

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF SUPPLY CHAIN AND INFORMATION SYSTEMS

SUPPLY CHAIN AS A SWORD AND A SHIELD: LESSONS FROM APPLE

LAUREN E. STERN
SPRING 2013

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Supply Chain and Information Systems
with honors in Supply Chain and Information Systems

Reviewed and approved* by the following:

Felisa Preciado
Clinical Associate Professor of Supply Chain and Information Systems
Thesis Supervisor

John C. Spsychalski
Professor Emeritus of Supply Chain Management
Honors Adviser

* Signatures are on file in the Schreyer Honors College.

ABSTRACT

In the past few decades, Apple has gone from being an incredible startup success story, to a company on the very brink of failure, to its current status as one of the most valuable and emulated companies in the world. It originally got its start through technological innovations, laser-like focus and a sometimes uncanny understanding for what consumers would want, and those things have certainly been constant themes during its periods of success.

But one of the biggest reasons for its outstanding success in the past decade has been the way Apple has leveraged its supply chain both to control costs and to give it a competitive advantage unmatched by any of its competitors. This paper analyzes the Apple supply chain to try to identify the way in which Apple has taken advantage of its supply chain, adapted it to changes in the market, and used it as both a defensive and offensive competitive weapon to become one of the most successful and influential companies in the world. It also compares the supply chain strategy used by Apple with those of its competitors to explain Apple's recent triumphs as well as some of the risks it faces in the future.

TABLE OF CONTENTS

Acknowledgements.....	v
Chapter 1 Introduction:	1
A Brief History of Apple	2
Chapter 2 Putting Apple in context: the Technology Industry Supply Chain Generally	8
Sources of and Constraints on Source Materials.....	11
The Role of Chinese Labor	13
Chapter 3 Apple’s Competition	16
Samsung	17
Apple and Samsung: a Love/Hate Relationship.....	18
Dell.....	21
Apple and Dell.	24
Chapter 4 Contracting Arrangements:	27
Quality and Pricing	27
Product Design.....	28
Apple in the Market	30
Product Quality	32
Working Conditions.....	32
Chapter 5 Implications for Competitive Position	35
Supply Chain Management as Apple’s Sword and Shield.....	35
Apple’s Supply Chain as a Sword.....	40
Apple’s Supply Chain as a Shield.....	41

Apple – Also the World’s Most Efficient SCM.....42

Conclusion43

Appendix A Inventory Component Prepayment.....46

Appendix B Estimated Value of the Mobile Phone Industry47

BIBLIOGRAPHY48

ACKNOWLEDGEMENTS

I would like to express my tremendous gratitude for the support and guidance provided by Dr. Preciado, my thesis advisor. Without her valuable and constructive recommendations and generous contributions of time and insight, this thesis would not have been possible. I would also like to thank Dr. Spsychalski for dedicating the time and energy required to help yet another young supply chain student. Dr. Preciado and Dr. Spsychalski exemplify what makes the Supply Chain program at Penn State one of the best programs in the nation.

Finally, I would like to thank my father for being so interested in Apple, serving as a great inspiration for this thesis.

Chapter 1

Introduction

Apple is both one of the most admired and criticized companies in the world. Admirers point to Apple's leading role in consumer technology innovations, the advantages Apple derives from the disruptive impact of those innovations on entire industries (including the computer, telephone, music and publishing industries), and the extraordinarily high quality of Apple's products. Critics point to Apple's obsessive control over every aspect of both its product line and customer experience, its so-called "walled garden" approach to securing its operating system and programs, and its paternalistic efforts to constrain its customers' ability to stray outside the parameters of what it believes the customer experience should be.

The fact that Apple has been able to inspire such passion in both its admirers and critics is both an outgrowth of and a testament to its success. Apple has gone from underdog to top dog in a little over a decade. Some of its success has stemmed from its unique ability to imagine and then create entirely new product categories that immediately became "the next big thing". Some of its success has come from an unparalleled focus on ensuring that average consumers, not just technophiles, would be able to use their products without complicated instructions or training. But a large part of

their success has come from carefully managing one of the biggest and most complicated supply chains in the world.

Modern supply chain management and logistics have become increasingly complex, in part because the world and the business of supply chain management have been changing so rapidly. This is especially true in the technology arena, where it is difficult to predict exactly what products will need to be manufactured and what new components may be available over a relatively short time horizon of months, rather than years.

This is one reason for Apple's ascendancy – as the company that has been more of an innovator in its market than any of its competitors; Apple has been able to see farther into the future. That has given it a strategic and tactical advantage in the industry in which it competes. This thesis attempts to describe how the clarity of Apple's vision has enabled it to use its supply chain mastery as both a sword – getting better prices and other terms from its suppliers than its competitors can generally manage – and a shield – preventing those same competitors from easily following Apple into the new product markets it has created. [This thesis also identifies certain developments, which may interfere with Apple's continued ability to dominate its supply chain in the future.]

A Brief History of Apple

Today Apple is one of the most valued and respected companies in the world. However, that has not always been the case. In fact, not too long ago Apple was on the very edge of extinction. The story of how Apple made its comeback to become one of the

world's most preeminent companies is, at least in part, one of the great triumphs in the history of supply chain management.

When Steve Jobs and Steve Wozniak founded Apple in 1976, the company was built upon a simple but visionary idea – that people would be willing to buy computers for their personal use. Until that time, computers were for the most part only used in businesses and universities. Jobs believed that the right kind of computers would have enough appeal to ordinary people that they would be willing to spend a substantial amount of money to buy one for themselves.

Prior to Apple, the few personal computers were custom-made by a small community of hobbyists and engineers. Steve Jobs believed that Americans were ready to buy computers if they came preassembled and were user friendly enough. And that is exactly what Apple did. The earliest Apple computers were not very different from the RadioShack and Tandy models with which they competed, but within a few years the advent of graphic user interfaces in Apple machines changed all of that. Macintosh computers were recognized as easy for the ordinary person to use – “computers for the rest of us” – and Apple had become worth millions of dollars.

But as brilliant as Steve Jobs was, he was not at first a good business manager. For one thing, he was not cost-conscious. When it came to building the early Macintosh computers he spared no expense. He believed that if he built top-notch machines, people would be willing to buy them even if they were fairly expensive. However, because he paid a great deal of money for the components that went into the early Macs, the machines were a bit *too* expensive for consumers. As a result, they began to have a hard time competing with the new PC industry.

Other managerial issues of Jobs eventually resulted in him being forced out of Apple. He left in 1985, and did not return for eleven years. During that time period, Jobs founded Next Computing and started Pixar (the graphics and animated movie company), and learned a great deal about management. And during that same period, Apple lost traction in the market and came close to bankruptcy.

One of the biggest problems Apple faced at that time resulted from mismanagement of its supply chain. For example, in 1993 Apple developed a surplus of Power Book laptops in inventory that cost them millions of dollars. Two years later they had moved so far in the opposite direction by manufacturing too few Power Macs that they had approximately one billion dollars in unfulfilled orders in their system. This inventory management failure was so damaging and apparent that it cost the then CEO of Apple his job (Apple Timeline).

When Jobs returned to Apple, he quickly recognized that supply chain management was critical to Apple's future, and he was determined not to let more such missteps keep Apple from succeeding. For example, in 1998 Jobs paid \$50 million to lock in all available holiday airfreight capacity to ensure that sales of the new iMac would not suffer from the same low inventory problems as the Power Macs (Exploring Apple's Supply Chain Secrets).

The other critical step Jobs took in 1998 was to hire Tim Cook away from Compaq, making him Senior Vice President for Worldwide Operations. Cook was a 16-year veteran of the computer-industry, having worked at IBM for 12 of those years.

According to *CNN*, he was given a "mandate to clean up the atrocious state of Apple's manufacturing, distribution, and supply apparatus" (Lashinsky).¹

Cook believed it was fundamentally dangerous in the computer industry to hold too much inventory because it "declines in value by 1% to 2% a week in normal times, faster in tough times." Cook has called inventory "fundamentally evil... You kind of want to manage it like you're in the dairy business. If it gets past its freshness date, you have a problem" (Lashinsky).

Fortunately for Cook and for Apple, advances in the supply/manufacturing landscape in the technology industry around the globe had given Cook an alternative. The Just-In-Time, or lean, manufacturing model first adopted by Toyota after World War II, and had then been utilized by companies such as Dell and Cisco Systems. As a consequence, large numbers of component manufacturers developed in places such as Taiwan and China who were eager to take orders for component parts from companies like Apple. And, these components did not become Apple inventory until Apple took possession, late in the manufacturing process (Just-In-Time Inventory Management Strategy & Lean Manufacturing).

By entering into contracts with component manufacturers, Cook was able to substantially reduce the extent to which Apple manufactured its own products, closing

¹ According to Lashinsky, to illustrate one of the characteristics that made Cook such an integral part of Apple's comeback, early in Cook's term at Apple he convened a meeting with his operations team to discuss a particular problem in Asia.

"This is really bad," Cook told the group. "Someone should be in China driving this." Thirty minutes into that meeting Cook looked at Sabih Khan, a key operations executive, and abruptly asked, without a trace of emotion, "Why are you still here?"

Khan, who remains one of Cook's top lieutenants to this day, immediately stood up, drove to San Francisco International Airport, and, without a change of clothes, booked a flight to China with no return date, according to people familiar with the episode. The story is vintage Cook: demanding and unemotional.

Apple factories and warehouses around the world. As a result, Apple's inventory quickly decreased from months to days. Less than a year after Cook made his Apple debut (fiscal year 1998), the corporation was reporting profits—an extraordinary shift from its prior fiscal year loss of \$1 billion (Apple's Climb Back to Success).

Jobs recognized and quickly rewarded Cook's tremendous results, promoting him to executive Vice President of worldwide sales and operations in 2002 and putting him in charge of the Macintosh division in time to deftly guide the company through the difficult transition from IBM PowerPC processors to Intel processors. Finally, in late 2005 – after already having run the company during Jobs' first medical absence – Cook was elevated to Chief Operating Officer, a title that was long overdue: “Tim has been doing this job for over two years now,” Steve said at the time, “and it's high time we officially recognized it with this promotion” (Lashinsky).

The evolution of supply chain management at Apple is especially impressive because Apple was always innovating its product line. In 2001 it introduced the first iPod, a tiny digital music player that came to dominate that product niche from then on. In 2007, Apple added the iPhone and iPod Touch. And in 2010, it unveiled the iPad, one of the most popular products in history. In each case, creating a new product line not only meant lining up suppliers for the new components, but arranging contracts that would allow Apple to meet demands for products so new that it was difficult to predict how many would be purchased (Current Evolution of Supply Chain Management).

