space.

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 unnecessary trips that increase the logistics costs.



Figure 4.1. Causes of inefficient last mile e-commerce delivery

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.

Without consolidation and coordination, the 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.

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.

CROSS-BORDER E-COMMERCE⁶

Approximately 16% of all e-commerce transactions in the world are cross-border. The percentage in Singapore is higher.

Cross-border e-commerce contributes significantly to the total e-commerce market. Approximately 16% of all e-commerce transactions in the world are cross-border. The percentage in Singapore is higher. It is estimated that 55% of all e-commerce transactions in Singapore are cross-border⁷. More than half of the products bought overseas are purchased from e-commerce sites in the USA.

In general, fashion (clothes, shoes, and accessories) is the top-grossing cross-border product category, followed by health & beauty products, personal electronics and computer hardware. The e-commerce cross-border transaction values for key markets in 2016 are summarized in Figure 5.1. Brand recognition and e-commerce site reputation play important parts in cross-border e-commerce. Customers are more likely to buy products with global brand recognition or to buy products from well-known e-commerce sites.



Figure 5.1. Cross-border e-commerce transactions in key markets in 2016

⁶ This section is synthesized from *Seamless Cross Border Delivery Experience*, Buck Consultants International and MetaPack, 2016

⁷ Teirlink, M., Plender, R., de Sande, S.E., and Visser, R. (eds.), *Cross-border eCommerce in Asian Markets: Singapore and Malaysia*, available in <http://www.payvision.com/cross-border-ecommerce-singapore-malaysia>

Cross-border e-commerce differs from local e-commerce not only in site operations but also in logistics arrangements. In cross-border e-commerce site operations, key elements for success include translation of sites into the local language, provision for displaying of prices in local currency and offering country specific online payment options. The e-commerce site needs to be able to adapt to the requirements of the customers, and be accepted by the market in the targeted countries. Similarly for the logistics arrangements for cross-border e-commerce, there is a need to consider various custom regulations and fulfilment strategies. As mentioned in the previous section, inconsistent and time consuming custom activities are one of the root causes of e-commerce logistics inefficiency. It can delay the delivery fulfilment for weeks and even months. It increases the logistics costs and decreases customers' satisfaction.

Having local fulfilment presence in all the countries is expensive and sometimes not necessary to meet customers' requested delivery times.

Cross-border fulfilment strategy, especially local fulfilment, is also a bit tricky. Cross-border e-commerce companies need to understand the customer expectations. Based on the study conducted by MetaPack in 2015, most customers want fast delivery (86%), the ability to choose their delivery options (82%), guaranteed delivery dates (83%) and the ability to specify their delivery time slots (80%) as summarized in Figure 5.2. This result is somewhat aligned with the e-commerce suppliers' (or manufacturers') expectations as revealed from our study on cross-border e-commerce solutions for Asia and Europe⁸. Our study also revealed that suppliers (or manufacturers) perceive "Tracking until delivery" as the most important service by a delivery company. Based on the expectations from both customers and suppliers, a reliable fulfilment strategy without incurring too much cost is needed. Having local fulfilment presence in all countries is expensive and sometimes not necessary to meet customers' requested delivery times. Engaging trustworthy local logistics partnering services may be needed.

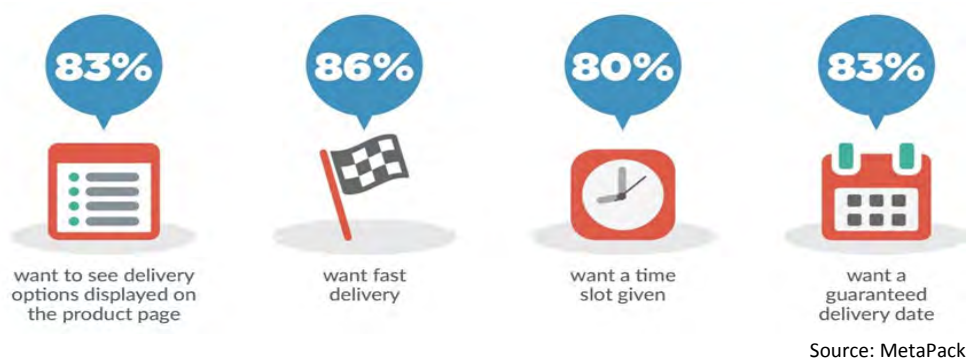


Figure 5.2. Customer expectations from cross-border e-commerce delivery

⁸ Ganbold, O., Tsai, Y., Ang, M.Z., Ang, J., de Souza, R., (2016), *E-Commerce Solutions for Asia and Europe, Working Paper*, The Logistics Institute – Asia Pacific, National University of Singapore

OPPORTUNITIES AND TECHNOLOGY

CHAPTER 6.

RETHINKING LOGISTICS OPERATIONS FOR E-COMMERCE⁹

There are several pressures on the traditional logistics systems & capabilities to cater to the service levels, speed, flexibility and (expected) costs required with the new e-commerce associated demand and expectations.

Being aware of the challenges in e-commerce, especially in last-mile e-commerce delivery, there are several pressures on the traditional logistics systems & capabilities to cater to the service levels, speed, flexibility and (expected) costs required with the new e-commerce associated demand and expectations. This pushes companies to rethink their logistics and supply chain as summarized in Figure 6.1.

6.1 Re-thinking Warehousing & Network Design

When we rethink warehousing and network design for e-commerce solutions, there are three main things to consider.

6.1.1 Mega Warehousing/Fulfilment Centers

Mega concepts like city supply chain are emerging. Mega warehousing/fulfilment centers are large scale city-wide central consolidation centers, where goods from these centers would then be transported and replenished at the store level (including within malls).

Rethinking Warehousing & Network Design	Rethinking Transportation & Last Mile Delivery	Rethinking End-to-End Logistics Orchestration
<ul style="list-style-type: none"> • Mega warehousing/fulfilment centers • Network flow with different SKUs • Smaller parcel deliver • Sortation by postcode 	<ul style="list-style-type: none"> • Transport and delivery management <ul style="list-style-type: none"> • Traffic congestion • Alternative delivery/ collection mechanism • Coordinate system 	<ul style="list-style-type: none"> • End-to-end e-commerce logistics orchestration • Cross-border management • How would technology and systems help?

Figure 6.1. Rethinking logistics operations for e-commerce

⁹ This section is contributed by Marc Dragon, CPIM, CEO of Y3 Technologies

Tactical concepts to optimize and utilize these warehousing/fulfilment centers are needed. These concepts include drop ship, forecasting, multi-echelon inventory optimization, utilizing these analytics concepts to optimally position the optimal amount of goods/items across various central/regional and point locations, as well as to orchestrate ideal transportation methods to meet the required demand and service levels.

6.1.2 Smaller Parcel Deliveries

Smaller parcel deliveries create problems associated with warehousing. Warehousing capabilities need to be upgraded to cater to efficient location management, storing/picking for high volume/throughput and stocking and picking at item level. Consolidation of multiple small orders into single delivery from one warehouse gives rise to several concepts such as goods-to-staff.

6.1.3 Sortation Strategy

To support the consolidation, there are different sorting strategies that can be explored. One of it is to sort the deliveries by postcode for final delivery to home or collection point. This can be done manually or automatically.

6.2 Rethinking Transportation & Last Mile Delivery

For transportation and last-mile delivery, there are the two main concerns to rethink for e-commerce.

There are plans to roll out a federated locker system in residential areas in Singapore to improve the last mile delivery of parcels around the island.

6.2.1 Transport & Delivery Management

A rising trend in transport and delivery management is the emergence of parcel lockers to reduce delivery process inefficiencies. The aim is to reduce the rate at which delivery fails when the consumer is not at home to collect his parcel. SingPost has come up with POPStation while Ninja Van has also partnered local retail shops to allow parcel collection from stores most convenient for customers¹⁰. In April 2016, Singapore's Deputy Prime Minister (DPM) Tharman Shanmugaratnam announced that there are plans to roll out a federated locker system in residential areas

¹⁰ Channel News Asia, *SingPost opens parcel locker service to more retailers, consumers*, 27 July 2016, available in <http://www.channelnewsasia.com/news/singapore/singpost-opens-parcel/2990126.html>; Colin Tung, *Ninja Van's new parcel collection spots let you pick up goods stealthily*, 8 December 2015, available in <https://e27.co/ninja-vans-new-parcel-collection-spots-let-pick-goods-stealthily-20151208/>

to improve the last mile delivery of parcels around the island, and projected his vision that Singapore will be the first country to do this nationwide¹¹.

End-to-end e-commerce logistics orchestration would require the companies to rethink how they manage their cross-border management.

Other than the parcel lockers, ideas around city delivery and planning for alternative delivery/collection have also emerged. City delivery strategies such as smaller vehicles to multiple stops and potentially including pick-up & delivery are explored. Planning and management around alternative delivery/collection mechanisms e.g. pick up at store, drop off/pick up from collection points etc. are also explored.

2) Consider local naturally coordinated 'systems' e.g. informal yet systematically managed last mile methods, especially in smaller towns and remote locations inherent in countries such as Indonesia and Thailand

6.3 Rethinking End-to-End Logistics Orchestration

End-to-end e-commerce logistics orchestration would require the companies to rethink how they manage their cross-border management and how technology and systems can help to plan, manage, and track all the above in a cohesive manner across the chain (this will be covered in more detail in next section).

Across all these capabilities, one overarching capability would be the e-commerce industry expertise. That requires a deeper understanding of the business and processes required to run specific industry verticals (e.g. fashion, electronics, food/perishables etc.). In addition, the depth and strength of the LSP network is also key in delivery value within specific e-commerce industry verticals.

