

Historical Analysis of a new category – E-commerce (MGMT 731)

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Summary:

This paper analyzes the evolution of e-commerce industry in the United States. E-commerce had its origins in early 1990's. Most of the e-commerce companies founded in 1990's got destroyed in the dot-com bubble in 2000. Some companies like Amazon and EBay survived the bust. Over time, many retailers have moved towards omni channel models (Walmart, Target, Sears). The industry has also evolved through various models. This paper analyzes the industry S-curves and diffusion dynamics and also predicts how this industry might shape in the future.

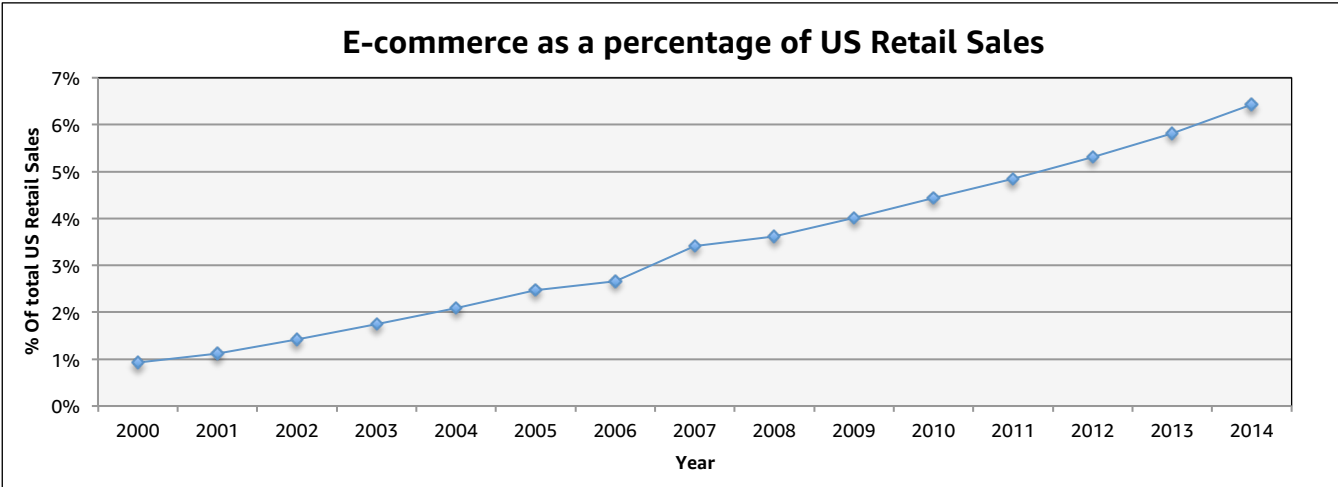
Industry evolution:

The history of e-commerce dates back to 1991, when the Internet was opened to commercial use. Technologies like electronic data interchange (EDI) and electronic funds transfer (EFT) in the 1980's enabled exchange of business information and do electronic transactions. Even after opening the Internet to public, it took some around 3 years for development of security protocols (HTTP) and DSL, allowing for faster connection speeds and many e-commerce companies came into existence around 1994, including Amazon.com and EBay. The time from 1997 to 1999 saw a large number of e-commerce companies come into existence, however many of these went bankrupt in the dot com bust in 2000. Some companies survived the bust, and we saw certain models emerge as dominant models in the business. Amazon and EBay were the two large companies that emerged in the e-commerce sector.

In the 2000's, multiple new companies emerged, but the ones that have survived (or doing well) either focused on proprietary merchandise, unique deals or a proprietary experience, which would be difficult to replicate. The table below lists some of the notable e-commerce companies since 1994 till date.

Serial No	Company Name	Entry Date	Exit Date	Status	About
1	Boo.com	1998	2000	Bankruptcy	Sell branded fashion apparel on internet
2	Amazon.com	1994	-	Operational	Online commerce
3	Booksamillion.com	1998	-	Operational	
4	Kozmo.com	1998	2001	Liquidation	Local delivery of number of retail items
5	Webvan	1996	2001	Bankruptcy	
6	Pets.com	1998	2000	Bankruptcy	Sold pet supplies to retail customers
7	EBay	1995	-	Operational	Marketplace for items
8	Bluefly	1998	2000	Bankrupt	First multi-brand apparel retailer on Internet
9	Walmart	2000	-	Operational	Omni-channel initiative of Walmart
10	Diapers.com	2005	2010	Acquisition	Largest online retailer for baby products.
11	Zappos.com	1999	2009	Acquisition	Online shoe and clothing shop
12	Groupon	2008	-	Operational	E-commerce marketplace for deals
13	Bluenile.com	1999	-	Operational	Largest online retailer of diamonds
14	Overstock.com	1999	-	Operational	Sell discounted deals
15	Bonobos.com	2007	-	Operational	Designs and sells men's clothing
16	GiltGroupe	2007	-	Operational	Deals on clothing
17	Etsy	2005	-	Operational	Peer to peer ecommerce for handmade items
18	Jet.com	2015	-	Operational	Costco replica in e-commerce
19	Drugstore.com	1999	2011	Acquisition	Retailer in health and beauty care products