It is here where Cook and the Apple supply chain have really demonstrated an unprecedented ability to succeed. In most cases, even industry experts far underestimated the demand for these new Apple products, and although Apple has at times faced severe

supply constraints, they have, for the most part, managed to avoid stock outs that resulted in consumers going elsewhere.

Chapter 2

Putting Apple in context: the Technology Industry Supply Chain Generally

It is not possible to properly appreciate the modern landscape of the consumer electronics industry supply chain without some understanding of the historic context of that industry.

In the aftermath of World War II, the US became firmly entrenched as the leader in worldwide manufacturing, including the consumer electronics industry. Nonetheless, over time US manufacturers allowed themselves to become complacent. When scientists in the Bell Labs developed the first practical transistors in the late 1940's, US companies were slow to adopt them because they had already made such substantial investments in manufacturing vacuum tubes. Japanese companies had not, and because setting up transistor manufacturing plants was less expensive than building vacuum tube factories, companies like Sony began to make transistor radios and similar things that quickly became the prevailing technology. This pattern held true for many years: the Japanese would aggressively try to capitalize on developments in laser, diode, CD, screen and other technologies built on discoveries and inventions made at U.S. laboratories like Bell Labs and RCA. Pretty soon, the U.S. companies that used to mock Japanese competition were being mocked in turn (Facts and Details).

The Japanese electronic industry was arguably at the height of its dominance in the

1980s. Even though Japanese companies continued to do very well into the late 1990s, when they were leaders in digital cameras, cell phones, car navigation systems, DVD machines and flat-panel liquid crystal and plasma television, it was clear by the early 2000's that new leaders were emerging in neighboring Taiwan, South Korea and China (Facts and Details).

This transition from Japan to Taiwan, South Korea and China was, in part, triggered by the success of some of Apple's new consumer products, such as the iPod. This device severely undercut Sony's role as a leader in the music-player industry, and the iPhone and the iPad became replacements for portable DVD players and other older technology. As a result, Japanese companies like Sony and Panasonic began to lose their position as leaders in the consumer electronics market.

Like Japan, Taiwan and South Korea also arose as powerhouses out of the devastation of World War II, but for a variety of reasons took much longer than their Japanese former conquerors. Both countries benefitted from an education system that had been, ironically, imposed on them by Japan when they were Japanese conquests. Both countries sought close political and trade ties with the United States and Japan because of their fears regarding Communist China. And American and Japanese companies viewed both countries as sources of cheap labor (Facts and Details).

In South Korea, the government promoted the development of *Chaebols*, companies handpicked by the South Korean government to be given subsidies and other favored treatment. Samsung as well as the two companies that eventually merged to form LG (Lucky and Goldstar) began as *Chaebols* (Facts and Details).

In Taiwan, the government contributed to the development of the technology in a

different way. Taiwan was under martial law by the Kuomintang until the 1980's, and the government acted harshly against any companies that seemed to have the potential to threaten their power. Small companies were the safest, politically, because they could maintain a low profile, and consumer technology was one of the few industries where small companies could carve out a niche at the time (Facts and Details).

Companies like Hon Hai Precision Industry Co., Ltd., which was founded in 1974 as a manufacturer of electrical connectors, later became one of Apple's biggest suppliers under its Foxconn trade name. The company kept a low profile until the Kuomintang's stranglehold on Taiwan relaxed, and then rose to become one of the most dominant outsourced component manufacturing companies in the world. For example, when Intel decided to begin concentrating on its core competency of chip making in 2001, it began using contract manufacturers such as Foxconn to make Intel-branded motherboards (Facts and Details).

The Taiwanese technology companies also began benefitting from improving political and trade relations with Mainland China. China was a source of cheap labor and critical raw materials, and it made sense for Taiwanese companies to open plants in China as demand for products and worldwide competition increased. So, for example, Hon Hai/Foxconn opened its first manufacturing plant on the mainland in 1988 (Facts and Details).

There are currently corporations with five major nationalities competing in the technology market: the US, led by Apple, HP, Dell, Cisco, IBM and Intel (and to some extent Google and Amazon); South Korea, led by Samsung and LG; Taiwan, led by Hon Hai, HTC and Taiwan Semiconductor Manufacturing Corporation (TSMC); Japan, led by

Sony, Sharp, Hitachi, Panasonic, Fujitsu, Toshiba, Sanyo and Pioneer; and China (Facts and Details).

Sources of and Constraints on Source Materials

In order to better appreciate the supply chain challenges that Apple and its competitors face, it helps to examine some of the source materials required to build their products.

Raw materials include common and inexpensive materials like silica (i.e., sand, the second most abundant substance on earth) limestone, iron, talc and coal, as well as less common but still readily available materials like aluminum, germanium, beryllium, copper, gold, silver, and wollastonite (Greene).

In addition, many of the seventeen “rare earths” on the periodic table of elements may also be needed. These elements are considered rare because of how difficult they are to commercially extract and purify, and a number of them have become essential for today’s consumer electronics.

Neodymium, for example, is used to make compact magnets that are twelve times stronger than conventional iron magnets, and so neodymium has become a staple for in-ear headphones, microphones, loudspeakers and hard disk drives for laptops. Hafnium and tantalum are used to make the electrical insulators used in mobile device semiconductors. Indium, as an essential part of the indium tin oxide alloy (ITO), is both conductive and transparent, is used in manufacturing the transparent front electrode controlling each pixel for flat-screen displays and TVs (Greene).

The interesting point from a supply chain perspective about these rare earth materials is that 95% of them are currently produced in Mainland China. This is due both because large deposits of the raw materials are located there, and because China has developed extraction methods that cannot be duplicated as inexpensively elsewhere (Greene).

One reason that China has such cheap extraction methods is that they are far less concerned about the environmental and health impact than, for example, the US and EU are. Current Chinese extraction and purification methods are highly toxic both to the environment and to workers and residents in surrounding areas, causing severe air and water pollution and creating radioactive wastes. Industrial pollution in China is now at levels that are causing severe illness and threatening the political stability of the Communist Party (Kidela Capital Group). It seems likely that China will need to take action to reduce pollution in the near future, and that this will have an impact on the rare earth supply chain, but for now China is where Apple and its competitors must go to obtain the supplies they need at the best prices.

This has a number of implications for the consumer electronics supply chain. For one thing, Apple and its competitors must buy at least the rare earth raw materials they need from China. For another, China charges more for rare earth materials exported from China than for the same materials purchased for use in Chinese manufacturing facilities (Kidela Capital Group). So, there is a very clear economic incentive to have manufacturing facilities for consumer electronics components located in China, even before the cost of labor is taken into account.

The Role of Chinese Labor

It has been popular in America to criticize US companies for choosing to outsource their manufacturing facilities. Economic concerns and national pride have made “Buy American” a popular slogan, but slogans cannot counteract the steep labor disparities between the US and EU nations, on the one hand, and countries in Asia and Latin America, on the other.

At the beginning of China’s economic reforms in 1978, the average wage of a Chinese urban worker was only \$1,004/year in U.S. dollars, or only 3 percent of the average U.S. annual wage at that time. Even though wages have begun rising in China, the annual wage of a Chinese urban worker in 2010 was still only \$5,487 in U.S. dollars (Powell). To emphasize the point, consider that the hourly compensation costs in the manufacturing sector in 2010 was only \$1.06/hour in China, \$8.36/hour in Taiwan, \$10.08/hour in Brazil, and \$16.62/hour in South Korea, compared with \$34.74/hour in the US. (U.S. Bureau of Labor Statistics). In other words, all other things being equal, a manufacturer would need to pay nearly *33 times as much per hour for labor in the US compared with labor in China.*

In addition, the workers in Chinese factories like the ones owned by Foxconn tend to be more disciplined and attentive to detail than those in the US. This can be critical when you are attempting to manufacture miniaturized consumer electronics to unprecedentedly high technical specifications, like Apple (How U.S. Lost Out On iPhone Work).

The Chinese workforce also seems to be much more adaptable and fluid than that in the US. In a New York Times article called *How the U.S. Lost Out on iPhone Work*, they illustrated this point with the following anecdote:

“One former executive described how the company relied upon a Chinese factory to revamp iPhone manufacturing just weeks before the device was due on shelves. Apple had redesigned the iPhone’s screen at the last minute, forcing an assembly line overhaul. New screens began arriving at the plant near midnight. A foreman immediately roused 8,000 workers inside the company’s dormitories, according to the executive. Each employee was given a biscuit and a cup of tea, guided to a workstation and within half an hour started a 12-hour shift fitting glass screens into beveled frames. Within 96 hours, the plant was producing over 10,000 iPhones a day. “The speed and flexibility is breathtaking,” the executive said. “There’s no American plant that can match that.”

One analyst, Richard Baldwin, Professor of International Economics at the Graduate Institute in Switzerland, points to another factor that has played a role in the appeal of China’s labor market – their willingness to be trained in new manufacturing techniques:

“In short, China’s growth was ... due to rich-nation firms teaching low-wage workers and managers how to produce world-class parts and components, or how to assemble them into world-competitive final goods. As wages in China rise, Chinese firms are now giving similar lessons to Bangladeshi and Vietnamese workers and firms” (Bradsher, Wang).

When you further take into account the added financial burden of complying with labor laws and standards here in the US versus in China (where there are, for example,

few minimum wage and no overtime pay requirements), it is little wonder that many manufacturers, including Apple, have felt obligated to manufacture their consumer electronics in China.

Some indication of this is that even Taiwanese and South Korean manufacturers rely heavily on China to manufacture their electronics. Foxconn has thirteen factories in nine cities in Mainland China, and Samsung has a network of twelve factories that it directly owns and operates in China. In addition, Samsung has sub-contracted with many additional factories that it does not directly operate but which make up an important part of Samsung's supply chain (Facts and Details).

Chapter 3

Apple's Competition

Companies like Apple are spirited competitors in a business where the competition is so fierce that constant vigilance is the price of success, and where that success is defined by the competition it overcomes.

Apple has had many competitors over the past few decades. At one time, its biggest competitor was IBM, and then it was Microsoft. The competition comes and goes but one thing has remained the same. Apple has done more to define its competitors than its competitors have been able to do to define Apple. That is to say, Apple's innovation is such that it has been leading the industry, taking its competition into new and different playing fields where being first is better. This has been one of Apple's greatest advantages in product development and in supply chain management. To illustrate this point, this section will focus on Apple's two greatest competitors in its two biggest lines of business: Samsung in the mobile phone market, and Dell in the personal computer market.

