

# **E-Commerce Revolution Report**

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**Exploring the New Age in Air Logistics**



# E-Commerce Revolution Report

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PRESENTED BY



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## 1. Executive Summary

E-commerce is here, changing the way consumers buy and disrupting traditional brick-and-mortar retail and logistics. Although this report is entitled E-commerce Revolution Report, the “revolution” is actually the culmination of years of evolution in logistics and retail that have interacted in complex ways to (nearly) enable global direct producer to consumer commerce. And it was Amazon’s inauguration of its own-controlled air network in spring 2016 that served as a wakeup call to participants in air cargo that a reckoning is at hand for business as usual.

E-commerce is a worldwide, yet not quite routinely cross-border, phenomenon. Amazon is the best-known player in the United States, hosting the pre-eminent Internet marketplace platform for consumers and merchants to meet, as well as for retailing myriad brand-name products, and increasingly, its own private branded items. Alibaba Group has adapted Amazon’s marketplace and logistics management strategies to the China market it dominates, but the company has satisfied itself so far with providing platforms instead of retailing on its own account and has not sought the same absolute control over every link of the supply chain as has Amazon.

There are also a number of other marketplace platforms throughout the world, including Walmart.com (U.S. and international) and JD.com (China and expanding into other markets). Brick-and-mortar retailers and e-tailers may maintain their own electronic storefronts and presences on marketplace platforms depending on the market.

This report is meant to serve as an overview of e-commerce, its current effects on logistics, and possible future developments; therefore, it concentrates on tangible goods, leaving aside e-commerce markets in areas such as media (e.g., iTunes) and services (e.g., Uber). The report concentrates on Amazon because of its stature in markets all over the world (although it is weak in China) and because of its recent innovative step into controlling its own virtual cargo airline network.

The report concludes by exhorting the logistics industry, and air cargo industry participants in particular, to pay attention to the changes created by e-commerce and to be flexible and innovative in response.

Some of the important topics discussed in this report are:

- *Developments in transportation, communications, and data processing have been crucial enabling technologies for e-commerce; however, without government infrastructure investment and the relaxation of government regulation, e-commerce could not exist in its current form*

- *The world is moving from a largely domestic producer-wholesaler-retailer-consumer logistics system to a global producer-direct to consumer system*
- *Successful brick-and-mortar retailers will have to adopt omni-channel strategies to leverage their physical presences online*
- *Amazon is building its own 40-unit 767 freighter U.S. domestic air freight network using two ACMI carriers, ATSG and Atlas Air Worldwide, in which Amazon has taken equity stakes.*
- *In China, Alibaba dominates e-commerce and although it does not have an own-controlled air network, it owns almost half of open logistics platform Cainiao and has invested in China-based integrator YTO Express*
- *E-commerce is also growing rapidly in India and other countries*
- *The next frontier is cross-border e-commerce allowing global buying and selling*
- *Although e-commerce is disrupting retailing and air and surface logistics, there are opportunities for the creative and agile*

New for the *E-commerce Revolution Report* this year is a web-based companion database tool for exploring relationships between major e-commerce and logistics industry players.

## 2. E-commerce Introduction: Market Size and Players

### 2.1 Glossary

This section provides a list of selected terms used in this report and elsewhere in discussing e-commerce.

- *B2B – Business-to-Business – intermediate and capital goods for production*
- *B2C – Business-to-Consumer – final goods for consumption.*
- *Brick-and-Mortar – retail conducted at a physical (as opposed to electronic virtual) store*
- *E-tailer – a retailer selling goods via electronic transactions on the Internet.*

- *Facilitation – payments, customs*
- *Fulfillment – receiving, warehousing, shipping, returns*
- *Marketplace – online platform providing catalog, ordering, transaction processing; may offer logistics management to sellers.*
- *GMV – Gross Market Value – retail value of transactions on a Marketplace platform. The Marketplace owner collects a commission from the Seller and may also charge the Seller various ancillary fees for product positioning, etc.*
- *O2O – Online-to-Offline – system combining Online and Offline elements to influence consumer purchase or acceptance of goods at brick-and-mortar store locations*
- *Omni-channel – retailer with integrated brick-and-mortar and online logistics.*
- *Marketplace revenue – commission and fees on Sellers, plus revenue from products sold by the Marketplace owner as a Seller*
- *Seller – retailer of goods on a Marketplace. The owner of the Marketplace may or may not also be a Seller.*

## 2.2 Market Size and Players

There are two major forms of e-commerce, Business-to-Business (B2B) and Business-to-Consumer (B2C). The \$8 trillion B2B market in the United States is about 60% larger than the \$5 trillion B2C market, and although e-commerce penetration in B2B in the U.S. is larger than B2C, e-commerce has been far more transformative to B2C retail and logistics than to B2B logistics. This is possibly because much of what is considered “e-commerce” in the B2B world still consists of fairly primitive legacy web portals, as opposed to the revolutionary marketplaces that dominate the B2C retail world.

E-commerce today allows nearly any consumer anywhere with a credit card (or electronic payment method) to buy a product from any online seller in the world (COD is still the primary method of payment in many developing countries). In this report, we will focus on the high volume B2C e-commerce revolution and its effect on air freight. Figure 1 (next page) highlights the major differences between B2C and B2B e-commerce.

**Figure 1** *Differences between B2C and B2B E-commerce*

|                                | B2C           | B2B            |
|--------------------------------|---------------|----------------|
| Number of Customers            | Millions      | Thousands      |
| Geographical Density           | Low           | High           |
| Shipment Unit                  | Package       | Pallet         |
| Value/Weight Ratio             | High          | Low            |
| Delivery Frequency             | On-demand     | Scheduled      |
| Delivery Speed                 | ASAP          | Predictable    |
| Shipper-Consignee Relationship | Transactional | Contractual    |
| Payment                        | Credit card   | Purchase order |

Source: ACMG

October 2017

There are several major roles a company can play in e-commerce (Figure 2, below). Some companies are “pure plays” competing only in one facet of e-commerce, while others straddle multiple roles.

**Figure 2** *E-commerce Roles*

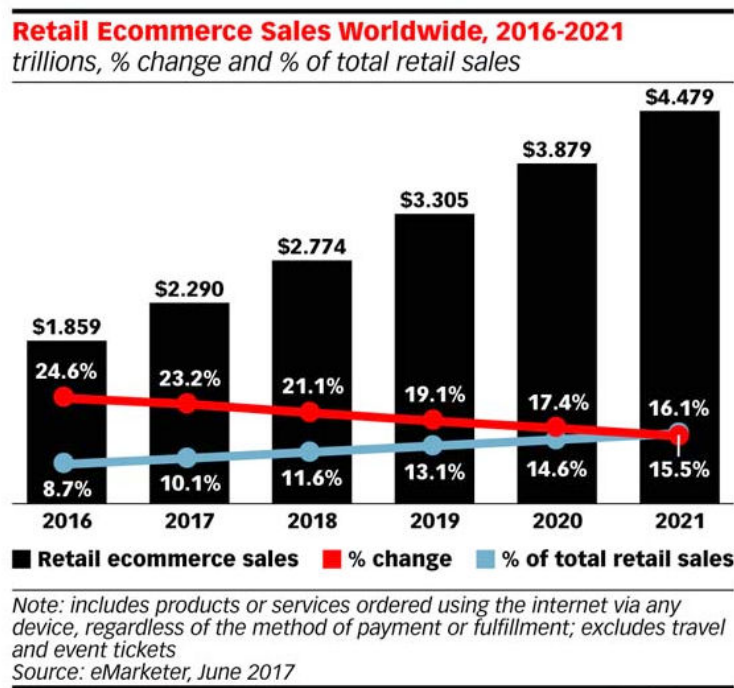
- *E-tailing* – a retailer selling goods via electronic transactions on the Internet
- *Facilitation* – payments, customs
- *Fulfillment* – receiving, warehousing, shipping, returns
- *Marketplace* – online platform providing catalog, ordering, transaction processing; may offer logistics management to sellers
- *Omni-channel* – retailer with integrated brick-and-mortar and online logistics

Source: ACMG

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Global e-commerce is forecast to more than double between 2016 and 2021, increasing from \$1.9 trillion to \$4.5 trillion according to *eMarketer* (Figure 3, next page).

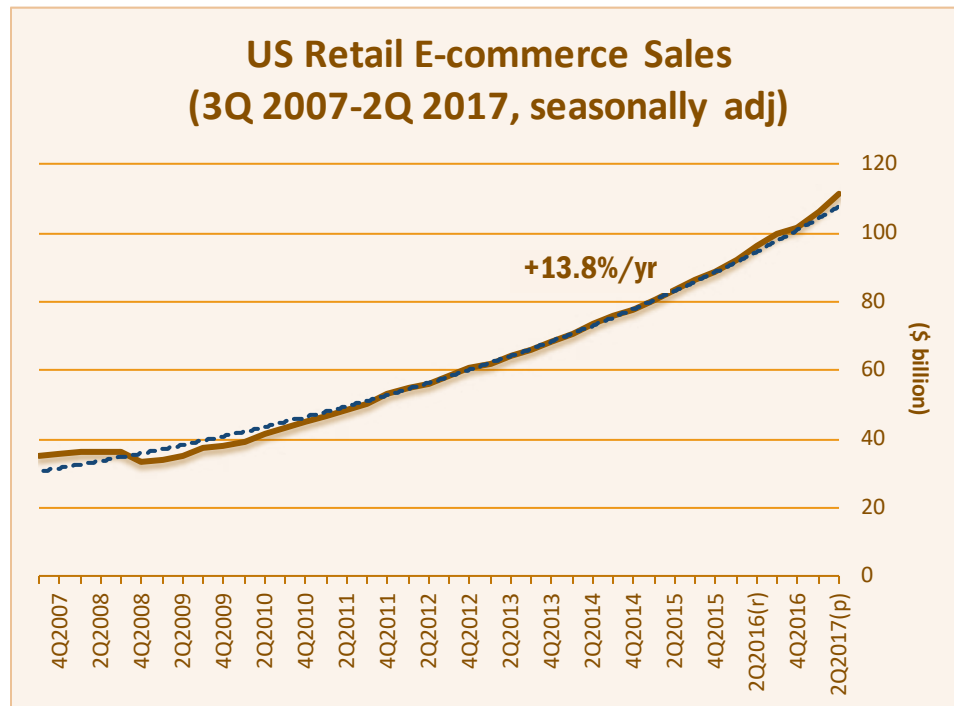
**Figure 3 Global Growth of Retail E-commerce Sales (2016–2021)**



In the United States, online shopping grew 15.6% in 2016, about the same rate as in 2015, but despite this fast growth, web-based purchases were still only 11.7% of total U.S. retail sales, so the trend of shifting retail sales to digital channels from brick-and-mortar stores has plenty of room to run yet.

Figure 4 (next page) shows that U.S. retail e-commerce grew at an average rate of over 13%/year from 2007, despite a dip lasting from 3Q 2008 to 3Q2009 of about 2% during the Great Recession and its immediate aftermath. B2C e-commerce quarterly sales reached more than \$100 billion for the first time in 3Q2016. From 2007 to 2016, Amazon’s sales increased by a factor of nine, from \$15 billion to \$136 billion.