Using the North America Industry Classification System (NAICS) and using the US Census data on e-commerce sales, we see that e-commerce has increased from \$27.4B (2000) to \$297.3B (2014), which translates into an increase from 0.92% of retail in 2000 to 6.4% of retail in 2014. The increase in share has been very steady. E-commerce has increased by a factor of 10.8 between 2000-2014 while the corresponding factor for retail sales (brick and mortar) is 0.46. This translates into 19% CAGR for e-commerce and 2.7% CAGR for traditional retail sales. The growth of e-commerce is plotted beneath¹:



Time series of number of companies in the industry:

While it is difficult to estimate the number of e-commerce companies at a given point in time, secondary research highlighted the following facts for e-commerce companies:

RJ Metrics Analysis: There are 60,000 e-commerce websites that generates revenues in excess of \$500k every year. However, the top 1% of these generates 34% of the industry revenues². This means that the top 600 companies account for \$100B of gross revenues. (There are many companies that just set-up their websites for commerce, which don't gain traction. Getting data on these companies is tough.)

Census report: This lists that there are 40,000 e-commerce companies in the US³.

During dot-com bubble: More than 210 e-commerce companies failed in 2000⁴ and 762 e-commerce companies failed in 2001⁵.

Most entrants in the space were in the year 1997-1999, where multiple e-commerce companies evolved. However, many of these (e.g. Webvan) didn't have sound business models and when faced with a funding crunch in 2000-2001, most of these shut down. Even the stable ones like Amazon faced a lot of investor ire for not turning profits, but survived the crash. It is interesting to note that Amazon had its first quarterly profit in 2002. Post 2002, there has been a mix of new e-commerce companies being established like Etsy, Diapers.com, Bonobos, Jet.com and so on. At the same time, there have been some consolidations in the space as well, like Amazon's acquisition of Zappos and Diapers.com. Hence, the total number of reasonably large e-commerce companies in the space has remained relatively constant post that.

Based on research done, I have tried to estimate the number of *reasonably large* companies in the space⁶:

¹ Appendix 1 has the raw data obtained from US Census

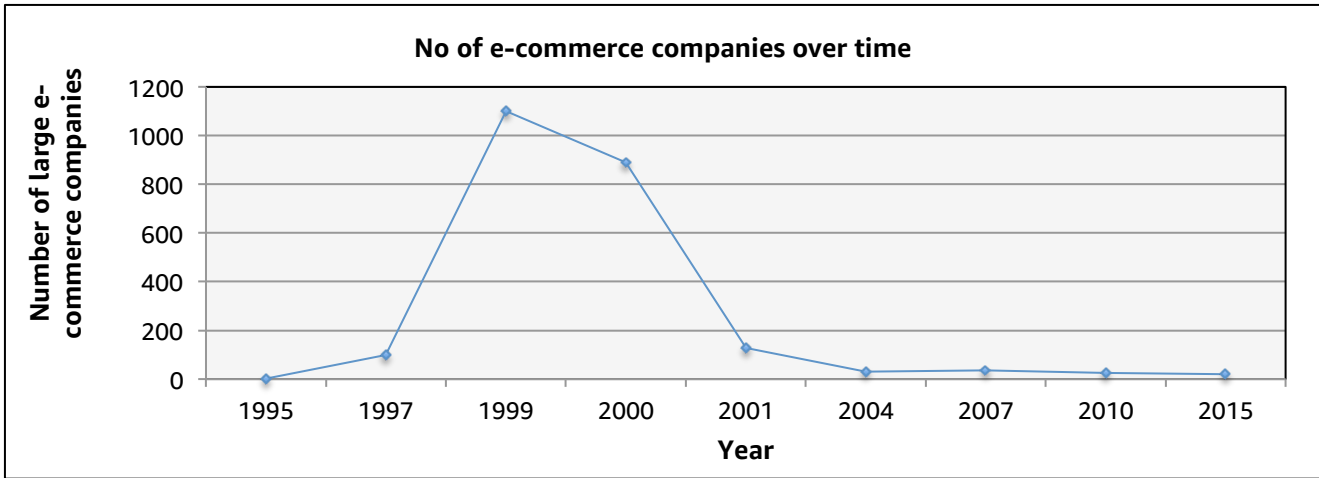
² <https://blog.rjmetrics.com/2014/06/18/how-many-e-commerce-companies-are-there/>