Samsung

Samsung was founded in Su-dong, South Korea, in 1938 by a businessman named Lee Byung-chull (1910–1987). It began as a small noodle making and grocery-trading company but quickly grew, relocating its head office to Seoul in 1947. When the Korean War threatened its operations in Seoul, Lee moved the company to the countryside where he started a sugar refinery. After the Korean War ended in 1953, Lee built the country's largest woolen mill (Samsung History).

After a military coup overthrew the corrupt South Korean government of Syngman Rhee in 1961, the new leaders quickly realized that they would need the help of companies like Samsung to carry out their ambitious plans to modernize the economy. They gave these companies, termed *Chaebols*, loans and other favors, which led to the *Chaebols* becoming very wealthy. Samsung was one of the most favored *Chaebols* (Samsung History).

With this assistance, Samsung began rapidly diversifying into many other businesses such as securities, insurance and retail. Samsung entered the electronics industry in the late 1960s. Its first product was a small black-and-white television set. In 1980, Samsung began manufacturing telephone switchboards, then telephone and fax equipment, and eventually Samsung became the center of South Korea's mobile phone industry. Now, Samsung has produced more than 800 million mobile phones (Samsung History).

In the 1980s, Samsung Electronics began to diversify geographically. In 1982 it built a television factory in Portugal; in 1984, it built one in New York; in 1985, another

in Tokyo; in 1987, one in England; and in 1996, another in Texas (How Samsung Went From A Dried Fish Exporter).²

By 1992, Samsung had become the largest flash memory chip manufacturer in the world and the second-largest processor chip manufacturer after Intel. In 1995, it created its first LCD (liquid-crystal display) screen. By 2005, it had grown to become the largest manufacturer of LCD panels in the world. By the first quarter of 2012, Samsung had become the world's largest mobile phone maker by unit sales (Samsung Delivers Record Profits and Makes a Statement).

Apple and Samsung: a Love/Hate Relationship

When Apple began manufacturing the iPod in 2001, it used the conventional spinning magnetic hard-drives that had been the mainstay of computers for so many years. The extent that Apple had been able to miniaturize these hard-drives to fit into the iPod was a remarkable feat at the time. However, then in 2005 when Apple set its sites on creating even smaller devices such as the iPod shuffle, iPod nano and then-upcoming iPhone, it realized it had to get rid of the hard disc drive and instead needed huge volumes of flash memory chips to provide storage for the devices.

The early partnership between Apple and Samsung arose because Apple needed to find a stable supplier of flash memory, and Samsung manufactured about 50 percent of the market. In 2005 that market was very unstable, and Apple wanted to lock in a

² Indeed, as of 2012, Samsung had invested more than \$13 billion in its Austin facility, making it the largest foreign investment in Texas and one of the largest single foreign investments in the US.

financially dependable supplier. "Whoever controls flash is going to control this space in consumer electronics," Jobs is said to have remarked at the time (Apple and Samsung: A Completely New Form of Tech Rivalry).

The close relationship between the two companies led to Samsung being asked to supply the critical system processors for the iPhone and iPad. The partnership gave Samsung invaluable information about Apple's business operations that no other company could gain access to. Specifically, since Samsung was the only supplier of iPhone processors, the company realized just how big Apple thought the smart phone market was going to be, which gave it incredible incentive to follow Apple's lead (Apple and Samsung: A Completely New Form of Tech Rivalry).

In order to enter the smartphone market, Samsung would need a robust and modern operating system that compared favorably with Apple's iOS (which, because of Apple's history, Samsung knew Apple would never license to Samsung or anyone else). Fortunately for Samsung, Google released its free Android operating system in 2008. That system so closely mimicked the advantages of Apple's iOS that its release caused Apple to sever many of its historic ties with Google, eject Google's CEO Eric Schmidt from the Apple Board of Directors, and threaten "thermonuclear war" against manufacturers who sold devices using that system (Patently Apple).

Of course, that didn't stop Samsung from using Android to become one of the world's most successful manufacturers of smartphones and tablet devices, but it did put quite a damper on its relationship with Apple and resulted in what became a vitriolic but entertaining patent battleground. As a result, Apple filed and successfully won a billion-dollar lawsuit against Samsung. However, Apple wasn't able to completely ban of the

copied Samsung products altogether because Apple couldn't prove a significant loss of sales as a result of them (Apple and Samsung: A Completely New Form of Tech Rivalry). So it now appears that the smartphone patent wars are grinding toward a stalemate, which may usher in a new phase in the complex relationship between the two companies.

"People play this stuff up because it shows a kind of drama, but the business reality is that the temperature isn't that high," said one attorney who has observed executives from both companies (Patently Apple).

However, the relationship appears to be somewhat damaged: for example, Apple is now attempting to switch to TSMC to source most of the processors. In addition, Apple has been increasing its investments in helping competing suppliers to procure the machinery needed to build large-scale plants devoted exclusively to the company. Apple spent approximately \$10 billion in fiscal 2012 on capital expenditures, and it expects to spend a further \$10 billion this year. By contrast, the company spent only \$4.6 billion in fiscal 2011 and \$2.6 billion in fiscal 2010 (Apple, Qualcomm Bids Spurned for Exclusive TSMC Supplies).

However, it may be difficult for Apple to completely eliminate Samsung as a flash supplier because it still remains the most essential producer in the market of the crucial chips (Apple and Samsung: A Completely New Form of Tech Rivalry).

Dell

Michael Dell, who was only a student studying at the university of Texas at the time, founded Dell in 1984. At the start, he had a vision to begin manufacturing customized IBM-compatible computers that were designed to meet each customer's needs. After about a year, Michael Dell dropped out of school and began dedicating his full attention to the business.

In the following year Dell released its first computer known as the Turbo PC, which was priced at \$795.00. The computers were sold through use of direct sales, and followed a "make-to-order" strategy. When the customer placed an order, they would choose which components would be used in building the device. Then, once the order was placed, the manufacturing process would begin. Dell wanted to utilize this strategy to be able to sell computers directly to customers by surpassing the retailers. This would in turn reduce some of the delays and additional costs that would be incurred if there were to be another stage in the supply chain (Fugate, Mentzer, 20). Dell's business strategies are based largely on five factors: rapid time to volume, products built to order, extraction of reseller markups, proficient service and support, and small amounts of inventory and capital investment (Fugate, Mentzer, 21).

A great portion of Dell's proficient financial performance can be attributed to its implementation of its direct-sales model. Since Dell was able to get the components at wholesale price, the company in turn was able to offer low prices that gave it a competitive advantage over its competitors. For example, in the first year of operations, Dell proved to be extremely successful and accumulated an overall net profit of \$73

million. The company maintains a market share largely in four different segments, consisting of Large Enterprise, Public, Small and Medium Business, and Consumer (Dell Inc).

In 1987, Dell began expanding its manufacturing globally. Ireland was the first of many international operations, and eventually the company grew from a \$30 million company to a \$90 million one. Then in 1999, Dell purchased Compaq (a company founded in 1982 that develops and sells computers and other related products) and became known as the top-selling computer manufacturing company in the country. Today, Dell is the third biggest PC seller in the world (The History of Dell).

Dell's direct model allows for the company to succeed at demand management. Since Dell sells directly to its customers and customizes each product, it allows for collaboration amongst the manufacturing and sales departments. And, due to the fact that Dell is in constant contact with its customers, it enables the company to have a greater insight into customer demand (Fugate, Mentzer, 22).

As well as having proficient collaboration within the company, Dell is also noted for having excellent coordination with its suppliers. The company collects real-time information regarding its suppliers' inventory levels at each stage in the supply chain, as well as any capacity outlooks and new technologies. On the other side, Dell gives its suppliers insight into customer demand and any forecasted shifts in the market. As a result of this exposure and its exceptional collaboration both internally and externally, Dell has the ability to react faster to changing demand than the rest of its competitors can. Furthermore, this synchronization leads to extremely accurate forecasts (Fugate, Mentzer, 23).

However, seeing that forecasts cannot be completely accurate, Dell manages to balance demand and supply. If, for example, demand happens to exceed supply and the company is short of certain products, Dell works closely with its suppliers to acquire expedited shipments of those products. If it is not possible to receive additional products quickly, Dell attempts to alter customer demand by changing its product promotions. Furthermore, Dell holds only small amounts of inventory: the company focuses on sending expedited products and components through the supply chain instead (Fugate, Mentzer, 23).

In order to adjust for long lead times and to be well prepared to handle the variability in demand, Dell ensures that its suppliers hold a certain amount of inventory in the supplier logistics centers (also known as “revolvers”) located near Dell’s manufacturing plants. Its suppliers hold just enough inventory to account for two hours of orders. This inventory is completely owned by Dell’s suppliers, and is included in the component pricing that Dell pays and in the final price of its computers sold to customers. By keeping such low inventory levels, it allows for higher quality products because it makes it easier to come across any product defects than it would be if too much inventory were on hand (Fugate, Mentzer, 23).

Dell Inc.’s direct-sales strategy is known to be the primary reason for its noteworthy competitive ability. After years of studying Dell’s core business strategies, it is assumed that Dell has unique proficiencies in logistics to help maintain its successful strategy.

Apple and Dell

While Dell is still notably successful and ranked to be 4th in the industry for supply chain performance, it still cannot compete closely with Apple in part due to the enormous difference in cash between the companies. In 2012, Dell's cash flow from operating activities was recorded to be approximately \$5.53 billion. Apple, on the other hand, had a net operating cash flow equivalent to \$50.86 billion dollars (Businessweek) – almost ten times that of Dell. To put it into perspective; just this past month, Dell took out a \$2 billion loan from Microsoft to put toward the overall amount of \$24.4 billion to make the company private. At the same time that this was happening, Apple's financial reports were released stating that the company now has \$131.7 billion in cash – more than five times what Dell is being bought for (Apple Now Has \$137.1 Billion In Cash).

Apple's immense amount of cash on hand gives the company such an enormous advantage against its competitors such as Dell especially when it comes to its suppliers and component parts. Key suppliers are much more willing to be involved in agreements with such a financially healthy company such as Apple, as opposed to Dell. Not only that, but Apple can afford to purchase large volumes of products upfront, which leads to product discounts from the suppliers, reducing the company's costs.

