

E-Commerce: A Statistical Market Analysis and Forecast of Emerging Trends

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Introduction

On August 11, 1994, Daniel Kohn and one of his Swarthmore College classmates stood on the cusp of history. Little did they know, but these college graduates and founders of NetMarket were about to initiate a trend that would revolutionize the culture for decades to come. With the purchase of the Sting CD, "Ten Summoner's Tales," these college grads completed the first ever secure retail transaction on the World Wide Web. Although Randy Adams and the Internet Shopping Network argue that they completed the first online transaction a month prior, one fact is clear – the year 1994 represents groundbreaking achievements in the internet realm (Gilbert 2004). Fast-forward just 14 years later to read the following statement regarding the industry these pioneers unlocked: "Relatively strong growth was seen in the global Internet and E-Commerce sector in 2007-2008, despite the global economic crisis...The Internet is about saving time (and therefore saving money), and the potential of the Internet has barely been tapped (*E-Commerce*)." If what Plunkett Research states about electronic commerce is even remotely correct, the world is likely to experience a Power Wave - a revolution in business practices that truly exploits the advantages of new technologies ("Dent Method").

Analyzing the past and present growth of online retail sales in the United States, a trend will be identified and given a projected duration time. In order to identify when online retail sales will reach market maturity, a forecast will be created to identify the depth and impact of the e-commerce trend in quantifiable terms. Overall, the impact of e-commerce on consumer purchasing will be thoroughly reviewed. The analysis and

forecast will cover U.S. online retail sales independently and as a percentage of total retail sales through 2020. Comparing the results under two models, S-Curve analysis and the Dent Method, forecast consistencies and discrepancies will be noted and analyzed. Only time will tell the degree to which the internet will make its imprint upon consumer society.

Short and Long-Term Research

The research is framed by the work of economists such as Harry S. Dent and research organizations such as Forrester Research, Jupiter Research, and Plunkett Research. At the short-term end of the research spectrum, Forrester Research, Jupiter Research, and Plunkett Research gather and analyze data concerning trends that are happening now. They often find correlations and make predictions based on current statistics. Similar methods will be used in this research project to analyze e-commerce sales data and compare it to total commerce data.

At the long-term end of the research spectrum, Harry Dent is an economic forecaster who uses a common sense approach. Essentially, he states that economics are tied to demographics. In turn, commerce is the logical result of people making predictable spending decisions as they move through life ("Dent Method"). Analyzing these predictable trends generates accurate long-term forecasts which can be utilized by both businesses and consumers. The Bureau of Labor Statistics supports Harry Dent's methods by emphasizing the importance of demographics. Demographics provide a direct link to the condition of the labor force and purchasing patterns. The government institution recognizes that population trends affect employment

opportunities by influencing the demand for goods and services. Population changes produce related changes in the demographic composition and size of the labor force. The Bureau of Labor Statistics also states that “Population is the single most important factor in determining the size and composition of the labor force...” (“Tomorrow’s Jobs”). Since such a high degree of importance is placed on the composition and size of American society, much attention will be placed on analyzing demographic trends and their relation to consumption. Using aforementioned techniques, the research will consist of finding and analyzing the e-commerce trend as it emerges. The better data can be used in accordance to accepted methodologies such as the Dent Method, the more accurate and useful the predictions will be.

Research Methods

In order to accurately analyze and forecast the online shopping trend, adherence to industry-approved methods is tantamount. The primary methodologies used will be the Dent Method (mentioned above), SPSS analysis, and S-Curve Economics. Following industry standards for social science research will provide a solid foundation for the generation of reliable forecasts.

First of all, Statistical Package for Social Sciences (SPSS) is a widely used analysis tool for the social sciences. Recently rebranded as Predictive Analytics SoftWare (PASW) in 2009, the statistical analysis tool can be implemented to interpret data in a number of ways. The software can be used to find differences, relationships, or descriptions of data. However, no analysis is meaningful unless the data is reliable and valid. Data is reliable if it can “consistently measure the topic under study at different times and across different populations” (Hinton 356). On the other hand, validity refers to the strength of the conclusion. Simply put, are they right? Keeping both reliability and validity in mind,

SPSS becomes a powerful tool. SPSS creates a mathematical way in which to make fact-based predictions using current data. Furthermore, finding correlations in the data will help generate predictive models for analysis and conclusion. While SPSS facilitates the detailed analysis of e-commerce data, it is the methodology of S-Curve economics which enables trends to be forecasted.