³ <http://www.census.gov/econ/estats/e13-estats.pdf>

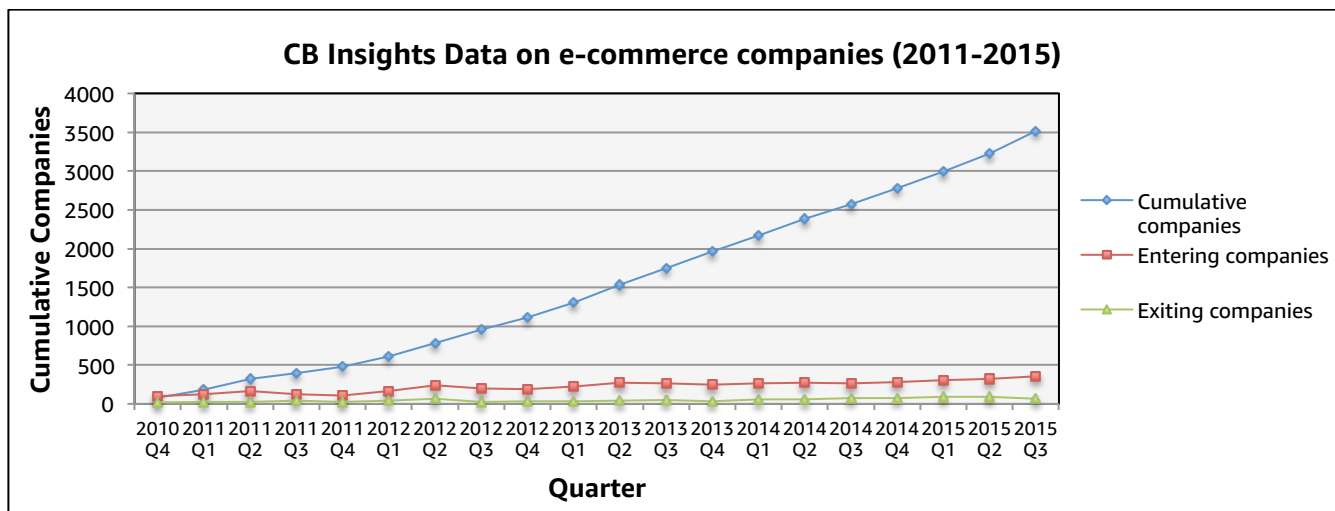
⁴ Hirakubo and Friedman, 2000

⁵ Pather, Erwin and Remenyi, 2003

⁶ Refer Appendix Point 2



An analysis of CB Insights for number of companies in e-commerce space (through deals) gives the following graph⁷:



However, this deals database isn't available prior to 2010, and hence we can't trace back all companies.

The GMV of the top two e-commerce companies in the US today is:

Company	GMV*	Assumptions / Data
Amazon	50.5 B	Amazon is 17% of US E-commerce market (GMV) – Source: Trefis
EBay	34.3 B	Using EBay's GMV (annual report) and 61% of its GMV is international
Total	84.8 B	* GMV – gross merchandise value

Thus, just 2 companies dominate the GMV in the US right now. Even though 600 companies contribute to \$100 B, the top 2 companies account for 85% of this GMV. This shows e-commerce currently is very concentrated.

Primary factors driving e-commerce growth:

E-commerce revolves mostly around price, selection and convenience (Amazon's operating philosophy). These are the key performance metrics around e-commerce, which can be tracked on the S-curve.

1. Price: E-commerce leads to removal of various layers of the supply chain, which leads to higher efficiencies in supply chain and reduces product distribution costs. Similarly, due to massive scale, the real estate costs and manpower costs can be tremendously reduced, either resulting in better prices for the end consumer, or better margins for the retail company.

