Leading Competition with Innovation and Technology in New Product Development – A Case Study

Jia-Qin YANG[1,a,*], Michael BLAIN[2], Kevin BOWLES[2], Jeff HOPTROFF[2], Brenton MARONA[2]

[1]Department of Management, Georgia College & State University, USA

[2]WebMBA Program, Department of Management, Georgia College & State University, USA

[a]jiaqin.yang@gcsu.edu

*Corresponding author

Keywords: IT industry, Innovation, Competition in high-tech industry.

Abstract. As the demand for more innovation in those high-Tech industry and worldwide trend in developing new products and services, especially in today's Internet era, the competition among these large international IT and computer producers and related companies becomes more intensified with a new focus – while still need to keep an eye on those traditional performance measures like low cost and better quality. This paper presents a case study – how the current international leader in the industry have been able to compete in such a new international environment through their innovation and new technology focus with some meaningful insights and managerial implications.

Introduction

Apple, headquartered in the famous Silicon Valley of California, has many different facets to its business, but all are centered around technology, whether they are advancing it with new innovation or simply enhancing today's technologies. Apple was founded in 1976 by today's famous Steve Jobs with his partners with the purpose to sell a personal computer designed and was later incorporated in 1977. The basic offering from Apple at the start was a personal computer, from the first Apple I to their mainstay today, the Macintosh (or Mac). Over the years they have expanded beyond their original market segment and into mobile devices, drivers, printers, input devices, displays, networking, software, and consumer products.

The current strategy of Apple according to their most recent statement is "bringing the best user experience to its customers through innovative hardware, software and services". The overall plan includes continued investment in research and development with a focus on marketing and advertising in order to enhance their sales. Apple views their various application stores (App Store, iTunes Store, iBooks Store etc.) as an avenue to expand their product offerings through complementary services. Sales are not only focused on these web-based methods but also expansion of the Apple retail stores utilizing high levels of service and post sales supports to continue to drive the profits. From a financial perspective, Apple is among the elite in the world. Sales from Sept 2008 to Sept 2013 (Apple operates on fiscal year ending in Sept) have grown from 42 million to 170 million (over 300% growth) and income has gone from 8 million to 37 million (over 360% growth). These numbers indicate that while sales continue to climb, profits are growing even faster which is indicative in the company's stock price, which over the same 2008 to 2013 period, has risen from around $100 per share to a price of just over $400. Over this time Apple has outpaced the S&P 500 Index and the S&P Computer Hardware index. Total assets have also substantially increased over 300%.

With so many products, competition for Apple products is rather diverse and intensified. New entrants to the market are constant, brought on by the rapid pace of changing technology. The gross margin is being driven down as more mobile devices and personal computers are being offered and lower prices resulting in a loss of market share for Apple. Some of the larger, more well-known competitors of Apple include Microsoft, Hewlett-Packard and Intel Corp. Among these Apple is

still regarded as an industry leader, producing the highest-quality products. Due to the inherent nature of the technology industry, substitutes are seemingly a dime a dozen. The iPhone could be replaced by a Samsung or HTC phone, while a MAC computer competes directly with Dell and Hewlett-Packard among others. On the Software side, Microsoft and Apple have been competing for years and a relatively new entrant, Google, has been on the rise recently.

Rivalry among all of Apple's competitors is intense, and the barriers to entry are high. So much of the business is based on innovation through research and development; many small innovations can threaten the core business of Apple. Apple utilizes a wide array of third parties for development and manufacturing and any of these relationships can develop rivals if not monitored closely. Some of these third party relationships drive price and service as Apple's fellow competitors often covet the same third parties. Overall Apple started in a garage in the late 1970's as an idea and since then they have competed with the titans in the technology sector such as IBM, and grown to the position that they are now a leader in the industry. New entrants arise daily and Apple must continue to create and innovate, as any perceived setback can have lasting negative effects on the company.

