

# Transforming Supply Chains in Digital Content Delivery: A Case Study in Apple

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**Abstract.** Agility, or the ability to respond quickly and effectively to market demands has become an important competitive tool in the manufacturing industry. Firms deploying global sourcing strategies have to balance the benefits of cost-effectiveness against the limitations of off shore productions. Improving supply chain performance is a key to achieving cost effectiveness, and the improvement largely depends upon the degree to which uncertainty can be reduced in the supply chain. This paper conducts a case study of Apple as it moves into the arena of digital content delivery and initiates hardware innovations in an industry that is characterized by increasing product variety, new technologies, price erosion, and fast inventory turn-overs. The purpose of this paper is to explore Apple's supply chain and some of the challenges it has faced in agilely managing its offshore manufacturing in facing demand. Secondly, the paper also explores the manoeuvring, shift of power and change of roles within the supply chain as it moves into the arena of digital content delivery. As a result of our study, we reach the conclusion that the traditional suppliers in the media content industry are yet to make the transition in mind to becoming pure digital players. As more and more consumers make a complete switch to digital media and become used to not owning physical media, the suppliers who retain control through copyrights fall back on strategies that reflect the workings of the non-digital era. Successful companies stand to face the dual task of changing the mindset of its suppliers on one hand, and meeting and setting up an uncharted path for its customers in digital content in a pioneering role for the industry on the other. We find that while managing the supply chain in the traditional 'non-e' market provides challenges related to cost-effectiveness and physical barriers, in the 'e' marketplace managing the supply chain encounters barriers not physical but rather strategic that is entrenched in more traditional operating modes.

**Keywords:** *E.Logistics, Supply chain management, Strategic business transformation, Strategic alliances, E-Commerce*

## 1. INTRODUCTION

Agility in managing supply chains has become an important concept in recent years. The supply chain has traditionally been characterized by a forward flow of materials and a backward flow of information [1]. In face of increasing demand

uncertainty and new retailing practices, agility has become an important competitive tool for manufacturers [2]. Brown and Bessant [3] define Agile manufacturing to include the ability to respond quickly and effectively to current market demands; as well as to be proactive in developing market opportunities. The need for being proactive is stressed by Helo [4] also, who states that companies need to be proactive to face uncertainties in a market. To reduce production costs, supplies are sourced on a global basis, however, this also requires a certain modicum of agility as a result on the part of manufacturers to meet retailers' needs (ibid). Abend [5] identifies that manufacturing firms utilizing a global sourcing strategy has to face the dilemma of how to balance the benefits of cost-effectiveness along with the inherent limitations of off-shore productions with the benefits of agility. The key challenge of course, is to meet the retailers' needs on a timely basis. Christopher and Towill [6] state that any supply chain performance improvement initiative requires reduction in uncertainty within the supply chain as much as possible to facilitate a more predictable upstream demand. However, they further identify that removal of uncertainty from a supply chain is dependent on the nature of the product; e.g. a highly fashionable product by its intrinsic nature has unpredictable demand. Thus, it is all the more imperative for such manufacturers to develop strategies that help them match supply and demand. This phenomenon is all the more visible in the electronics and high-tech industry.

This paper is based on a case study of Apple Computers, a familiar name and one of the most innovative players in an industry that is characterized by time based competition, increasing product variety, new technologies, price erosion, and fast inventory turn-overs. Along with the traditional computing hardware business, in recent years Apple has had an unprecedented success with its iPod line of music players. But at the same time this growth in sales has come exponentially defying analyst estimates at every bench point, making it even hard for Apple itself to accurately measure the effect of the launches of the variations in its product line, and how to adjust its supply chain accordingly. Furthermore, the success of the iPod line has helped Apple to move into the arena of digital content delivery through its iTunes music and video store that offers downloadable content.

The purpose of this paper is to explore Apple's supply chain and some of the challenges it has faced in agilely managing its offshore manufacturing in facing demand for its computer product line. Secondly, the paper also explores the manoeuvring, shift of power and change of roles within the supply chain as it moves into the arena of digital content delivery.

We present a very brief review of literature pertaining to supply chain and agility below so we may frame the rest of the discussion in perspective.