**Figure 4** U.S. Retail E-commerce is Growing over 13% per year

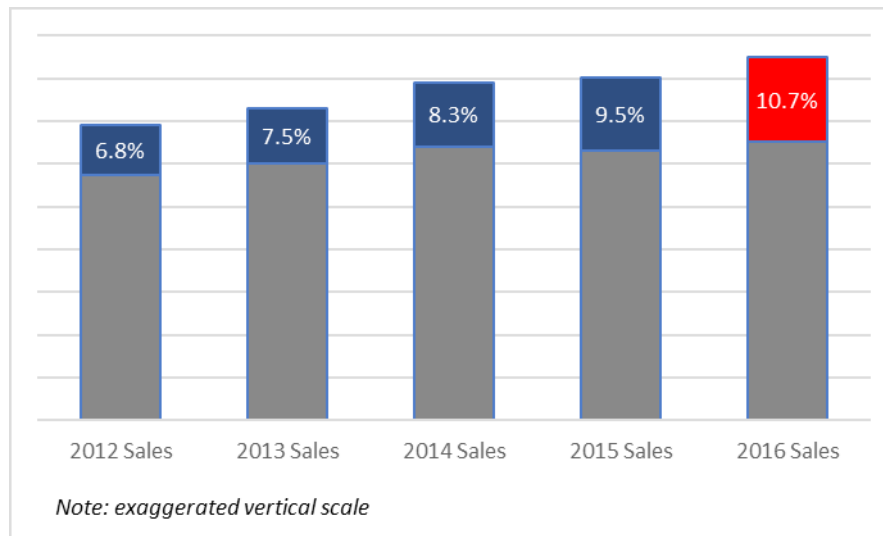


Source: U.S. Census Bureau

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With e-commerce growing at a double-digit annual percentage rate, while overall retail trade is growing at only 3.8% (3Q16-2Q17), it is no surprise that e-commerce is increasing its share of retail sales. U.S. e-commerce sales increased 70% during the 2012-2016 period from \$230 billion to \$390 billion, while the e-commerce share of total U.S. retail sales increased nearly three percentage points, to 8.0%. The U.S. Department of Commerce definition of retail sales, however, includes automobiles and fuel, goods not typically purchased over the Internet. Figure 5 (next page) shows the change in e-commerce penetration ratio after removing these items from the total. (Note: to readers of ACMG's 2016 *E-commerce Report*, the methodology used here gives an e-commerce penetration ratio about one percentage point lower last year's.)

**Figure 5 E-commerce Share of Total U.S. Retail Sales (excl. Autos and Fuel)**



Source: U.S. Census Bureau

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The dominant global players in B2C are Amazon (U.S. and Europe) and Alibaba (China). The largest e-tailers in the world are shown in Figure 6 (below). The United States dominates with five companies in the top ten. China is next, with three (up from two in 2014), but these are the three fastest growing companies on the list. Number one, Amazon is larger than the next four added together. Alibaba does not appear, as it is primarily a Marketplace platform, not an e-tailer. The fastest growing e-tailers are shown in Figure 7 (next page).

**Figure 6 Largest E-tailers in the World**

| Rank | Company             | Country | E-commerce                      |                  |                       |
|------|---------------------|---------|---------------------------------|------------------|-----------------------|
|      |                     |         | Retail Sales (2015, \$ million) | of Total Revenue | Growth (2011-15 CAGR) |
| 1    | Amazon              | USA     | 79,268                          | 100%             | 17.2%                 |
| 2    | JD.com              | China   | 26,991                          | 100%             | 68.3%                 |
| 3    | Apple               | USA     | 24,368                          | 47%              | 26.9%                 |
| 4    | Walmart             | USA     | 13,700                          | 3%               | 21.0%                 |
| 5    | Suning              | China   | 8,095                           | 37%              | 70.9%                 |
| 6    | Otto                | Germany | 7,181                           | 68%              | 5.1%                  |
| 7    | Tesco               | UK      | 6,539                           | 8%               | 12.9%                 |
| 8    | Vipshop Holdings    | China   | 6,084                           | 100%             | 127.7%                |
| 9    | Liberty Interactive | USA     | 5,146                           | 52%              | 7.1%                  |
| 10   | Macy's              | USA     | 4,850                           | 18%              | n/a                   |

Note: Alibaba is primarily a Marketplace platform, not an e-tailer

Source: Deloitte

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**Figure 7** *Fastest Growing E-tailers in the World*

| E-tail<br>Growth<br>Rank | E-tail<br>Size<br>Rank | Company        | Country     | FY11-15<br>Growth<br>(CAGR) |
|--------------------------|------------------------|----------------|-------------|-----------------------------|
| 1                        | 8                      | Vipshop        | China       | 128%                        |
| 2                        | 32                     | Wayfair        | USA         | 80%                         |
| 3                        | 5                      | Suning         | China       | 71%                         |
| 4                        | 2                      | JD.com         | China       | 68%                         |
| 5<br>tie                 | 15                     | Zalando        | Germany     | 55%                         |
| 5                        | 22                     | E. Leclerc     | France      | 55%                         |
| 7                        | 30                     | Metro          | Germany     | 49%                         |
| 8                        | 35                     | Nike           | USA         | 46%                         |
| 9                        | 11                     | Home Depot     | USA         | 38%                         |
| 10                       | 36                     | Ahold Dalhaize | Netherlands | 38%                         |

*Source: Deloitte**October 2017*

Of the fastest growing e-tailers in the world, three of the top four are China-based. It is easier to grow quickly in the beginning on a small base, but not only are these three companies among the fastest growing, all are ranked in the top ten in size, too. This year, U.S.-based Wayfair, which specializes in furniture and other products for the home, came out of nowhere to occupy the number two slot. In last year's report, no U.S. company placed higher than eighth in the ranking.

The largest in the United States are shown in Figure 8 (next page), while selected leading e-commerce marketplaces are listed in Figure 9 (next page). There are additional marketplaces (not shown) that specialize in various types of products, such as Etsy, for handmade items.

**Figure 8**    *Largest E-tailers in the United States*

| Rank | Company             | E-commerce Sales   |                  |
|------|---------------------|--------------------|------------------|
|      |                     | (2016, \$ billion) | of Total Revenue |
| 1    | Amazon              | 94.7               | 69.6% *          |
| 2    | Apple               | 16.8               | 7.7%             |
| 3    | Walmart             | 14.4               | 3.0%             |
| 4    | Macy's              | 4.6                | 17.9%            |
| 5    | Costco              | 4.2                | 3.5%             |
| 6    | QVC (excl. Zulilly) | 4.0                | 46.6%            |
| 7    | Nordstrom           | 3.2                | 21.8%            |
| 8    | Target              | 3.1                | 4.4%             |
| 9    | Kohl's              | 2.9                | 15.4%            |
| 10   | Gap                 | 2.5                | 16.3%            |

\* excludes cloud-based services

Source: eMarketer, WWD

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**Figure 9**    *Leading Marketplaces*

| B2C   |
|---|
| <ul style="list-style-type: none"> <li>- Amazon (U.S. and global)</li> <li>- Tmall (China) - owned by Alibaba</li> <li>- JD.com (China)</li> <li>- eBay (U.S.)</li> <li>- Flipkart (India)</li> <li>- MercadoLibre (Latin America)</li> <li>- Rakuten (Japan)</li> <li>- Tesco (UK)</li> <li>- Zalando (Germany)</li> <li>- Cdiscount (France)</li> </ul> |
| C2C   |
| <ul style="list-style-type: none"> <li>- Taobao (China) - owned by Alibaba</li> <li>- eBay (global)</li> </ul>  |

Source: ACMG

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Amazon, which tops the lists in both Figures 8 and 9, has developed in 23 years from online bookseller to nearly indispensable marketplace platform on which millions of buyers can select from as many as 480 million products and variants (e.g., size, color) when the hundreds of thousands of Amazon Marketplace vendors are included.

In the U.S. domestic market, Amazon sells more on-line than the combined total of the e-commerce sales of the rest of the top 50. Amazon has created an evolving ecosystem increasingly judged by consumers to be cheaper and more convenient than traditional brick-and-mortar retailing. And, as Amazon has disrupted the retail industry, it has also built its own national logistics network, one of the latest features of which is the investment in its own-controlled air network operated by ACMI specialists ATSG and Atlas Air Worldwide Holdings. See Section 5.2 (page 16).

Alibaba is the world's largest e-commerce company with a Gross Merchandise Value (GMV) of \$560 billion, more than Amazon (estd. \$250 billion) and eBay (\$84 billion) combined. By comparison, Alibaba's Chinese retail revenue is tiny—only \$17 billion compared to Amazon's \$136 billion. This is because Alibaba is a “pure play” Marketplace, unlike Amazon, which also sells its own merchandize.

After conquering the China market, Alibaba's strategic goal is “Global buy, global sell”, to move any order from seller to buyer worldwide in three days or less. See Section 5.1 (page 15).

### 3. History

E-commerce is the latest iteration of direct-to-consumer sales, the aim of which is to cut out the middleman between buyer and seller. Direct-to-consumer sales in the United States is not a particularly new concept; Benjamin Franklin was a primitive forerunner of Amazon, publishing a catalog offering scientific and academic books in 1744. However, on a truly national scale, Aaron Montgomery Ward is credited with recognizing the direct-to-consumer retail potential of the early national railroad network and creating the American catalog mail order department store in 1872. Within twenty years the Montgomery Ward catalog grew from a single sheet to a 540-page book offering over 20,000 items. Between 1908 and 1940, archrival Sears, Roebuck and Co. even sold mail order houses.

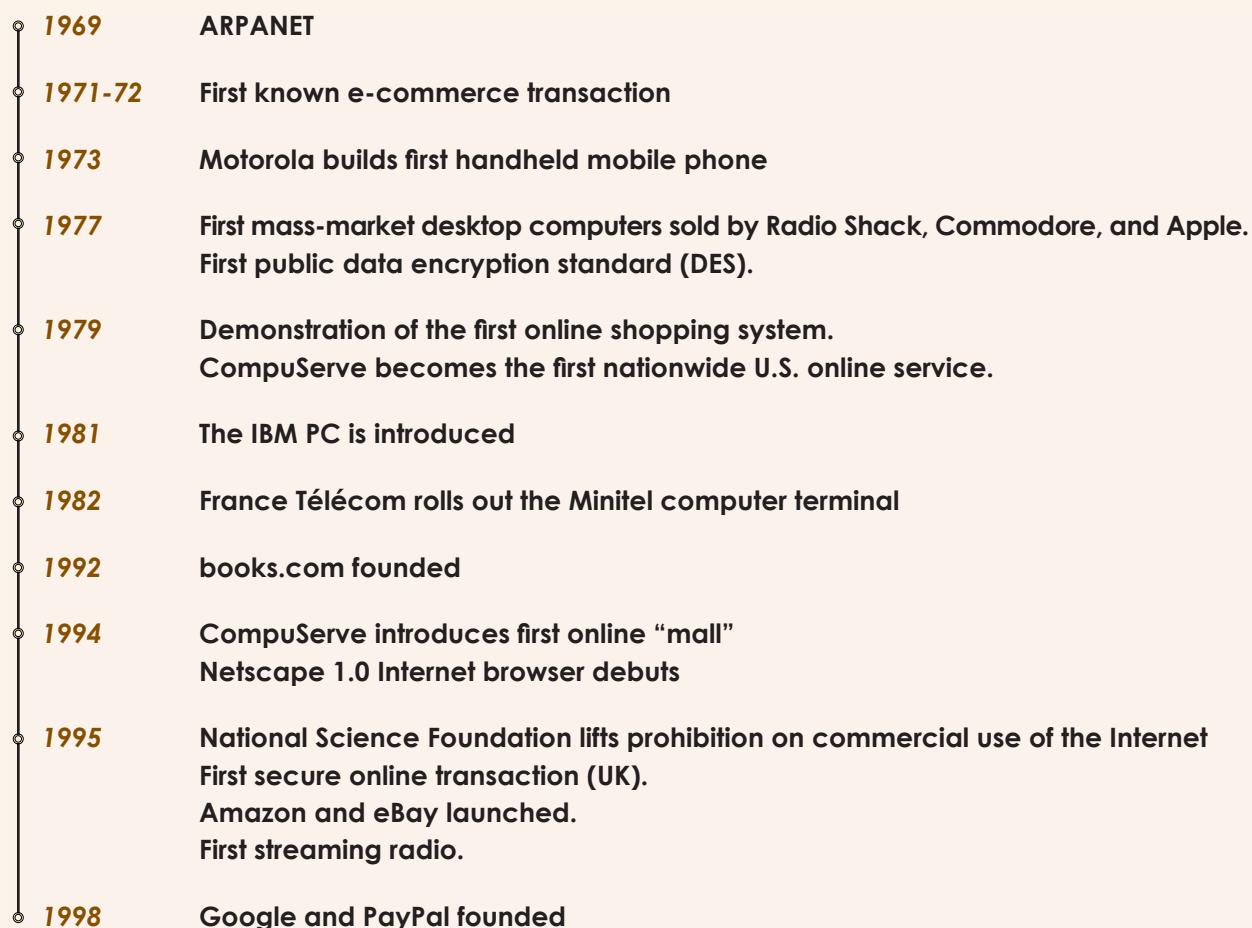
E-commerce is supported by the confluence of multiple technologies that emerged from the electronic communications and computer revolutions in the 1960s and which had laid the foundations of the Internet by 1969. Not long after, in 1971, Fred Smith founded Federal Express (now FedEx) with the goal of offering nationwide door-to-door delivery of documents and small packages, sparking the express revolution, since which logistics has never been the same.