One of the most notable features about Apple's supply chain is its inventory turnover. Apple had a turnover period of just five days – exceeding all other companies in the technology industry. Although Dell was the second leading company in the industry in regards to its inventory turnover with a period of ten days, it still cannot really

compare to Apple's (Apple Boasts Strongest Manufacturing Supply Chain in the World, Turns over Inventory in Five Days).

In addition to cash and inventory metrics, Apple is praised for having the highest customer satisfaction in the industry, leading to an immense increase in its customer base and loyalty of those customers. After many polls conducted, Apple was given a customer satisfaction score of 86 on a scale of 0-100. Dell on the other hand, received a score of 77 out of 100. Apple's extreme dedication to its customers and its trouble-shooting efforts will continue to give Apple an advantage over Dell due to the increasing brand loyalty (Businessweek).

In the Gartner Supply Chain Top 25 review for this past year, Apple was ranked as having the top supply chain in the world – and for great reason, too. Apple excels primarily through its continuous innovation and constant development of new markets. While most of the companies in the technology industry such as Dell are becoming complacent and producing similar types of products, Apple is continuing to use its creativity to its advantage. The company is not only praised for its operational expertise, but for developing new ideas that have never been thought of before. Apple manages to create new ideas, lock in suppliers, and tie up the entire market before its products are even released. So, by the time that companies like Dell can attempt to copy Apple's products, there is minimal component capacity remaining, and the prices for those components are much higher than the ones Apple received. This in turn it makes it much more costly for other companies to source. And because of this, it is difficult for companies to keep up.

Although Dell is most likely the next leading competitor when it comes to supply chain performance, the company just does not have the same innovation, creativity, or assets to adequately compete with Apple.

Chapter 4

Contracting Arrangements

Quality and Pricing

Due to Apple's long-term contract agreements with numerous suppliers, proactive supply chain, and excellent resiliency, it has become nearly impossible for any other company in the industry to compete. Ever since Steve Jobs took over in 1997, the company has been working to improve even the smallest details of its supply chain that has led it to become one of the most profitable companies in the world. According to several interviews with former employees of Apple, executives familiar with the company's operations, Apple has managed to construct a closed system where it maintains control over almost every aspect of the supply chain, from the design and manufacturing to the retail store. "Operations' expertise is as big an asset for Apple as product innovation or marketing," says Mike Fawkes, the former supply-chain chief at Hewlett- Pacjtard. "They've taken operational excellence to a level never seen before (Satariano, Burrows, 1)."

Over the years, Apple has strategically locked in suppliers needed for key component parts years in advance in order to assure that they are able to produce enough products to meet the high demands, and to avoid stocking out. By planning ahead so far in advance for the components they plan to use for future products, it has allowed them to tie up most of the essential component parts needed for the devices, resulting in a lack of

parts for other companies. And, as well as just reserving key component parts, executives at Apple reserve huge amounts of airfreight space to ensure fast delivery. As previously noted, in 1998, Jobs spent over \$50 million to reserve all of the available holiday airfreight space in order to ensure that Apple's new computer would be readily available for all consumers at Christmas the following year. By doing so, some of Apple's competitors, such as Compaq were unable to book any air transport for their products during this time period. To serve as another example; in order to manufacture the iPad 2, Apple purchased such a large quantity of high-end drills to build the product's internal casing that the wait times for other companies ranged anywhere from six weeks to six months (Satariano, Burrows, 1).

Executives at Apple stated that every year the company allots approximately \$24 billion in prepayments to key suppliers, and plans on doubling its investments in its supply chain to \$7.1 billion (*Refer to Appendix A*). Because of these immense prepayments and purchase volumes, Apple is able to get the lowest prices on parts, manufacturing capacity, and airfreight (Satariano, Burrows, 2). This operational advantage is what enables Apple to effectively manage immense new product launches without incurring the costs of holding a large amount of inventory.

Product Design

Still, one of Apple's biggest and most threatening advantages it has in the industry is the in-house design of its own parts. While most technology companies rely on chips or other key component parts manufactured by an outside vendor, Apple actually designs

the parts itself. Apple has complete ownership of all of its technology, starting from the iOS software to its hardware with the most advanced A6 chip built into Apple's most recent iPhone 5. Unlike most other companies that outsource most of its products design to ODMs (Original Design Manufacturers), Apple exerts a firm control over design (The Great Tech War Of 2012).

According to the Bloomberg article "Commentary: Apple's Blueprint for Genius," most technology companies rely on ODMs to design its products for them. Then, once the design is made, companies must then tweak it to be exactly how they want it to be, and even still, may be extremely difficult to perfect. Apple, on the other hand, has its engineers complete all of the mechanical and electrical work (Burrows).

Even more importantly, Apple's devices are specifically designed to run on a specific set of operating systems designed by Apple itself. On the contrary, a Dell, Gateway, or PC for example, has to wait for Microsoft to come out with any new features for it to use. Apple designs all of its own software, including the operating system for the MacBook as well as many applications, such as iTunes and iPhoto.

Apple's exertion of control over both its own hardware and software eliminates the need to have to tweak the product design to adapt to the software. On the other hand, companies such as Dell must constantly change their products to be able to work accordingly with Microsoft software.

This tactic of utilizing in-house design also enables Apple to create extremely high-quality products that are nearly impossible to completely replicate; some even refer to Apple's products as "little works of art." And, as imaginable, these little works of art are not always simple for the manufacturers to construct. For instance, when Jobs still

held the position of CEO of the company, he insisted that no screws be visible on the MacBooks. When the manufacturers told Jobs that the company did not know how to make that possible, Apple worked with them to come up with new tooling equipment to make it so it was. "They had to learn new ways to do things just to meet Apple's design," says Grossman (Businessweek).

Apple in the Market

Although Apple's competitors eventually catch up in the component technology needed to manufacture the devices, at that point Apple has already made arrangements with its suppliers so far in advance that the company has negotiated discounted rates to source those parts. Because of the low prices that Apple receives from their suppliers for component parts, the company has accordingly been able to price their products so much lower than those of its competitors and compete effectively on cost (How Apple Became a Monopsonist). Apple can afford to do this because it has secured pretty much the entire supply chain, and has the ability to place over ten million production orders far in advance with its suppliers abroad (Apple's Secret iPad Advantage: The Supply Chain).

More specifically, in addition to preorders, between the combination of Apple's 300 plus retail stores and its online Apple Store, it is estimated that the company sells approximately 50% of iPads directly to customers. Apple prospers from those large profits that it makes through direct sales to customers, and so it can afford to make little money from sales through its retail partners. Even though Apple has formed contract arrangements with companies such as Best Buy, Target, Wal-Mart, and Amazon, it is

mostly for marketing purposes, rather than to achieve high profits that way. In comparison, companies such as Motorola, HP, and Samsung must make all of their profits by selling their devices wholesale to the retailer partners (The One Big Reason Why iPad Rivals Can't Compete on Price).

Even with Android's leading market share (controlling about 40% of the smart phone industry), the profit margin it makes on its product is so insignificant compared to that of Apple's. This is because Apple makes profit on iOS devices, while other companies do not. And, as a result, Apple doesn't even need a leading marketing share to exceed its competitors, but every other company in the market does, giving Apple such a huge competitive advantage (The Great Tech War Of 2012).

For all of these reasons, Apple was able to set the lowest price in the market for a ten-inch Wi-Fi tablet at \$500.00. Thus far, even with the release of high-quality tablets by other vendors, there are no products in the industry that even come close to this low price (Apple's Secret iPad Advantage: The Supply Chain). For instance, the Android tablet, The Motorola Xoom, will reportedly cost \$800 at release. Similarly, The seven-inch HTC Flyer is expected to cost around \$700, and the screen is still three inches smaller than that of Apple's iPad. Another appealing tablet with a seven-inch screen is the BlackBerry PlayBook. However, this device is projected to cost about the same as the iPad with far fewer features and lower quality. The Hewlett-Packard TouchPad based on Palm's webOS appears to have similar quality as the iPad, but will also cost around \$700 (The One Big Reason Why iPad Rivals Can't Compete on Price).

Product Quality

Not only are Apple's prices the lowest in the market, but companies are constantly replicating features of the smart phone for its own product because of the incredible quality. Currently in the market, every smart phone produced has some feature taken from Apple's iPhone (The Great Tech War). Due to Apple's sincere dedication to high-quality products and astonishing innovation, Ive and his engineers will dedicate months to living in hotel rooms close to Apple's supplier sites in order to help to refine the production processes of the devices. In regards to new product designs such as the MacBook's casing, Apple's designers constantly work together with suppliers to create new manufacturing equipment (Satariano, Burrows, 2).

Not only does Apple have the lowest prices accompanied with the best quality, but Apple manages to make a substantially larger profit than any other tablet-producer. On average, it is estimated that Apple makes a \$368 profit per phone. Google, for example, makes only about \$10 per device because it gives most of the profits to the phone makers (The Great Tech War).

Working Conditions

Over the last ten years, Apple has become one of the most valuable companies in the entire world, in part by successfully mastering global manufacturing. However, it was found that factory workers manufacturing Apple's products have been exposed to

dangerous working conditions. According to officials, employees work long overtime hours and live in crowded dormitories and some of the workers are under-age. In the year 2010, 137 workers at an Apple supplier in eastern China were injured from using a toxic chemical to clean the iPhone screens. In the following year, two explosions at iPad-manufacturing factories injured 77 people and killed at least four. And even before that happened, Apple had been reportedly notified of dangerous working conditions inside the Chengdu plant.

However, in a released report Foxconn denied some of the alleged accounts directed toward Apple. The company stated that the working conditions complied with the code of conduct and national laws:

“Conditions at Foxconn are anything but harsh. All assembly line employees are given regular breaks, including one-hour lunch breaks... Foxconn has come a long way in our efforts to lead our industry in China in areas such as workplace conditions and the care and treatment of our employees.”

Regardless, executives in Cupertino were unpleasantly surprised. “Apple is filled with really good people who had no idea this was going on,” a former employee said. “We wanted it changed, immediately.” (Duhigg, Barboza)

Apple has stated that it requires every detected labor violation to be altered, and will end contracts with their suppliers if they do not follow this. To take action, executives at Apple began conducting an annual audit report, which was published in 2007. By 2011, Apple inspected almost 400 facilities, which included both the company’s first hand suppliers, as well as suppliers of those suppliers. This happened to be one of the vastest audit-based programs in the technology industry (Duhigg, Barboza).

In the course of three years, Apple performed 312 audits, and each year, the audits displayed evidence of extended overtime and work weeks consisting of six or seven days. In addition, it was found that employees were being paid less than minimum wage. Apple discovered over 70 major violations during that time, including cases of forced labor, under-age workers, improper disposal of dangerous waste, and many employees exposed to toxic chemicals (Duhigg, Barboza).