## **2. ROLE OF AGILITY IN SUPPLY CHAIN AND SUPPLY CHAIN MANAGEMENT**

Agility is the ability of an organization to thrive in an unpredictable and continuously changing business environment. Supply chain agility is a crucial factor

and agility of the international supply chain may determine the survival of a firm [7]. Agility means responding quickly to changes in demand in terms of both volume and variety [8]. Agile manufacturing enterprises have the capability to responding to rapidly changing customer demand and from time to time they are able to take advantage form that [7]. According to Christopher [8], in order to be "truly agile" supply chain must have some characteristics. These are market sensitivity (through the capturing and transmission of point of sale data), creating virtual supply chains (based on information rather than inventory), process integration (collaboration between buyers and suppliers, joint product development etc.) and networks (confederations of partners linked together as against "stand alone" organizations). According to Gunasekaran [9] strategies, technology, people and systems are the four key dimensions for the design of agile manufacturing system.

Two concepts are important to define supply chain agility: speed and flexibility. Speed means meeting customer demand in the context of shortened delivery lead times [8]. Flexibility can be explain the degree to which the firm is able to adjust time for shipping or receiving goods and flexibility can be broken down in capabilities the promptness with and the capabilities of the firms adjustment its supply chain speed, destinations and volumes. Zhang and Sharifi [10] identified a number factor of "agility providers"; these are practices, methods, tools, techniques facilitating a capability for agility. Narasimhan and Das [11] have done empirical study of purchasing managers in manufacturing firms, from the result they found that a key determinant of the ability of manufacturing to make rapid changes was the selection, development and integration of suppliers with appropriate capabilities.

Although firm's agility is affected by the speed and flexibility of the supply chain but in many cases, a firm's international supply chain may not be able to respond as quickly and reliably as the rest of the organization [7]. Firms operating in an international environment face a host of uncertainties that make it difficult to meet deadlines reliably. Unfortunately, measures taken to increase agility often lead to increases in complexity, which works against agility. Thus, a company should attempt to strike a balance between the degree of agility desired and the degree of vulnerability it gets exposed to as a result. Agility in supply chain should be adjusted to decrease complexity and uncertainty if need be, and thus decrease external vulnerabilities.

## **2.1 Supply Chain Partnership and Agility**

An agile manufacturing system can shift rapidly among product models or between product lines, ideally in real-time response to consumer demands. Development of supply chain partnerships is a key component for such quick response strategy Perry, Sohal et al [12]. A number of other authors have also identified the importance of supply chain partnerships for quick response [13-14]. Kasarda and Rondinelli [15] further highlight the importance of this, saying that "in an era of rapid, unanticipated change, the most competitive firms will be those that respond quickly and efficiently.

Their success will not depend on in-plant re-engineering but also on external logistical and infrastructure support systems".

### **3. APPLE'S PROBLEMS IN SUPPLY CHAIN**

#### **3.1 The Change in Philosophy**

As far back as October, 1995, Apple was having supply chain problems similar to some other PC makers. However, for Apple it was more of a difficult situation since a lot of the components that went into Apple's hardware were custom designed, and often sourced from a single supplier. In 1995 Apple failed to meet the Christmas demand surge because of a lack of parts. The problem was recognized by Apple management, who however was of the opinion that it was primarily the fault of its salesforce who had under reported future sales in their forecast for getting over quota bonuses. The president of Apple at the time denied there were any systemic problems. Thus there was an inability to increase capacity to match increased demands; instead there was a faulty structure in place that encouraged low forecasts. By the year 1997, Apple was a borderline bankrupt company, which was losing \$1 billion every year. This was the time when Apple's Board brought back the founder and the original visionary of the company Steve Jobs to steer the company again. In the 10 years of Jobs' absence, the company had expanded its product line tremendously, however, apparently often with self-competing products that sometimes ate away at its own profits. It had 19 products in 1997, with the commensurate complexities of supply management. On average, Apple was holding inventory that was a month's worth and valued at \$437 million.

One of the first moves by Steve Jobs on his re-induction was to focus on inventory and supply chain management. Product lines were cut from 19 to just 4, and efforts were taken to minimize inventory as a priority above all. By 1999, Apple was carrying inventory worth just \$25 million as opposed to \$437 million, raising gross margins by 40%. By 2004, the operations principle had changed. Focus was now on being flexible, and on developing strong relationships to recognize and utilize opportunities as they arose.

#### **3. 2 Locking in the Supply Chain: the iPod Nano**

Some analysts have dubbed Apple's challenges in its supply chain and meeting demand to be "good problems" to have, as opposed to facing software and security bugs that other major player such as Microsoft continually has. A Yankee group analyst further opined that the new iPod line of Apple could actually simplify the supply chain and stressed that the challenges would come down to physical availability of hardware. This becomes crucial at a time when Apple expands into

newer overseas markets while tackling the growing internal demand in the US. The huge success of the iPod lines of Apple infused it with the capability to bear pressure upon suppliers and even lock them in to stringent contracts. Being overly successful at marketing a product that has a healthy dose of innovation can also enable a company to set up a so called “predatory supply chain” [16]. Apple has attempted precisely such a set-up for its iPod Nano product line, which uses flash based memories instead of micro hard drives used in its more expensive iPod line up. Apple sold one million iPod nanos in the first 17 days after release, and the demand for it had still not abated.