¹¹ Lim, P.J., *Locker system for parcel deliveries in residential areas to be implemented: Tharman*, Channel News Asia, 26 April 2016, available in <http://www.channelnewsasia.com/news/singapore/locker-system-for-parcel/2731536.html>

TECHNOLOGY IMPLICATIONS¹²

With the multiple models and operational complexities, what is needed to ensure smooth and optimized flow is ultimately the deployment of good enough (for e-commerce logistics service level expectations), and in some cases, best in class, technology solutions.

Technology Solutions in e-commerce

- *Technology for planning and orchestration (such as control tower and integrated e-commerce ecosystem)*
 - *Technology for transportation management system*
 - *Technology for Warehouse Management System*
-

7.1 Rethinking Planning & Orchestration

- Control Tower & exception management
- Integration across e-Commerce ecosystem, including marketplaces, LSPs, suppliers, and even retailers (for O2O operations)
- Orchestration of all transportation activities, including decision support around fulfilment from warehouse or drop-ship fulfilment (from Consumer Goods supplier), and by which LSP/provider

7.2 Rethinking Transportation Management System (TMS)

- Ability to organize and track shipments across modes and across LSPs
- Seamless interface with appropriate heterogeneous (SCM/ERP) systems across the eco-system
- Real-time online order, dispatch/transportation and POD status,
- Online alerts for critical information via text or mobile

7.3 Rethinking Warehouse Management System (WMS)

- Rethinking dock management to optimize flow of goods in/out of warehouse
- Rethinking load optimization/management for optimal productivity gains for loading/unloading
- Warehouse design and location optimization is important to optimize productivity/movements within the warehouse
- Explore the use of drones for inventory counting and visual analytics to optimize productivity within the warehouse, especially with the impact of the high throughput and small item type environment

¹² This section is contributed by Marc Dragon, CPIM, CEO of Y3 Technologies

- Explore the use of Automated Guided Vehicles (AGVs) to optimize moving goods within the warehouse, including to potentially facilitate ‘goods to staff’ type capabilities in a picking environment

7.4 Application of Analytics

- The increased importance of much more accurate demand forecasting (by SKU by location)
- The improved application of multi-echelon inventory optimization and replenishment capabilities
- Last mile route optimization, including the ability to cater to both pick-up and deliveries

7.5 Other Areas that need to be considered:

- Another consideration is the implication or necessity to deal with cross-border shipments, and would this be managed directly by the retailer, or by the LSP.
- There are a lot of payment modes and models for e-commerce transaction and logistics. This includes mobile-based in store payment modes. The preferred payment methods in Singapore is illustrated in Figure 7.1. These preferred payment methods may influence the kind of strategy to be implemented.

Data analytics would be able to help last mile route optimization, including the ability to cater to both pick-up and deliveries.

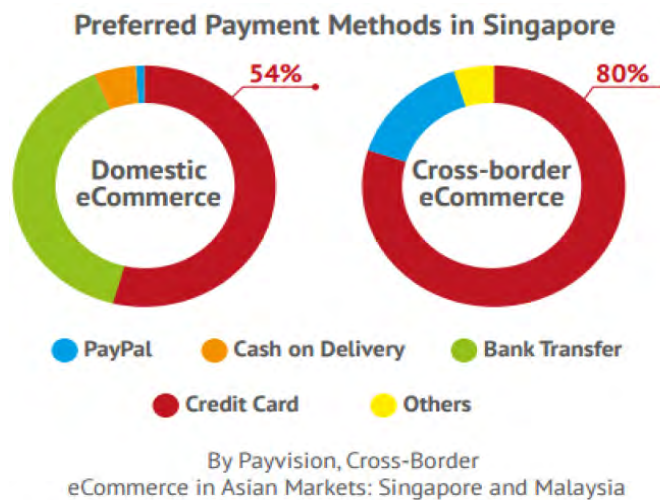


Figure 7.1. Preferred Payment Methods in Singapore

- Omni-channel experience & orchestration capabilities which includes integrated O2O e-commerce model may change the e-commerce logistics strategies.
- Classification, tagging, and having the ability to trace items across the chain is critical, and that’s where various IOT technologies come in, at the pallet and box levels at times, as well as the ability to associate to individual items
- The importance of a strong reverse logistics/returns management process and capability may influence the e-commerce logistics.

DRONES FOR DELIVERIES¹³

While delivery vans and milk runs are the most used delivery methods, some companies are also trailing drone deliveries to get reach customers. Drone deliveries, while technologically advanced, can be very complicated to implement in some geographies given the regulations with flight operations and nature of market. Even though there are some inherent challenges, drone deliveries can open up a realm of opportunities for companies to explore. In this section, we discuss the opportunities, challenges and landscape with respect to commercialization of drone deliveries – a Singapore perspective.

Even though there are some inherent challenges, drone deliveries can open up a realm of opportunities for companies to explore.

8.1. Drone Deliveries in e-Commerce

While e-commerce is a very mature market everywhere, using drones for delivering e-commerce purchases and commercialization of drone deliveries is fairly nascent. Globally, Amazon (USA) created waves by announcing drone deliveries in the future through their drones "Prime Air" will deliver packages under five pounds in 30 minutes or less with a range of 15 miles¹⁴. In Asia, there are several pilots and use-cases such as:

- **Alibaba**¹⁵: Alibaba in China was testing of drone delivery of tea over a 3-day period. In China, a company needs to receive permission to do airborne testing and there are restrictions to flying, particularly within cities in China.
- **JD. Com**¹⁶: Delivery of online shopping to JD.com delivery personnel on ground in rural and far flung provinces of China via drones on fixed delivery routes from warehouses to hubs. These are then hand-delivered to customers' homes. The pilot was executed in Jiangsu province of China recently and they are looking to expand their services to 4 other provinces

¹³ This section is contributed by Shaily Shah, IDC Singapore

¹⁴ Amazon, *Amazon Prime Air*, available in <https://www.amazon.com/b?node=8037720011>

¹⁵ Bischoff, P., *Alibaba is testing drone delivery in China with a 3-day pilot program*, available in <https://www.techinasia.com/alibaba-testing-drone-delivery-china-3day-pilot-program>

¹⁶ Jing, M., *JD.com's drone delivery goes into operation*, available in http://www.chinadaily.com.cn/business/2016-06/08/content_25655486.htm

The idea of drone delivery is to ensure quick, efficient and unmanned delivery of parcels to recipient – they could be via UAVs or even via ground robots.

- **Alphabet**¹⁷: In August 2014, Google's parent company Alphabet piloted a drone delivery service in Australia. The air traffic control system for the drone traffic used existing cell network infrastructure to keep the drones in line while only reaching heights of 500 feet.
- **Rakuten**¹⁸: Drones can provide food, snacks and golf accessories like new balls to players while they are out on the golf course. The drones are developed by Autonomous Control Systems Laboratory (ACSL), a Japan-based firm in which Rakuten (Japan's e-commerce player) invested.
- **SingPost**¹⁹: Partnered with IDA for the 2-kilometer test flight from Lorong Halus to Pulau Ubin island off Singapore's north-eastern coast took 5 minutes, and carried a payload of a letter and T-shirt in a packet.

8.2. Commercialization of drone deliveries

Drone deliveries is a fairly nascent market as policies are being framed and players are running pilot tests of their UAVs. Drone deliveries will have applications for retail, healthcare, F&B, logistics, supply chain and last mile delivery. It could open an \$82 billion opportunity for the industry over the next 10 years.

This ecosystem is composed of drone manufacturers, battery, charging stations, landing pads, devices and software for air traffic coordination, drone recovery and safety, drone insurance to policing and license plates.

8.3. Opportunities

- **Reduced cost of delivery** – Drone deliveries will translate to instant cost savings, part of which will be passed on to consumers. It costs far less to operate a fleet of unmanned aerial vehicles than it does a fleet of ground vehicles. When compared to fleet delivery trucks, last mile drone deliveries for smaller packages are expected to cost between \$2 and \$8 (Example: Amazon). An e-commerce player can sell their products at reduced or negligible shipping costs – thus reducing instances of abandoning shopping costs, resulting in cost savings for the consumer and hence more likely to win consumer loyalty.
- **Opportunities for non-aerial drones** – This is a perfect solution for deliveries in no-fly zones with several aviation regulations that deter

¹⁷ Bergen, M., Drones from Google's Alphabet will take flight soon. But can they outmatch Amazon?, available in <http://www.recode.net/2016/8/2/12362744/alphabet-project-wing-drone-delivery>

¹⁸ Rakuten Press Releases, available in http://global.rakuten.com/corp/news/press/2016/0425_01.html

¹⁹ SingPost Press Release, available in <http://www.singpost.com/about-us/news-releases/singpost-collaborates-ida-develop-first-drone-mail-delivery>

Drone deliveries will have applications for retail, healthcare, F&B, logistics, supply chain and last mile delivery.

aerial flights of drones. The idea of drone delivery is to ensure quick, efficient and unmanned delivery of parcels to recipient – they could be via UAVs or even via ground robots. Ground based drones can carry larger packages (weighing up to 20 pounds) and are more cost effective due to lesser energy expenditure. Example: Starship Technologies in Washington DC is pioneering technology for ground based drones that can carry packages across city sidewalks while dodging pedestrians²⁰. They are equipped with cameras, sensors and autonomous navigation technologies

- **Faster delivery** – Drones will enable retail and e-commerce companies to promise quick deliveries (Example – Amazon Prime delivery is currently 2 days and with drones it is expected to be 30 minutes). This, coupled with low delivery costs, adds to the customer delight in the overall shopping experience and ensures capture of higher retail market share.
- **Easing the supply chain** – Since drone deliveries are possible within the 5-10-mile radius, the number of checkpoints and delays caused due to centralized warehouses will reduce considerably. The bottlenecks created at these storehouses will ease as retail chains will move to hub and spoke models and decentralized delivery locations.
- **Opportunities for companies with complementary offerings** – Drone delivery gives opportunities for several related industry offerings such as battery packs, landing pad manufacturers, charging pad manufacturers, insurance for drone deliveries, safety and alarm systems, Drone as a Service (DaaS) systems, etc. Vendors in this space are increasingly looking to provide an end-to-end solution to end users thereby creating a larger market for drones.
- **Lower carbon footprint** – Substituting a truck delivery with multiple drone deliveries can help reduce the number of trips and hence help in contributing to a greener sustainable environment, significantly reducing carbon footprint and energy consumption in the long run.