During a four-month time period, a pilot program was put in place in order to develop worker “hotlines.” These hotlines allowed employees to report hazardous conditions in the workplace, as well as receive counseling if needed. Although Apple was not directly involved in the program, the company was regularly updated on its progress. “My BSR colleagues and I view Apple as a company that is making a highly serious effort to ensure that labor conditions in its supply chain meet the expectations of applicable laws, the company’s standards and the expectations of consumers,” stated Aron Cramer, BSR’s president (Duhigg, Barboza).

Apple is certainly not the only company in the technology industry that was conducting business within a harsh working environment. Poor labor conditions have also been reported at factories for companies such as Dell, Hewlett-Packard, I.B.M., Lenovo, Motorola, Nokia, Sony, Toshiba and many others. According to Ms. White of Harvard, it is concluded that until consumers start demanding better working conditions internationally, there is not much pressure on companies to implement change in the work force. “I actually think Apple does one of the best jobs of any companies in our industry, and maybe in any industry, of understanding the working conditions in our supply chain,” Steve Jobs stated (Duhigg, Barboza).

Chapter 5

Implications for Competitive Position

Supply Chain Management as Apple's Sword and Shield

We have discussed Apple's unique role as market leader in the consumer electronics industry, one of the fastest moving and most competitive in the world. Apple has gone from being a dogged but outgunned and often outmaneuvered underdog to being the most profitable and most respected company in its industry. In this section, we will examine the capabilities that have allowed that to happen.

Think Different. One of Apple's most famous mottoes and marketing slogans is "Think Different", and Apple has proven time and again that it lives by those words.

Under the leadership of Steve Jobs, Apple has created or at least completely transformed four separate product categories that wound up defining their respective markets. The Mac, a personal computer "for the rest of us", which prior to Apple were do-it-yourself machines used only by dedicated hobbyists and computer engineers; the iPod, a portable digital music player which prior to Apple had such limited capacities and were so hard to use that, once again, they were the preserve of diehard technology fans. The iPhone, the first smart phone with the touch screen interface that allowed it to act as a miniature fully functional computer, as well as a GPS unit and personal digital assistant; and the iPad, which was the first tablet computer that seized the public eye and became an overnight sensation. The fact that Apple has proven so capable in introducing entire new product lines has not only made it beloved by the marketing industry and

consumers, but is also one of the main reasons it has been able to become the most effective and successful supply chain company in the world.

How do the two things – their unparalleled ability to introduce entirely new product categories and their supply chain mastery – relate? Well, when most companies try to create a new product, they also try to use existing components as much as possible in order to keep down the cost and logistical difficulties. However, whenever Apple has introduced a new product category, it has designed products that are so different, so ahead of their time, that they have also needed to either design new components especially for the purpose, or have incorporated components invented by others but not used in quite that way before.

For example, just when Apple was on the verge of introducing the iPhone, Steve Jobs realized that he had a problem with the materials needed to create the touch screen. Existing glass was too fragile for a device meant for use so many times a day and plastic would scratch so easily that within a few months the screen would become illegible.

Jobs had been meeting with Corning Glass on a different matter and he raised the screen problem with them in February 2007. It just so happened that they had been working on a kind of glass they called Gorilla Glass that would be strong enough to solve the problem, but had never had reason to produce it before in large quantities. Despite daunting hurdles, Corning managed to figure out all the technical difficulties and manufacture enough Gorilla Glass to meet Apple's iPhone launch and subsequent manufacturing needs (Aamoth).

Most interesting is the fact that prior to the iPhone creating an entirely new market for touch-screen devices, there had never been a need for Gorilla Glass. When the

iPhone launch created that market, the market for Gorilla Glass launched too. Although Gorilla Glass is now one of the most prolific materials in consumer electronics and is used in more than 750 products and 33 brands worldwide, including notebooks, tablets, smartphones, and TVs, for the first several years almost all of the Gorilla Glass Corning could produce was reserved for Apple. Competitors had a hard time fighting over what was left (Satariano, Burrows, 1).

Apple has followed a similar pattern – first innovating and developing a new product category and thereby creating the demand for a particular component, and then tying up all or most of the available supply – with a variety of parts. For example, Apple was the first to make what are called unibody aluminum laptop, iPhone and iPad casings, which are carved out of solid blocks of aluminum using special CNC milling machines. The new casings were lighter, stronger and more elegant than the piece-assembled casings used previously and were a big hit with consumers. Competitors immediately wanted to follow suit. However, there was one problem – Apple had contracted for the full output of not only all the existing CNC machines capable of manufacturing in large scale, but for the future output of machines not even built yet (Apple's Average Supply Chain).

To serve as another example; Jony Ive wanted some way to allow an indicator light to shine through the solid aluminum on the MacBook. Apple discovered that you could use specialized lasers to create tiny pinholes nearly invisible to the human eye that would allow light to shine through in the way Ive wanted it. Again competitors tried to follow Apple's lead, only to find that Apple had contracted for the output of all of the

available lasers that would do the trick (Apple Green Light Reveals Control of Supply Chain).

What Apple is doing by following this pattern of innovation and thereby creating the demand for a component where no demand previously existed is to create what is known as a monopsony. A “monopsony” is defined as: "a market situation in which there is only one buyer" (Oxford American Dictionary). Basically, a monopsony is the opposite of a monopoly but it gives the monopsonist similar market power to a monopolist (with the big difference that monopsony is not illegal). As the sole buyer in a given market, the monopsonist is able to dictate terms to the available sellers that it would never be in a position to do if there were other competing buyers.

This should be especially true in a newly created market. The sellers are so eager for the new market to be created that they are willing to offer very favorable terms to that first buyer, especially if the buyer is a company such as Apple with enormous influence over new market creation coupled with enormous stockpiles of cash to back up their orders.

Eventually Apple’s competitors, the suppliers, and their mass production techniques catch up. They figure out how to make production of a given component sufficiently commoditized to bring the supply and demand for a given component into the more typical equilibrium. However, by then Apple has a huge lead in the market, which adds to its market power and therefore its ability to negotiate unusually favorable deals with suppliers even after its period of monopsony is over. The company is then able to compete effectively on cost and undercut its rivals (How Apple Became a Monopsonist).

Apple's unique position and market power as a monopsonist is obviously not the only weapon in its supply chain arsenal. It's enormous supply of cash, which was calculated at over \$135 Billion in early 2013 and is more cash than all of its major competitors put together. That designated supply of cash gives Apple enormous leverage compared to any of its competitors (How Apple Became a Monopsonist).

It is a combination of all of these factors that allow Apple to dedicate huge amounts of attention on everything from large production issues to the smallest, but critical details. This has allowed Apple to practically purchase all of the world's supply of smartphone displays to the design team living in hotel rooms close to a supplier's site in China to be able to monitor and help with the design process (How Apple Became a Monopsonist).

Component manufacturers have learned that even though Apple is a very tough negotiator, a purchase commitment from Apple is the strongest in the business, so they are willing to make deals with Apple that they might not make with anyone else (Satariano, Burrows, 1). Indeed, they are able to make deals they could not make with anyone else. Apple's strong cash position means that it can, in effect, act as a finance company to its suppliers; Apple will often prepay for components so that suppliers have the necessary cash to build the factories necessary to meet Apple's future demand for a particular component (Satariano, Burrows, 1).

Apple's unique ability to negotiate favorable short and long-term commitments with its suppliers signifies that it is able to use its supply chain arrangements as both a sword – for example, negotiating the lowest cost for components allows it to undercut its competitors and make much greater profits in selling the finished product (thereby further

increasing its cash and leverage) – and as a shield – blocking competitors from getting the supplies they would need to compete in a given market in the first place, thereby further cementing Apple’s lead in that market.

Apple’s Supply Chain as a Sword

Apple has developed an unparalleled ability to leverage its power as a monopsonist and vast purchasing power to stockpile inventory in advance of its major product releases. For example, Apple negotiated prepaid deals for NAND flash, displays and other components needed to manufacture iPhones and iPads. This is something the company has been doing since at least 2001, when the iPods were first being produced (Apple's Secret iPad Advantage: The Supply Chain).

To illustrate the power of this approach, rumors that Apple was planning to release a new kind of tablet computer abounded prior to the release of the iPad in April of 2010. Among the myriad of other mostly inaccurate rumors preceding that release, one of the most active discussions had to do with price. The general consensus was that the least expensive model would go for about \$1000. All of the “experts” agreed that it would remain around that price, and opined that if Apple could sell it for around \$800 it might stand some chance at being popular (the conventional wisdom was that even that chance was very small, since it was just a big iPod Touch).

When the iPad was actually released with a base model price of \$499, everyone was taken by surprise. As we now know, the iPad had the most successful launch of any consumer electronics product in history. One reason was the surprisingly affordable

price. Even after the iPad was disassembled and the components were priced out, it was difficult for industry analysts to understand how Apple could sell such an obviously high quality product at that price and still make a profit. This was even more impressive when it turned out that, according to Apple, it still was able to achieve a profit margin of greater than 35% (The One Big Reason Why iPad Rivals Can't Compete on Price).

Finally, when rivals finally realized the fact that they could not afford to cede the entire consumer tablet market to Apple without putting up a fight, they finally came to market with tablets of their own. However, no company was able to come close to the iPad specifications at anywhere close to the iPad's sales price (The One Big Reason Why iPad Rivals Can't Compete on Price).

Apple's Supply Chain as a Shield

As previously mentioned, Apple not only manages to leverage its supply chain by signing long-term agreements with suppliers and locking in components and transportation to beat rivals in pricing, it also uses it to prevent competitors from building or maintaining adequate inventories of competing goods (Satariano, Burrows, 1).

For example, in 2010 Apple bought all available capacity of high-resolution displays for its iPhone 4, preventing HTC from being able to obtain the screens it needed for its own competing devices. In the aftermath of the March 2011 earthquake and tsunami in Japan that posed as a threat to component parts, Apple offered immediate cash payments to reserve parts ahead of its competitors. Later in 2011 in preparation for release of the iPad 2, Apple purchased such a large number of the drills needed to

manufacture the casings that it resulted in a six-month wait period for other competing companies. Finally, when Apple agreed to begin the use of Intel's proprietary Thunderbolt connector in its new computers in 2012, part of its deal with Intel was a six-month lead before the connector would be available to any of Apple's competitors (Apple Leverages Deep Pockets to Gain Supply Chain Edge over Rivals).