Apple had proposed about \$3.8 billion worth joint investment with Samsung Electronics in the production lines of flash chips to be used in the iPod Nano players. It should be noted that almost all other Mp3 players in the market also depend on flash chips for memory, and by trying to enter a restrictive and long term deal with Samsung, Apple’s strategy in part was to create impediments in the way of other competitors in the market gaining access to flash chips in high quantities. This is due to the limits of production capacity at the moment for such chips, and the time that it takes to expand new plants to meet extended demands. By locking in supplies of flash chips with producer like Samsung, Apple would have benefited in two ways: one by securing the supply chain for its own line of products, and thus assuring that demand would be met. Secondly, by denying the other competitors in the market the chance to compete on an equal footing by denying them access to equipment parts that goes into production. This type of deal would have created an ideal partnership for both Apple and Samsung in international supply chain management. In fact, prior to signing of the deal, Apple’s competitors already were raising complaints that Samsung was involved in unfair business practices, and that the chip maker was supplying flash memory chips to Apple at half the market price, as part of its efforts to lock in the deal. However, several other events occurred at the time of such negotiations for the deal; such as Samsung Electronics and its U.S. subsidiary pleaded guilty to price fixing charges and agreed to pay a \$300 million fine for taking part in a conspiracy to fix the prices of semiconductors for computers and other electronics products in the US. A week after the results of the investigation were published, in mid October, 2005, Apple ended its plans to enter into the joint venture with Samsung. However, the plan, according to Apple, was not shelved due to the above, but because of the bad press Samsung was already receiving, as well as new anti-trust investigations being started in Korea against both Apple and Samsung for possible price fixing in the flash chips. Since then, Apple had already started talks with other chip makers for joint production of flash chips in the US. As a result of such talks, on November 21, 2005, Apple announced that it had entered into long-term supply agreement with Hynix, Intel, Micron, Samsung Electronics and Toshiba to secure the supply of NAND flash memory through 2010. Apple is prepaying \$1.25 billion dollars for flash memory only during the period December 2005 to February 2006, effectively cornering the market of suppliers for flash memory (Apple press release, November, 2005).

Even though Apple may not have continued the joint venture with Samsung, their continued pursuance of such production facilities highlights the importance attached to locking in suppliers to key inputs.

### **3.3 Supply Chain Analysis of Apple Traditional Product Line: Computer Hardware**

For a company like Apple which specialises in its unique brand of hardware and relies on strong partnership with its manufacturers to gain market momentum, managing its supply chain is to take an even more increasingly crucial role. According to a 1999 study by the AMR Research (1999) it was estimated that US companies spent nine trillion dollars on cost of goods sold in 1999 alone and another 2.5 trillion in sales, general, and administrative costs. Thus any reduction in COGS would yield substantial savings down the line. As it used to happen, in case of most companies successfully engaging in supply chain management did so out of the need to face growing competition and increase customer satisfaction.

Before Apple had shifted its focus and virtually reinvented itself as a major player in the music and entertainment industry, both as a hardware vendor and a content provider, it remained and was operating as any other computing manufacturer that was trying to pit itself against the phenomenon of the spread of the Windows operating system by Microsoft in the early nineties, and the corresponding taking over of the market by the x86 platform based PC hardware makers. To cope with the production uncertainty, Apple in early 1990 moved its production facilities to Southeast Asia, with a strategy that production facilities could then hire more workers if demand surged at a lower cost than the US [17]. This can be considered as the first step by Apple towards implementing agility in its supply chain. Products after manufacturing were shipped via sea freight to its warehouses in California. However this strategy while reducing cost in its supply chain lineup also left it vulnerable to delays due to unforeseen or uncontrollable factors, for example transport times being affected by the weather in the Pacific. At the time the product line that experienced high variations in demand was its powerbook line of products. Apple's manufacturers were selected based on their ability to cope with the uncertain demand but there was little that could be done at the time to reduce the delays in transport times [17], leading to unfulfilled demand. According to a study by Levy [18-19], Apple could, on average, expect a 25 percent probability that unfulfilled demand would exceed 10.4 percent over a 36 month period. In addition, there was a 10 percent probability that unfulfilled demand would exceed 13.6 percent. It was up to Apple to decide how much risk of demand unfulfillment they could absorb. Thus the equation of achieving agility in supply chain versus risk in meeting demand had started to take shape for Apple.