8.4. Challenges and Risks

- **Smaller delivery radius** – Currently drones have a 5-mile delivery radius. While it may work well for closely located retail chains such as Walmart in USA and Fair Price in Singapore, companies such as Amazon and RedMart may not have hubs and stores located so close to each other. Drones will not be able to make long distance and multiple deliveries on a single flight. Retail chains will still have to rely on delivery trucks and vans to fulfil their long distance orders and ensure multiple deliveries on a single run.

²⁰ Starship in the press, available in <https://www.starship.xyz/press/in-the-news/>

Multiple permits need to be sought from various government authorities and international bodies for attempting drone delivery pilots in Singapore.

- **Drone Regulations in Singapore:** Multiple permits need to be sought from various government authorities and international bodies for attempting drone delivery pilots in Singapore.
- If a drone weighs less than 7kg, and is flown for non-commercial purposes, more than 5km away from an aerodrome or not in protected areas, not higher than 200 feet, then you will not need a permit to fly it. The situations in which permits are required to fly a drone are:
 - Within 5 km of aerodromes - The risks posed to aircraft landing or taking off is why drones are banned within a 5km radius from aerodromes.
 - Operating heights greater than 200 feet
 - Flight within protected areas, such as police stations, areas where military operations are conducted and the Istana. Penalties for flying over a protected area without a permit are a fine of up to \$20,000 and/or imprisonment for up to 12 months.
 - There is discharge or dropping of substances/items from the drone. The penalty for doing this without a permit is a fine of up to \$20,000;
 - The radio frequencies and power limits used for operating the drone do not comply with IDA guidelines for short range devices
 - Photographs (including video and live-streaming) of a protected area are taken using the drone. The penalties for doing this are a fine of up to \$20,000 and/or imprisonment of up to 12 months; or
 - The drone is flown in special event areas as declared by the Ministry of Home Affairs. The penalties for doing this without a permit include a fine of up to \$20,000 and/or imprisonment of up to 12 months. If the drone flight was found to disrupt or interfere with the conduct of any activity associated with the special event, the offender may be fined up to \$20,000 and/or imprisoned for up to 12 months.
 - For operation of unmanned aircraft without the required permits, the penalties are a fine of up to \$40,000 and/or imprisonment for up to 15 months.
 - Applications for permits should be submitted at least 2 weeks in advance, and cost between \$20 and \$600.
- **Privacy and security concerns** - There are heightened privacy concerns as drones can be bought for as little as \$200-\$300 and could be improperly used by paparazzi, law enforcement and could also lead to corporate espionage. Drones could also be used to aid thefts or smuggling. These illegal and scandalous activities do not

Due to human intervention and collisions into structures, drone technology is currently not the safest for condominiums and high-storey skyscrapers in countries like Singapore.

have the correct risk aversion and damage control protocols in place. The technology to combat invasion of privacy by drones is also not very advanced and fool-proof currently.

- **Safety concerns** – Due to human intervention and collisions into structures, drone technology is currently not the safest for condominiums and high-storey skyscrapers in countries like Singapore. There are efforts being made to make the systems intelligent and respond to upcoming barriers by changing course or halting – however there are no error-free pilots that have guaranteed their successful deliveries.
- **Battery life** – Drones need to be recharged or refurbished with new additional battery packs after each ride. A short one-way distance can exhaust the battery making it expensive and inconvenient to replace batteries often. The limited battery life is currently limiting possibilities of drones doing long distance deliveries. New drone technologies for wireless, on-the-go charging and provision of extra battery packs are being sought to make commercial deliveries a reality. Example: A recently-published patent describes Amazon's plans to add UAV docking stations to buildings, power poles, street lights, and cell towers. The docking stations can include package handling facilities and can act as a final destination or as a delivery hub. They can extend the range of UAVs by providing recharging/refuelling stations. Also they can also include navigational aid and provide routing information from the central control.
- **Delivery Authentication**– A protocol needs to be put in place for authentication of drone deliveries to ensure privacy and security. The guidelines for delivery by drones to the correct recipient need to be formulated. With the complex maze of high rises in some densely populated suburbs of Singapore, it will be absolutely essential to introduce digital signatures or thumb/finger print authorization for receiving packages sent by drones. This can also mean innovation in the value chain. For instance, JD. Com in China enlists their own delivery personnel to collect packages on the ground and ensure doorstep delivery and authentication.
- **Labour & Support**– While drones will ease the actual delivery process from point A to point B, there will be a lot of support staff needed for management, coordination and monitoring of drone deliveries. Drones may require pilots and other technical skills staff for drone delivery management and security. The cost of this support staff needs to justify use of drones and elimination of delivery men and delivery vans.

8.5. Critical Success Factors for Vendors

- **New Technology:** Technology vendors and manufacturers in the region will have to be quick to adopt new technologies to make drones more intelligent and less accident prone.

Technology vendors and manufacturers in the region will have to be quick to adopt new technologies to make drones more intelligent and less accident prone.

- *Infrared Beacons*: Google has developed "mobile delivery receptacles" which are remote boxes on the ground with wheels. They communicate and guide the drones in the sky via infrared beacons or lasers. Once located, the drone flies down to ground level and transfers its package into the mobile delivery receptacle and delivers to secure holding location
- *Sense & Avoid Technology*: Drones Amazon drones that use this technology to communicate with other manned aircrafts to avoid collisions
- *Remote monitoring systems*: Cloud based software managing system for remote monitoring of aerial robotics
- *End to end technology solution*: Strategic partnerships with hardware and software vendors to provide drone as a service (DaaS)
- **Provide end-to-end solution**: This includes hardware, landing pads, monitoring software, security applications, etc.
- **Security**: DroneShield and DDC (Domestic Drone Countermeasure) have products which use acoustic drone signatures and radio frequency transmitters to detect drone and send out alerts via alarms, text messages, email etc. Another company, Dedrone is partnering with Airbus to secure airspaces and airports by using its sensor technology and long range radar to send out warnings to piloted drones to change course or jam their entry if they fly near airports.

8.6. Critical Success Factors for End Users

Retail and e-commerce players which have been piloting their drone delivery trials will have to establish an agile business model for customer delivery.

- **Form alliances**: Drone manufacturers will be partnering with retail and logistics players and industry leaders to deliver products and services. Alliances will be mutually beneficial to capture opportunities in the market
- **Align with regulations**: Currently Singapore drone regulations prevent commercial drone deliveries and have many guidelines for hobby and photography drones that need to be adhered
- **Maximize ROI**: Justify investment and maximize return on investment for drone technologies, hardware and sensors. Identify the best fit model to optimize and justify use of drones for delivery.

- **Understand best practices:** Evaluate competition and alter service rollouts and offerings based on best practices in the industry. Identify the best vendor partners to launch end-to-end commercial solutions.

STANDARDS FOR E-COMMERCE LOGISTICS²¹

E-commerce is driving significant changes in how companies interact with consumers. To meet consumer expectations in today's omni channel world, companies are transforming all aspects of their businesses. Transformation is particularly common in transportation and logistics (T&L) business processes.

An open standard to facilitate information exchange would enable real-time visibility and tracking across the entire set of activities to conduct business seamlessly with different stakeholders

With many stakeholders involved and collaborating at the same time, communication standards to facilitate information exchange would be important for any system or technology in e-commerce to work. In addition, with the evolution of different e-commerce business models, delivery orders being sourced from different warehouses and the merge in-transit process are no longer effective, new standards are called for. The massive increase in the number of items for deliveries and transits has also put additional strain on the visibility for tracking the deliveries. As such, an open standard would enable real-time visibility and tracking across the entire set of activities to conduct business seamlessly with different stakeholders.

The open standards would help in the following:

- develop easy to use message standard protocols for all stakeholders in the ELM concept
- provide common ways to uniquely identify delivery items such as pallet and parcel so that all relevant stakeholders can track them as they move from the supplier sites until arrive in customer's door
- provide a more accurate and efficient information exchange strategy that can be used by all stakeholders.

Examples of open standards include GS1 Logistics Label (or Electronic product code), GS1 EDI and Serial Shipping Container Code (SSCC). Example of GS1 Logistics Label is shown in Figure 9.1.

On the GS1 Logistics Label a distinction is made between the types of data communicated on the GS1 Logistics label, in order to facilitate

²¹ This section is adapted from GS1, *GS1 Standards: The Logical Choice for Logistics, 2015* and GS1, *Last Mile Discovery GS1 Blueprint, 2016*

interpretation by machines and people. For this purpose the data can be expressed in three building blocks:

1. The 'Free Format' building block may contain non-HRI (Human Readable Interpretation) text and graphics.
2. The 'Non-HRI Text Including Data Titles' building block contains non-HRI text reflecting the information represented in the barcode(s) using data titles rather than Application Identifiers (AIs), and optionally additional information not represented in barcodes (preferably including data titles).
3. The 'Barcodes and HRI' building block contains the barcode(s) including HRI.