⁷ Refer Appendix Point 6

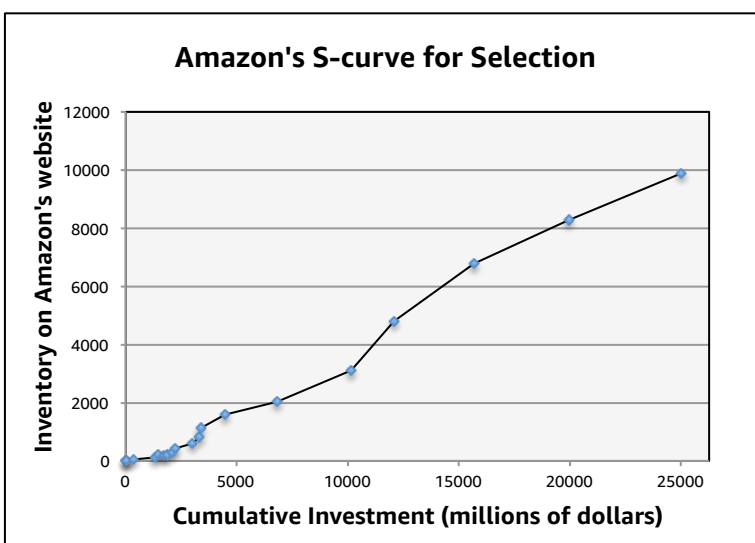
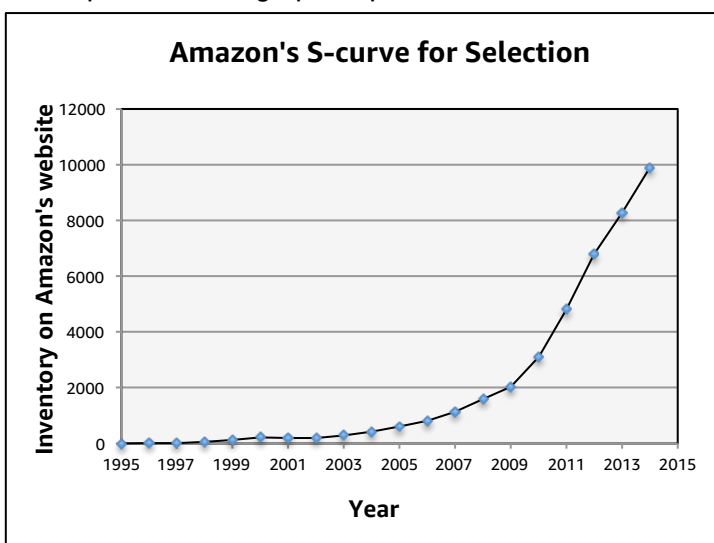
2. **Selection:** High variety is possible in e-commerce compared to traditional retail. The high variety of items also reduces information asymmetry.
3. **Convenience:** Removal of the additional step of going to the store and purchasing the product. In recent years, Amazon has focused on bringing the delivery times to as less as a couple of hours.

S-curve for product performance as a function of cumulative investment:

To plot industry performance metric, we consider selection defined by the number of items on the e-commerce platform as a driver for this category. Since Amazon and eBay dominate the e-commerce space in the US, we use the selection data of these two companies to determine product performance as a function of the cumulative investment by these two companies.

S-curve (mapping Product Selection on the platform as a performance metric):

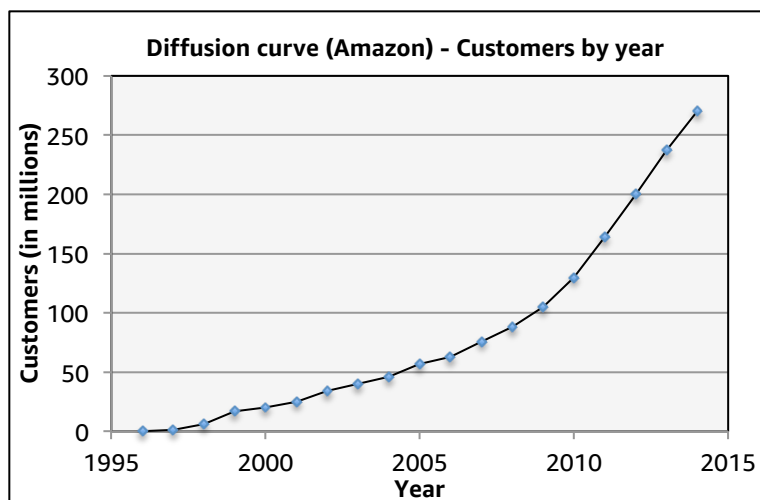
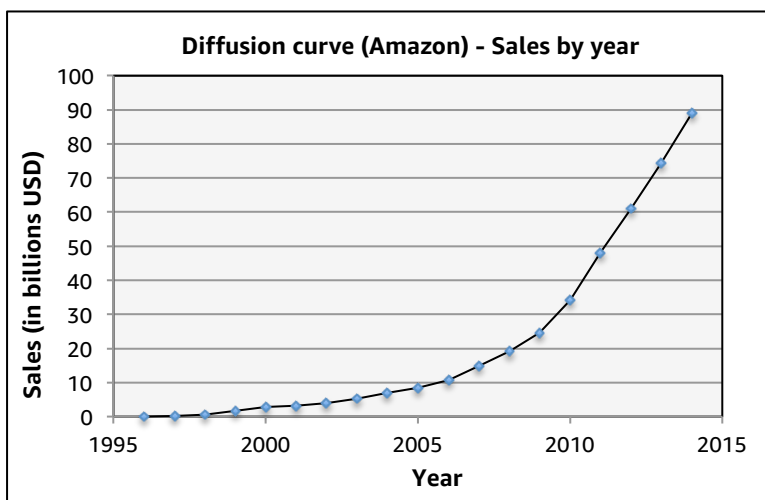
For the purpose of this analysis, we need to plot Amazon's product selection as a function of time/investment. Data on Amazon's selection isn't available directly. We consider Amazon's inventory as a surrogate of its selection for the purpose of this exercise. Inventory has been calculated from the balance sheet of Amazon for every year since 1997. Similarly, cash flow statements were used to calculate the net investment every year.⁸ The shape of the two graphs represents Amazon's selection as a function of (a) time and (b) investment.