By effectively blocking its competitors from being "fast followers", Apple is able to "shield" and increase its window of opportunity for gaining and retaining a commanding lead in any new market they are able to create. This is an invaluable advantage.

Apple – Also the World's Most Efficient SCM

Apple's ability to use its supply chain mastery as both a sword and a shield is an incredible advantage, and if that were its only supply chain advantage it would be very impressive. But in addition to that leverage, Apple is incredibly efficient as a supply chain manager. It is no coincidence that Apple is consistently rated as having the best supply chain management of any company in the world. Tim Cook has done an incredible job at building a supply chain that is not only lean and cost-effective, but typically solidly reliable and extraordinarily efficient.

To demonstrate this, let us look at a measure commonly used by Gartner and others to evaluate supply chain management effectiveness. A company's "inventory turnover ratio" is calculated by taking the cost of goods sold (found on the income statement) and dividing it by the average or current period inventory (found on the

balance sheet). This tells you how many times per year a company turns over its inventory.

For Apple, that turnover ratio in 2012 was 74 times per year, or roughly once every five days. In comparison, Samsung's ratio is 17, or once every 21 days. Dell, who for some time had a reputation for being the best SCM shop in the business, has a turnover ratio of 36, or once every 10 days. Apple is, by this measure, twice as good as Dell and seven times better than Samsung (The Atlantic Wow).

Granted that having a high turnover ratio is not always an advantage: for example a company with a higher turnover ratio could run into inventory problems during peak product demand. Nonetheless, Apple has managed that extremely successfully, for the most part, except for on occasions when the company has run into component manufacturing problems when first introducing a new product with new components (which is to some extent unavoidable).

Conclusion

Apple has shown that it is just as brilliant at innovating in the area of supply chain as it is in the area of developing new consumer electronics. Its products are machined to nearly inhuman tolerances and are the embodiment of an obsession with perfection that sets the high standard for its competition. Apple's supply chain similarly operates to nearly inhuman tolerances and with a similar obsession with perfection.

Apple's unique role over the last decade as an extreme innovator has given it the ability to create new markets where it is, at least initially, without competition. And in an

industry where the competition has traditionally relied on skill at being fast followers, on being able to copy new products as soon as they hit the market and compete nearly immediately, Apple's innovations in both product development and supply chain management have also given it the ability to become an effective monopsonist, which in turn has allowed it to extend its creative lead even further.

Finally, Apple's control over every part of its platform – from the hardware, to the software, to the application and media ecosystem it built up with such patience before its competitors even realized how much of a competitive edge that had given it, to the online and retail distribution network it has built – has given Apple some of the best branding and most customer loyalty in modern history.

Critics point out that all of this developed under the energetic and brilliant leadership of Steve Jobs, who died from cancer in 2011 at the age of 56. They also note that companies tend to become complacent at some point, especially when they have lost a visionary leader like Jobs. They stop innovating quite as much, and they make mistakes. Critics say that without Jobs, Apple will no longer be able to come up with the innovative products it has seemed able to pull out of its magic hat every 4 – 5 years.

If the critics are right, if Apple stops innovating, it is true that it will not be able to surge into new markets, that it will not be a monopsonist, that it will not have the popularity with consumers or its suppliers that it currently uses.

Nonetheless, there are hopeful signs that the critics are wrong. Before he died, Jobs worked hard to instill creativeness into the very core of Apple's culture; he even established a "university" within Apple to reinforce the entrepreneurial thinking and creativity that have made Apple what it is today. And Apple still has enormous amounts

of assets. It still has Jony Ives and his team of creative industrial designers. Recently, there have been rumors from reliable sources that Apple is working on new products in the field of television and wearable computing, such as watches.

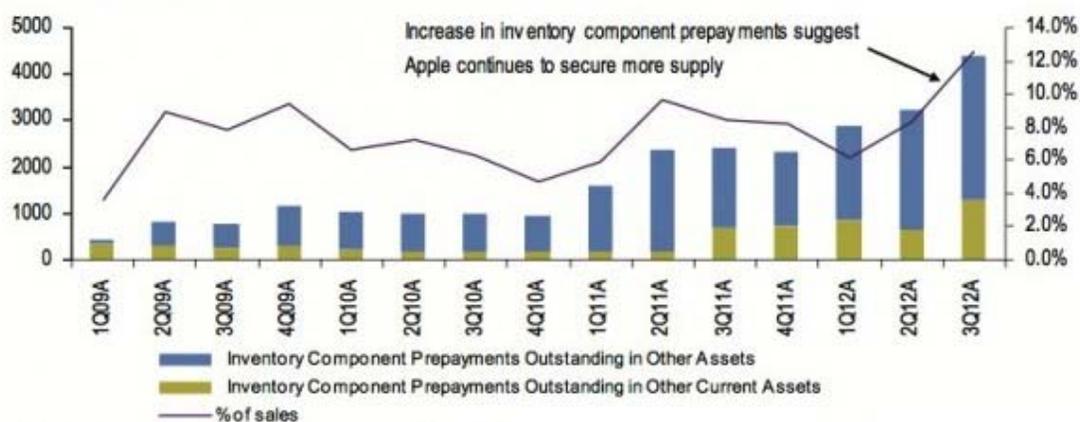
Most importantly from a supply chain perspective, Apple is still led by Tim Cook, the person who demonstrated what the world's most successful supply chain system should look like. If product design and engineering are the creative spirit and brains of Apple, its supply chain is its heart. And the prognosis for those indicates that Apple should have a long and healthy future.

Appendix A

Inventory Component Prepayment

As illustrated by *Asymco*:

Exhibit 4. Inventory Component Prepayment (in \$MM)

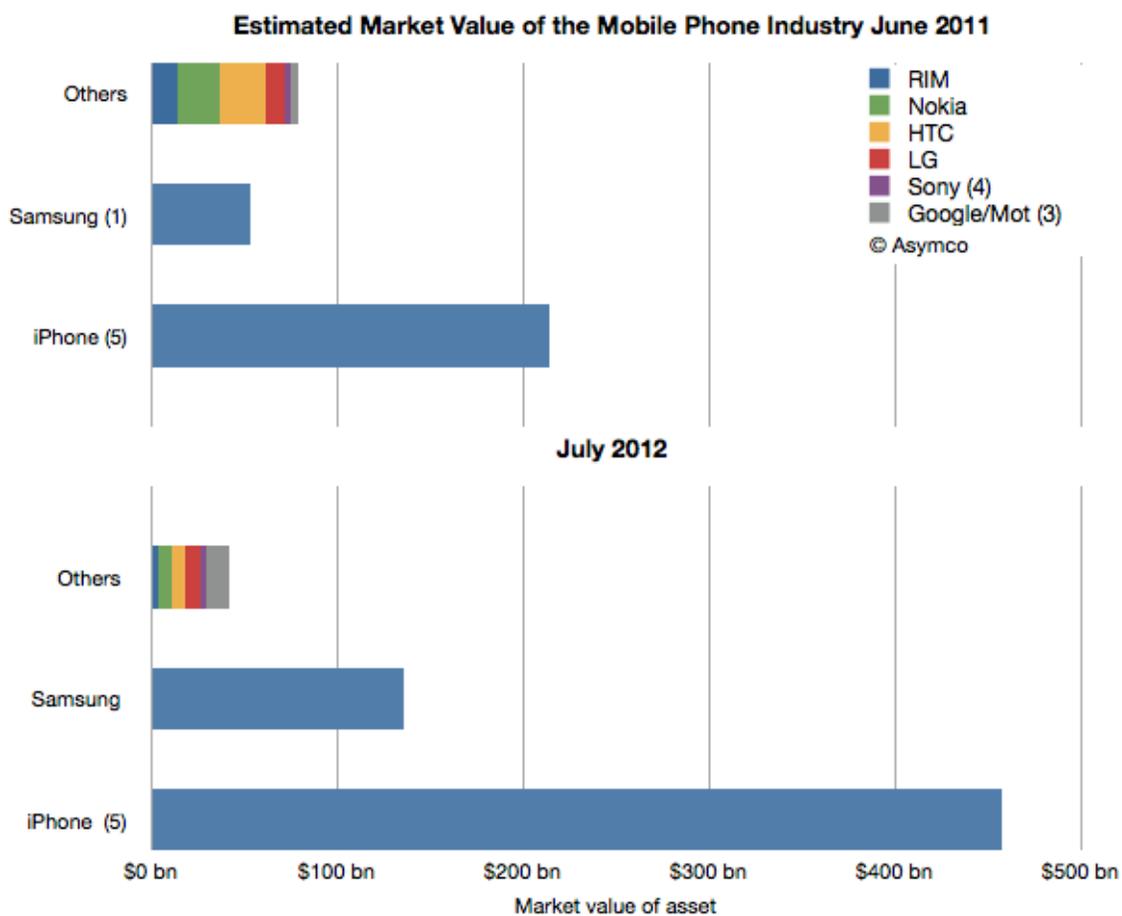


Source: Company reports and Wells Fargo Securities, LLC

Appendix B

Estimated Market Value of the Mobile Phone Industry

As illustrated by *Asymco*:



Notes:

1. Samsung value computed as 14 x trailing 12 months' estimated EBIT from phones
2. Apple Cash and marketable securities estimated at \$118 billion at end of June 2012
3. Motorola valuation as of August 2011 acquisition price
4. Sony valuation as of October 2011 acquisition of 50% of Sony Ericsson
5. iPhone valuation computed as 14 x trailing 12 months' estimated EBIT
6. Excludes other brands such as ZTE and Huawei

BIBLIOGRAPHY

Aamoth, Doug. "A Story About Steve Jobs, Steel Balls and Gorilla Glass (You, with the Cracked Phone: Read This) | TIME.com." *Time*. Time. Web. 02 Apr. 2013.

<<http://techland.time.com/2013/01/11/a-story-about-steve-jobs-steel-balls-and-gorilla-glass-you-with-the-cracked-phone-read-this/>>.

"Apple - Supplier Responsibility - Reports." *Apple - Supplier Responsibility - Reports*.

Web. 01 Apr. 2013. <<http://www.apple.com/supplierresponsibility/reports.html>>.

"Apple and Samsung: A Completely New Form of Tech Rivalry." *MercuryNews.com*.

Web. 02 Apr. 2013. <http://www.mercurynews.com/business/ci_22565192/apple-and-samsung-completely-new-form-tech-rivalry>.