Since the beginning of 2000, Apple has shifted its main focus from being a computer hardware company to becoming a media and 'computing facilitator' company. The company projects an image of a new generation music and online content provider, and as if almost incidentally it also provides the equipments that enables a user to access and utilize such content. A look at the Apple webstore reflects that the new image is not a transitory event, but rather reflects the ground shift in Apple corporate thinking. The company has heavily banked on digital content and delivery in recent years, and very successfully so in the form of the iTunes music store, which now is a major source of revenue for Apple. This in turn has provided

Apple with a large breathing or maneuvering space in its supply chain management by taking some of the pressures off of the computer parts manufacturing.

### **3.4 Reshaping of the Supply Chain in the Context of Digital Content Delivery**

Even in 1985, Porter and Millar [20] stated that information technology changes the way companies operate, and that it not only affects the product but also the entire process of product creation. The old ways of dealing with customers, suppliers, and even employees are destroyed in this process and replaced by radically new ways. Turban et al. [21] state that the most significant characteristic of the e-marketspace is that it offers the chance of disintermediation, or a direct relationship with the customer without the involvement of distributors, wholesalers, or dealers. Perhaps nowhere else this has been more evident than in the digital music industry, which has increasingly become Apple's forte, replacing the traditional business of computer hardware vendor. Apple has capitalized on this disappearance of intermediaries and transformed the music industry. The dominance of the record companies as sole suppliers of music (85% of all music is released by 5 major labels, Sony, EMI, UMG, Time Warner, & BMG - Federal Trade Commission (FTC Statement, 2002) to the market was first challenged by the internet, and more specifically through the proliferation of the file sharing networks, such as Napster. Power and Jansson [22] identified that the file sharing programs that facilitated often 'illegal' sharing of music files were viewed as a threat to collect revenues on the copyrighted materials, but additionally they were also viewed as a threat for the profitable and strategically useful domination of the physical distribution networks. Thus, maintaining the status quo in the business model was a major strategic factor for the suppliers to maintain long term profitability.

Apple had entered the market in its somewhat traditional role of hardware provider, by introducing the audio player iPod in 2001 which became immensely successful. By 2003 the company veered towards vertical integration, and launched its iTunes music store online. This necessitated massive partnership with the supplier base of digital content, because whether the music (the product) was in physical format like the CDs or in digital format, the recording companies still retained the copyrights, and they could shut down the supply chain for Apple's new product.

Apple launched its new online store in April 28, 2003, and received widespread media attention. Companies such as Real.com and musicmatch had by that time already attempted to establish an online presence through stores such as Rhapsody and MusicNet, however there appeared to be less interest on the part of customers in such. The store began after Apple cut deals with all four major record labels, EMI, Sony BMG (which at the time was still the separate Sony Music Entertainment and BMG), Universal and Warner Bros. This was a result of over two years of negotiations in which the music labels repeatedly refused to participate. Finally, Sony was the first label to sign up with Apple, and others followed. Today it also includes over 600 independent labels, with a total offering of over 2,000,000 songs. Apple's store allows the user to purchase songs and transfer them easily to the iPod through

iTunes. To date, the iPod remains the only digital music player (besides some Motorola cell phones) that works with the iTunes Music Store, although some other digital music players work with iTunes. In order to achieve agility on an international basis, Apple began to expand the iTunes store in other countries in 2004. On 15 June 2004, the iTunes Music Store was launched in France, Germany, and the United Kingdom. On 10 May 2005, the iTunes Music Store "went live" for Norway, Sweden, Switzerland and Denmark, and iTunes Japan opened in 2004, and Australia received its store in October, 2005. The international stores provided Apple with more flexibility in providing localized content, and to enter in agreements with local suppliers of digital content. It also allowed them to more accurately judge demand for localized products.