S-Curve economics illustrates the introduction, growth, and maturation of innovations as well as the technological cycles that most industries experience. Essentially, an S-Curve can be broken down into four phases: innovation, growth, maturity, and decline. Innovation refers to the introduction of a new product or technology to the market place. The majority of products and technologies never make it past the first phase due to the high costs and low revenues associated with new ideas. Specifically, the innovation phase represents the period of time when 0%-10% of the market adopts the new technology or product. As a product moves through the innovation phase, market adoption grows very slowly if it is adopted at all. However, once a concept, such as e-commerce, reaches 10% market penetration, it is said to be a concept whose ‘time has come.’ Entering the growth phase, which represents 10%-90% market penetration, the concept starts to grow in an exponential fashion. Unlike the slow growth during innovation, once about one out of every ten people readily uses the technology, it begins to grow like wildfire. To put it into perspective, it takes roughly the same period of time to grow from 10%-90% as it did to grow from 0-10% market penetration. Virtually nothing can stop its rapid growth once it enters into the growth phase. As adoption nears nine out of every ten people, growth slows as it enters maturity. Although almost no technology is universally adopted and reaches 100% market penetration, maturity refers to slow growth

that occurs between 90% and 100%. Once a market matures, growth often tapers off and declines. The decline phase only occurs when a new technology or product is created which makes the old obsolete. Once the new begins to be readily adopted by the masses, the old starts its decline. The S-Curve is essential to understanding how markets move. Combined with the Dent Method, it further improves the accuracy of forecasts related to e-commerce.

Initial Projections

Based on current data, it is projected that e-commerce will experience the growth phase of its S-Curve over the next decade. I expect the rapid growth to result in the maturation (roughly 90% penetration of the potential market) of online shopping by 2020. Despite the current economic downturn, e-commerce continues to grow while other industries move backward (“E-Commerce”). Since online shopping is based on saving time and money for the consumer, as well as the business owner, hard economic times will only deepen the e-commerce trend. While sales may not increase as rapidly as in strong financial conditions, individuals will look to spend their limited finances in as efficient a fashion as possible. The internet, coupled with the ability to do comparison shopping, research, analyze customer reviews, and order from a single location, provides the demanded shopping efficiency.

S-Curve economics presents a case for the rapid growth of online shopping. Due to the nature of market development, exponential growth occurs once a new technology reaches roughly 10% market penetration and continues until it reaches roughly 90% market penetration. Data compiled by Forrester Research shows that e-commerce has entered its growth phase in the United States. Their definition of e-commerce retail sales includes all online sales except auto, travel, and prescription drug sales. Since the expected market cap of US online sales is 50% of total U.S. sales, the growth phase begins once

online sales equal 5% of all sales. In 2007, the feat was achieved according to Forrester Research when online retail sales reached 5% of all retail sales in America (“U.S. E-Commerce”). Historical evidence strongly suggests that a period of exponential growth will follow, accelerated by the speed of the information age. As stated earlier, new products and technology generally take the same time to complete the introduction phase as they do to complete the growth phase. E-commerce appears to have its humble beginnings during the latter months of 1994. Since it took 13 years (from 1994-2007) for e-commerce to reach 10% market penetration, it is expected to take approximately 13 years from 2007 for US online sales to reach 45% of total US sales, which is 90% penetration of the projected market. According to my initial projections, e-commerce would complete its growth phase during the year 2020. The results may be historically significant as the American culture is transformed by internet shopping.

Cultural Impact

The fact that American society is in the midst of a culture-changing trend makes it a significant area of investigation for Americans in general, for research, and for the business field. On the individual level, e-commerce tends to save Americans both time and money. Online shopping allows consumers to compare costs and read product reviews from the comfort of one’s own home. This saves time that would otherwise be spent in traffic or waiting in line. The nature of e-commerce forces businesses to respect the consumer. The internet makes it easier than ever to compare and contrast products, do research, and read reviews. Businesses must offer customers competitive pricing and a satisfying online experience or risk losing the sale. With the click of a button, customers can leave one virtual store and enter another. According to a Forrester Research report, retailers must make their websites more

conducive to browsing. They can elicit favor with shoppers by focusing additional energy on accurate product information, improved imagery, flexibility in payments and returns, and by reducing the hurdles of shipping costs (Rosencrance 2008). Essentially, e-commerce empowers the consumer. The concept of consumer empowerment is demonstrated by the fact that people's actions on the internet dictate the response of businesses. The supply of specific information, products, and services is tailored to the individual based on past purchases or search results. The level of consumer empowerment created online cannot be duplicated in the traditional store.