"Apple Boasts Strongest Manufacturing Supply Chain in the World, Turns over Inventory in Five Days." *IMore.com*. N.p., n.d. Web. 10 Mar. 2013.

<<http://www.imore.com/apple-boasts-strongest-supply-chain-world-turns-inventory-days>>.

"Apple Green Light Reveals Control of Supply Chain in Cook Operations: Tech."

Bloomberg. Web. 01 Apr. 2013. <<http://www.bloomberg.com/news/2011-11-03/apple-green-light-reveals-control-of-supply-chain-in-cook-operations-tech.html>>.

"Apple Now Has \$137.1 Billion In Cash, More Than HP's Annual Revenue And Vietnam's GDP." *TechCrunch RSS*. Web. 07 Apr. 2013.

<<http://techcrunch.com/2013/01/23/apple-now-has-many-billions-in-cash-more-than-hps-annual-revenue-and-vietnams-gdp/>>.

"Apple Leverages Deep Pockets to Gain Supply Chain Edge over Rivals - Report." *Apple Leverages Deep Pockets to Gain Supply Chain Edge over Rivals - Report*. N.p., n.d. Web. 10 Mar. 2013.

"Apple, Qualcomm Bids Spurned for Exclusive TSMC Supplies." *Bloomberg*. N.p., n.d. Web. 10 Mar. 2013. <<http://www.bloomberg.com/news/2012-08-29/apple-qualcomm-spurned-in-bids-for-exclusive-tsmc-chip-supply.html>>.

"The Apple Supply Chain: The Best in the World?" *Logistics Viewpoints A Blog for Logistics Supply Chain and 3PL Executives RSS*. Web. 01 Apr. 2013. <<http://logisticsviewpoints.com/2012/07/02/the-apple-supply-chain-the-best-in-the-world/>>.

"Apple Timeline." *Apple Timeline*. Web. 01 Apr. 2013. <<http://www.landsnail.com/apple/local/evolution/timeline.html>>.

"Apple Turns to Tim Cook to Replace Steve Jobs." *Macworld*. N.p., n.d. Web. 10 Mar. 2013. <http://www.macworld.com/article/1161929/apple_turns_to_tim_cook_to_replace_steve_jobs.html>.

"Apple's Secret Garden: The Struggle over Leaks and Security." *Ars Technica*. N.p., n.d. Web. 10 Mar. 2013.

"Apple's Secret iPad Advantage: The Supply Chain." *ZDNet*. N.p., n.d. Web. 10 Mar. 2013. <<http://www.zdnet.com/blog/perlow/apples-secret-ipad-advantage-the-supply-chain/15813>>.

"Apple's 3 Product Design Strategies That Google, Microsoft and Nokia Can Follow."

International Business Times. Web. 01 Apr. 2013.

<<http://www.ibtimes.com/apples-3-product-design-strategies-google-microsoft-nokia-can-follow-266047>>.

"Apple's Climb Back to Success, 1999 to 2001." *Low End Macs RSS*. Web. 01 Apr. 2013.

<<http://lowendmac.com/coventry/06/1013.html>>.

"Asymco." *Asymco*. Web. 07 Apr. 2013. <<http://www.asymco.com/>>.

"The Great Tech War Of 2012." *Fast Company*. N.p., n.d. Web. 10 Mar. 2013.

<<http://www.fastcompany.com/1784824/great-tech-war-2012>>.

"Beleaguered: Apple Bottoms Out, 1996 to 1998." *Low End Macs RSS*. Web. 01 Apr.

2013. <<http://lowendmac.com/coventry/06/beleaguered-apple.html>>.

Burrows, Peter. "Online Extra: Commentary: Apple's Blueprint for Genius."

Editorial. *Bloomberg BusinessWeek* 20 Mar. 2005. Web. Mar. 2013.

<<http://www.businessweek.com/stories/2005-03-20/online-extra-commentary-apples-blueprint-for-genius>>.

"Businessweek." *.com*. Web. 02 Apr. 2013.

<<http://investing.businessweek.com/research/stocks/financials/financials.asp?ticker=DELL>>.

"Can Samsung Learn From Apple's Supply Chain? | Celtrino Blog." *Can Samsung Learn*

From Apple's Supply Chain? | Celtrino Blog. Web. 01 Apr. 2013.

<<http://blog.celtrino.com/2012/08/can-samsung-learn-from-apples-supply-chain/>>.

"Chart 3.1." *U.S. Bureau of Labor Statistics*. U.S. Bureau of Labor Statistics. Web. 01

Apr. 2013. <<http://www.bls.gov/fls/chartbook/2012/section3a.htm>>.

Crothers, Brooke. "Apple's A6 Chip Development Detailed." *CNET News*. CBS Interactive, 17 Sept. 2012. Web. 01 Apr. 2013. <http://news.cnet.com/8301-13579_3-57514662-37/apples-a6-chip-development-detailed/>.

"Current Evolution of Supply Chain Management." *Supply Chain Risk Management*. Web. 01 Apr. 2013. <<http://scrmblog.com/review/current-evolution-of-supply-chain-management/>>.

"Dell Inc." *News*. 01 Apr. 2013. Web. 01 Apr. 2013. <http://topics.nytimes.com/top/news/business/companies/dell_inc/index.html>.

"Dell Sets up 1st Supply Chain Management Institute in Xiamen." - *What's On Xiamen*. Web. 01 Apr. 2013. <<http://www.whatsonxiamen.com/invest1091.html>>.

The Economist. The Economist Newspaper. Web. 01 Apr. 2013. <<http://www.economist.com/blogs/freeexchange/2012/01/supply-chains/print>>.

"EDI Basics." *EDI in the High Tech Industry*. Web. 01 Apr. 2013. <<http://www.edibasics.co.uk/edi-by-industry/the-high-tech-industry/>>.

"Exploring Apple's Supply Chain Secrets." *TUAW*. Web. 01 Apr. 2013. <<http://www.tuaw.com/2011/11/04/exploring-apples-supply-chain-secrets/>>.

"Facts and Details." *JAPANESE ELECTRONICS INDUSTRY: HISTORY, SEMICONDUCTORS, DECLINE AND COMPETITION FROM APPLE, CHINA AND SOUTH KOREA*. Web. 01 Apr. 2013. <<http://factsanddetails.com/japan.php?itemid=922>>.

"The Five Most Common Supply Chain Challenges | Supply Chain Council." *Supply Chain Council*. Web. 01 Apr. 2013. <<http://supply-chain.org/top-supply-chain->

challenges>.

Fugate, Brian, and John Mentzer. "Dell's Supply Chain DNA." *ProQuest* (2004): 20-24.

Oct. 2004. Web. Apr. 2013.

<<http://search.proquest.com/docview/221223366?accountid=13158>>.

"Gartner: Samsung Has the Best Supply Chain in Asia." – *CSCMP's Supply Chain*

Quarterly. Web. 01 Apr. 2013.

<<http://www.supplychainquarterly.com/news/20120828-gartner-says-samsung-has-the-best-supply-chain-in-asia/>>.

"Google Buys Motorola's Insured Supply Chain - Actio Corporation." *Google Buys*

Motorola's Insured Supply Chain - Actio Corporation. Web. 01 Apr. 2013.

<<http://www.actio.net/default/index.cfm/actio-blog/google-buys-motorolas-insured-supply-chain/>>.

Greene, Jay. "Digging for Rare Earths: The Mines Where iPhones Are Born." *CNET*

News. CBS Interactive, 26 Sept. 2012. Web. 02 Apr. 2013.

<http://news.cnet.com/8301-13579_3-57520121-37/digging-for-rare-earths-the-mines-where-iphones-are-born/>.

Hartung, Adam. "Google's Big Mistake - Buying Motorola to Save Android." *Forbes*.

Forbes Magazine, 18 Aug. 2011. Web. 01 Apr. 2013.

<<http://www.forbes.com/sites/adamhartung/2011/08/18/googles-big-mistake-buying-motorola-to-save-android/print/>>.

"The History Of Dell." *The History Of Dell*. Web. 01 Apr. 2013.

<<http://www.webhostingreport.com/learn/dell.html>>.

"How Apple Became a Monopsonist." *Fortune Tech Technology Blogs News and*

Analysis from Fortune Magazine RSS. N.p., n.d. Web. 10 Mar. 2013.

<http://tech.fortune.cnn.com/2011/07/05/how-apple-became-a-monopsonist/>>.

"How Samsung Went From A Dried Fish Exporter To One Of The Top Names In Tech." *Business Insider*. Web. 02 Apr. 2013.

<http://www.businessinsider.com/history-of-samsung-2013-2?op=1>>.

"How Tim Cook Is Changing Apple." *Fortune Tech Technology Blogs News and Analysis from Fortune Magazine RSS*. N.p., n.d. Web. 10 Mar. 2013.

<http://tech.fortune.cnn.com/2012/05/24/apple-tim-cook-ceo/>>.

"HTC Challenging Apple's iPhone with a Tournament of Ideas." *HTC Challenging Apple's iPhone with a Tournament of Ideas*. Web. 01 Apr. 2013.

<http://www.chinapost.com.tw/print/303445.htm>>.

"The Inventory Turnover Ratio." *Investment U RSS*. Web. 01 Apr. 2013.

<http://www.investmentu.com/2011/August/inventory-turnover-ratio.html>>.

"InvestorCenter." *DailyFinance.com*. Web. 01 Apr. 2013.

<http://www.dailyfinance.com/2012/03/23/apple-lesson-of-the-day-inventory-is-evil/>>.

"It's an iPad World and We Just Live in It." *NBC Bay Area*. N.p., n.d. Web. 10 Mar.

2013. <http://www.nbcbayarea.com/blogs/press-here/Its-an-iPad-World-and-We-Just-Live-in-It-128264508.html>>.

"Jeff Williams: Apple's Other Operations Whiz." *Fortune Tech Technology Blogs News and Analysis from Fortune Magazine RSS*. N.p., n.d. Web. 10 Mar. 2013.

<http://tech.fortune.cnn.com/2011/09/13/jeff-williams-apples-other-operations-whiz/>>.

"Just-In-Time Inventory Management Strategy & Lean Manufacturing." *Just-In-Time*

Inventory Management & Lean Manufacturing. Web. 01 Apr. 2013.

<<http://www.academicmind.com/unpublishedpapers/business/operationsmanagement/2005-04-000aaf-just-in-time-inventory-management.html>>.

Kidela Capital Group. "Chapter 6: Raw Materials and Electronics." *The Internet*

Roadmap. Print.

Lashinsky, Adam. "The Genius behind Steve." *CNNMoney*. Cable News Network. Web.