Using Operations As Its Competitive Weapon

As the leading company in the computer and tablet industry, Apple has been continuing in using its operations to gain the needed competitive advantages through innovation and new technology including: product and process design, vertical integration, demand management, capacity planning, inventory control, organizational design, and more importantly, modern quality management and the new supply-chain management system. A detailed discussion about the above each operational element is below:

Product Development - the current lineup of products includes:

- *iPhone* – Smartphone which serves as a phone, digital media player, internet device, camera (video and photo) along with many other features and capabilities
- *iPad* – Multi-purpose tablet which is slightly larger than the iPhone and yet smaller and more portable than a personal computer.
- *Mac* – Desktop and Laptop versions of the personal computer
- *iPod* – Portable music and digital media player
- *Online Stores (iTunes, Mac App etc.)* – Virtual stores which allow for downloads of music, digital media, Mac Apps and much more
- *iCloud* – A service which allows users to store and backup various types of data from music to applications and documents.
- *iOS* – Apple operating system, which serves as the operating system for many of their portable devices.
- *OS X* – The Mac operating system with a UNIX-based foundation
- *iLife* – Lifestyle software designed for storing the user various personal hobbies
- *iWork* – Software designed to help users create and present various work related documents and spreadsheets
- *Displays and Peripheral Products* – these include storage devices, printers, cameras and many other computer related products.

There are plenty of published research reports about the success of *iPad* and *iPhone* as the leader in its related market, and it has been the foundation for the recent growth of the company.

Processes

Many of Apple's processes are kept highly confidential, while some are publicly released. The decision to disclose or protect process information hinges on what adds or protects value in Apple's opinion. For example, Apple recently revealed its new laser technology patent that will be utilized to manufacture ultrathin iMacs. [8] This announcement only adds value because it will create interest from consumers and subsequently an increase in Apple's stock price, equating to increasing

demand for AAPL and cause for concern from competitors. This information is protected by patents, so the risk of publicizing this technology is mitigated. On the other hand, component manufacturing plants such as those run by Foxconn International in China have security protocols in place that rival those at the Pentagon. Employees are searched upon entry and exit. [10] Furthermore, Apple splits up the manufacturing of various components among different plants and assembles finished products elsewhere. This way, risk of leaks of upcoming products are minimized to only the particular components being assembled at each location, which also has the added benefit of creating a "buzz" around new products with details available controlled and released by Apple when and how they choose to.

Apple has become the financial powerhouse it is today in large part due to product design. One paramount advantage Apple has over most companies is that the design process leads manufacturing rather than design being restricted by manufacturing capabilities. Product design is king at Apple. Once an idea is born, a team is formed and the design process begins without being in contact with anybody accept those with certain security clearances. This team does not need to be mindful of project costs or manufacturing limitations. If finished, the manufacturing limitations are figured out to accommodate the new innovation.

Apple is also known for its outsourcing prowess in manufacturing. Over the years, Apple has developed strong relationships with its suppliers by aggressively ensuring that their suppliers' capacity is filled by Apple's demand and assisting in the development of new manufacturing processes that benefit both Apple and the suppliers. [13] By ensuring their suppliers' capacity is filled by their own demand, Apple effectively eliminates the possibility of competitors taking advantage of the suppliers' competitive advantage obtained through improved manufacturing processes.

Vertical Integration

Despite outsourcing all manufacturing of its products to other companies, Apple does and has championed a vertical model controlling the end product by controlling every aspect of the design of each of its component parts, both hardware and software, and the integration between the two for over 35 years. Design dictates the manufacturing, which is atypical in many large multinationals today. This integrated hardware and software approach is what has set Apple apart from the competition in many respects, allowing for the creation of quality products in the view of customers which ultimately allows for a premium to be charged. Apple has set the standard for this approach but it did not come without its challenges as it employed the same approach that did not work to its benefit in the 1980's and 1990's competition in the PC market, where it lost to Microsoft. One of the critical aspects of juggling both software and hardware engineering is that a company must stay ahead of the competition in innovation on both fronts, which Apple clearly does today but was not able to do 20 years ago. Apple is now a leader in innovation in the technology sector, allowing for the benefits of vertical integration to be fully realized as shown by the exponentially increasing profits and revenue. Apple's emphasis on controlling end to end design of its products is indicative of the culture of delivering what it believes the customers want, and that no one can do that better than Apple itself, leaving no detail to chance or risk.