On the research level, e-commerce is important because it is altering the face of the consumer. As convergence of the telecommunication industry and internet occurs, individuals change the way they buy products and services, communicate, bank, pay bills, and research information.

According to one of the world's leading authorities on technology and trends shaping the world of wireless mobility, Mr. Andrew M. Seybold, this connection allows for greater access to voice, audio, data, and video services than ever before (Seybold 11). New research is now necessary to understand how the new consumer makes decisions. As information is constantly changing, a rapid response from researchers is required to stay up-to-date. Online shopping is creating major changes in not only the way consumers think, but the way in which businesses market to their customers. The growth of e-commerce and converging technologies recreate the need for trust. Analyzing the need for trust is central to market research. Piotr Cofta, Chief Researcher in British Telecom's Mobility Research Group, shows that without a trust in businesses or the medium through which the transaction takes place (the internet), no commercial transaction will occur no matter

how convenient or developed the technology is (Cofta 1).

Despite the recent scare of entering credit card and personal information online, security measures and higher encryption standards allow consumers to trust the safety of online shopping. In the 21st century, it has become more a risk to hand one's credit card to a clerk in a store than to enter the information on a mainstream website. Although risks do exist on lesser known websites with lower levels of data encryption, the majority of competitive internet companies offer high levels of security for customers. More and more online firms offer all-encompassing return policies. Such policies guarantee that the customers receive the exact product they are looking for in excellent condition. If they are not satisfied, they can send it back to the company for replacement or refund. As return policies are improved, customers will be more confident in making purchases over the internet. E-commerce will continue to flourish and grow if trust continues to grow in the minds of consumers. On both sides of the equation, e-commerce is laying the groundwork for major changes in society – changes which pave the way for future research.

On the retail level, internet shopping is extremely significant to the business field. Currently, many businesses are changing their focus from traditional retailing to driving online sales. According to Ken Allard, a chief executive strategist, a wide range of organizations are making large investments in internet commerce. He understands the new investment cycle to be the result of four main trends, consisting of internet commerce becoming a reliable engine for growth, new web technologies enabling additional capabilities, both consumers and businesses demanding new features and services, and marketing budgets shifting to the internet (Allard). As current trends propel online shopping to not simply become the way of the

future but the way of the present, companies must quickly adapt their business practices to meet the growing demand. Similar to researchers, businesses must learn to understand the changing face of the consumer. They must learn to supply customers with what they want and how they want it, while competing with more and more competitors online. If actions are not taken to utilize the marketplace of the future, online market share is lost daily. Companies simply will not survive if they do not have a viable internet option for customers to access.

Preliminary Findings

I initially projected that e-commerce retail sales will become a mature market by 2020 based on Forrester Research's e-commerce sales data. According to Forrester's measure of online retail sales (which excludes auto, travel, and prescription drug sales), e-commerce entered its growth phase (10% market penetration) in 2007. However, for the purpose of this report, I will be utilizing the U.S. Census Bureau's measure of online retail sales. Their measure includes all online retail transactions except online travel services, financial brokers and dealers, and ticket sales agencies. Since they record e-commerce data differently than Forrester Research, online retail sales were only 3.17% of total retail sales (6.34% market penetration) in 2007 ("Measuring the Electronic Economy"). Thus, e-commerce as recorded by the U.S. Census Bureau has not yet entered its growth phase. Using this scale means that U.S. online retail sales are not expected to reach 90% market penetration until after 2020.

Since I have not yet had access to SPSS software, my forecast under the S-Curve model is based on an exponential regression (LOGEST function) in Microsoft Excel. Although a logistic regression would be more accurate in forecasting a complete S-Curve, Excel does not currently have such a function. Until I have access to a logistic analysis tool, the exponential regression will do a good job

of forecasting the exponential growth portion of the S-Curve (which is the portion I am analyzing). Using both online and offline retail sales data from 1999-2008, I forecasted the growth rate of retail e-commerce sales, the volume of retail e-commerce sales, the retail e-commerce growth rate as a percentage of total retail sales, and the final e-commerce percentage of total retail sales for each year from 2009-2020. According to my forecasts, online retail sales will not enter the growth phase until 2011 when they represent 5.8% of total retail sales (11.6% market penetration) in the US. At this level, online retail sales will total over \$257 billion in 2011. My short-term forecasts line up closely to that of Forrester research, which predicts that e-commerce sales will reach \$334.7 billion in 2012 (Rosencrance 2008). My forecasts place the 2012 online retail sales forecast at \$318.57 billion. The variation may exist due to differences in the definition of an online retail sale. Different forecasting methods might also be a reason for the discrepancy. Nonetheless, my short-term estimates are strongly correlated with a well-established forecasting company.