The raw data for this analysis can be found in the appendices.

Diffusion Curve for e-commerce:

We use two metrics that are a good surrogate for diffusion rate of e-commerce – Sales and total customers for

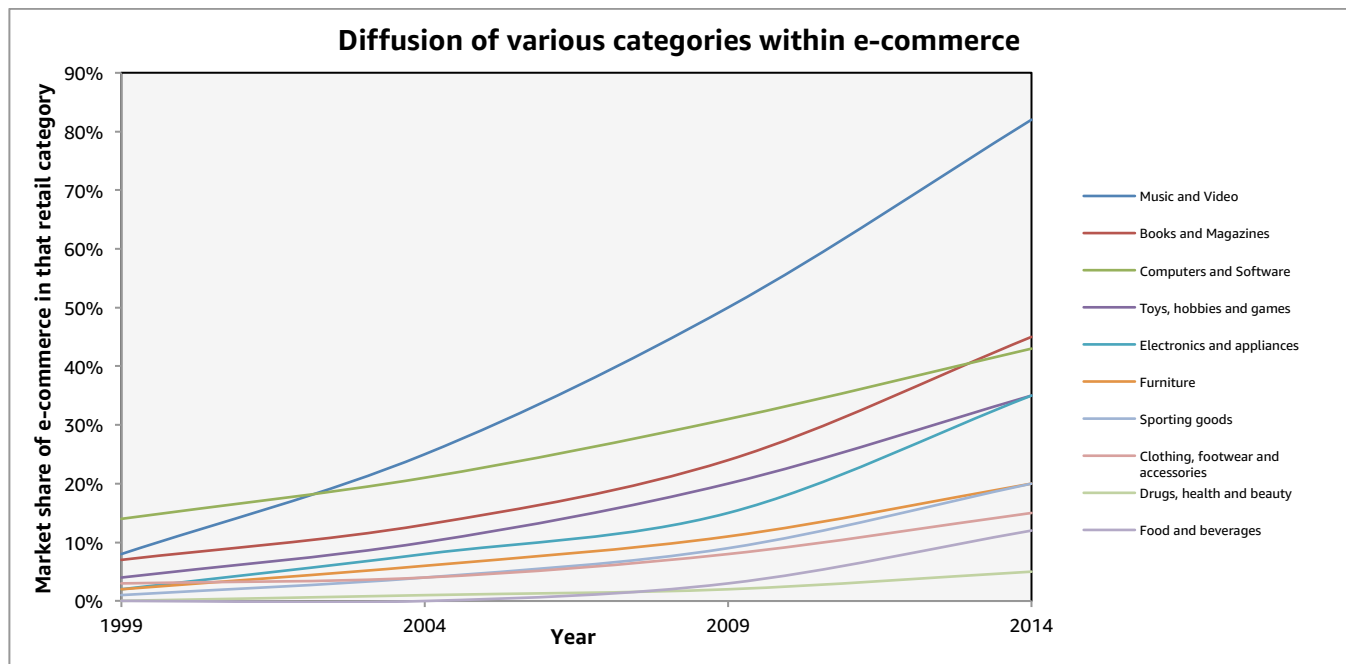


⁸ We assume that all financials are linked to retail alone, although AWS is a significant part of Amazon since 2008. Refer Appendix 3 for the data obtained through Amazon annual reports.

Amazon.com⁹. These measures were obtained from the Annual reports from 1998-2014. These are plotted on the previous page.