Following the success story of the iPod and the iTunes store, a picture emerges of how the supplier's grip over the music industry has virtually been wrenched away by a successful innovator like Apple by devising a way to deliver the content through an alternative channel, and also by providing the supporting hardware. Thus the supply chain in case of music has in effect been transformed, the role of record companies supplanted by Apple itself in the supply chain. In 2002, the record companies entered the agreement with Apple after several high profile failures to successfully launch stores of their own, and in the face of severe downturn in the traditional record business resulting out of the big record companies price fixing over the decade and driving out smaller companies (Washington Post, 2004). This has pushed an already alienated customer base that had viewed having to buy a heavily overpriced CD for just one or two songs that they may like. This was one of the major success factors behind iTunes because users could simply download one song. The suppliers did not like this model since it cut down on CD sales, and the companies did not want to move out of a business model that helped them to overcharge customers. This mindset has persisted even after doing business online for three years. On March 31, 2006, the record companies restarted negotiations under threat of revoking business that Apple needs to provide them with the freedom to price the tracks over 99c.

This in effect shows a complete inability on the part of the record companies to grasp the fact that by commoditizing music itself to serve their purpose for so long, they are now at the receiving end of it. By dispensing with notions of customer loyalty through price fixing and lawsuits against customers, the record industry has created an environment where there is no consumer bonding with the companies. Hence customers have moved onto an alternative supply channel with very little qualm, helping Apple to achieve a billion downloads of songs in just two years. At the same time, it has proven the viability of the supply chain for the customer and also as a direct marketing and supply outlet. This has little to do with the product itself.

#### **4. DISCUSSION OF FINDING**

As Brown and Bessant [3] identified agility in supply chain as the ability to quickly and effectively respond to current market demands, we find that even though in its traditional hardware centric business model Apple was not so effective in achieving

agility in its supply chains. In keeping with the principles of achieving agility, Apple sources its supplies on a global basis, and as Helo [4] stresses the need for proactivity in agile supply chain management, we find evidence that Apple is indeed more proactive than other players in the industry. The evidence of this lies in locking down the flash memory chip market for ipods, and entering into exclusive contracts with suppliers. Furthermore, Christopher and Towill [6] emphasize that any supply chain performance improvement initiative requires that there should be a reduction in uncertainty within the supply chain as much as possible which results in a more predictable upstream demand. However, while this may be possible for Apple computer product line which follows more stable growth expectancy, the same cannot be said to hold true for the ipod product line. The ipod market remains volatile as far as surge in demand is concerned. This is in concordance with Christopher and Towill's [6] findings that removal of uncertainty from a supply chain is also dependent on the nature of the product. Thus there is only a limited extent to which agility may be achieved in a non-digital product supply chain.

In the context of digital products, the definition provided by Handfield and Nichols [23] can be brought into view who state that supply chain encompasses all activities associated with flow and transformation of goods to the end user as well as all information flows. Since digital products are bits of information also, this places digital products suppliers and manufacturers within the purview of the supply chain frameworks. Additionally, Mentzer et al. [24] identify the presence of a network of organizations involved in upstream and downstream linkages in a supply chain who they define as different activities and processes that produce value for the end user in the form of goods or services. In case of the digital product line up of Apple, we find a strong presence of 'networks'. Apple itself is providing the value added service of maintaining an e-store from where the end users can download digital content (music, video etc.). The suppliers are a major network or consortium of recording studios wielding considerable power on the functioning of the supply chain. What we in effect see is that this reluctance on the part of the suppliers (e.g. the record companies) stems out of their viewing their traditional role of monopoly distributor of music to the masses being threatened by the shift towards digital music delivery. In the new model, they switch their role from being distributor and retailer to becoming suppliers and rights holders to digital content on the web. This is a role transition or transformation dictated by market reality that has not yet been fully accepted by the above suppliers. We find evidence of it in the fact that the companies are yet again trying to impose traditional CD like market prices on digital music and pressuring Apple to accede to such demands. Apple on the other hand is declining because it views the downloadable music market to be different than the CD based market. Christopher (2000) stated that a truly agile supply chain has to have a few characteristics, such as market sensitivity, creation of virtual supply chains (based on information rather than inventory), process integration, and networks. Based on the evidence of the iTunes music stores, Apple has achieved agility almost to perfection in its supply chain for digital content. It has shown sensitivity to the fact that the digital content market is essentially and entirely separate from the traditional media content market, and has priced its products accordingly. It has also refused to

renegotiate with its suppliers on pricing because then it stands to lose its market sensitiveness, an aspect Apple at this point is better poised to judge than the suppliers. It has also created virtual supply chains that span several continents and numerous countries, with almost instantly replenishable and inexhaustible inventory with very little scaling costs. It has further integrated the processes so that there is a seamless transaction between the end user and the provider (Apple) of the digital content, by Apple providing both the hardware for the content to be used in, as well as the content. Finally, Apple has managed to establish a network with all the major industry players to ensure a smoothly functioning supply chain for its digital content.

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