Source: GS1 Logistic Label Guideline
Figure 9.1. Example of GS1 Logistics Label

PROPOSED SOLUTIONS

CHAPTER 10.

E-COMMERCE LOGISTICS SOLUTIONS: E-Commerce Logistics Management (ELM)

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.

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 District²². 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
- 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

²² de Souza, R., Lau, H.C., Goh, M., Ng, W.S., Tan, P.S., Lindawati, (2016), Retail Precinct Management: A Case of Commercial Decentralization in Singapore, Transportation Research Procedia, Vol 12, pp. 765-776

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 10.1. The main features are described in more detail below.

Using consolidation, multiple deliveries can be done at the same time to reduce the transportation cost and optimize the truck load.

10.1. 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 10.2. 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 10.3 describes two strategies to be used in consolidation: performance-based contract and delivery postponement.



Figure 10.1. E-Commerce Logistics Management (ELM) Concept

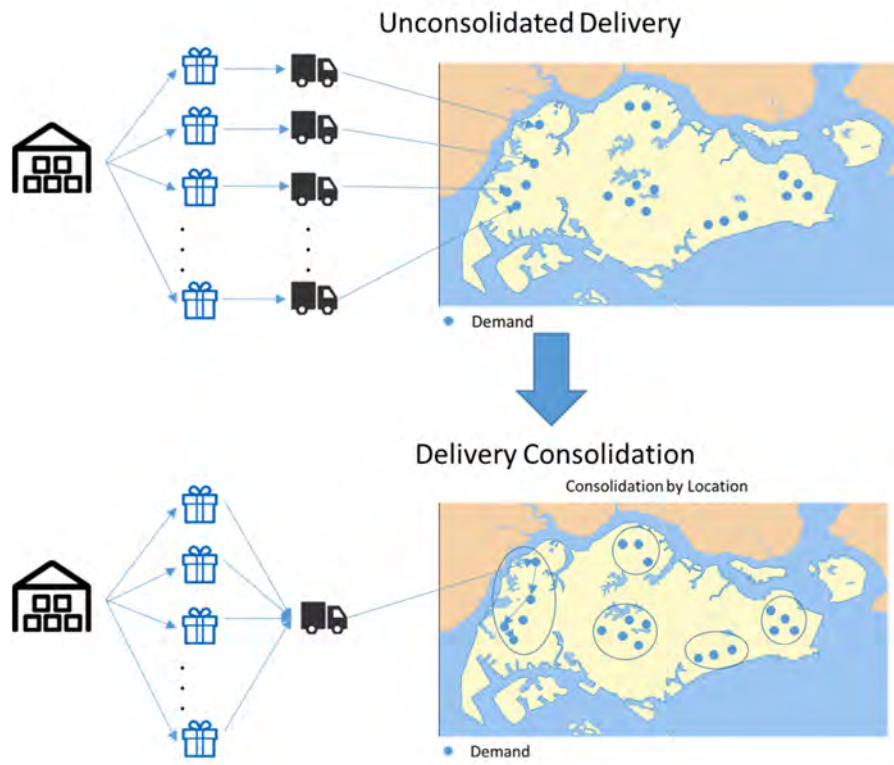


Figure 10.2. Delivery Consolidation



Figure 10.3. Strategies for consolidation

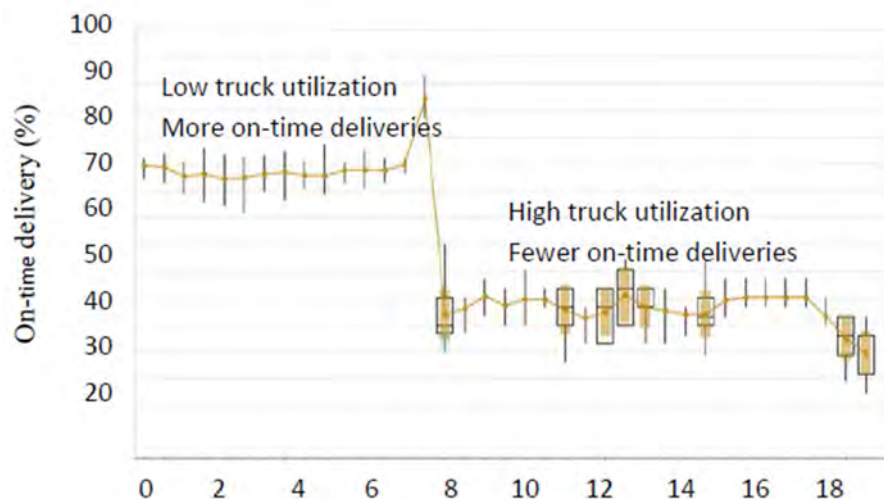
10.1.1 Performance-Based Contract (PBC)

Performance Base Contracts (PBCs) improve logistics service availability and reduce the cost of logistics resources ownership.

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.

10.1.2 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 deliveries²³. An analytical result for the impacts of postponement strategy on delivery performance is shown in Figure 10.4.



Source: The Logistics Institute – Asia Pacific, Challenges and Opportunities in Clustered Urban Logistics: The Jurong Gateway Precinct, 2014

Figure 10.4. Example of delivery postponement impacts on delivery performance

²³ The Logistics Institute – Asia Pacific, (2014), *Challenges and Opportunities in Clustered Urban Logistics: The Jurong Gateway Precinct*

10.2. ELM FEATURE: Dynamic Delivery Scheduling and Real-Time Tracking

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.

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 10.5), 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.



Source: The Logistics Institute – Asia Pacific, Challenges and Opportunities in Clustered Urban Logistics: The Jurong Gateway Precinct, 2014

Figure 10.5. Visualization of expected traffic

10.2.1 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.) at the micro (city), meso (regional) and macro (global) levels can be developed to support dynamic scheduling and tracking, as illustrated in Figure 10.6.

Micro view visualizes the last-mile delivery routes within the city.

Meso view connects supply chain and logistics nodes in several small areas covered by micro view.

Macro view focuses on cross-border transportation via existing trade lanes.

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.

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.

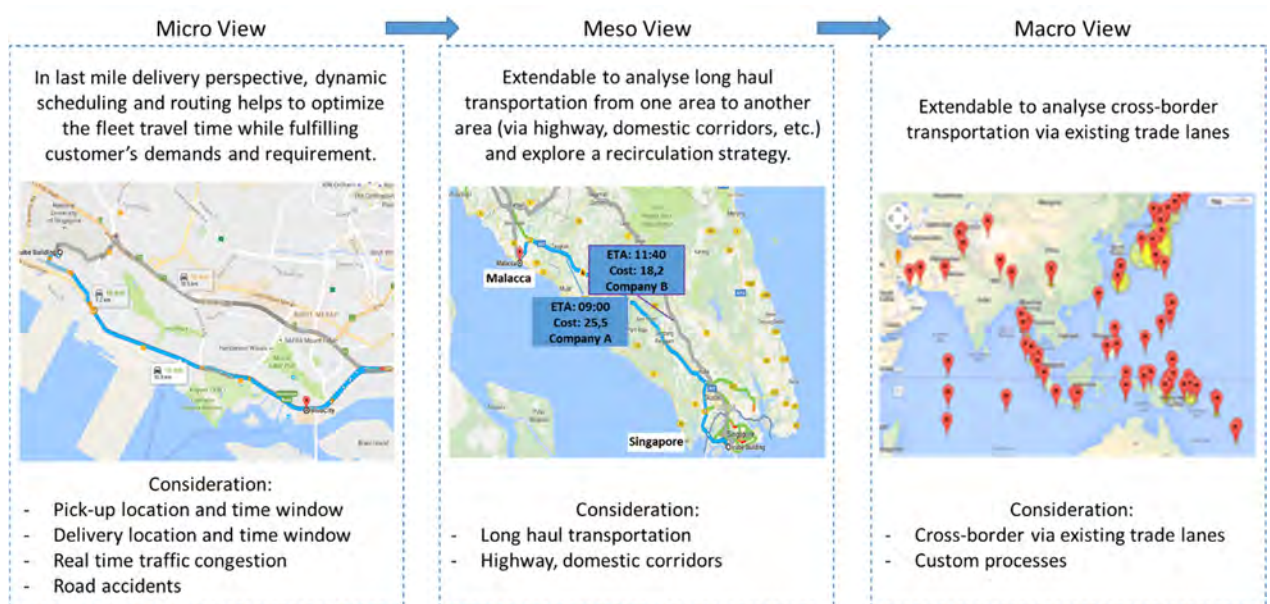


Figure 10.6. 3-View of Dynamic Scheduling and Tracking

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 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 disruptions in the **time-cost-disruption GIS visualization** would help the preparation and mitigation of disruptions.

10.3. ELM FEATURE: Multi-Party Delivery Coordination

E-commerce business may wish to translate the fixed cost to marginal cost through options such as an “Uber-like” model or a “4th Party Milk Run”.

To optimize logistics cost for delivery, e-commerce businesses can explore different options as illustrated in Figure 10.7. 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”.

10.3.1 “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.