The first e-commerce transaction is nearly as old as ARPANET, the U.S. Defense Department-developed network created in 1969 that spawned the technologies that form the Internet as we know it today. In 1971 or 1972, an online sale of marijuana was transacted between students at the Stanford University Artificial Intelligence Laboratory and students at MIT.

E-commerce requires efficient and nimble logistics and communications networks. During most of the 20th Century, all forms of transportation in the United States were heavily regulated by federal and state governments, and switched network voice telephony was monopolized by AT&T. By the end of World War I, the U.S. Postal Service's Parcel Post and American Railway Express (later Railway Express Agency) held a near duopoly on domestic package delivery. It took United Parcel Service (UPS) until 1959, 52 years after its founding, to extend its common motor carrier network across the entire country.

The greatest hurdle to forming the world's first express airline however was regulatory—licensing, routes, and fares of interstate air carriers, both passenger and cargo, were controlled by the powerful Civil Aeronautics Board. Fred Smith spearheaded the abolishment of the CAB by the Airline Deregulation Act of 1978, and air cargo was unshackled first. Shortly thereafter, in 1980, the Motor Carrier Act similarly freed trucking from government controls on capacity and tariffs. The final regulatory act paving the way to e-commerce was the judicially mandated breakup of AT&T's national telecommunications monopoly in January 1982 after fifteen years of administrative and court battles.

A brief timeline of major e-commerce developments is provided in Figure 10 (next page).

**Figure 10** *A Timeline of E-commerce Developments*

|         |   |
|---------|---|
| 1969    | ARPANET   |
| 1971-72 | First known e-commerce transaction  |
| 1973    | Motorola builds first handheld mobile phone   |
| 1977    | First mass-market desktop computers sold by Radio Shack, Commodore, and Apple.<br>First public data encryption standard (DES).  |
| 1979    | Demonstration of the first online shopping system.<br>CompuServe becomes the first nationwide U.S. online service.  |
| 1981    | The IBM PC is introduced  |
| 1982    | France Télécom rolls out the Minitel computer terminal  |
| 1992    | books.com founded   |
| 1994    | CompuServe introduces first online “mall”<br>Netscape 1.0 Internet browser debuts   |
| 1995    | National Science Foundation lifts prohibition on commercial use of the Internet<br>First secure online transaction (UK).<br>Amazon and eBay launched.<br>First streaming radio. |
| 1998    | Google and PayPal founded   |

Source: ACMG

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In the dot.com technology startup boom from 1997 to 2000, e-commerce companies thrived, many attracting high stock valuations on nothing but revenue growth, without any prospects of near-term profitability. However, in the 2001 dot.com bust, many of these companies went bankrupt.

Amazon, despite not turning an annual profit until 2003, survived, and by 2016, Amazon sold 50% of books printed by the major publishers and, in the United States, sold almost three quarters of all e-books. But the most important statistics measure Amazon’s seeming never ending market share growth—in 2016, Amazon accounted for more than half of all e-commerce growth in the United States. In 2015, a study by Survata found that 44% of respondents searching online for products went directly to Amazon.com—a year later, that proportion had increased to 55%. Wall Street firm Needham forecasts that half of all U.S. e-commerce sales will pass through Amazon by 2021.

The prerequisites for today's large-scale e-commerce are:

- *Ubiquitous electronic communications network: Internet and mobile phones*
- *Universal express delivery networks: FedEx, UPS, DHL, and the developing home-grown express networks in China*
- *Simple, secure, payment method: credit cards, PayPal, Alipay*
- *Sophisticated international supply chain management, both forward, for delivery to the consumer, and reverse for returns to the seller*
- *Trust facilitation – Platform seller ratings systems, such as those built into Amazon's and eBay's platforms*
- *Large middle-class population*

Note that the above has brought the developed and developing nations and trade blocs (e.g., the EU) only as far as “national” B2C e-commerce—truly global cross-border B2C trade still requires speedier customs facilitation, foreign currency transaction infrastructure and uniform enforcement of intellectual property rights. Moreover, smarter, more robust multi-lingual search, trust and reputation platforms will be required if global small businesses are to succeed in reaching customers worldwide.

## 4. Evolution of Distribution and E-commerce Logistics

A major change in logistics with the rise of global marketplace platforms is the detailed view of the entire logistics chain that big data provides. Previously forwarders and integrators had some of this data, but with the marketplaces' access to both shipper and consumer behavior, players like Amazon are able to predict product demand geographically and optimize the logistics chain across a combination of shipping modes. Although sellers have the option to fulfill their own orders directly to the customer, other options are available, such as shipping to an Amazon Fulfillment Center (Fulfillment by Amazon). Increasingly, integrators and others are also creating fulfillment services for small and medium-size e-tailers.

Air logistics is the focus of this report, but consumer demand for “free” shipping places severe cost pressure on shippers and Marketplace logistics systems to minimize the use of relatively expensive air whenever possible. If inventory of the most commonly ordered items is staged forward, as close to the customer as

possible, “two-day” ground shipping is often sufficient. The shipper may use an integrator, such as UPS, with its extensive UPS Ground system, the national post office, or independent contract trucking firms. Whatever combination of modes is used, the last mile may still be the most expensive link in the process and is being actively attacked by all players.

Traditional brick-and-mortar retailers, with legacy processes and IT are under pressure from e-commerce. In response, many have cut the number of their store locations and reduced service drastically, leading to a death-spiral, where remaining brick-and-mortar customers increasingly defect for convenience and service online. Retailers have not stood still, and most have responded with their own attempts at providing online shopping, with various levels of success. At first, web sales operations were “bolted” onto the retail supply chain and operated in their own silos with little coordination with the brick-and-mortar side of the business. This often led to poor service and limited the ability of retailers to leverage their physical presence in the fight against Internet-only retailers.

“Omni-channel” aims to break down the wall between the web and brick-and-mortar retailing, integrating both the logistics chain and customer experience across the retail enterprise. Ironically, some online retailers are beginning to see the strategic advantage in supplementing their existing businesses with a brick-and-mortar presence. Amazon, after being singled out as the chief cause of the demise of mega-bookstore Borders, is now itself experimenting with brick-and-mortar bookstores, and surprisingly, not just as an outlet for its Kindle electronic readers and virtual book inventory, but also as a place where customers can touch and feel actual physical paper books. And, in its most recent disruptive action, in August 2017, Amazon became the owner of Whole Foods Market for which it paid \$13.7 billion, giving it more than 450 brick-and-mortar locations in affluent neighborhoods all over the United States, and what was Amazon’s first action upon assuming control? Cutting prices by up to 43%.

The world’s leading brick-and-mortar retailer, Walmart, which is also the second largest e-commerce destination in the U.S., is striking back. It bought Jet.com last year to grow its online marketplace—not just to sell its own products. The effect has been to boost Walmart’s e-commerce business 69% in the last year. Walmart plans to use its ubiquitous presence on the ground in the United States and Mexico to provide rapid in-store delivery of products ordered on its website. Jet.com, still with its own separate brand identity, also brings a core customer base of urban millennials who shun the Walmart brand.

## 5. Profiles of Selected E-commerce Companies

Now we will examine in more depth some of the major e-commerce players.

## 5.1 Alibaba

Jack Ma, a former English teacher, founded Alibaba in 1999 in Hangzhou, China as a global wholesale marketplace. The company now has the largest e-commerce ecosystem in the world and has diversified into cloud computing, finance, media and more.

As Alibaba grew, by December 2001, Alibaba.com had 1 million registered users. In May 2003, online shopping site Taobao Marketplace was founded. Yahoo! made one of most lucrative bets of all time, when it bought a 40% share of Alibaba in 2005 for \$1 billion. Taobao Mall (Tmall) was created in 2008 as the B2C retail companion to Taobao. In 2009, the company established Alibaba Cloud. The company's cross-border platform, AliExpress, was launched in 2010 along with Alibaba's first Taobao mobile app. Frustrated by the state of the logistics infrastructure in China, Alibaba formed the Cainiao Network platform in cooperation with a consortium of logistics companies. In September 2014, Alibaba reaped a record \$25 billion when it listed on the NY Stock Exchange. Soon thereafter, the company launched an over \$1 billion five-year campaign to revolutionize rural China logistics. Alibaba forged a major partnership with Suning, the largest appliance and electronics retailer in China in August 2015. In its FY2016 (ended 31 March 2016), Alibaba reached 3 trillion RMB (\$466 billion) in GMV. In April 2016, the company acquired Singapore-based Lazada, one of the leading marketplace platforms in Southeast Asia. And finally, in its latest fiscal year, 2017, the Alibaba Group boasted \$23.0 billion in consolidated revenue and \$6.98 billion in profit, for an operating margin of 30%.

### Group subsidiaries

- *Alibaba/AliExpress (B2B marketplace)*
- *Taobao (B2C/C2C marketplace)*
- *Tmall (global brand portal)*
- *Cloud Computing Services*

**Cainiao (JV logistics platform, 43% Alibaba share)**

- 15 strategic partners
- 7 regional China hubs, 4 million+ m<sup>2</sup> warehouse space
- 60+ cross-border partners, 100+ overseas warehouses
- 20-30 million packages/day (handles 81% of all items sold on Alibaba sites)
- Capacity goal 100 million pkgs/day anywhere in China in 24 hours

## 5.2 Amazon

Amazon was founded in 1994 as Cadabra, an online bookseller. Seven years later, in 4Q2001, it reported its first quarterly profit. In 2016 the company moved about \$250 billion of gross merchandise value (GMV) through its marketplace (Amazon does not disclose its GMV) and had sales of \$136 billion; however, stockholders see an operating margin of just over 3%, a net margin of 1.7% and a 2.8% return on assets (two-thirds the retail trade industry average). This is possible because the company's visionary founder Jeff Bezos still controls almost 20% of outstanding shares and reinvests relentlessly, prioritizing growth over profit. Financial fundamentals aside, in 2015, Amazon surpassed in stock market capitalization Walmart, the largest brick-and-mortar retailer in the world with 3.5 times Amazon's revenue. Amazon has 341,000 employees, not counting seasonal employees and those employed indirectly via staffing agencies; and before even completing its four-building main headquarters in its Seattle home (the company's entire Seattle headquarters complex includes 33 buildings totaling 8.1 million square feet and employs 40,000), the company is now in search of a second headquarters location in North America where it forecasts it will spend \$5 billion to build facilities for another 50,000 employees.