Both the diffusion curves show that we are currently in the phase of the peak adoption cycle and neither of these show any signs of plateauing. Peak rate of adoption of customers is 36 million customers/year (2013) and the peak rate of sales is \$14B/year (2014). It took Amazon close to 4 years before it took off on sales and about 3 years to gain a decent customer adoption (time to really scale-up).

Since various categories have evolved at different times, we have plotted the diffusion curves for various categories using the e-commerce sales data available from US Census¹⁰. It is interesting to see how different categories have diffused at different rates.



This chart shows that there exist mature and nascent categories in e-commerce and it is easier to explain the diffusion of the individual categories much better. Most categories are in the increasing slope section of the diffusion curve. Some like music and video will plateau soon, while some like food and beverages are yet to enter the steep growth phase.

Adoption dynamics for E-commerce based on Roger's five-factor framework:

I have attempted to analyze the diffusion for the category based on Roger's five-factor framework:

- **Relative advantage:** E-commerce had a clear advantage over brick and mortar in terms of product selection. The pricing advantage could have only been achieved with scale (especially to get prices lower than competitors like Walmart). However, at scale, e-commerce will lead to lower prices due to the lack of intermediaries, lesser real estate costs and manpower costs. (4/5)
- **Visibility:** Amazon and EBay spent a lot in the initial years on advertising and marketing. Approximately 25% of net sales were invested into sales and marketing. (3/5)
- **Trialability:** This is probably the most important barrier to adoption since e-commerce requires a fundamental change in the way people buy. The trialability is easy for some categories, but tough for some others. As a result of this, some categories like grocery are still in the early phases of the adoption curve since people prefer to purchase grocery after seeing the produce. (1/5)
- **Simplicity:** Using ecommerce in the initial days was complex, since people weren't used to ordering online. Some initiatives like single-click purchase made the online purchase process really simple (4/5)

⁹ Refer Appendix 4 for dataset from Amazon annual reports

¹⁰ Refer Appendix 5 for data from US Census for e-commerce sales

- Compatibility: There are no issues with compatibility, since the final product usage remains the same. (5/5)

Discussion on the various models that have evolved in e-commerce:

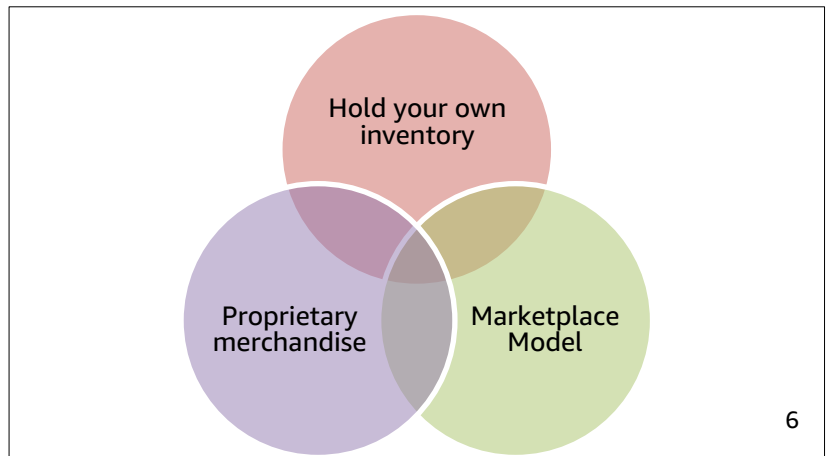
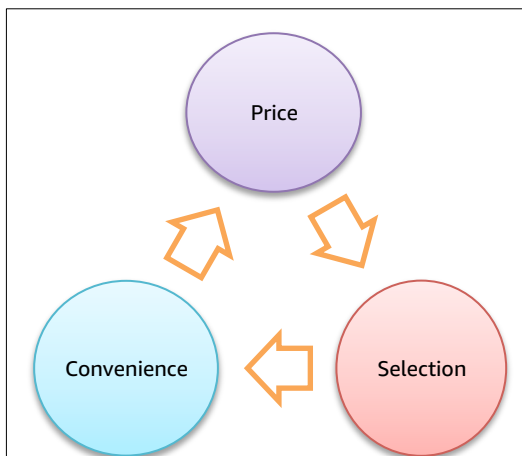
The key models in e-commerce:

- Maintain own inventory of products and sell it based on consumer demand
This is the model based on which Amazon.com started operations in 1995. Amazon had a proprietary one-click purchase, which made the purchase experience really quick. This coupled with an excellent product search algorithm, right recommendations, customer reviews, fast-responding payment gateway and a strong logistics network was the model Amazon started e-commerce with.
- Marketplace model
This is the model that EBay adopted initially – by acting as an intermediary between buyers and sellers, without owning any inventory and without handling logistics. The marketplace was open for all product categories.
- E-commerce restricted to a product category
In the mid 2000’s, some companies (Zappos, Diapers) evolved that just focused on one category and mastered it by building in features that were very customized to enable the best customer experience through online purchase – something that would have been difficult for Amazon or EBay to do. This helped categories like shoes move from offline to online purchase.
- Own the product value chain right from design to e-commerce sales
Companies like Bonobos and Warby Parker specifically controlled the entire product value chain by owning product design and manufacturing apart from selling. Since they had their proprietary products, it was impossible for incumbents to enter the space without investing heavily into product development. However, the Bonobos and Warby Parker models are more asset heavy models and require more investment than those of the incumbents. Some of these companies also have brick and mortar stores that they launched to improve brand equity and enable a good touch-and-feel shopping experience.

Out of all companies, Amazon has continued to be a leader in the e-commerce space and has evolved its model over time. Since starting in 1995, where the focus was only on books, Amazon has moved into most categories of e-commerce and has built logistics and supply chain as its core capability. It has always focused on achieving the lowest price, widest selection and highest degree of convenience to the customer. In 2000, Amazon introduced marketplace model (like EBay) and went a step further by enabling sellers use the Amazon logistics platform to deliver products to buyers through an initiative called FB&A (fulfilled by Amazon). In categories where customization was essential, Amazon acquired Zappos and Diapers and integrated these into the Amazon network. E-commerce economics works with scale and Amazon has the best capability with the widest selection of items. Its massive & loyal customer base (especially through the Prime program) helps bring enormous scale, leading to very low delivery costs across the supply chain. Through initiatives like Prime Now (1 hour or 2 hour delivery) and drones in the future, Amazon has the potential to reduce delivery times on most ordered items to as low as 2 hours. (Already through the Prime program, Amazon can deliver millions of products within 2 days to the customer – a capability that hardly any other e-commerce company is capable of)

Dominant Model:

The dominant model might have the following characteristics:



Based on my assessment of the category, the dominant model will have the following characteristics:

1. Fast moving items have to be inventorized: This is essential since it will be most convenient to the customer in this model since it enables a very quick delivery. Only items that have a local supply chain (mostly food, groceries) can be provided quickly through hyper-local delivery models.
2. Marketplace model: Marketplace has to co-exist with holding one's own inventory. Marketplace would be specifically for products that have low demand and high variability. Marketplace is the easiest way to widen selection, without taking on unnecessary risk on oneself. Marketplace could also evolve as the dominant model in categories having local supply chain (e.g. Instacart model for groceries).
3. Proprietary merchandise: While companies that adopt this model have a control on their products, they don't necessarily have the most efficient logistics network. In the long run, enormous synergies can be unlocked if these are integrated with Amazon, since the delivery costs through Amazon would be far lower than the current costs these companies bear. There always exists the possibility that Amazon can acquire these companies.

From the S-curves, it is clear that the dominant model has evolved in most e-commerce categories, except food and beverages. There are multiple companies trying out on-demand delivery models (like Postmates & Uber), hyper-local delivery models (like Instacart) and aggregated inventory e-commerce models (like Amazon).

Disrupting one's own established model:

Amazon has in the past disrupted its own model in categories where e-commerce penetration became high. Amazon entered e-commerce through books and over time created a massive disruption in the space, which could potentially be replicated across other categories over time. The disruptions are:

1. Kindle: Instead of selling hard copies of books, Amazon invented the Kindle device so that books could be wirelessly delivered to the Kindle, instead of actually reading a hard copy.
2. Publishing business: Amazon recently started printing its own books, based on customer orders. This removes the need to maintain an inventory of the finished products. Amazon can print books in some of its warehouses based on the customer order and the printed book can be delivered to the customer.

Moving into manufacturing requires very different core capabilities depending on the category and might be a stretch for Amazon to achieve this for every category. Thus, some other players that have mastered manufacturing capabilities for proprietary products will co-exist.

However, Amazon's logistics and warehouse capability is a huge core competency that is very difficult to replicate. Recently, Jet.com entered e-commerce with a highly reputed management team and with the backing of Bain Capital, Google Ventures and NEA. While they have a unique model where they trade-off customer convenience for a lower product price, the cash burn in the initial stages till Jet.com reaches 5 million customers would be enormous. Moreover, the cash burn will always be a function of Amazon's pricing since Amazon has alternate revenue streams (like AWS) to burn more cash in e-commerce if required. It would be really difficult to compete with Amazon in today's age without owning the entire product value chain, in which case there is no way that Amazon would have access to the product portfolio.