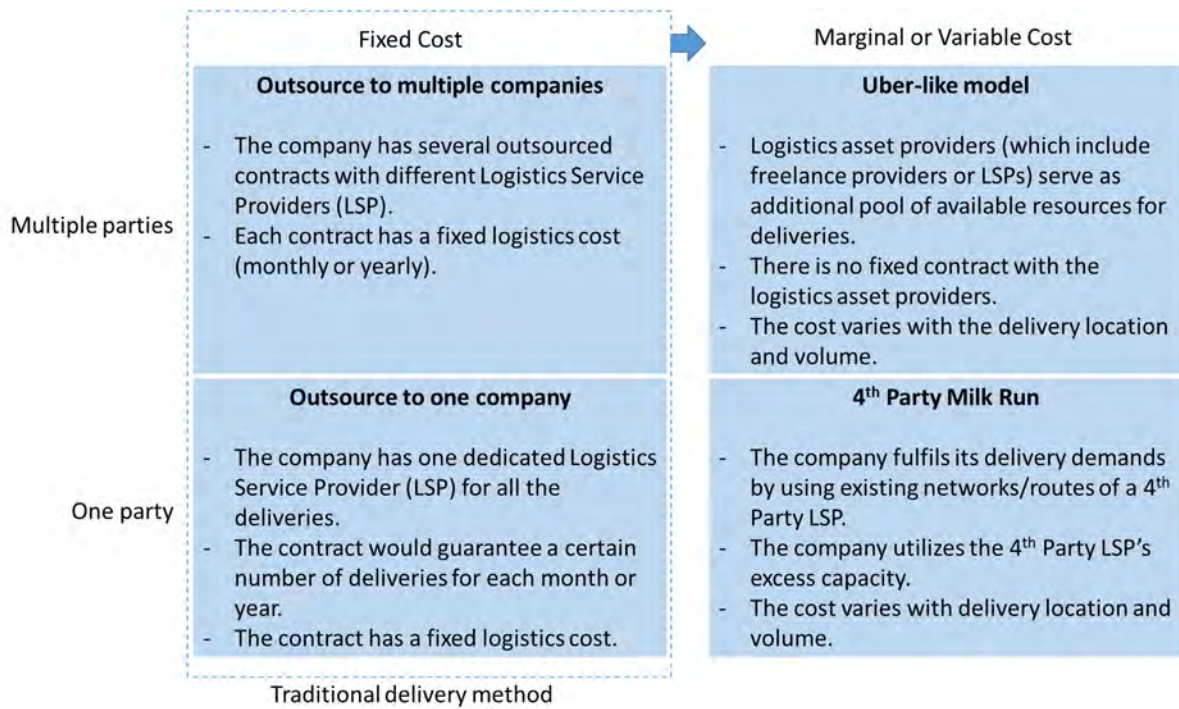


Figure 10.7. Delivery Coordination Matrix

Two essential components to support this mechanism are crowd-sourcing platform and crowd-sourcing contract.

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 stakeholders²⁴ is essential. This platform acts like the Uber mobile app to 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 upon²⁵. 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.

²⁴ The Logistics Institute – Asia Pacific, (2013), *COLLABORATIVE URBAN LOGISTICS: Synchronized Last-Mile Logistics for Sustainable, Efficient Urban Delivery*

²⁵ The Logistics Institute – Asia Pacific, (2013), *COLLABORATIVE URBAN LOGISTICS: Foundation Pillars for effective coordination of urban freight movements*

10.3.2 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.

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.

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

	Private	Public
Unattended CDP	<ul style="list-style-type: none"> - Locker point or communal reception box owned by a private Logistics Service Provider (LSP) company. - Investment cost for this unattended CDP is covered by the company. - Customers using delivery services from that particular LSP can collect and return their goods. 	<ul style="list-style-type: none"> - Locker point or communal reception box is provided by the government to facilitate last-mile deliveries. - It can be operated or managed by the government itself or by a private company. - Any LSP company would be able to use it by paying a certain fee.
Attended CDP	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Government offices or facilities or MRTs can be used as collection/return points for certain deliveries. - The government staff will manage the goods

Figure 10.8. Types of Collection-and-Delivery Points (CDPs)

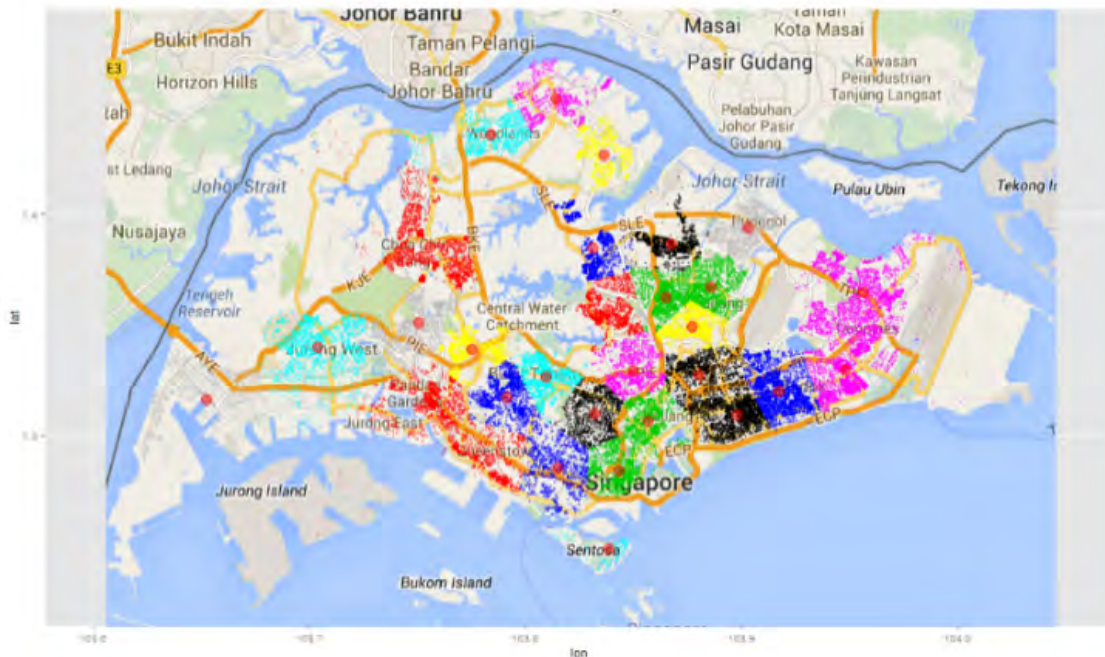
10.4. ELM FEATURE: Multiple Collection and Delivery Points

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.

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 10.8.

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.



(Source: de Souza, R., Lindawati, Shuang, Q., Goh, M., Wu, H., Wee, S.N., Optimizing The Last Mile Deliveries using Collection-and-delivery Points for e-Commerce, Global Supply Chain Management, 2014, China)

Figure 10.9. Example of GIS tool for determining CDP location

Visualization tool would help to re-examine a set of alternative locations for Collection-and-Delivery Points (CDPs) with the flexibility to analyze “what-if” scenarios.

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 10.9) can be used to support decision makers in identifying suitable locations for these facilities²⁶. It would help to re-examine a set of alternative locations with the flexibility to analyze “what-if” scenarios.

²⁶ de Souza, R., Lindawati, Shuang, Q., Goh, M., Wu, H., Wee, S.N.,(2014), *Optimizing The Last Mile Deliveries using Collection-and-delivery Points for e-Commerce*, Global Supply Chain Management, China; Lindawati, de Souza, R., (2016), *Determining Urban Freight Facility Locations using Post-Evaluation Deliberation*, IEEE Smart City Conference, Australia

DEMAND UNCERTAINTY

The customer behaviour in e-commerce is different from traditional retail due to high dependency on seasonality, disruption in social and behavioural norms, customer buying criteria, and disruption in supply patterns from competitors.

Other than e-commerce logistics, uncertainty in demand is also a great concern throughout the entire e-commerce industry. Customer behavior in e-commerce is different from traditional retail. In e-commerce, the customer base is often unclear. It is highly dependent on seasonality, disruption in social and behavioural norms, customer buying criteria, and disruption in supply patterns from competitors²⁷.

11.1 Understanding Customer Behaviour in e-Commerce

When customers buy products, they go through a systematic process that can be described using models such as the buying funnel²⁸ and AIDA model²⁹ (Attention, Interest, Desire, Action model). From the consumers' point of view, the above models can be summarized into four steps; Awareness, Research, Decision, and Purchase³⁰ as illustrated in Figure 10.1.

When companies incorporate these four steps in their e-commerce strategies, companies can reach out to their customers more efficiently and effectively, and invest in providing vital information for them to make purchase of their products. From the customers' point of view, the buying funnel works on the theory of information processing³¹ that populates the demand traffic from various sources.

²⁷ O'Grady, M., *Forrester Research Online Retail Forecast, 2013 To 2018 (Western Europe), Q4 2014 Update*, 24 December 2014, available in <https://www.forrester.com/report/Forrester+Research+Online+Retail+Forecast+2013+To+2018+Western+Europe+Q4+2014+Update/-/E-RES120541>

²⁸ Ramos and Cota, *Search Engine Marketing*. McGraw-Hill, New York, 2008

²⁹ Lancaster and Withey, *CIM coursebook 06/07 Marketing Fundamentals*. Butterworth-Heinemann, Oxford, 2006

³⁰ Jensen and Resnick, (2006), *An examination of searchers' perceptions on non-sponsored and sponsored links during e-commerce web searching*. Journal of the American Society for Information Science and Technology, Vol 57 (14), pp. 1949-1961.

³¹ Bettman, Luce, and Payne, (1998), *Constructive consumer choice processes*. Journal of Consumer Research, vol 25 (3), pp. 187-217.

An important factor for customers to make a purchase, and thus for the success for companies, is the choice of keywords.

An important factor for customers to make a purchase, and thus for the success for companies, is the choice of keywords. This area of the campaigning is known ‘keyword advertising’, which is a part of an ‘organic search campaign’. On major search engines, companies typically bid on key phrases that relate to some product or service they provide. Based on an allocation mechanism, the Search Engine Result Page (SERP) list will be allocated to the various companies. Another way to campaign the product on search engines is ‘AdPosition Ranking’, where the companies bid on the positions on the SERP (based on the location apart from organic search result). According to Adword of Google, the ad positions are allocated to advertisers based on the Second price auction mechanism, also known as Vickrey-Clarke-Groove (VCG) mechanism³². In Adwords, the focus was given to the consumer behaviour, as they include Ad quality in allocating the positions on SERP. It is believed that the relevant information is the key for higher conversion rate.