### Amazon Facts:

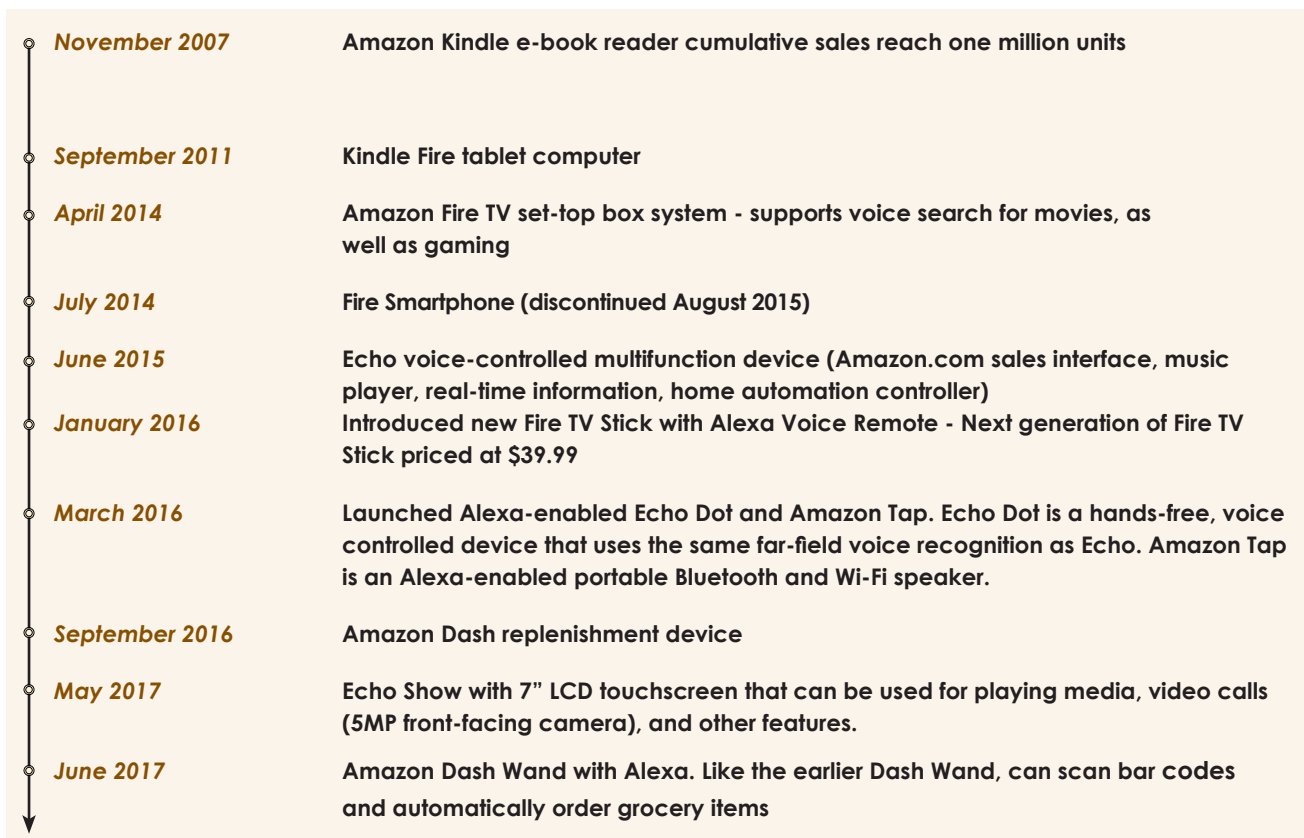
- Dominant global player in B2C outside of China
- More than 12 million unique products (excluding books) sold by Amazon itself
- 480 million products and variants (e.g., size, color), when the more than 200,000 Amazon Marketplace vendors are included

The Amazon web portal is much more than an e-commerce website with an electronic shopping cart—it is the front end of a vast consumer behavior database and state-of-the-art logistics system connecting sellers, buyers, warehousing and transportation. As of 2005, Amazon had the world's three largest Linux computer databases. Amazon's technology architecture handles millions of back-end

operations every day, as well as queries from third-party sellers. Credit card details are stored in a separate database. Amazon collects “big data” on customer buying behavior to steer customers to specific items based upon past purchases and browsing.

Amazon also manufactures devices (Figure 11, below) aimed at consumers while mobile (Kindle), or at home in the living room (Fire, Echo, Echo Show), or pantry (Dash Buttons and Dash Wand), and now your bedroom closet (Echo Look)—all to increase delivery density and to reinforce a consumer psychology of immediate gratification for discretionary purchases and automatic, subscription-based resupply of essentials. Amazon seeks to know everything about your purchasing behavior and will soon tell you what you want before you know it yourself.

**Figure 11** *Selected Amazon Consumer Electronics*



Amazon’s goal is to become a top-five grocery retailer by 2025, and one of its means to get there is AmazonFresh, a same-day home grocery delivery service first trialed in 2007 and currently available in an ever-growing number of U.S. metropolitan areas and in London, Tokyo and Berlin. Customers in Seattle can also collect their purchases at two drive-up locations, and Whole Foods will, undoubtedly, become yet another AmazonFresh logistics and marketing channel. Amazon Prime Pantry is a similar service covering the 48 contiguous United

States, allowing the order of up to 45 pounds (dim-weighted) of dry goods and non-perishable groceries for a flat \$5.99 delivery fee. Amazon is also competing in the restaurant meal delivery space and in meal kits.

Amazon is also pushing deeper into B2B e-commerce, which one analyst estimates could add \$18 billion in company revenue by 2020. Amazon Business, its B2B unit, was founded in 2015 in the United States and has been expanded to Germany and the UK. It already sells a broad line of goods, such as office supplies, tools and industrial equipment, but it may be only a matter of time before Amazon Business enters specialty verticals, such as building materials, chemicals, and medical supplies. Competitors in the B2B e-commerce sector include Staples, Office Depot, Grainger and Fastenal. In its first year, Amazon Business had more than \$1 billion in sales and counted 300,000 customers, and in 2017 could surpass \$8 billion. Traditional brick-and-mortar wholesale distributors now face the same disruption affecting brick-and-mortar retail. Amazon Business is already drawing away small- and medium-size distributor customers, and in some categories over 80% of major manufacturers have extensive branded storefronts on the Amazon B2B platform.

### 5.3 eBay

eBay was founded by Pierre Omidyar in September 1995 as an online person-to-person (C2C) trading marketplace for the auction of goods and services for consumers, and is best known as an online auction house although most transactions now take place at fixed, “Buy It Now” prices. Trust between buyers and sellers is measured with an online ratings system, but for an additional fee, eBay also offers escrowed exchanges. The company’s business model is to charge for posting on its platform, collect a percentage-of-sale commission on every transaction and (with PayPal) a fee for serving as a financial intermediary.

- *When an item is listed on eBay a small, \$0.30 nonrefundable Insertion Fee is charged (the first 50 listings are free)*
- *A fee is also charged for additional listing options to promote the item, such as highlighted or bold listing*
- *A Final Value (final sale price) fee is charged at the end of the seller’s auction. This fee is 10% of the final sale price (up to a maximum of \$750)*

eBay notifies the buyer and seller via e-mail at the end of the auction if a bid exceeds the seller’s minimum price, and the seller and buyer finish the transaction independently of eBay. The binding contract of the auction is between the winning bidder and the seller only.

Because eBay is mostly an e-commerce platform as opposed to an online retailer, the company need not worry about inventory risk or logistics costs. This allows eBay to operate with impressive profitability: operating margin is over 25%. However, competing against Amazon has put severe pressure on eBay. The company reported a modest increase of 4.4% in sales during the second quarter of 2017, while e-commerce, as a whole, is growing at 8–12% in the United States; and costs are increasing faster than revenues. Management is expecting full-year revenue of \$9.4 billion, an annual increase of 5%.

## 5.4 JD.com

JD.com was launched by Richard Qiangdong Liu, as a B2C website in January 2004. It is the largest e-commerce company and retailer in China based on revenue. In 2016, JD generated \$37.5 billion of revenue, and its GMV was \$94.8 billion.

The company's primary subsidiaries are:

- *Jingdong Century – retail*
- *Shanghai Shengdayuan – information technology*
- *Tianjin Star East – fulfillment*
- *Jingbangda – courier services*

The group has equity interests in supply chain management, payments, finance, media, travel and other companies. The company is also connected to automobile marketing, e-commerce, and financing in China.

In May 2014, the company listed on the US NASDAQ, raising \$1.5 billion and, through a private placement, raised another \$1.3 billion.

In 2016, JD.com invested in 47% of Dada, China's largest crowdsourcing delivery company.

Also in 2016, JD entered into one of its more important strategic alliances, with Walmart, in which Walmart acquired 5% of JD's outstanding equity. In 2016, Walmart sold its e-commerce marketplace, Yihaodian, to JD.com. As of the end of 2006, Walmart held 10.1%. The two partners continue to collaborate to leverage each other's supply chains, including launching a two-hour app-based delivery service in selected cities.

JD.com's business model is much more similar to Amazon's than to Alibaba's—JD passionately seeks to control every aspect of the customer experience. In pursuit of this goal, it has built its own fulfillment infrastructure and last-mile delivery network in China. The company operates 256 warehouses with an area

of 5.6 million square meters in 54 cities, and it operates 6,906 delivery stations and pickup stations in 2,655 counties and districts across China. It employs 65,968 delivery personnel, 17,544 warehouse staff and 11,699 customer service agents. Same-day and next-day delivery is available in 1,410 counties and districts across China. Like Amazon, JD.com also is a seller on its own Marketplace platform which accommodates 120,000 third-party sellers.

In 2016, JD.com fulfilled 1.78 billion orders (1.59 billion for physical goods) for its over 200 million active customers. The company has a 33% B2C market share in China based on transaction volume.

Recently, JD has entered into agreements with more luxury Western brands. It is also leveraging blockchain technology to assure supply chain integrity of infant formula products. In the second quarter of 2017 it announced a far-reaching partnership with China Eastern Airlines and, in cooperation with Japan-based logistics company, Yamato, is building a cold chain logistics network in China.

## 5.5 Walmart

While Walmart is best known as the largest general merchandise discount brick-and-mortar retailer in the world, it is also the second largest U.S. online retailer. On walmart.com, Walmart sells a wide and growing selection of merchandise from third parties not carried in-store. Walmart.com is the third-most-visited e-commerce site in the United States (after Amazon and eBay), with 92 million unique visitors per month (Amazon.com sees 183 million per month). The site currently offers 15 million different items (about one-third more than it did in 2016). When sizes and colors are taken into account, Walmart.com offers 50 million SKUs. That compares to about 150,000 items in a typical Walmart Supercenter, and more than 300 million on Amazon. Walmart operates 22 dedicated e-commerce fulfillment centers in the United States and 15 more for its International business segment.