In the long-run, I predict that online retail sales will surpass \$1 trillion by 2018 according to the model. Online sales are expected to exceed \$1.6 trillion in e-commerce sales in 2020. At this point in time, e-commerce should capture approximately 27% of total retail sales (54% market penetration) in the United States. If this comes to pass, the e-commerce trend will continue for at least another decade until it captures 45% of total retail sales (90% market penetration) and becomes a mature market. Besides considering the factors of S-Curve Economics, the Dent Method should be considered in the analysis as well.

The Dent Method allows economists to logically forecast future consumption in the U.S. The forecast is ultimately determined by the size and composition of the population.

Personal consumption represents roughly 70% of the Gross Domestic Product in America. At an average age of 47.5, consumers reach their predictable peak in spending (“Dent Method”). The consumer influences the overall economy greatly in the U.S. It is important to analyze the size of those groups in their peak spending years during the e-commerce trend from 2000-2020. This will provide better a better understanding of the growth rates estimated in the regression analysis.

Based on the most recent U.S. Census of 2000, 60.1 million people were between the ages of 40 and 54 years of age in 2000 (“QT-P1. Age Groups and Sex: 2000”). This age bracket represents groups in their peak spending years according to the Dent Method. From 2000 to 2010, the number of people between 40 and 54 years old grew over 9.2% to 65.7 million (the growth level assumes the same number of individuals who were 30-44 years old in 2000 are now 40-54 years old in 2010). However, from 2010 to 2020, the number of people between 40 and 54 years old is expected to fall roughly 10.4% to 58.9 million. The contraction in the population represents a larger generation (the Baby-Boomers) preceding a smaller generation (Generation X). This may impact the e-commerce trend in a number of ways. Since there is an expected reduction of those who will be in the peak spending years from 2010 to 2020, I expect personal consumption to grow slowly or even fall during the decade. Due to the anticipated slow-down in spending, I expect my estimates for 2020 to be too high. How high is difficult to determine until future analyses can be made. However, I still expect e-commerce to be within 5% of the 27% of total sales anticipated in 2020. I also expect online retail sales to exceed \$1 trillion by 2020, despite reduced consumption levels.