Competitors in the mobile device market use other operating systems where Apple creates and controls its own iOS operating system along with the hardware. The customers, or fans, of Apple devices pay for the hardware design along with the operating system, or in simpler terms, the Apple ecosystem. Other large technology multinationals like Google, Amazon, and Oracle are starting to delve into integrating hardware and software through strategic acquisitions and R&D. [1] This ability to innovate incessantly, vertically integrate the design process, and realize the cost benefits from outsourcing manufacturing is a competency Apple has developed over time and now deploys successfully creating what some would describe as a hybrid approach to vertical integration, which none the less clearly is working for Apple. The question of whether other firms can emulate this vertically engineered hardware and systems approach Apple bases a significant portion of its competitive advantage on remains unanswered, but Apple can be safely assured it is not a

competency that is developed overnight, as they have honed their skills for three decades and still believe there is opportunity for further improvement.

Demand Management

Because Apple has developed such a popular customer base following for its products, there is really no need to accurately project product demand. In fact, underestimating product demand can be seen as an advantage. Loyal customers in frenzy, fighting to get to the front of the line to get their hands on the latest and greatest Apple product creates marketing buzz, further increasing demand and yielding higher margins. [3] Inventory costs are also kept to a minimum during fortunate times like this. Procurement for Apple continues to become more of a competitive advantage as the company grows due to scale. Many suppliers are dependent upon Apple's orders. Apple utilizes this clout by achieving efficiency in costs associated with component manufacturing, freight, manufacturing capacity, and equipment. Apple is known to commonly demand disclosure of detailed analysis of how the product or service provider derives their figures. [3] This scale muscle is also flexed in order to achieve product quality standards. Manufacturers can be on the hook for remuneration associated with recalls and warranty issues. Also, as previously stated, Apple often assists with manufacturing process improvements, which includes equipment associated with the production of specific Apple components. This assistance, order volumes, and quality assurances are often included in contractual agreements of exclusivity. [2]

Apple's effectiveness in demand management is obviously a function of their highly demanded products, but in the last decade the company has been recognized specifically for supply chain management. "Apple could have faltered in meeting demand (for the iPhone) or failed on quality. It did neither. Behind-the-scenes moves like tying up essential components well in advance and upgrading basic information systems have enabled Apple to handle the demands well in advance of its rabid fan base without having to fall back on their forgiveness for mistakes." [1] Some investors doubted Apple's ability to maintain their margins with the passing of Steve Jobs. Tim Cook, a supply chain guru, has obviously made an impact in recent years.

Capacity

The discussion on demand management provides a perfect segue into a discussion on capacity at Apple. Again, the procurement strategy of Apple involves massive supply contracts that intertwine supplier dependency on Apple due to sheer order volume, or scale. Manufacturers, and most organizations for that matter, seek to minimize risks in their businesses. One key risk associated with manufacturing is demand fluctuation. It is costly to adapt output, whether the goal is increasing or decreasing. Thus there is definable value in ensuring demand and revenue will remain steady for a given period of time. This value to the manufacturers translates to a net savings to Apple. This strategy is implemented through all variables that determine capacity. For example, in 1998, Steve Jobs bought up all of the available holiday season air freight space for $50 million in order to ensure that the supply of the then new blue iMacs would be able to flex with the anticipated Christmas demand. [11] The added expense to ship by air versus sea was more than justified because it crippled competitors' ability to meet seasonal demand. Then again in 2001, when iPod sales were sky-rocketing, Apple again turned to air freight, but this time for economic reasons. With air freight procurement clout, Apple was able to ship via air directly from Chinese factories to consumers around the world. Amazingly, an online order for one of these iPods could arrive at the consumers' doors as early as 2 business days later! [11]

In total, Apple has spent $21.2 billion on capital expenditures since releasing the iPhone. In 2012, capital spending topped $8 billion and is expected to exceed $10 billion in 2013. [14] This level of supply-chain investment cannot nearly be matched by Apple's competitors. Apple has actually reached the capital spending level of powerhouses such as Intel. So dropping $50 million on strategic transportation procurement not only hurts competitors, but it ensures that Apple's larger investments are able to reach the fullest potential.