But as the world's largest retailer seeks to win shoppers away from Amazon.com and eBay, it is adding one million items per month to its marketplace, launched in 2009. Walmart last year finished a major overhaul of its website that will allow it to handle more variety, provide more information on each item and better support third-party sellers.

The \$3.3 billion acquisition of jet.com in 2016 helped lift Walmart's e-commerce sales almost two-thirds in the first quarter of 2017. The company has also been buying up small e-commerce-related companies to boost innovation.

Walmart of being forced to offer free shipping on two million of its most popular products in January 2017 to compete with Amazon Prime. Unfortunately, the retailer's footprint advantage over rivals is greatest in smaller cities and rural regions, not with affluent urban consumers more likely to do their discount shopping at Costco. Retail market analysts believe that Walmart has a lot of catching up to do even if Walmart's marketplace does not necessarily have to match the variety of Amazon's marketplace.

Walmart is also pursuing initiatives such as partnering with Google in the United States to offer voice ordering via the Google Home smart speaker to take on Amazon's expanding array of speech-enabled Echo products. Walmart has also teamed with JD.com in the fast-growing China retail market (Walmart owns more than 10% of the China-based e-commerce company). Since teaming with JD, Walmart has launched five online stores on JD platforms. In China, 134 Walmart stores across 18 cities offer one-hour delivery using the JD Daojia platform.

While marketplace margins are tempting, success is far from guaranteed. Best Buy closed down its marketplace business after five years, and Target is focused solely on its own e-commerce business. Walmart (and its investors) obviously would prefer to be more like Amazon than Best Buy.

## 5.6 Others

In this section we provide short overviews of other large e-commerce players.

**Apple**, most famous for the iPhone, is the third largest e-commerce company in the world with 2015 estimated e-commerce revenue of \$24.4 billion. However important the introduction of each new generation of iPhone for the air freight industry, for the purposes of this report, Apple is not a major force, since Apple's e-commerce business is centered on its iTunes platform, where it sells intangible downloadable and streaming media.

**Suning**, China's second largest e-commerce company by sales (not GMV). It is an omni-channel retailer of home appliances, electronics and streaming media with more than 1,600 stores in 700 cities in China. In June 2016, the company issued 1.86 billion new shares to Taobao Software, a subsidiary of Alibaba, for 28 billion RMB (\$4.3 billion). The company in 2017 reports *triple-digit* percentage gains in e-commerce volume.

**Otto**, the sixth largest e-commerce company in the world by e-commerce revenue is a private Germany-based e-commerce company that also happens to own the U.S.-based retailer Crate & Barrel. It operates in twenty countries and is

rapidly expanding into services; however, it has had the slowest e-commerce revenue growth of any of the top ten e-commerce companies.

**Tesco**, one of the ten largest retailers in the world. Although pursuing an omni-channel strategy and being the first company in the world to offer online shopping, as far back as 1984, it still derives 92% of its total revenue from its brick-and-mortar retail businesses, ubiquitous in the UK, where it has a more than 25% of grocery sales. Tesco also operates six online grocery fulfillment centers in the UK. The company went on a geographic and market-vertical diversification spree starting in the early 2000s, with mixed success—recent years have seen spinoffs, outsourcing, and downsizing, as the company struggles to battle online rivals.

**Vipshop**, a China-based discount e-tailer, is the fastest growing company in the e-commerce top-ten and has the third largest e-commerce website in China, after Tmall and JD.com. It has a nearly 40% share of the Chinese discount market. The company went online in 2008 and was listed on the New York Stock Exchange, less than four years later, in 2012. The company has been profitable for nineteen straight quarters. VIP.com has recently expanded not only into consumer payments (“VIP Expense”) but also into supply chain financing.

## 6. Inside Amazon: Details on a Revolutionary Logistics Strategy

Amazon’s strategy is to deliver reliably both variety and low-prices nearly instantly. The company devotes relentless attention to the customer experience. In the process, Amazon has earned incredible customer loyalty which it has converted into a predictable source of cash flow through its Amazon Prime membership program. Prime offers free shipping on products ordered through the Amazon marketplace and customer perks, such as a library of free streaming movies via Prime Video, free books via Prime Reading, and streaming music at Prime Music. At every step of every purchase and during consumption of video, music, and print, Amazon collects massive amounts of customer data that can be used to predict future buying behavior and to hone the company’s growing air and ground logistics networks.

### 6.1 Amazon Prime

Amazon Prime is Amazon’s \$99 per year subscription service which offers free nationwide two-day shipping of over 40 million eligible products. In April 2017, Amazon Prime membership was estimated at 80 million by *Business Insider* (a 50% increase from our report last year), Prime customers are also eligible for Prime same-day delivery—customers in 34 cities can select from among one million items, and orders placed by noon typically will be received by 9pm, seven

days a week. Prime Now, which delivers a limited selection of products, groceries, and takeout food from local restaurants in a growing number of cities, promises deliveries within two hours (or one hour for an additional \$7.99).

Figure 12 (below) is a map showing the locations of Prime Now cities. As would be expected, these cities correspond closely with the locations of Fulfillment Centers. Amazon does not (yet) offer Prime Now in every metropolitan area with a Fulfillment Center, but if we assume that Prime customers are particularly heavy users of shipping, it is in Amazon's interest to optimize its network of Fulfillment Centers and growing own-controlled network aircraft to improve network connectivity and reliability, and to shave every possible cent off the cost of each link in its logistics chain.

**Figure 12 Amazon Prime Now Cities**



Source: ACMG

October 2017

## 6.2 Fulfillment by Amazon (FBA)

Amazon Fulfillment centers provide warehousing and order-fulfillment for both Amazon and its third-party sellers. For an extra fee, shippers can locate their goods at Fulfillment Center locations specified by Amazon. The shipper is told where to ship the goods, and Amazon takes care of the rest. Centers are located in a large and growing number of U.S. cities, often located on the periphery of the metropolitan areas served and in close proximity to airports. Before Amazon reached settlements with states to collect sales taxes on shipments to state residents, Fulfillment Centers were located primarily in states with favorable tax treatment on sales and inventory. The size of newer centers can be over one million square feet, which requires the availability of relatively inexpensive

industrial land, and since each giant warehouse requires a flexible (often temporary contract) workforce of 1,000-2,500 unskilled and semi-skilled workers, the centers can often be found in rural or suburban locations with relatively higher unemployment. This allows Amazon to extract generous financial incentives from local governments.

However, Amazon is turning increasingly to robots in its newer centers, such as its tenth California fulfillment center which opened in August 2017 in Sacramento, where robots working alongside 1,500 humans will allow the facility to handle 50% more goods than a non-automated facility of the same size. Amazon's newest centers are capable of stocking 3.5 million different products and fulfilling one million orders per day.

### 6.3 Amazon Prime Air

*Figure 13 Amazon Prime Air*



Source: ACMG

October 2017

#### 6.3.1 Amazon Relationships with Integrators and the USPS in the United States

Without the express revolution pioneered by FedEx and followed by UPS, which supports overnight or two-day delivery to nearly every zip code in the United States, the explosive growth of e-commerce and Amazon itself would have been impossible. In the early days of Amazon, it relied on the logistics system investments of the integrators and became especially close to UPS which tailored features of its network around Amazon's needs as the Internet retailer grew. The close relationship between the two is evidenced by the large cluster of Amazon logistics facilities concentrated near the main UPS air hub at Louisville, Kentucky (SDF).

However, as Amazon began to build its own logistics network, the power in the commercial relationship began to tilt increasingly toward Amazon. As far back as 2005, when Amazon launched its Prime unlimited two-day shipping service, UPS reportedly offered Amazon discounts of as much as 70% to win the lion's share of the new business.

The growing rift between the companies became public when winter weather and poor planning cost UPS \$200 million in refunds to Amazon customers for delayed Christmas shipments in 2013. To avoid being caught flat-footed again, UPS increased capital spending by 10%, only to fall behind competitor FedEx's on-time delivery performance during the 2015 holiday season. Relations with UPS have further soured as Amazon has poached key executives and management from the integrator. The two have even publicly fought with the U.S. Postal Service (USPS) over pricing, with UPS suspicious that Amazon may be getting a more favorable deal from the USPS than its SurePost mail consolidation service.

Both UPS and FedEx are exposed to the increasing independence of Amazon's logistics network, but UPS more so. In 2013, when FedEx refused to lower prices enough to meet Amazon's demands, Amazon shifted a significant share of its business from FedEx to UPS. According to *The Wall Street Journal*, Amazon's deal with UPS generated roughly \$1 billion in revenue in 2015, five times that in 2005 (17% growth per year).

Amazon's impact on revenue growth is likely much more important, but it is hard to imagine Amazon's price leverage not resulting in razor-thin margins on this traffic for UPS. On the other hand, UPS has significant fixed costs which would have to be covered by smaller volume should the company lose a significant amount of Amazon's business.

FedEx does not accept media claims that Amazon's rapidly growing controlled logistics network is an existential threat. Founder and CEO, Fred Smith said pointedly on a recent earnings call, "Concerns about industry disruption continue to be fueled by fantastical—and I chose this word carefully—articles and reports... In all likelihood, the primary deliverers of e-commerce shipments for the foreseeable future will be UPS, the U.S. Postal Service and FedEx."

While FedEx and UPS face potential head-to-head competition with Amazon's own-controlled logistics network in the United States, DHL has begun to partner with the e-commerce giant. When Amazon moved its U.S. air network from Wilmington, OH (ILN) to Cincinnati (CVG) in May 2017, it chose DHL to operate its (daytime) hub until Amazon completes its own \$1.4 billion air cargo facility at the airport. Cincinnati is also DHL's nighttime U.S.-International express hub,

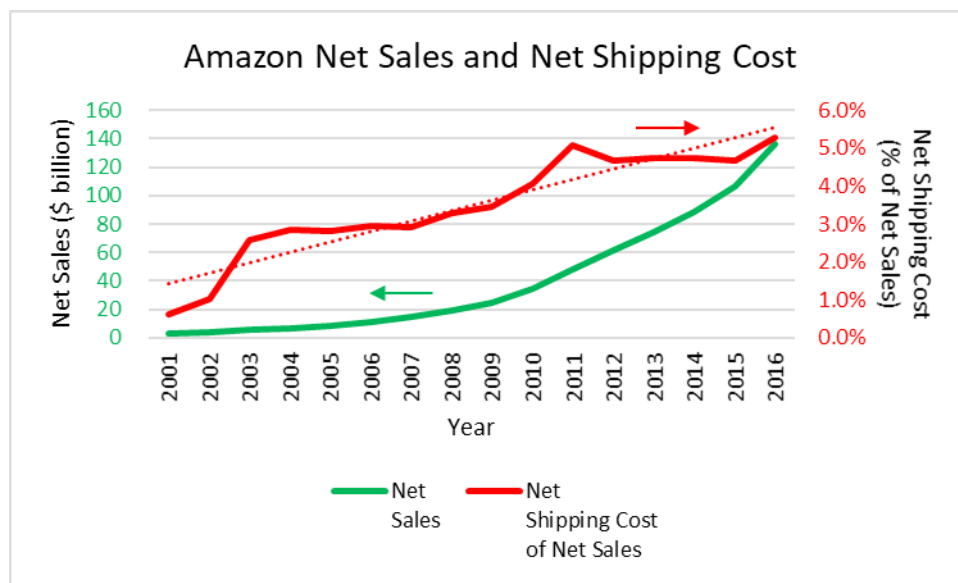
and the operations base of Atlas Air, which will be flying half of the 40 aircraft in Amazon's U.S. route system. Interestingly, Atlas Air's sister carrier Polar, in which DHL holds a stake, could be useful to Amazon in providing cross-border e-commerce air cargo capacity between the U.S. and Asia and between the U.S. and Europe.