01 Apr. 2013.

<http://money.cnn.com/2008/11/09/technology/cook_apple.fortune/index.htm>.

"Living in Dell Time." *Fast Company*. Web. 01 Apr. 2013.

<<http://www.fastcompany.com/51967/living-dell-time>>.

"Made in America: Apple's Supply Chain Increasing US Production." *Made in America:*

Apple's Supply Chain Increasing US Production. N.p., n.d. Web. 10 Mar. 2013.

<http://appleinsider.com/articles/12/07/19/made_in_america_apples_supply_chain_increasing_us_production.html>.

"Made in America: Small Businesses Buck the Offshoring Trend." *Wired.com*. Conde

Nast Digital, 28 Feb. 2011. Web. 10 Mar. 2013.

<http://www.wired.com/magazine/2011/02/ff_madeinamerica/>.

"MaRS Discovery District." *MaRS Discovery District RSS*. Web. 01 Apr. 2013.

<<http://www.marsdd.com/articles/dell-distribution-and-supply-chain-innovation/>>.

"Mystery Men Forge Servers For Giants of Internet." *Wired.com*. Conde Nast Digital, 17

Dec. 0011. Web. 10 Mar. 2013.

"New Apple Chief Tim Cook Regarded as Operational Genius." *New Apple Chief Tim Cook Regarded as Operational Genius*. N.p., n.d. Web. 10 Mar. 2013. <http://appleinsider.com/articles/11/08/24/new_apple_chief_tim_cook_regarded_as_operational_genius.html>.

"News." *GreenBiz.com*. Web. 01 Apr. 2013. <<http://www.greenbiz.com/news/2011/10/28/hp-apple-show-strong-leadership-supply-chain-transparency>>.

"The One Big Reason Why iPad Rivals Can't Compete on Price." *TechRepublic*. N.p., n.d. Web. 10 Mar. 2013. <<http://www.techrepublic.com/blog/hiner/the-one-big-reason-why-ipad-rivals-cant-compete-on-price/7724?tag=nl.e101>>.

"Online Business Management Courses." *Understanding Dell's Approach to Supply Chain Management*. Web. 01 Apr. 2013. <<http://www.business-management-courses.com/2012/01/understanding-dells-approach-to-supply.html>>.

"Patently Apple." *'Patently Apple'* Web. 01 Apr. 2013. <<http://www.patentlyapple.com/patently-apple/2012/11/apples-challengers-are-out-to-topple-their-supply-chain-mastery.html>>.

Powell, Bill. "The End of Cheap Labor in China." *Time*. Time. Web. 02 Apr. 2013. <<http://www.time.com/time/magazine/article/0,9171,2078121,00.html>>.

Reporting., Charles Duhigg And Keith Bradsher; David Barboza, Peter Lattman And Catherine Rampell Contributed. "THE IECONOMY; How U.S. Lost Out On iPhone Work." *The New York Times*. The New York Times, 22 Jan. 2012. Web. 10 Mar. 2013. <<http://www.nytimes.com/2012/01/22/business/apple-america-and-a-squeezed-middle-class.html>>.

Reporting., Keith Bradsher; Hilda Wang Contributed. "China Confronts Mounting Piles Of Unsold Goods." *The New York Times*. The New York Times, 24 Aug. 2012. Web. 10 Mar. 2013.

Research., Charles Duhigg And David Barboza; Gu Huini Contributed. "THE IECONOMY; In China, the Human Costs That Are Built Into an iPad." *The New York Times*. The New York Times, 26 Jan. 2012. Web. 10 Mar. 2013. <<http://www.nytimes.com/2012/01/26/business/ieconomy-apples-ipad-and-the-human-costs-for-workers-in-china.html>>.

Research., Edward Wong; Shi Da Contributed. "Beijing Takes Steps To Fight Pollution As Problem Worsens." *The New York Times*. The New York Times, 31 Jan. 2013. Web. 01 Apr. 2013. <<http://www.nytimes.com/2013/01/31/world/asia/beijing-takes-emergency-steps-to-fight-smog.html?pagewanted=print>>.

"Samsung Delivers Record Profits and Makes a Statement." *Supply Chain Matters RSS*. Web. 01 Apr. 2013. <<http://www.theferrarigroup.com/supply-chain-matters/tag/samsung-electronics-company/>>.

"Samsung History." *History Of Samsung*. Web. 02 Apr. 2013. <<http://www.samsung-mobiles.net/history-of-samsung.html>>.

"Samsung Tops Asian Supply Chain Ranking." *Purchasing and Supply News, Law, Analysis and Resources*. Web. 01 Apr. 2013. <<http://www.supplymanagement.com/news/2012/samsung-tops-asian-supply-chain-ranking/>>.

Satariano, Adam, and Peter Burrows. "Apple's Supply-Chain Secret? Hoard Lasers." *Bloomberg BusinessWeek* 03 Nov. 2011: 1-2. Web. 04 Nov. 2012.

<<http://www.businessweek.com/magazine/apples-supplychain-secret-hoard-lasers-11032011.html>>.

Speculations, Great. "Apple's Well-Fortified Supply Chain Can Handle The Sharp Scare." *Forbes*. Forbes Magazine, 05 Sept. 2012. Web. 01 Apr. 2013.

<<http://www.forbes.com/sites/greatspeculations/2012/09/05/apples-well-fortified-supply-chain-can-handle-the-sharp-scare/>>.

"SPIEGEL ONLINE." *Druckversion*. Web. 01 Apr. 2013.

<<http://www.spiegel.de/international/business/rare-earths-high-tech-companies-face-shortages-as-china-hoards-metals-a-658977-druck.html>>.

Stone, Brad, Adam Satariano, and Peter Burrows. "Mapping a Path Out of Steve Jobs's Shadow." *Bloomberg BusinessWeek* (2012): n. pag. *Mapping a Path Out of Steve Jobs's Shadow*. 03 Oct. 2012. Web. 04 Nov. 2012.

<<http://www.businessweek.com/articles/2012-10-03/mapping-a-path-out-of-steve-jobs-shadow>>.

"The Strategic Sourceror: Problems in the Supply Chain - HTC, APPLE, AT&T, Verizon, Sprint." *The Strategic Sourceror: Problems in the Supply Chain - HTC, APPLE, AT&T, Verizon, Sprint*. Web. 01 Apr. 2013.

<<http://www.strategicsourceror.com/2010/07/problems-in-supply-chain-htc-apple-at.html>>.

"Supply Chain Management." - *Supply Chain & Partners*. Web. 01 Apr. 2013.

<<http://www.samsung.com/uk/aboutsamsung/sustainability/supplychainpartners/supplychain-management/supplychain-management.html>>.

"Supply Chains Changed the Growth Model." *The Economist*. The Economist

Newspaper. Web. 01 Apr. 2013. <<http://www.economist.com/economics/by-invitation/guest-contributions/supply-chains-changed-growth-model/print>>.

"Tim Cook Biography." *Bio.com*. A&E Networks Television. Web. 01 Apr. 2013.

<<http://www.biography.com/print/profile/tim-cook-20967297>>.

"Who Is Apple's New CEO Tim Cook? [Bio] | Cult of Mac." *Who Is Apple's New CEO*

Tim Cook? [Bio] | Cult of Mac. Web. 01 Apr. 2013.

<<http://www.cultofmac.com/110498/who-is-apples-new-ceo-tim-cook-bio/>>.

"Why Apple Is Winning: Innovation, Opportunity and Execution." *Business Money Why*

Apple Is Winning Innovation Opportunity and Execution Comments. N.p., n.d.

Web. 10 Mar. 2013.

<<http://business.time.com/2012/04/25/why-apple-wins-innovation-opportunity-and-execution/>>.

Wired.com. Conde Nast Digital. Web. 01 Apr. 2013.

<http://www.wired.com/wired/archive/4.02/jobs_pr.html>.

"Wow! Apple Turns Over Its Inventory Once Every 5 *Days*." *The Atlantic*. Web. 01

Apr. 2013. <<http://www.theatlantic.com/technology/archive/2012/05/wow-apple-turns-over-its-inventory-once-every-5-days/257915/>>.

ACADEMIC VITA

Lauren E. Stern

Les5287@psu.edu

EDUCATION

**The Pennsylvania State University, *Schreyer Honors College*
Smeal College of Business**

University Park, PA
Expected Graduation: May 2013

Bachelor of Science in Supply Chain & Information Systems

Minor in International Business

Studied Abroad at CEA Florence Campus

WORK EXPERIENCE

ACE Insurance Group

Philadelphia, PA

Summer Legal Intern

Summer 2012

- Interned in the legal department
- Learned about the company's Procurement strategies by participating in monthly Procurement Department meetings
- Honed research skills by assisting with legal research and various legal matters
- Learned and utilized computer software, as well as HTML coding
- Handled placement content for company's global social media site
- Developed problem solving, organizational, teamwork, and communication skills collaborating with others

Cheltenham Racquet Club

Elkins Park, PA

Tennis/Swim Instructor, Lifeguard

Summer 2006-2011

- Assisted with tennis/swim lessons for young children from the ages of 3-11
- Interacted with over 500 diverse club members
- Developed interpersonal, social, leadership, and communication skills

Philmont Country Club

Philmont, PA

Lifeguard, Caterer

Summer 2011

- Interacted with people of all ages
- Support staff for special events
- Developed good communication skills, as well as social and interpersonal skills

ACADEMIC ACHIEVEMENTS

- Dean's List: 7/7 semesters
- Beta Gamma Sigma Honor Society

Spring of 2013

LEADERSHIP

Alpha Sigma Alpha Sorority

University Park, PA

Treasurer of Gamma Eta Chapter

Spring 2011-Fall 2011

- Prepared annual budget, including monetary flows through 41 subgroups
- Communicated with national headquarters regarding the chapter's financial obligations
- Managed a \$39,000.00 fund, collected biannual dues from 91 members, and prepared and wrote checks weekly
- Acted and served as a role model to chapter members
- Learned excellent organizational skills by being responsible for maintaining a budget of the chapter's finances, as well as for member's invoices and payments
- Developed leadership skills by serving as a member of the Executive board for 91 members

ACTIVITIES

Panhellenic Dance Marathon

University Park, PA

Active Member, Volunteer

2009-PRESENT

- Assisted in organizing fundraisers by helping to plan and create philanthropic events
- Actively involved in fundraising efforts where chapter exceeded initial goal by raising over \$200,000
- Developed good teamwork skills by collaborating with over 90 members to raise money