Product Quality

Apple has held the torch on product quality for the last decade. For Apple, product quality is not just an item on a checklist, it is the foundational emphasis for every product design, developed, and distributed. Quality is the driving force included in the DNA of Apple and all the innovative products, which provides the common link in the Apple branding strategy. When looking at how Apple compares against its main competitors, it becomes apparent that quality and reliability is a main distinguishing factor for the organization. The Figure 1 below compares the quality and reliability of smart phones, which is based on a sample size of 30 million users:
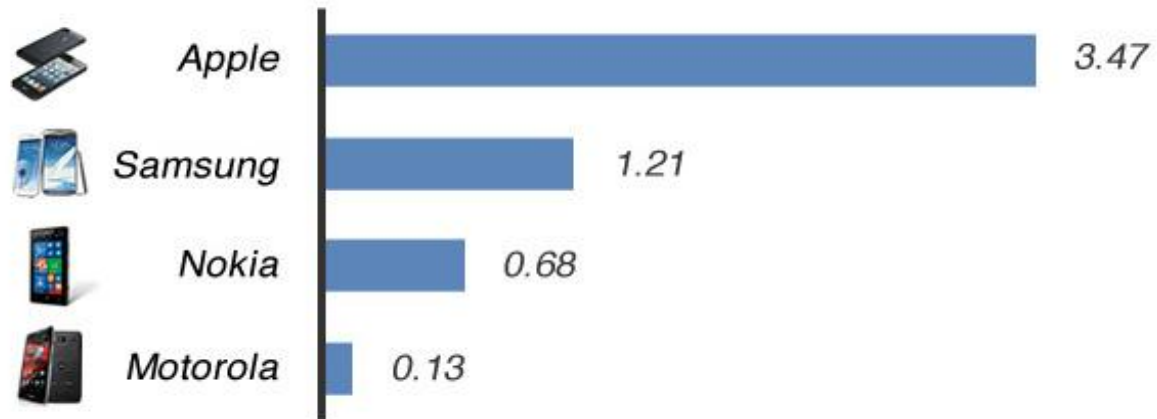

Apple		3.47
Samsung		1.21
Nokia		0.68
Motorola		0.13

Figure 1: Quality Comparison among Competitors

From Figure 1 above, it is clear the Apple's smartphone quality in well ahead of the competition, but what about computers [6]. The Figure 2 below from consumer report displays of quality and reliability of laptop computers:

RELIABILITY

- Apple (1282)
- Acer (752)
- Toshiba (1427)
- Dell (824)
- Asus (409)
- HP/Compaq (1902)
- Lenovo (148)
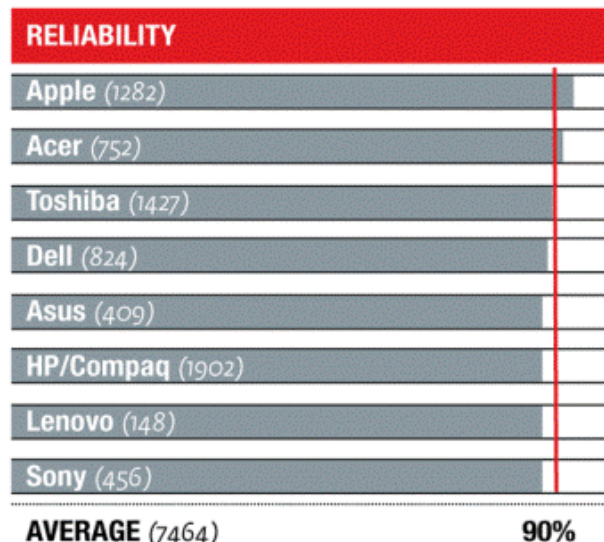- Sony (456)

AVERAGE (7464) **90%**

Figure 2: Reliability Comparison among Competitors

It becomes clear that Apple places material emphasis on quality and reliability [7]. To understand how Apple continues to surpass the competition on quality, it becomes essential to review the quality control process. Apple has built an environment of suppliers that support the mission for unsurpassed quality and innovation. The Apple Diversification Programs, which was organized in 1993, provides a vehicle for suppliers that meet the specification to be incorporated in the supplier ecosystems Apple has created. An example of the standard of quality control of the suppliers is the extreme quality parameters Apple places on its all subcontractors and other suppliers. The drive for

quality is so great that is created a very productive environment which outlines the level and threshold of quality control that Apple has instituted.