Amazon is famous for its secrecy.

Little information is available regarding Amazon's shipment volumes or the share of shipments moved by air versus ground, or how many are handled by UPS, FedEx or the U.S. Postal Service. However, ACMG has used U.S. Department of Transportation data to estimate air freight moving on Amazon Prime Air's system (see Figure 19, page 31).

We do know that Amazon's sales of \$136 billion in 2016 are nine times the \$15 billion in 2007, and that the company's shipping costs (net of shipping revenue paid by customers) have increased from an average of 3.4% in the 2007-2010 period to 4.9% in the 2011-2016 period (see Figure 14, below). In addition to the Christmas delivery debacles discussed in the previous section, rising costs have Amazon seeking alternative delivery methods.

**Figure 14 Growing Net Shipping Cost**



Source: Company reports

October 2017

### 6.3.2 Beginnings: "Aerosmith"

In this section, we have combined available public information from Amazon, its airline partners, and observations from other sources to chronicle the genesis and speculate about the potential of Amazon's project to create an own-controlled air freight network.

In fall 2015, Amazon conducted three air network trials, one in Europe with Schenker, the freight forwarder, and two in the United States—one with Alaska-based Northern Aviation Services (NAS), a scheduled and ACMI freighter aircraft operator, and one with Air Transport Services Group (ATSG).

The European test was operated by ASL Airlines France with a 737-400F on a Wroclaw (WRO)–Doncaster (DSA)–Kassel (KSF)–Wroclaw rotation. ASL France operates for French post office, La Poste, a major Amazon delivery provider in Europe.

The NAS test used a 737 operating on a San Bernardino (SBD)–Seattle (SEA)–Boise (BOI)–San Bernardino rotation. This test ended after the peak 2015 holiday season.

ATSG started operations of the much more ambitious Amazon experiment, codenamed “Aerosmith”, a transcontinental network operated with 767 freighters at its Wilmington, OH (ILN) headquarters, the former DHL U.S. domestic express hub—since moved to DHL’s current hub at Cincinnati (CVG). The original hub spokes were Allentown/Bethlehem/Easton, PA (ABE), Dallas/Ft. Worth (DFW), Ontario (ONT), Phoenix (PHX) and Tampa (TPA). Oakland (OAK) was briefly tagged onto ABE (see Figure 15, below). This network has since been converted into a hybrid hub/point-to-point network and expanded, with the addition of Baltimore (BWI), Charlotte (CLT), Rockford (RFD), San Antonio (SAF), Seattle/Tacoma (SEA), and Stockton, CA (SCK). We expect Sacramento (SMF) to join the system before the 2017 peak holiday season.

**Figure 15 Amazon “Aerosmith” U.S. Air Network**



Source: Flight Aware, ACMG

October 2017

In March 2016, ATSG and Amazon jointly announced that the existing trial network would be expanded to twenty 767F aircraft (a combination of -200s and -300s) and that Amazon would take an equity stake in ATSG with an option to acquire more. The air cargo industry was still reeling from that shock, when Amazon announced a second twenty-unit 767F deal with Atlas Air Worldwide Holdings, also including an equity investment by Amazon.

Amazon Air's planned 40 aircraft fleet might seem a small number in comparison with the (largely) domestic combined 258-unit and 186-unit narrowbody and medium-widebody freighter fleets of FedEx and UPS, respectively. However, such an approximate 9% capacity increase (based on aircraft units) in the mature U.S. air freight market is significant. Note that because FedEx and UPS operate some of their fleet in these size categories outside the United States, Amazon's actual U.S. capacity share could be larger than 10%.

### 6.3.3 Aircraft Operator Agreements

ATSG began to operate a trial air network for Amazon Fulfillment Services, Inc. (AFS) in September 2015. The network grew to five freighter aircraft through first quarter of 2016 and includes services for cargo handling and logistical support. On 8 March 2016, ATSG entered into an Air Transportation Services Agreement with AFS pursuant to which ATSG's leasing subsidiary, CAM will lease twenty 767F aircraft to AFS, twelve 767-200Fs for five years, and eight 767-300Fs for seven years. ABX Air and ATI will operate the aircraft, while ATSG subsidiary, LGSTX Services Inc. will provide hub and gateway services (except at Cincinnati, where DHL will operate the hub). We believe that substantially all of the agreed twenty aircraft are now operating for Amazon (as of the end of 2Q17, eighteen were leased by ATSG's subsidiary CAM to Amazon Fulfillment Services). ABX Air currently also has at least two 767-300 passenger aircraft either in storage or in conversion.

ATSG network revenues from AFS comprised 41% of the company's consolidated revenues in the first half of 2017. In comparison, DHL, which was formerly the company's largest customer, now only contributes 26%.

In conjunction with the commercial agreement, the parties entered an investment agreement in which ATSG will issue warrants granting Amazon the right to acquire up to 19.9% of outstanding ATSG common shares. Purchase by Amazon of a portion of shares is contingent on ATSG meeting certain performance targets. The first of three tranches of warrants were issued in July 2016. The remaining two will be vested in March 2018 and September 2020.

In May 2016, two months after the deal with ATSG was announced, AFS and Atlas entered into an agreement for the CMI operation of a further twenty 767Fs

(all -300Fs) that will be dry leased by Atlas Air Worldwide over a ten-year term. The CMI operations will be for seven years, with extension provisions to total ten years. The first aircraft was placed in service in the second half of 2016. We believe there are eight currently operating in the Amazon Prime Air network. The remainder are expected to be placed in service through 2018. Although Atlas flights for Amazon operate alongside ATSG's, a given segment is usually scheduled to be operated by one carrier or the other. See summary in Figure 16 (below).

**Figure 16 Amazon Prime Air Support Contract Key Features**

|                          | ATSG                       | Atlas        |
|--------------------------|----------------------------|--------------|
| Date Announced           | 9 March 2016               | 5 May 2016   |
| Aircraft Number and Type | 12x 767-200F + 8x 767-300F | 20x 767-300F |
| Agreement Term           | 5-7 years                  | 7-10 years   |
| Full Network             | 2017                       | 2018         |
| Equity Stake             | up to 19.9%                | 20-30%       |

Source: Company reports

October 2017

The Amazon Prime Air Network at the time the agreements with ATSG and Atlas Air is shown in Figure 17 (below).

**Figure 17 Amazon Prime Air Network at Agreement Signing**



Source: Flight Aware, ACMG

October 2017

### 6.3.4 Prime Air Network

Today's Amazon Prime Air network is shown in Figure 18 (below). The number of points has increased from the seven shown in Figure 17 to twelve, but transforming the network topology away from hub and spoke has raised the number point-to-point connections. We calculate that aircraft utilization has benefited, and network redundancy has been enhanced, but at the cost of greater network complexity.

**Figure 18** *Current Amazon Network*

**Amazon Prime Air Domestic U.S. Route System**  
(August 2017)



Source: Flightaware, ACMG

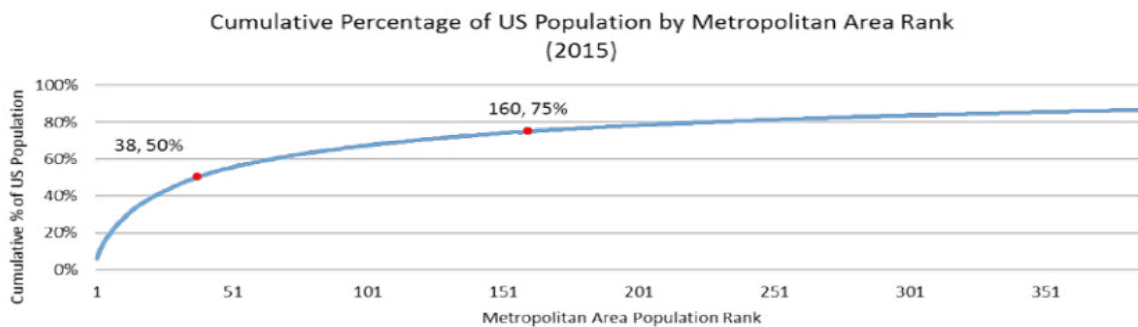
October 2017

We analyzed U.S. Department of Transportation airline traffic data for the twelve months ended May 2017 for ABX Air, Air Transport International, and Atlas Air to approximate the air freight traffic flowing over the Amazon Prime Air U.S. domestic network. During the period, the network carried 266 million tons. (241,000 tonnes) with traffic of 383 million ton-miles (559 million tonne-km). There were 11,302 departures, with an average payload per departure of 24 tons (22 tonnes). In comparison, during the same period the FedEx and UPS contiguous U.S. jet air networks carried 13 and 6.3 times as much traffic, respectively. This comparison underestimates the relative size of Amazon's current network, as it was growing rapidly during the analysis period. Traffic statistics of the three networks are compared in Figure 19 (next page).



A 40-aircraft ATSG and Atlas operated Amazon network with some allowance for airport trucking could provide overnight service to well over 50% of the U.S. population, as shown in Figure 21 (below). The graph clearly demonstrates that there are diminishing returns to the addition of aircraft to the network, as each incremental aircraft would presumably serve more isolated metropolitan areas with lower populations than those already served. Further, in the western U.S., flying times to the hub are longer, providing less time for regional trucking to and from the airport to meet the correspondingly tighter flight cutoff times.

**Figure 21** *More than 50% of the U.S. Population Lives in Fewer than 40 Metropolitan Areas*



Source: Flightaware, ACMG

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For an idea of the difference in returns, consider one of the original four ILN network trial flights (ILN-ABE), and compare it to the sixth flight (ILN-SCK). The 4½ hour flight time to Stockton, CA gives Amazon 8½ hours from airport to Fulfillment Center to Sortation Center to reach the customer's doorstep by 9pm, of which drive time alone to reach the entirety of the San Francisco Bay Area could consume 1½–2½ hours. Including metropolitan areas in California's Central Valley reachable in about the same amount of time, such as Sacramento (soon to receive its own Amazon flight) and Fresno, gives this flight a catchment area population of about 12 million. The corresponding reach of the ABE spoke, with a flight time from the hub of just over one hour, allows this flight to reach more than 28 million people in New York/Newark, Philadelphia and other nearby metropolitan areas in eastern Pennsylvania. Now, consider that the population of the catchment area of the dedicated flight required to serve the 23rd largest metropolitan area in the United States, Portland-Vancouver-Hillsboro, OR-WA, and surrounding points within two hours by truck, is only about 3 million.

## 6.4 What are Amazon's Goals?

Amazon has a growing pile of cash it could spend on developing its own logistics network. Its free cash flow in 2016 was \$9.7 billion, with cash on hand at the

end of 2016 of \$19.3 billion. In comparison, its largest delivery partner in the United States, UPS, had free cash flow in 2016 of \$3.55 billion, while FedEx free cash flow in FY2017 was actually negative, at -\$0.19 billion. In addition, Morgan Stanley Research estimates that Amazon Prime throws off almost \$6 billion in subscription revenue per year. The combination of financial resources and the lock Fulfillment by Amazon has over both shippers and consumers makes an Amazon own-controlled logistics network a formidable market entrant.

