

The Efficiency and Performance of Apple's Supply Chain Management

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Abstract: *The success of companies is significantly shaped by the efficiency and effectiveness of supply chain management in the dynamic realm of global commerce. Apple Inc. is at the top of this complex supply and demand dynamic in international business management. Apple, as the market leader, is well-known for its supply chain capabilities as well as groundbreaking innovations in technology. This paper aims to explore Apple Inc.'s advanced supply chain management network, showing how it has contributed to the company's extraordinary success and how it translates into building a market competitive advantage. Apple maintains a strong market position by continually improving its supply chain performance, as evidenced by its expanding gross margin and negative cash-to-cash cycle, which are indicators of both successful cash management and high market demand. Overall, Apple's supply chain journey serves as a model for other companies that seek quality, innovation, and long-term competitiveness. Companies can overcome hurdles and position themselves as market leaders by embracing strategic fit and prioritizing consumer satisfaction. Apple's supply chain success demonstrates the value of optimal management and strategic alignment in the ever-changing global business.*

INTRODUCTION

The success of companies is significantly shaped by the efficiency and effectiveness of supply chain management in the dynamic realm of global commerce. Apple Inc. is at the top of this complex supply and demand dynamic in international business management. Apple, as the market leader, is well-known for its supply chain capabilities as well as groundbreaking innovations in technology. This paper aims to explore Apple Inc.'s advanced supply chain management network, showing how it has contributed to the company's extraordinary success and how it translates into building a market competitive advantage.

Apple became the first company to reach a market capitalization of \$3 trillion on June 30, 2023, making it the most valuable company in history (Vlastelica, 2023). Citi analyst Atif Malik predicted that Apple might rise another 25% over the next 12 months despite its recent spectacular rise. He set a \$240 price objective for the stock based on the undervalued potential for profit margin growth (Saul, 2023). Apple would be on course to finish the year to be the most valuable company for the fifth consecutive year. This further displays the company's dominance in the market. This success cannot be separated from its supply chain operations. Apple products are manufactured and delivered via a sophisticated and extensive supply chain. Apple's rapid success can be credited to its supply chain's well-coordinated management, which is made possible by optimal strategic planning to achieve a strategic fit and ultimately, customersatisfaction.

Figure 1. Apple's Dominant Market Capitalization Throughout the Years



According to Apple's company statement (2023), the Apple supply chain extends across more than 50 countries, with supplier locations serving all aspects of the full range of tasks necessary to develop, deliver, and maintain Apple goods and services. Apple collaborates closely with its suppliers on every facet of its operations. Apple is constantly searching for ways to improve upon the most cutting-edge technological manufacturing and recycling procedures and processes, all the while preserving human and environmental health. The philosophy of Apple also includes a never-ending search for innovation and sustainability. Apple is dedicated to advancing technical production and recycling, and as such, it is always improving its processes while putting the welfare of people and the environment first. Furthermore, Apple collaborates with companies outside of its supply network, and a large amount of its innovation comes from within. A strong structure for asset recovery and manufacture is in place within Apple's own operations and production facilities, supporting the company's objectives and goals.

Nevertheless, Apple's success is not without challenges, even though the COVID-19 pandemic crisis may have passed, supply chain issues persist. Fluctuations in foreign exchange rates, political instability, increasing energy costs, and economic difficulties are all causing concern. A decrease in the capacity available for the production and delivery of spare parts could be one of these effects. There are indications from *Apple's third-party repair program*

that this is a real issue, as there is now less availability of parts through the program (Evans, 2023). Apple's third-party repair program provides access to original Apple parts, tools, and repair manuals for devices that are outside warranty. Included in this program is the Independent Repair Provider (IRP) program, which provides the same pricing for genuine Apple parts and tools as Apple's service and repair network, in addition to free access to training, repair manuals, and software tools (www.apple.com, 2022).

Apple experienced a similar issue back in 2021, the global chip shortages and COVID-19-related production disruptions in Southeast Asia caused supply limitations for the corporation, resulting in a \$6 billion supply chain issue (Kline, 2022). Apple has taken several measures to resolve the problem, such as collapsing cycle times and improving yields. Additionally, Apple invested in additional production capacity to mitigate the shortage impact and meet the demand for Apple products. The CEO, Tim Cook, expressed his gratitude for his team's response to the persisting problems in no uncertain terms.

Despite Apple's efforts to address its supply chain challenges, it remains uncertain how successful these measures will be going forward. However, Apple's track record of improving its supply chain operations suggests that they are capable of enhancing its processes and overcoming obstacles. As such, Apple's supply chain continues to play a crucial role in maintaining its competitive advantage and status as a global market leader. The paper will attempt to provide an examination of Apple's supply chain strategies, showcasing Apple's accomplishments and problem-solving methodologies. The following are the purpose of this study:

1. To analyze Apple's supply chain strategy decisions.
2. To analyze how Apple achieved strategic fit.
3. To analyze Apple's supply chain strategy through its e-commerce.
4. To understand and identify drivers of Apple's supply chain.
5. To analyze the role of information technology in Apple's supply chain.
6. To analyze Apple's supply chain efficiency and performance.
7. To analyze Apple's mitigation and solution of its supply chain issues.
8. Compile essential information and useful lessons of what we can learn from Apple.