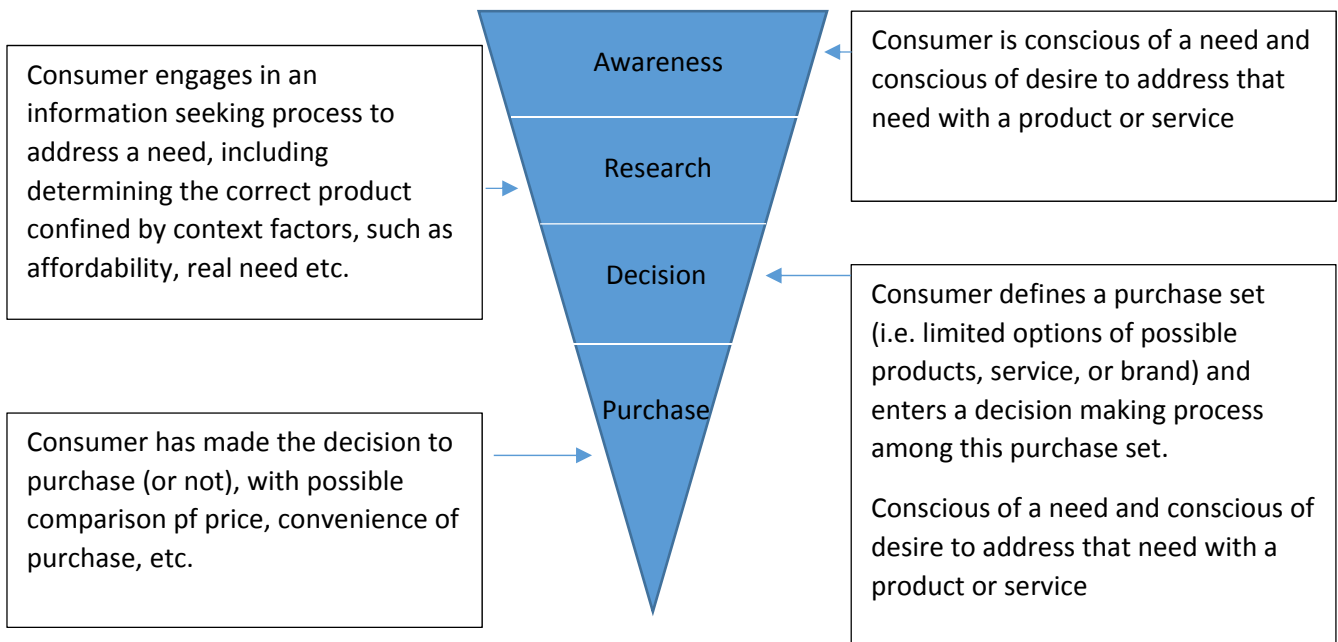


Figure 11.1. Customer Buying Funnel

³² Gagan, A., Ashish, G., Rajeev, M., (2006), *Truthful Auctions for Pricing Search Keywords*. ACM Conference on Electronic Commerce.

11.2 Understanding Business Drivers

Using these Business Drivers, e-commerce companies can design strategies to have a higher conversion rate from visitors to purchasers.

E-commerce companies need to analyze their customer base and identify business drivers for their companies. Examples of business drivers identified from the literature and industry landscape are shown in Figure 11.2. These business drivers represent factors or activities that drive the online traffic for their demand. These factors or activities can come from different traffic sources; organic search or paid-search, media or non-media, etc.

Using these business drivers, companies then design strategies to have a higher conversion rate from visitors to purchasers. These strategies include Search Engine Optimization (Keyword search), Click and Collect, and Cost-Per-Click. The source of traffic can be anything ranging from 'Organic' search to 'Paid' search or application on mobile, etc. Regardless of the traffic source, the efforts are devoted to design strategies that will produce higher conversion rate.

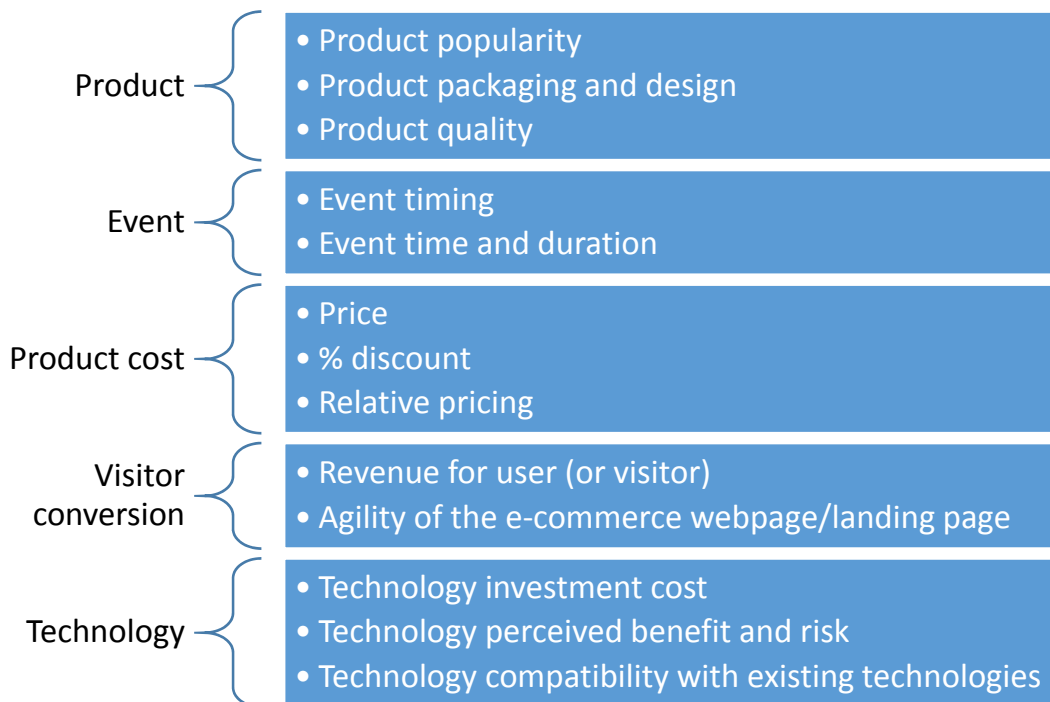


Figure 11.2. Examples of Business Drivers in E-Commerce

CASH-TO-SERVE

CHAPTER 12.

CASH-TO-SERVE: THE FINANCIAL CASE FOR E-COMMERCE³³

With the evolution of internet and mobility, business operation has been re-defined. In the face of globalization and increasing competition from e-commerce providers, companies are also thinking of jumping onto the e-bandwagon to reach out to the global market quickly without necessarily incurring a corresponding increase in operational costs.

But are global outreach, revenue enhancements and cost reduction opportunities the only reasons why brick and mortar companies should consider integrating e-business into their existing channels in today's digital age? Undoubtedly, these are very strong reasons that cannot be ignored. But beyond these strong reasons, there are some fundamental benefits which have often been overlooked by many.

Cash is as essential to any business, as oxygen is to an individual. Cash flow is the lifeblood of any company and can be fatal if mismanaged.

Cash is as essential to any business, as oxygen is to an individual. Cash flow is the lifeblood of any company and can be fatal if mismanaged. It has been said that a company can afford to make losses for some time, but it can only run out of cash once. The world is replete with many examples of profitable companies filing for bankruptcy – simply because of mismanagement of their cash flow. Cash is still king, without which there is no kingdom to talk about.

We all know that cash flow ultimately determines the overall financial health of a business. Maintaining sufficient cash to fund short-term operations has always been a priority. Yet, many companies are still facing cash flow mismatch that potentially threatens its very survival. If executed correctly, e-commerce model could be the answer to getting paid faster and at the same time, reduce the amount of inventory on their books. In short, e-commerce companies in general tend to have better cash conversion cycle (CCC) compared to offline companies.

³³ This section is contributed by Mr. John Choo

12.1 The Cash Conversion Cycle (CCC)

The CCC measures how quickly the company can turn its cash on hand, into inventory and payables, then to sales and receivables and then back to cash available for new investments.

What is CCC? The CCC is “the average days required to turn a dollar invested in raw materials into a dollar collected from a customer”³⁴. This metric calculates the time lag necessary to convert inventories back into available cash. Every company has its own CCC and it varies from industry to industry. CCC is also dependent on several determinants such as seasonality, bargaining power, underlying product, financing cost etc. The CCC measures how quickly the company can turn its cash on hand, into inventory and payables, then to sales and receivables and then back to cash available for new investments. What makes up the CCC? In general, there are 3 main components that make up CCC. They are Days Payable Outstanding (DPO), Days Inventory Outstanding (DIO) and Days Sales Outstanding (DSO).

The cycle, as shown in Figure 12.1, is the time difference between having paid for the raw materials to receiving payments for sale of finished goods. Its three components: DIO, DPO and DSO can be computed in the following manner:

$$\begin{aligned} \text{DIO} &= \text{Average Inventory} / \text{Cost of Goods Sold per Day} \\ \text{DSO} &= \text{Average Accounts Receivable} / \text{Revenue per Day} \\ \text{DPO} &= \text{Average Accounts Payable} / \text{Cost of Goods Sold per Day} \end{aligned}$$

If the company is a manufacturing concern, the raw materials the company orders from its suppliers needs to be converted into finished products before the company can sell. The period the company takes to convert the raw materials into finished products then to the point of sale represents the DIO. If the company is a distributor, the DIO measures how long it takes for the company to sell the entire inventory. The shorter the DIO, the better it is for the company as less cash is tied up in inventory.