Amazon's move to integrate its own-controlled domestic air freight network into its existing logistics system raises obvious questions. The most basic is whether Amazon intends to establish an air express network aimed at satisfying general B2C demand, or whether it has a more modest goal of balancing inventory in its own Fulfillment by Amazon system. If Amazon only wants to link a limited number of cities and does not require overnight or day-turn service for all of its shipments, the network is likely to consist only of medium widebodies serving perhaps the top 50 medium-to-long distance domestic lanes. As noted earlier, in many densely populated areas east of the Mississippi River and on the west coast, a 40-aircraft route network could serve far more than the top 50 U.S. metropolitan areas.

Is Amazon building an air network solely for its own internal needs or is it attempting to build a larger network with capacity sufficient to offer service to unaffiliated shippers, in direct competition with FedEx and UPS? How would having Amazon as a competitor impact the businesses of the present duopolists. There is also the unlikely possibility that Amazon could decide at some point that the investment required to build its own airline is not worth the return, and that it cannot attain the scale economies of the incumbent integrators, leading Amazon to abandon the concept of controlling its own air network and return to today's status quo.

If, however, Amazon can operate its air system at a reasonable cost and therefore obtain finer control over its logistics chain, what does that mean for profitability and growth at FedEx and UPS? With only a fixed sum of domestic air freight demand at any point in time, a larger share for Amazon can only mean less for the incumbents, unless the revenue premium to Amazon of adding customer value through ever faster delivery is sufficient to overcome the incremental cost of shifting surface traffic to air. In that case, air freight demand could be stimulated and not simply diverted from other airlines (although demand would be diverted from ground).

If Amazon diverts air freight traffic from FedEx and UPS, will the number and type of freighters added by U.S. airlines change at all? Would Amazon's partner carriers simply buy or convert aircraft that would have been expected to be acquired by FedEx and UPS, or would overcapacity cause enough of a decrease in the incumbents' delivery density for them to consider reducing their fleet sizes or down-gauging some 757F routes to freighter-converted newer technology narrowbodies, such as the 737 or A320/321 families?

Amazon is also attacking the “last mile”, by using both the USPS and its own employees/contractors in higher-density delivery areas. Of course, Amazon has attracted massive publicity for its experiments with drone package delivery. The news program, *60 Minutes* reported in December 2013 that Amazon Prime Air would use drones to deliver small packages (less than five pounds) within 30 minutes by flying short distances (6-12 miles) from local Amazon Fulfillment Centers. By July 2014, Amazon’s most advanced prototypes could fly at speeds of 50 miles an hour; however, FAA regulations currently preclude the mass deployment of such drones.

A much less glamorous or publicized initiative being taken by Amazon is to tap the customer to provide their own last mile transportation by positioning package lockers at locations customers are likely to visit in the course of the day: train stations, (ironically) brick-and-mortar stores, and the lobbies of large apartment complexes.

One ominous hint regarding Amazon’s plans was released in its 2015 annual report where for the first time the company referred to itself as a “transportation service provider”. Amazon CFO Brian Olsavsky has said that Amazon is indeed building its own logistics business, but that it is not meant to replace any of the existing partners, like FedEx or UPS. Or will it?

Setting up a nationwide U.S. logistics network to compete head-to-head with FedEx and UPS would be an expensive and protracted undertaking despite getting a forty-aircraft network up and running in only three years. Will Amazon stop there and use a hybrid approach where it continues to outsource much of its air linehaul to the integrators and to the U.S. Postal Service, or will it seek to replicate its cloud computing business model, where it now aggressively sells to others through Amazon Web Services (AWS) processing and storage capacity it originally developed for internal purposes?

But if Amazon extends Fulfillment by Amazon to “Express by Amazon”, could Amazon hook sellers on the one stop convenience of “Prime” shipping the same way it has its loyal Amazon Prime consumers, in effect making Amazon the owner of both shipper and consignee, a feat FedEx and UPS cannot match? Amazon’s official stance is, “we are very happy to have the delivery capacity our carrier partners can provide. They provide a high-quality service, and our own delivery efforts are needed to supplement that capacity rather than replace it.” Only time will reveal the end game of multiple logistics initiatives Amazon is pursuing behind its famous shroud of secrecy.

## 7. E-commerce in China

In China, the dominant e-commerce marketplace platforms are Alibaba's Taobao and Tmall. The air express revolution is also well underway, with several vigorous competitors and more waiting in the wings for the Chinese government to grant them Airline Operating Certificates.

Among the existing and new venture express carriers are:

- *China Postal (see Figure 22, next page)*
- *SF Express (see Figure 23, page 37)*
- *YTO Express (see Figure 24, page 37)*
- *Longhao Airlines*
- *China Air Cargo Corp.*
- *United Star Express (starting in 1Q2018)*

Alibaba does not have an own-controlled network (yet). It has instead promoted an "open" logistics platform, called Cainiao of which it owns 43%. Cainiao matches shippers and air, road, rail, and ocean freight carriers and facilitates payments. Among its founding members is YTO Express, in which Alibaba has taken a stake. Although YTO's airline network is in its infancy (see Figure 24) the company, established in 2000, including its ground operations are second only to China Post in size, servicing more than 2,700 Chinese counties and districts.

Cainiao now provides same-day delivery to Alibaba customers in major Chinese cities including: Beijing, Tianjin, Guangzhou, Shanghai and Chengdu. Second-day delivery is available in many more. One of the most ambitious goals of Cainiao has been to improve logistics in rural China. Cainiao and Taobao have already built a network of service stations in over 26,500 villages.

Before looking at the major air express networks in China, some geography is informative. Although the land area of China is 25% greater than that of the contiguous United States, its population and industrial production is far more concentrated geographically. The U.S. has two main centers of population, one on its Atlantic coast, and the other on its Pacific coast, about 4,000 km apart, where each of the country's only two mega-cities (metropolitan areas with a total population in excess of ten million), New York and Los Angeles, are located. Most of China's population is located in a band less than 1,600 km wide by 2,000 km long. Despite its 9–14 megacities (depending on agglomeration methodology),

only 57% of China's 1.379 billion people live in urban areas, while 82% of the U.S. population lives in cities.

Note the concentration of east-China routes in the networks of China Postal and SF Express. SF Airlines' fleet is growing faster than China Postal's. Since last year's report, China Postal has added three aircraft—all 757Fs and now has a fleet of 30, including the four operated for it by Air China Cargo. Meanwhile, SF Airlines has added six (two 737-300Fs, two 757-200Fs and two 767-300BCFs) to reach 39 aircraft. YTO now operates a six aircraft 737-300 freighter fleet. However, all three of the major China-based airlines have more aircraft currently in conversion or on order, and all plan to acquire next generation narrowbody freighters in a big way. China Postal signed a deal with Boeing for ten 737-800BCFs and seven 757-200Fs in December 2015, SF has commitments for an unspecified number of 737-800BCFs, and YTO has firm orders for ten 737-800BCF conversions (plus ten options) from Boeing.

No route maps are shown for three smaller cargo airlines. Guangzhou-based Longhao Airlines launched operations in March 2017 and now operates three 737-300Fs. Another Guangzhou-based carrier, China Air Cargo Corp., is a startup which took redelivery of its first 757-200F in July 2017 and is expecting the redelivery of its second soon. Also in start-up phase is United Star Express, the joint venture part-owned by U.S.-based ATSG and China-based Okay Airways which is expecting certification from the Chinese aviation authorities in 2018.

**Figure 22 China Postal Airlines Air Network**

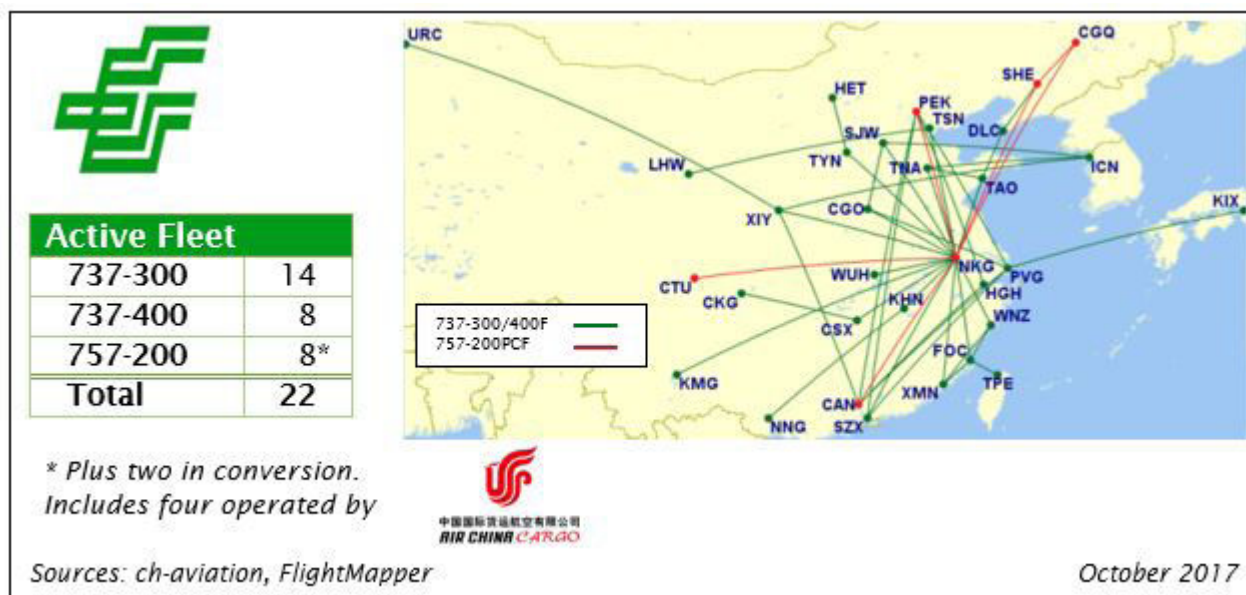


Figure 23 SF Airlines Air Network

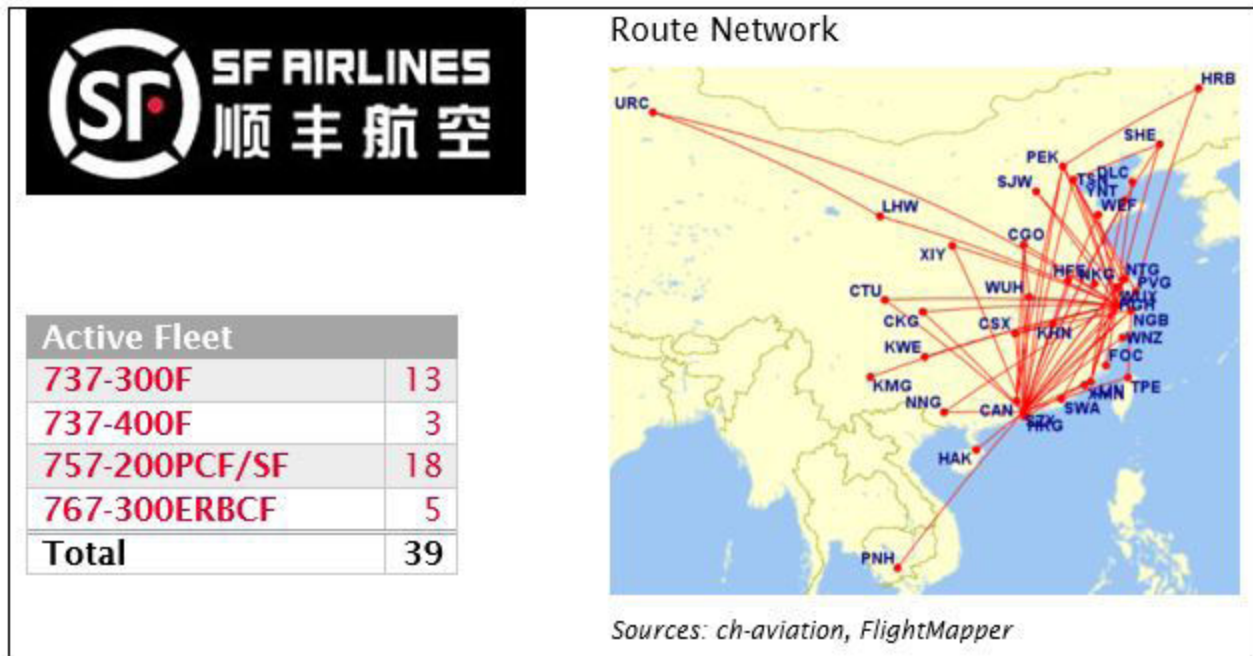


Figure 24 YTO Express Air Network



Source: Flightaware, ACMG

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## 8. Other E-commerce-related Logistics Developments in Asia

### 8.1 Japan

Japan-based ANA has developed an all-767F operated express air network centered on Naha, Okinawa (OKA) shown in Figure 25 (below) permitting it to connect overnight Japan, China, and most of the rest of Asia. Points within the circular region can be reached within four hours from the hub. Although the airline cancelled unprofitable flights to Qingdao (TAO) and Xiamen (XMN) the system has been a bright spot for the airline in an otherwise difficult air cargo market in and out of Japan.