Productivity & Efficiency

The innovation, quality, and forward thinking approach comes to mind when discussing Apple, but the productivity and efficiency rarely get recognized. The productivity and efficiency that Apple has deployed enables the organization the ability to place considerable time and capital on the innovation and quality control. While the productivity and efficiency typically take a backseat in the consumer's mind, it provides Apple with the driver for innovation, design, and quality. Apple's efficiency is possibly the most unrecognized asset of the organization. When looking at profit and correlation with full-time employees, Apple reigns supreme when compared to the other technical powerhouses. The Figure 3 below displays net income per employee for large technology organizations:
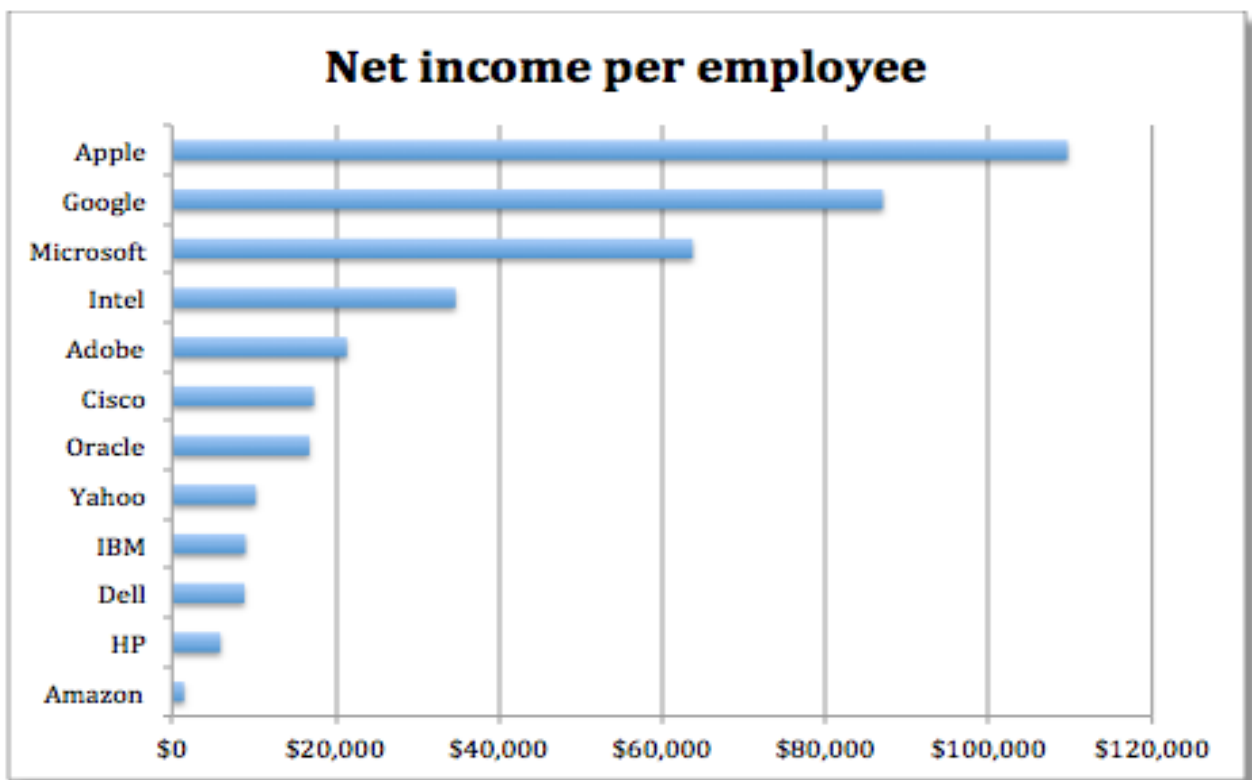

Figure 3: Productivity Comparison among Major Competitors

As it can be seen, Apple is the front runner for productivity and efficiency in the industry. The stress on product and efficiency may be silent from the consumer's perspective, but it affords the organization the opportunity to pursue innovation, design, quality, and strategy initiatives. A strong example of productivity and efficiency programs implemented by Apple is the inventory management component detailed below.

Inventory Management

Apple has found itself in a favorable position relative to competitors in terms of many aspects of business and inventory management is no different. In 2008 when iPhones were popular, Apple managed to maintain only 5 days of inventory during the holiday season. If this sounds outrageous, it is because it absolutely is especially when compared to competitors. During the same time period, Dell, Lenovo, and HP all kept 7, 15, and 32 days of product in inventory. [4] The Table 1 below shows that Apple turns over inventory 74.1 times per year (every 5 days) in 2012. Apple has maintained this competitive advantage while still devoting astonishing amounts of money into

improving processes. In the industrywide comparison, Apple's supply chain has earned a composite score of 9.7 out of 10. The runner up, Amazon, scored a 5.4.