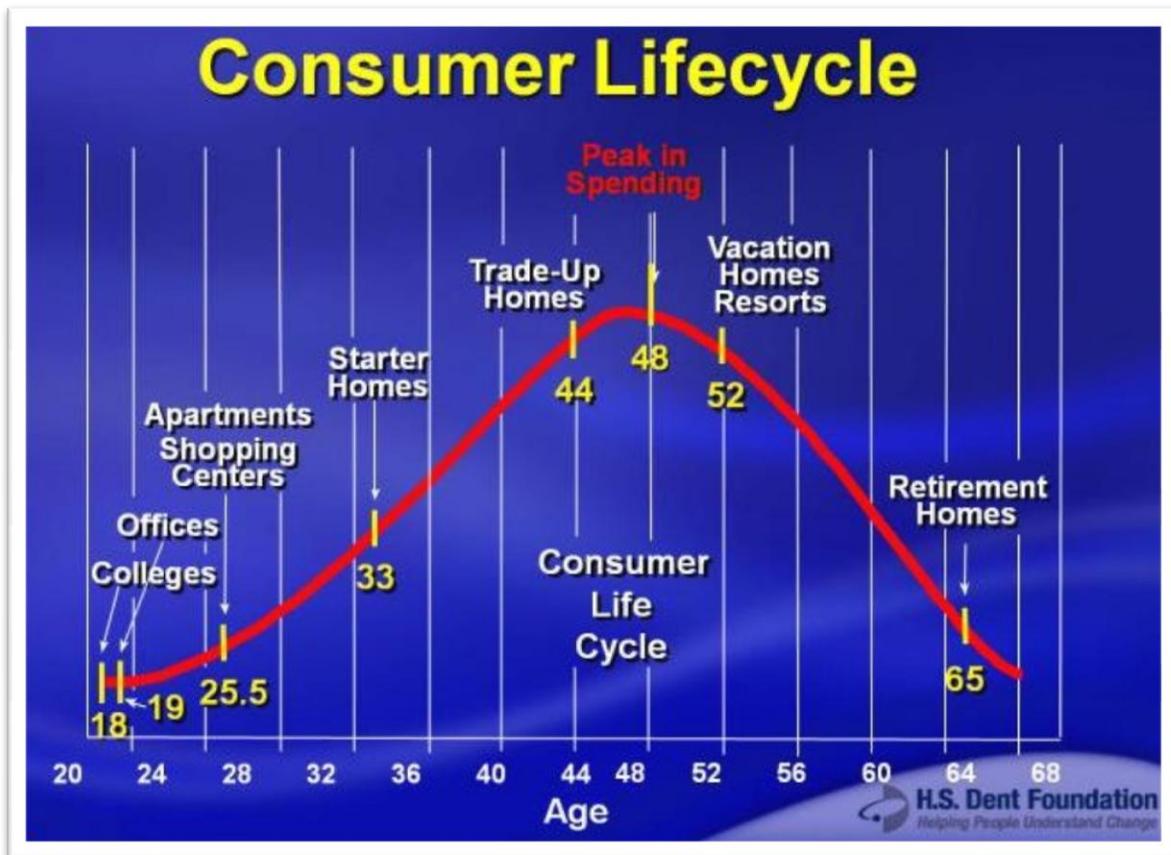
Conclusion

America is likely to experience a dramatic restructuring of its consumer culture over the next two decades. The growth of the internet coupled with the rapid nature of the information age will produce changes expected to occur faster than ever. E-commerce is the driving force behind the significant changes in store for research, for the business field, and for Americans in general. After analyzing the past and present growth of online retail sales in the United States, it is clear that a trend is emerging. Comparing the data from the S-Curve analysis perspective and the Dent Method perspective proved useful. While the S-Curve model allowed me to forecast both e-commerce sales (\$1661.357 billion) and its percentage of total sales (27.297%) in 2020, the Dent Method highlighted the limitations of the growth rate under current demographic conditions. Even though the changes in internet use over the past fifteen years have been significant, the potential of online shopping has barely been tapped. The greatest period of growth has yet to be experienced, but it has already altered many aspects of America’s consumer society either directly or indirectly. It is only a matter of time before e-commerce completely integrates itself into American society. Once it does, e-commerce will have completed its journey from its first sale involving a Sting CD, to provoking rapid cultural change, to maturing and becoming synonymous with American culture.

Current Economic Data: 1999-2008										
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Retail E-Commerce Sales (billions)	15.004	28.824	34.263	44.706	55.731	76.344	93.28	107.014	126.697	132.257
Total Retail Sales (billions)	2866.898	3060.748	3156.754	3141.468	3275.407	3474.34	3693.43	3869.536	3994.823	3959.957
% of Total Retail Sales	0.523%	0.942%	1.085%	1.423%	1.701%	2.197%	2.526%	2.766%	3.172%	3.340%
Actual Growth Rate (E-Commerce Sales)	92.109%	18.870%	30.479%	24.661%	36.987%	22.184%	14.723%	18.393%	4.388%	26.026%
Actual Growth Rate (% of Total Retail Sales)	79.942%	15.255%	31.114%	19.563%	29.143%	14.936%	9.502%	14.680%	5.308%	21.280%

Forecasted Economic Data: 2009-2020												
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Forecasted Growth Rate (e-commerce sales)	26.026%	24.740%	24.004%	23.561%	23.284%	23.104%	22.984%	22.901%	22.843%	22.802%	22.772%	22.749%
Forecasted Retail E-Commerce Sales (billions)	166.6784	207.9149	257.8231	318.5701	392.746	483.4861	594.6091	730.7817	897.7167	1102.414	1353.453	1661.357
Forecasted Growth Rate (% of Total Retail Sales)	21.280%	20.197%	19.577%	19.204%	18.970%	18.818%	18.717%	18.647%	18.598%	18.563%	18.538%	18.519%
% of Total Retail Sales	4.051%	4.869%	5.822%	6.940%	8.256%	9.810%	11.646%	13.818%	16.388%	19.430%	23.032%	27.297%

Consumers' Peak Spending Years				
	2000	2010	2015	2020
40 to 44 years	22,441,863	20,510,388	19,381,336	18,964,001
45 to 49 years	20,092,404	22,706,664	20,510,388	19,381,336
50 to 54 years	17,585,548	22,441,863	22,706,664	20,510,388
Peak Spending Population Total (40-54years)	60,119,815	65,658,915	62,598,388	58,855,725
Population Growth (2000-2010)		9.213%		
Population Growth (2010-2015)		-4.661%		
Population Growth (2015-2020)		-5.979%		
Population Growth (2010-2020)		-10.361%		
Population Growth (2000-2020)		-2.103%		



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