**Figure 25** ANA Air Cargo Network



Source: Ryukyu Shimpo

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### 8.2 India

E-commerce is growing rapidly in India. The country currently has about 450 million Internet users, and although Internet penetration is nearly 60% in urban areas, there is a vast number of potential users in largely unserved rural India. E-commerce penetration is lower still. Problems include transportation infrastructure bottlenecks, both air and ground and payments still largely COD,

despite significant venture capital investments in recent years to remedy these shortcomings.

Despite past false starts, permanent changes may be underway at last in this, the second most populous country in the world. Government reforms have enabled explosive growth, recently exceeding that of China's economy. Investments pouring into India have led to the expansion of indigenous companies like Flipkart and Snapdeal and to the entry of foreign competitors. Investors like Amazon and Japan's Softbank have stakes in the developing \$14.5 billion Indian e-commerce market.

The dominant air express network in India is operated by DHL's Blue Dart, a large Indian integrator with country-wide presence on the ground and in the air. Blue Dart Aviation's network, operated by a fleet of just six 757-200Fs is shown in Figure 26 (below).

**Figure 26** *Blue Dart Aviation's Air Network*



Sources: FlightMapper      October 2017

### 8.3 Other Emerging E-commerce Markets

Among other countries and regions with emerging e-commerce markets are Russia, Mexico, South America, and Southeast Asia. E-commerce in Russia has developed rapidly, especially among the small segment of very affluent consumers searching for electronics and luxury goods from Europe and Asia. AirBridgeCargo has been a major beneficiary.

Mexico is benefiting from healthy economic growth and has about 60% of its population online, and e-commerce grew over 60% last year. Growing integration of logistics networks with its northern neighbor, the United States, has brought e-commerce involvement ranging from Neiman-Marcus to Walmart, the latter of which already has a large brick-and-mortar presence in the country. However, the last mile is a major challenge, and payments are still largely confined to COD.

E-commerce in South America, home of marketplace platform MercadoLibre, is growing about 20% per year. Short-term prospects should improve as Brazil recovers from its deepest recession since the 1930s. Note that the Brazilian post office, Correios, has a well-developed overnight air express package network between major cities operated by Sideral Air Cargo and Total Linhas Aéreas.

The African e-commerce scene is full of innovative startups. In Africa, the dominant e-commerce marketplace is Nigeria's Jumia. E-commerce in Africa's largest consumer market, Nigeria, has been growing at 100% per year since 2010. Nigeria-based Konga is also a major force in African e-commerce. South Africa is another important e-commerce market, boasting e-commerce site Takealot.com and bidorbuy (an auction site similar to eBay). And, Tonaton ("Buy and Sell" in the Akan language) is Ghana's leading e-commerce marketplace.

While starting from a small base, e-commerce is growing rapidly in Southeast Asian countries, such as Indonesia and Thailand, as newly middle class consumers' personal disposable incomes have increased.

Developing e-commerce markets continue to suffer from heavy-handed government regulation, customs barriers in cross-border trade and inadequate infrastructure. This, however, has not prevented e-commerce from taking root in many developing economies around the world.

## 9. Cross-border E-commerce

One of the hottest areas in e-commerce right now is cross-border e-commerce, typified by Alibaba's determination to grow by offering "Global buy, global sell"—e-commerce from shipper to customer anywhere in the world in three days or less.

Supporting this goal is both a significant opportunity for airlines and a great challenge. Integrators' systems have been oriented to carry international packages from origin to destination via one or more hubs connected by international trunk air segments in a simple extension of their in-country networks (intra-EU in the case of Europe). Major trunk segments served by freighters though are relatively few in comparison with point-to-point belly capacity made available by combination carriers using ever more capable, freight-friendly long-range widebody aircraft.

The combination carriers' frequency advantage is often undermined by years of under-investment in cargo infrastructure, such as inefficient legacy IT systems and poor integration with ground systems connecting shippers and consumers with airports. Some carriers, such as IAG and its partner Qatar Airways, have received the message and are experimenting with and growing their own door-to-door networks.

Cross-border e-commerce has also suffered from a lack of automation in the customer experience. Traditionally, freight forwarders and customs brokers had a monopoly on the knowledge base needed to facilitate cross-border shipping. They were the ones that knew how customs regulations worked and how to financially facilitate transactions in multiple currencies. However, this is changing, as IT companies have created databases and applications that can be integrated into e-commerce platforms themselves to instantly provide customs duties and guaranteed foreign exchange rates, so that when a customer clicks the buy button on an e-commerce website, buyer and seller can have confidence in a firm, fixed price with no surprises.

Other barriers in providing a low-cost, hassle-free e-commerce experience are handling returns (20–30% of all goods transported through e-commerce, according to FedEx) cost-effectively and in restrictive practices such as geo-blocking, where buyers are diverted to in-country websites intended to maintain higher prices consistent with traditional brick-and-mortar retailer agreements with sellers and distributors. Eventually, we believe the most egregious restrictive practices will yield to greater transparency, as consumers search across the Internet for the best deal.

## **10. Opportunities and Challenges to Incumbents**

Integrators have invested huge amounts of capital in building the infrastructure to move packages rapidly door to door, so they are best positioned to support e-commerce but the intricacies and high cost of these same carefully optimized systems also appear the most vulnerable to disruption.

Although we do not believe that e-commerce will be as disruptive to the air cargo industry as the express revolution, incumbents cannot afford to bury their heads in the sand when it comes to challenges from innovation. Fred Smith of FedEx famously said on an earnings call with financial analysts, "Concerns about industry disruption continue to be fueled by fantastical—and I chose this word carefully—articles and reports... In all likelihood, the primary deliverers of ecommerce shipments for the foreseeable future will be UPS, the U.S. Postal Service and FedEx." He said further, that, "[Same day delivery] still represents [a] very small percentage of our overall portfolio, but we are able to scale when demand dictates."

ACMG believes such industry over-confidence in the permanence of the status quo is a dangerous illusion. Last mile logistics, especially, remains a difficult to solve, high cost consequence of increasing e-commerce demand. In its Q1FY18 earnings conference call, FedEx reported significant extra costs in its Ground business segment associated with the changing mix of residential vs. commercial packages caused by an increase in e-commerce traffic from just two large shipper customers.

One solution being actively pursued by express companies, and Amazon itself, is the expansion of customer pickup at brick-and-mortar locations—an ironic, back-to-the-future solution requiring the customer to provide their own last mile service and relying on retailers under-siege by e-commerce effectively to lower the delivery costs of their on-line competitors in the hope that those same customers picking up or dropping off packages might also shop.

Walmart, in the later part of the 20th Century upended traditional retail with its sophisticated logistics system and an everyday low-price commitment enabling the company's stores to dominate retail in large towns and small cities in the United States neglected by the large department store chains and big-box stores of the time. Now, with venerable retail giants Macy's, Penney's, and Best Buy fighting for their continuing existence, Walmart cannot afford to be complacent.

A cautionary tale is the downfall of once dominant U.S. retailer, Sears & Roebuck. Sears, founded in 1886, was one of the defining companies of the American Century. In the 1960's, Sears accounted for 1% of U.S. GDP, 1 of 200 U.S. workers received a Sears paycheck, and more than one-in-three U.S. consumers carried a Sears credit card. Despite this, after a series of ill-judged acquisitions and the failure to adjust to change, by 1990 Walmart had surpassed Sears to become the largest retailer in the world. Sears has effectively become a distressed real estate owner of anchor stores in once thriving shopping malls that in many cases have become ghost towns or bazaars, hawking ultra-low-cost goods.

Fast forward, to today, and Walmart, itself a major force in e-commerce, is now under threat from Amazon and Alibaba.

## 11. Conclusions

E-commerce has rapidly grown in importance globally and up-ended the retail world. In the 2017-18 period, e-commerce penetration globally will reach 10%. But where it has become perhaps most transformative is not in the developed countries but in China, where it is roughly double the world average and growing at about 25% per year.

We believe the consequences of e-commerce are just beginning to be felt by the logistics industry. As marketplace platforms like Amazon and Alibaba continue to grow and achieve hitherto unbelievable economies of scale and leverage big data in a potentially boundary-free global e-commerce market, they will increasingly evaluate the cost and control benefits of establishing their own-controlled logistics networks.

We believe that this change contains both challenges and opportunities for integrators and carriers of air cargo. Responsive, low-cost providers, like the ACMI air carriers now in partnership with Amazon will benefit. And integrators will benefit in the short term as e-commerce leads to an increase in the number of packages requiring rapid delivery to consumers. However, integrators could lose in the long term if the Amazon own-controlled network concept proves successful and is copied by others. Integrators, however, are rapidly developing solutions for cross-border e-commerce and 3PL solutions for e-commerce sellers concerned about becoming captive to the major marketplace platforms.

Carriers and forwarders accustomed to handling large cargo consolidations will need to find ways to handle individual packages economically, or face the prospect of further reductions in freight volumes in the commodity air freight market.

Retailers that adopt omni-channel logistics strategies that leverage their physical presence will also gain, but as such crossover strategies proliferate, we believe that the term omni-channel will lose relevance—what will matter is to market and deliver to the customer anytime, anywhere. Those without sufficient brand strength and agility will perish.

Efficient national posts and independent ground transport companies that can flexibly adapt to the trunk and high-cost last-mile demands of the large e-commerce companies stand to gain, but labor content will be eliminated ruthlessly by razor-thin margins.

There are still problems to be solved and therefore roles for innovative companies solving problems in and integrating processes in cross-border trade, as well as for companies providing alternative technologies, such as drone delivery and advanced data analytics.

E-commerce has conditioned consumers in all but the poorest countries to instant gratification, and even some of the poorest countries will leapfrog traditional retail and move straight to an e-commerce model. The waves from the “big bang” of the e-commerce revolution affecting the supply chain and logistics show no signs of subsiding. Will e-commerce revolutionize logistics, as the express revolution did? Perhaps, but however it plays out, e-commerce will be the omnipresent new reality. Jack Ma, founder of Alibaba, still seems particularly prescient when he said, “I hope 15 years later people forget about e-commerce—because they think it’s like electricity.” We agree. The logistics industry cannot afford to be complacent.