Table 1: AMR Supply Chain Top 25

The Gartner Supply Chain Top 25 for 2012

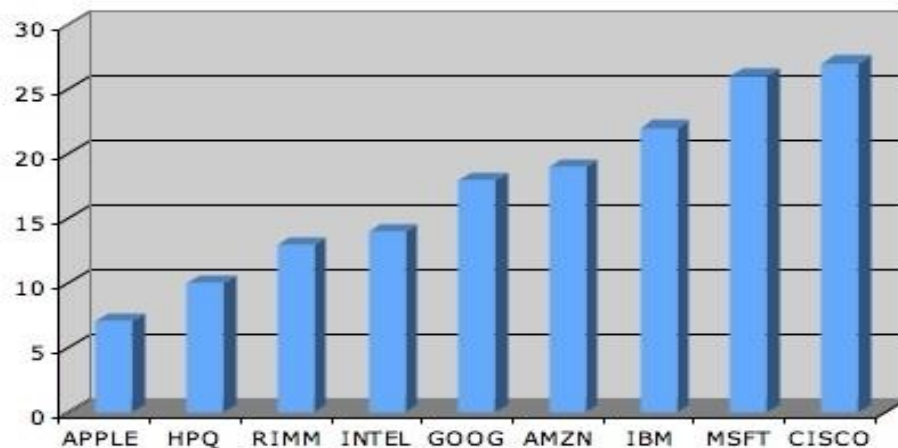| Rank	Company	Peer Opinion[1] (173 voters) (25%)	Gartner Opinion[1] (37 voters) (25%)	Three-Year Weighted ROA[2] (25%)	Inventory Turns[3] (15%)	Three-Year Weighted Revenue Growth[4] (10%)	Composite Score[5]
1	Apple	3241	651	20.2%	74.1	51.5%	9.69
2	Amazon	2713	435	4.4%	10.0	37.7%	5.40
3	McDonald's	1121	283	16.0%	142.4	7.2%	5.37
4	Dell	2131	546	6.8%	35.6	2.7%	5.30
5	P&G	1940	622	9.2%	5.5	2.5%	5.05

Apple blends both made-to-stock and made-to-order strategies for various needs in the manufacturing process. This is a common phenomenon in the technology industry. Dell's rapid rise in market share was due in large part to innovations that allowed complete made-to-order final products. Many of Apple's products require the same or very similar components. These components can be massively and efficiently produced as batch or straight line depending on the component. These components are then assembled into the final products based on orders. As already mentioned, this assembly process and subsequent delivery is what allows Apple to be able to "wow" consumers and competitors alike.

Cost Control

Another component that Apple does extremely well that is under the radar is cost containment and control. Again, the focus and management of the expenses allows Apple to apply focus and funds to the more visible components of the organization. This strong foundation of cost control that Apple has created allows the organization to spend less in overhead as a percentage of total revenue than any other technology company. The Table 2 below displays a comparison on the expenses associated with sales, general, and administrative costs [12].

Table 2: Cost and Revenue Comparison

SGA PERCENTAGE OF REVENUE

As it can be seen in Table 3 above, the high-tech company expenses as a percentage of total revenue comparison chart, Apple produces the least expenses in relation to revenue. Over the last 10 years, the SGA percentage has decreased incrementally. Apple appears to be at a point where

SGA expenses remain fairly fixed in the face of increasing revenues. This underappreciated aspect of Apple plays a significant role in the more visible components of the organization. Without this efficient cost control structure that has been implemented, it becomes clear that the innovation, design, and quality would not be at the high level it is today.

Organization Management

One of the best kept secrets of Apple, and intentionally so, is what the corporate structure truly looks like as they do not publish organization charts or speak publicly on the topic. However, through insights from former employees and leaders at the company some of inner workings have been discovered. In many respects, Apple, with more the 50,000 employees, operates like a startup and discounts modern corporate organization practices. There aren't separate divisions for products, but functional divisions which all have their role in the creation of a product. The most talented people are assigned to smaller project teams, typically fewer than 100 resources, in order to ensure focus and accountability is not lost and, in a sense, replicates the startup mentality within the larger organization. The communication among these teams and among the various functions in a true, open team atmosphere is what allows Apple to continuously innovate and raise the bar in modern technology.