Conclusion:

1. Amazon has adopted elements of various successful models to evolve its model comprising of maintaining own inventory, marketplace and backward integration into categories like books. This, along with its core capability of logistics will make it a dominant player in the space.
2. The food and beverages category (huge market) is still up for grabs and a dominant model is yet to evolve in this space. With players like Uber, Amazon and well-funded companies like Instacart in the race, it will be interesting to see who finally wins.

Appendices:

1. US Census data for e-commerce sales:

Year	Ecommerce	Total Retail	Ecommerce as a % of Retail Sales
2000	27425	2979447	0.92%
2001	34173	3062281	1.12%
2002	44487	3129672	1.42%
2003	57003	3261711	1.75%
2004	72410	3460875	2.09%
2005	91182	3686598	2.47%
2006	103015	3877651	2.66%
2007	136205	3997120	3.41%
2008	142137	3928719	3.62%
2009	145090	3614839	4.01%
2010	169335	3819417	4.43%
2011	198623	4105199	4.84%
2012	228552	4300992	5.31%
2013	259857	4468973	5.81%
2014	297322	4628090	6.42%

2. Data for companies over a period of time:

Year	Companies
1995	2
1997	100
1999	1100
2000	890
2001	128
2004	31
2007	35
2010	25
2015	20

3. Amazon's data for S curve for selection:

Year	Inventory (as a surrogate for selection)	Investment every year	Cumulative investment
1995	0	0.052	0
1996	1.4	1.2	1
1997	14.9	22	23
1998	61.0	323	346
1999	117.1	951	1297
2000	230.0	163	1460
2001	195.0	253	1713
2002	206.9	121	1834
2003	292.4	236	2070
2004	432.6	145	2215
2005	606.4	778	2993
2006	823.9	333	3326
2007	1141.2	42	3368
2008	1597.2	1089	4457
2009	2042.4	2337	6794
2010	3109.5	3360	10154

2011	4807.7	1930	12084
2012	6788.1	3595	15679
2013	8272.4	4276	19955
2014	9887.6	5065	25020

* All data in the table is from Amazon Annual reports - Balance sheet & cash flow statement (1998 – 2014)

4. Diffusion Curve for Amazon (through sales and customer data)

Year	Sales (\$ million)	Customers (\$ million) ¹¹
1996	15.7	0.18
1997	164	1.5
1998	610	6.2
1999	1639	16.9
2000	2760	20
2001	3120	25
2002	3932	34
2003	5263	40
2004	6921	46
2005	8490	57
2006	10711	63
2007	14835	76
2008	19166	88
2009	24509	105
2010	34204	130
2011	48077	164
2012	61093	200
2013	74452	237
2014	88988	270

5. Share of retail market for different categories within e-commerce

	1999	2004	2009	2014
Music and Video	8.0%	25.0%	50.0%	82.0%
Books and magazines	7.0%	13.0%	24.0%	45.0%
Computers and software	14.0%	21.0%	31.0%	43.0%
Toys, hobbies and games	4.0%	10.0%	20.0%	35.0%
Electronics and appliances	2.0%	8.0%	15.0%	35.0%
Furniture	2.0%	6.0%	11.0%	20.0%
Sporting goods	1.0%	4.0%	9.0%	20.0%
Clothing, footwear and accessories	3.0%	4.0%	8.0%	15.0%
Drugs, health and beauty	0.0%	1.0%	2.0%	5.0%
Food and beverages	0.0%	0.0%	3.0%	12.0%

¹¹ <http://www.statista.com/statistics/237810/number-of-active-amazon-customer-accounts-worldwide/>

6. CB Insights raw data

Quarter	Deals	M&A	IPO	Cumulative companies	Entering companies	Exiting companies
2010 Q4	99	17	3	79	99	20
2011 Q1	127	27	0	179	127	27
2011 Q2	170	27	1	321	170	28
2011 Q3	125	46	0	400	125	46
2011 Q4	110	29	1	480	110	30
2012 Q1	170	35	4	611	170	39
2012 Q2	237	65	0	783	237	65
2012 Q3	199	27	1	954	199	28
2012 Q4	193	33	1	1113	193	34
2013 Q1	220	31	0	1302	220	31
2013 Q2	271	36	3	1534	271	39
2013 Q3	266	51	2	1747	266	53
2013 Q4	252	30	5	1964	252	35
2014 Q1	265	60	2	2167	265	62
2014 Q2	271	51	7	2380	271	58
2014 Q3	269	75	2	2572	269	77
2014 Q4	285	72	5	2780	285	77
2015 Q1	306	91	2	2993	306	93
2015 Q2	323	82	7	3227	323	89
2015 Q3	352	63	1	3515	352	64