Figure 12.1. The Cash Conversion Cycle

³⁴ McClellan, (2012), “Drivers of the Cash Conversion Cycle in Retail: a Test of Resource Dependency Theory”

Ideally when the company sells its goods, the company wants its buyer to pay cash on delivery or even better - advance payment. But in reality, we can only dream on. DSO is the average time the company takes to collect payments from its trade debtors. The longer the DSO, the more working capital the company will need to fund this period. From experience, every industry has its peculiar market practice which the seller cannot deviate far, to close its sales. Every buyer will certainly ask for longer payment term to strengthen its cash flow but this definitely does not bode well for seller's cash flow position.

DPO tells how long it takes for the company to pay its trade creditors on average. If the company pays the trade creditor promptly, then the DPO represents the credit term granted by its suppliers. In general, the longer a company takes to pay its trade creditors, the more cash it has on hand for re-investments, the better it is toward the working capital, cash flow and profitability. The burning question always is - are the suppliers prepared to give longer credit term at the expense of their cash flow and financing cost?

Put together, the CCC equals the DSO plus the DIO minus the DPO ($CCC = DSO + DIO - DPO$). CCC is the number of days the company's working capital will stay invested, until the company's buyer pays in cash for the finished goods. If the CCC is 60 days, the company will need to fund the equivalent working capital requirement in dollar value for up to 60 days as it awaits payments from buyer. This 60 days is usually funded by way of short term bank loan in the form of a trust receipt loan or an import loan. A good working capital management will result in shorter CCC and vice versa.

The conventional wisdom is that maintaining a high current ratio (current assets divided by current liabilities) is good for companies. Current ratio is mainly used to measure a company's ability to pay back its short term liabilities with its short term assets. Most financial textbooks would say that the higher the current ratio, the more capable the company is in paying its short term obligations, as its current asset value is proportionately higher than its current liabilities values.

Most of us without accounting background would religiously follow this definition, thinking that a high current ratio should impress our bankers or investors during the yearly review of credit facility. By thinking so, we may unwittingly fan the flame of poor working capital management. Maintaining a high level of inventories and receivables will invariably raise the working capital requirement, causing the cash conversion cycle to lengthen! Consequently, more cash will be tied up in the inventories and receivables, leaving little cash for new investments to generate new

sales. In the extreme, unavailability of cash to meet short term obligations may even turn into reality. Thus, we must guard ourselves against this misconception!

12.2 Why a short Cash Conversion Cycle is good

Every company should strive for a short CCC. The shorter the CCC, the better it is for the company. This is because shorter CCC means less time the capital is tied in the business operating cycle. It also means that cash quickly becomes available for the next round of investments (in inventories & receivables) to generate new sales, and the better it is for the company's profit margin. The more rounds completed in a financial year, the more profits are generated.

The cash conversion cycle is also a good way to gauge how effective the company's management is in managing its working capital. When combined with other activity ratio, CCC can show how efficient the management is in deploying short-term assets and liabilities to generate cash for the company.

To illustrate how CCC can favourably stacks up in an e-commerce business, a CCC comparison between an e-commerce and an offline retailer is discussed in Box 3.

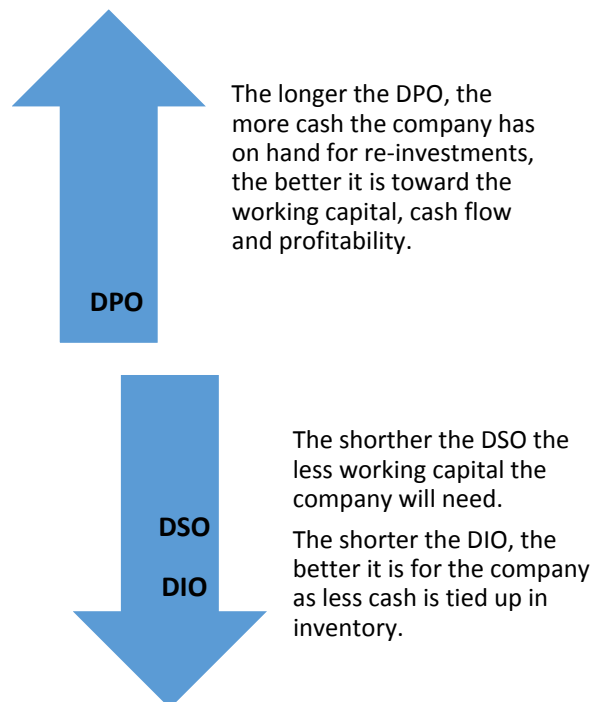


Figure 12.2. DPO, DSO and DIO impact to CCC

Box 3: Cash Conversion Cycle Comparison Between Online and Offline Booksellers

The following illustrates how e-commerce business can offer a critical advantage over comparable offline business, we compare two “real” companies: e-commerce bookseller (Company A) and offline retail bookseller (Company B).

Company A is an e-commerce and cloud computing company. It is the largest Internet-based retailer in the world by total sales and market capitalization. Company B on the other hand is a Fortune 500 company and a leading retailer of content, digital media and educational products. The company operates more than 600 retail stores in all 50 U.S. states.

The following financial figures of both companies were extracted from their respective annual audited financial reports.

Table 2. Financial figures comparison between Company A and B

Year ending (\$ millions)	Company A		Company B	
	2010	2011	2010	2011
Net revenue	34,204	48,077	5,810	6,999
Cost of goods sold	26,561	37,288	4,134	5,206
Gross profit	7,643	10,789	1,676	1,793
Net income	1,152	631	36	(122)
Assets				
Cash and Cash equivalents	3,777	5,269	61	59
Net receivables	1,587	2,571	106	150
Inventories	3,202	4,992	1,370	1,537
Total assets	18,797	25,278	3,705	3,595
Liabilities and stockholder equity				
Accounts payables	8,051	11,145	868	949
Short term debt/accrued liabilities	0	0	100	786
Total liabilities				
Stockholder equity	6,864	7,757	903	818
Days Inventory Outstanding (DIO)	44	48.87	120.96	107.76
Days Sales Outstanding (DSO)	16.94	19.52	6.66	7.82
Days Payable Outstanding (DPO)	110.64	109.09	76.64	66.54
Cash Conversion Cycle (CCC)	-49.7	-40.71	50.98	49.05
Working Capital Requirement (WCR)	-3,262	-3,582	608	738

Let us examine the supply chain metrics of both companies closely and see how they impact the respective company's cash flow.

In DIO, Company A's inventory stays in its warehouse for around 44 days and 48.87 days on average for 2010 and 2011 respectively. As an e-commerce company, Company A's turns its inventory around 2.5 times faster compared retailer Company B. In other words, Company A has fewer days of capital tied in inventory compared to Company B. All associated inventory costs such as insurance and storage space will also be comparatively lower.

In DSO, Company A's e-model generates impressive figures of 16.94 days in 2010 and 19.52 days in 2011. Simply put, Company A takes an average of less than 20 days to receive cash from sales in 2011. Being an e-commerce provider, its source of payment from online sales are the credit card companies and payment gateway company. On the other hand, as a giant retailer with more than 600 retail stores, Company B clearly outperforms Company A with mere 6.66 days in 2010 and 7.82 days in 2011 respectively. It is worthy to mention, at this juncture, that Company B's superiority in DSO is largely because of its business model as a giant retailer, where payment term is largely cash or credit card. Company A DSO's contrast to other supply chain players such as a distributor or a manufacturer, where credit term given to buyers is often an industry norm, could not be sharper.

Lastly in DPO, Company A pays its suppliers on average 109.09 days later in 2011. Compared to Company B of 66.54 days, Company A is able to defer its payment on average by around 63% longer than Company B.

Combining all three matrices will show each company's CCC. What is amazing is Company A has *negative* CCC in both 2010 and 2011 while Company B has 50.98 days and 49.05 days respectively. What does a *negative* CCC mean for Company A? Because Company A sells online, it doesn't hold much inventory and often orders from suppliers *only after* the customer pays with a credit card. It means Company A's trade activity is fully funded by its trade creditors, without the need for it to even invest in current assets to generate sales. It also means Company A gets paid long before it pays its suppliers. It simply means every complete turn results in positive free cash flow.