Communication is frequent and clear from the top down, with Monday morning status meetings of every project and initiative currently underway with the top management team. Roles are also clear as evidenced by the often quoted fact that at Apple, only the Chief Financial Officer is responsible for profits and loss. Each project has a DRI, or Directly Responsible Individual, who is the point of contact for projects and typically gives reports on the status so there is no confusion who is responsible for each project underway at any given time. This individual is not always a high level manager, but could be an individual contributor level employee who has expertise in that particular instance, reinforcing the culture of accountability and the respect of expertise, not necessarily title.

Job specialization is prevalent with employees staying in their particular area of expertise, to ensure the best people at their jobs are in every role. Employees are not encouraged to move to different roles for the sake of experience, but are encouraged to be the very best at what they do. Employee motivation is not limited because compensation at Apple is not limited by manager versus individual contributor roles as is common in most large corporations. In the direct words of Steve Jobs on the subject of hiring the top talent and keeping in the roles they excel at, "Let people's talent define their jobs, not the jobs define the people." [9]

Turnover at Apple is extremely low, which is an indicator along with surveys that employee satisfaction is high and has been described as a happy place to work with true believers, which is extremely similar to the way people would characterize Apple's customers, as believers. A key factor is that Apple targets not only the top talent, but the best of the best who want to work for the company. While employee satisfaction is extremely high, it is not a secret that accountability is enforced from the top down and results are expected. The culture and simplicity in the structure of the organization that Apple has fostered, is another source of its competitive advantages over competitors.

Apple's operation posture is clearly at the externally supportive stage as it expected that the operations model significantly contributes to the overall success of the company and fully support the corporate strategy. Apple's operations are world class and proactively managed, exceeding industry expectations time and time again. There is a highly correlated relationship between Apple's engineering, manufacturing, and marketing decisions to the extent that there is no clear distinction between the operations of the business and other functions. In terms of social responsibility, both in regards to environmental sustainability and worker conditions, Apple has shown a clear commitment to environmental sustainability working toward creating self-sustaining facilities powered by renewable energy, of which all of its data centers have already made the transition to being 100% powered by renewable energy. Apple also has been monitoring its carbon footprint since 2009, releasing the annual statistics on its website. Packaging and materials used in

Apple's products are evaluated based on their carbon footprint and recyclability, and Apple offers to recycle customers' used phones once their lifecycle is complete. Another aspect of social responsibility is that of workers' safety and conditions. There are no issues on the corporate side of Apple in the US but have been some notable and public concerns raised related to Apple's overseas manufacturing operations. Scrutiny has arisen due to poor factory conditions both related to safety, the use of child labor (under age of 16), and forced excessive working hours. Apple has committed to releasing an annual supplier responsibility report subjecting itself to internal audits at all levels of the supply chain, which covered more than 1.5M million foreign workers. Their website also clearly states that the report addresses the findings of the audits along with "the work we're doing to correct issues and improve our suppliers' performance". [2] While these are third party manufacturers or suppliers mainly in China, Apple is still ultimately responsible for evaluating its third parties and deciding what standards it chooses to uphold, those of the host country or those of the US. It appears that Apple has chosen to hold suppliers accountable to its own standards of safe working conditions and safe working conditions by not only publishing the positive and negative aspects of the audits but also publicly addressing in press releases and its website the very issues mentioned above. There may not have been much of a choice given the publicity of some of the issues, but Apple appears to be on the path to holding its suppliers and manufacturers accountable. Due to the level of influence Apple has over much of its supply chain, they should, in our opinion, be able to initiate socially responsible change. The final verdict of if Apple can produce real change overseas will not be known immediately, but if Apple applies the same effort and ferocity to holding its external supply chain accountable as it does to creating world class products, we expect that Apple will be able to repair any damage to its reputation due to clear, transparent results overseas.

Conclusions

In regards to Apple, it is evident that their operations activities and product strategy are compatible, which create synergies for the firm. This is clearly evidenced by their high levels of success in financial metrics as well as operational measures. While there may be a few incompatibilities between the operations strategy and the business strategy and other functional strategies, these incompatibilities are few and far between. When looking into future operations, many options may impact operations at Apple. While these options loom in the near future in regards with every technology company, Apple has positioned themselves to have the ability to quickly adapt and adjust to needed measures both operationally and functionally. In our opinion, the operational excellence displayed by Apple, which does not get the same publicity as other aspects of the company, has been a substantial factor in its monumental success in the same respects as innovation, marketing, and branding.

For potential recommendations and suggestions, it is recommended that Apple continue to follow behind the strong leadership while in the acquisition and maintaining of human resource talent, they must continue to keep the best and most innovative workforce in the market. Brilliant minds have always been the backbone for Apple, and this must continue to be as competition will continue to grow in this lucrative market of technology and technology services. Apple should continue to maintain a startup mentality and create innovative products they believe the consumer will want, as they have done so well recently, not just react to consumer demands. Essentially, Apple puts itself in the customers' shoes and creates products of the highest quality and design that they want, and then create the demand for them with their reputation which is typically the opposite from most large firms. Apple will need to maintain a close relationship and transparency with its third party manufacturers to ensure that the quality of the assembly of its products and worker conditions are not compromised in the future. We also suggest that Apple continue to seek ways to further improve operational excellence, and fully expect that it will, as this is the foundation that supports the Apple business model. In the most simplistic terms, Apple needs to stay true to its roots and always "Think Different".

References

[1] AMR. 2013. AMR's Supply Chain Top 25. AMR Research, Garter. Accessed: <http://www.gartner.com/technology/user/pcpreg/showUserpcpRegister.do?resId=249115&srcId=1-3132930191&pcp=gi_sr_sc25>.

[2] Apple and Procurement. 2013. Apple. N.p.. Web. 8 Nov 2013. Accessed: <http://www.apple.com/procurement/>.

[3] Banker, S. 2012. The Apple supply chain: The best in the world? Logistics Viewpoints. Accessed: http://logisticsviewpoints.com/2012/07/02/the-apple-supply-chain-the-best-in the-world/.

[4] Berka, J. 2009. Analyst says Apple very efficient at managing inventory. Ars Technica. Accessed: <http://arstechnica.com/apple/2009/03/analyst-says-apple-very-efficient-at-managing-inventory/>.

[5] Clark, L. 2012. Apple's extreme iPhone 5 quality control leads to Foxconn strikes. Wired. Accessed: <http://www.wired.co.uk/news/archive/2012-10/08/foxconn-strike>.

[6] Clover, J. 2013. FixYa Study Finds Apple Smartphones to be the Most Reliable. MacRumors. Accessed: <http://www.macrumors.com/2013/02/22/fixya-study-finds-apple-smartphones-to-be-the-most-reliable/>.

[7] Consumer. 2013. Brands and reliability." Consumer. Accessed: <http://www.consumer.org.nz/reports/laptops/brands-and-reliability>.

[8] Patently Apple. 2013. Apple reveals new laser manufacturing process for the iMac. Patently Apple. Accessed: <http://www.patentlyapple.com/patentlyapple/2013/10/apple-reveals-new-laser-manufacturing-process-for-the-imac.html>.

[9] Elmer-DeWitt, Phillip. 2011. Apple's headcount, up 30%, still industry's most productive. CNN Money. Accessed: <http://tech.fortune.cnn.com/2011/10/30/apples-headcount-up-30-still-industrys-most-productive/>.

[10] Fox News. 2010. Inside Apple's secret manufacturing plants. Fox News. Accessed.

[11] Satariano, A & Burrows, P. 2011. Apple's Supply-Chain Secret? Hoard Lasers. Bloomberg Businessweek. Accessed: <http://www.businessweek.com/magazine/applessupplychain-secret-hoard-lasers11032011.html>.

[12] Seeking Alpha. 2011. What Apple Does Well: Cost Management. Seeking Alpha. Accessed: <http://seekingalpha.com/article/284455-what-apple-does-well-cost-management>.

[13] USF. 2013 Apple's supply chain management make it a global supply chain leader. University of San Francisco. Accessed: <http://www.usanfranonline.com/applesprocess-improvements-make-it-a-global-supply-chain-leader/>.

[14] Wong, S. 2013. Where is Apple spending its money? USA Today. Accessed: <http://www.usatoday.com/story/tech/2013/06/07/apple-expenditures/2400059/>.