Improvements in CCC

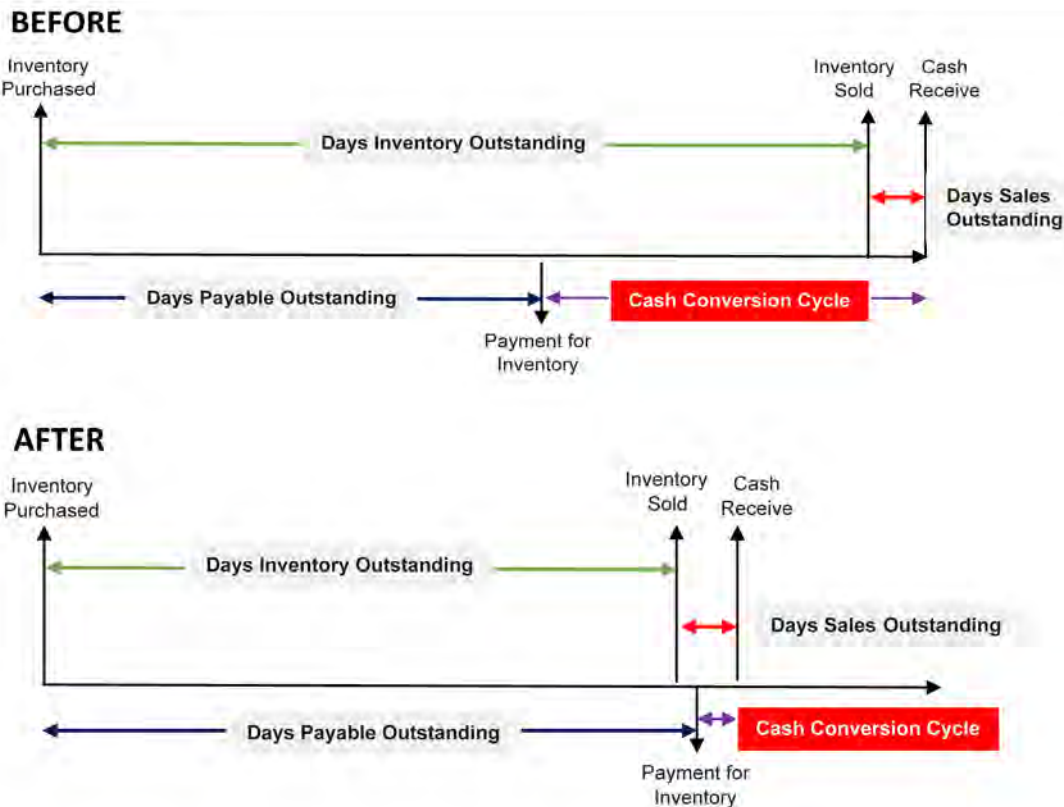
Company B on average has to wait around 49.05 days in 2011 before its investment is repaid with profits. For FY2011, it achieved sales turnover of \$6.99 billion through investments of some \$738 million of working capital in 2011 to generate the sales turnover. As with most companies, the working capital requirement is largely supported by short term loans from banks.

If Company B has plans to grow its sales another \$0.5 billion in the following year, it would require around \$52.7 million of fresh working capital to support this growth. Question - are Company B' banks prepared to finance this additional \$52.7 million? Would the banks require additional collateral? Would there be any collaterals available for the banks to support this fresh working capital request? Even if the banks are agreeable to grant this \$52.7 million of fresh working capital loan, would there be new any conditions, or new pricing, or new financial covenants imposed by the banks?

Let's assume Company B could make the following improvements:

		Before (in days)	After (in days)
DIO	107.76	67	By 40.76 days
DSO	7.82	7.82	No change
DPO	66.54	70	By 3.45 days
CCC	50.98	4.82	By 46.16 days

The improvements in CCC can be illustrated in figure below.



What other financial benefits?

Let us deep dive into what does a superb CCC mean to a company.

"I do not like debt and do not like to invest in companies that have too much debt, particularly long-term debt. With long-term debt, increases in interest rates can drastically affect company profits and make future cash flows less predictable." — Warren Buffet³⁵

With a superb *negative* CCC, Company A is literally a cash machine as it is able to generate cash flow with every turn. In short, it does not need to rely on external financing to fund its operating cycle. This is clearly seen in its balance sheet for 2010 and 2011, where there was no short term debt outstanding. Company A was able to fund its own operating activities without the need for bank borrowings.

Company B on the other hand, needed external financing to bridge the CCC gap of around 50 days in 2011. What does a 50 days CCC mean exactly? Translate into dollar and cents, Company B needed in aggregate around US\$738 m to fund its working capital requirements in 2011 to achieve its sales revenue of \$6.99 billion. Where can it obtain this funds to bridge the gap? Most companies would fund the gap using bank's short term debt. From its 2011 annual report, Company B had a maximum borrowings outstanding of US\$622.8 m. With a weighted average interest rate of 4.3%, it incurred bank interests of no less than US\$26.78 m in 2011.

With a newly minted CCC of 4.82 days from 50.98 days, it can be seen from the diagram that the CCC is shortened significantly. With an improvement in DIO to 67 days from 107.76 days, investments in inventories can be substantially reduced from \$1.537 billion to \$956 million. It means around \$581 million of cash will be unlocked from the inventories. At the same time, an improvement in DPO from 66.54 days to 70 days by mere 3.45 days will also reduce capital investments by \$49 million. Company B' new working capital requirement is now as follows:

³⁵ www.azquotes.com

Inventories	= \$956 m (from 1,537 m)
Accounts Receivables	= \$150 (no change)
Accounts Payable	= \$998 m (from \$949 m)
New Working Capital Requirements	= \$108 m

With this assumption, Company B' working capital requirement will be reduced from \$738 million to only \$108 million, freeing up cash of around \$630 million! In other words, with these improvements, Company B now only needs to borrow \$108 million (instead of the usual \$738 million) from banks to support its operating cycle. With a weighted average interest rate of 4.3%, Company B can start smiling its way to the bank. This is because with the reduction in bank loan by \$630 million, it could potentially save on interest payment of some \$2.7 million in 2011! This significant savings in interests means better profit margins!

At 4.82 days now instead of 50.98 days previously, Company B can now potentially turn its cash cycle many more times in one financial year than it could in the past. Since every turn represents a new profit earned, Company B should be able to enjoy a higher profit margin with the new short cash cycle. Simply put, Company B now needs much *less* resources to achieve the same sales revenue! How awesome is that? This means the remaining available cash can be invested to generate more sales!

What about its plan to grow its sales by another \$0.5 billion? Does it still require \$52.7 million of fresh working capital? No, with the improved working capital management, not anymore. Instead, \$7.7 million of fresh working capital is all it needs to generate additional \$0.5 billion of sales! In other words, to achieve \$7.49 billion of sales (\$6.99 billion plus \$0.5 billion), Company B now only needs to borrow \$115.7 million of working capital loan in total from banks. Compared to initial \$738 million of working capital loan in the past, it represents a significant reduction of 84% by shortening its CCC from 50.98 to 4.82 days.

12.3 MAKING E-COMMERCE WORK FINANCIALLY

Every company should be very concerned about the long term risks such as over leveraging because any unfavorable turn in the interest rate environment can increase its financial risk. Making adjustments to the company DSO, DPO and DIO can reduce the cash conversion cycle and free up significant amounts of capital – cash that doesn't have to be borrowed from the bank.

Companies that use e-commerce to sell online tend to have an advantage in order-to-cash compared with those that do not. As goods are immediately converted into cash, these companies tend to achieve a low DSO as well. On the procure-to-pay process, online companies that order from suppliers only after receiving orders from their customers tend to achieve efficiency in its inventory management thus a low DIO.

Beyond pursuing revenue enhancement and cost reduction, optimizing cash flow should be the priority of every business. But is e-commerce the *only* answer to brick and mortar companies seeking to optimize their cash flow? Clearly we are not suggesting so, as the DNA of every company varies from one to other. This paper, limited in its scope, is to give a conceptual idea to readers that e-commerce does have a clear advantage on cash flow compared to the traditional brick and mortar companies. From the example in Box 1, it was clear that Company A achieved a negative CCC not because of its superiority in accelerating its sales payment, but because it was able to work with its suppliers for a longer payment term as well as its efficient inventory management.

Are there any brick and mortar companies that have achieved *negative* CCC? Yes, most definitely. Some of the best of class global supply chain leaders such as Apple³⁶, Inditex³⁷, and Procter & Gamble³⁸ just to name a few, clearly have comparable *negative* CCC. Although desirable, not many companies can realistically achieve a *negative* CCC. Neither does that necessarily mean they are subpar relative to their peers. Some super-efficient retailers such as Walmart is able to bring its CCC down to single digit which is already very impressive³⁹! Regardless of which industry the companies are in, as long as the companies continuously strive a shorter CCC than its peers, these companies have already clearly established an edge over the rest.

³⁶ GuruFocus, Apple Inc (NAS:AAPL), Cash Conversion Cycle (CCC), As of Jun 2016, CCC is -59.10 days (DSO 25.23, DIO 7.15, DPO 91.48), available in www.gurufocus.com

³⁷ Bloomberg, FY 2015 01/31/2015, CCC is -34.16

³⁸ GuruFocus, Procter & Gamble, As of Mar 2016, CCC is -5.16 days (DSO 26.59, DIO, 58.12, DPO 89.87), available in www.gurufocus.com

³⁹ GuruFocus, Walmart, As of July 2016, CCC is 8.14 days (DSO 3.98, DIO 44.85, DPO 40.69), available in www.gurufocus.com

SUMMARY & KEY TAKE-AWAYS

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.

Technology Solutions for E-Commerce:

- Technology for planning and orchestration (such as control tower and integrated e-commerce ecosystem)
- Technology for transportation management system
- Technology for Warehouse Management System

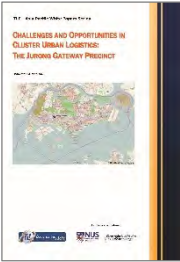
An **open standard** to facilitate information exchange would enable real-time visibility and tracking across the entire set of activities to conduct business seamlessly with different stakeholders.

The **Cash Conversion Cycle (CCC)** measures how quickly the company can turn its cash on hand, into inventory and payables, then to sales and receivables and then back to cash available for new investments.

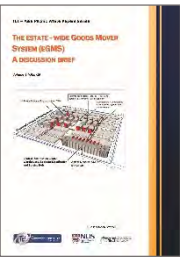
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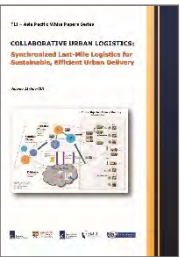
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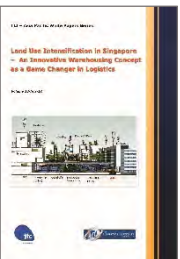
Challenges and Opportunities in Cluster Urban Logistics: The Jurong Gateway Precinct (Volume 14-Nov-CUL)



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