LITERATURE REVIEW

Understanding the Supply Chain

According to Chopra and Meindl (2007), all parties involved in completing a consumer request, whether directly or indirectly, make up a supply chain. The supply chain in any company, like manufacturing, consists of all the processes involved in receiving and meeting customer demands. New product creation, marketing, operations, distribution, finance, and customer support are just a few of these roles. The supply chain, a sophisticated web of linked operations that spans from the procurement of raw materials to the delivery of finished goods to customers, is crucial to the success of modern enterprises (Christopher, 2016). The system that manages the primary components that enable Apple products to reach their customers is Apple's supply chain. The reason the supply chain is so crucial is that it adds value for suppliers, customers, and the business itself. Apple's system for supplying its products to the globe is made up of an innovative combination of materials, labor, and technology.

Achieving Strategic Fit

In order to improve performance, a firm's strategy, structure, capabilities, and resources must be in alignment with its external environment (Chopra and Meindl, 2013). This is known as strategic fit. Aligning organizational objectives with market dynamics requires achieving strategic fit and scope within the supply chain (Simchi-Levi et al., 2008). A company may fail due to a lack of strategic fit or because its resources and operations are lacking to carry out the strategy that was intended. To create an effective overall strategy, the competitive strategy and every functional strategy must be integrated. To properly implement these strategies, every part of a company needs to organize its resources and processes. To support the supply chain strategy, the overall supply chain design and each stage's function must be in harmony and achieve strategic fit. There has been much research done on aligning supply chain strategies to overall company goals. Mentzer et al. (2001) highlight the significance of attaining strategic fit and scope, emphasizing the role that a supply chain strategy that is well-aligned plays in gaining competitive advantage. The only way to ensure growth in the current business environment is to develop a worldwide plan and take decisive action in addition to a well-coordinated approach (Veselko and Jakomin, 2008). Apple's ability to properly match its supply chain with its overall goals is demonstrated by the company's achievement in growing to a \$3 trillion market value. In the rapidly changing technological world, the company's capacity to produce goods that meet consumer demand while upholding operational efficiency establishes a benchmark for attaining competitive strategy by achieving strategic fit.

Supply Chain Drivers

The tools that are known as supply chain drivers help supply chain management achieve its goal of efficiency and responsiveness (Chowdhury et al., 2019). These drivers are the essential components or factors that have a major impact on a supply chain's performance and overall success. Businesses and supply chain managers must recognize and comprehend these factors because they are critical in determining the efficiency and responsiveness with which goods and services are transferred from suppliers to end customers. To achieve a strategic fit in the supply chain, the drivers must collaborate and synchronize. An organization's overall competitiveness is increased when its supply chain is well-aligned, which guarantees that it can react to changes in the business environment quickly and efficiently. Understanding the factors influencing Apple's supply chain success may be learned by examining how the company defines and monitors its supply chain drivers.

Designing Distribution Networks and Applications for Online Sales

Distribution is the process of moving and storing a product in a supply chain from the supplier stage to the customer stage (Chopra and Meindl, 2013). Because the product cannot be delivered without the distribution network, this system is extremely important in determining the degree of consumer satisfaction. When creating the ideal distribution network, the business must be able to align its decision-making process with its primary goal. A poor decision about the distribution network could harm the business. The development of distribution networks is a crucial component of modern supply chain management, particularly when it comes to online sales (Fernie & Sparks, 2014). A strategically planned distribution network that

adjusts to the needs of the online market helps Apple achieve its global reach. This section will explore how Apple's distribution networks are deliberately designed, with a focus on adapting them to the increase in online sales.

Supply Chain Performance Measurement Approaches: Review and Classification

Supply chain performance measurement refers to the evaluation of the input and output of operations that are focused on strategic choices, goals, and customer satisfaction. They also note that operational areas that are considered bottlenecks in performance measurements require improvement, which is reflected in performance measurement. Supply chain effectiveness refers to the degree to which a client's needs are satisfied, whereas efficiency is the measure of how well a company uses its resources to reach a predefined degree of customer satisfaction (Agami et al., 2012). Several indicators and metrics can serve as supply chain performance measurements, such as KPIs, supplier-on-time delivery performance, inventory turnover, forecasting accuracy, perfect order index, return on asset, balanced scorecard, and gross margin or contribution margin. We should analyze the metrics to suit the needs of the business.

Apple's ongoing efforts to improve and innovate supply chain procedures demonstrate its dedication to performance monitoring. This paper will explore the specific strategies Apple uses for evaluating the effectiveness of its supply chain and how these measurements affect the company's overall performance.

RESULT AND DISCUSSION

Company Profile

On April 1, 1976, Steve Jobs, Ronald Wayne, and Steve Wozniak established Apple Computer Company to create and market Wozniak's Apple I personal computer. In 1977, Jobs and Wozniak incorporated it as Apple Computer, Inc. Apple Inc. has evolved into a global technological corporation with its main office located in Cupertino, California. The corporation creates, produces, and sells a broad variety of tech goods, such as wearables, tablets, smartphones, PCs, and accessories. The iPhone, iPad, Mac, iPod, Apple Watch, and Apple TV are among its product offerings. Apple sells accessories, digital content from third parties, software programs, and related services in addition to hardware (www.GlobalData.com, 2023). The Americas, Europe, the Middle East, Africa, and Asia-Pacific are all covered by the company's business operations. Apple is renowned for its cutting-edge devices and loyal customer base. Based on market capitalization and sales, Apple is the largest corporation in the world for technology as of March 2023.

Decision Phase of Apple's Supply Chain

During the supply chain's decision-making phase, strategic decisions have a big impact on overall performance. Apple's ability to make decisions is demonstrated by its careful approach to supply chain management, which makes sure that every choice is in line with the company's overall goals and consumer needs. The following is the decision phase of Apple's supply chain:

Supply Chain Strategy or Design

An overarching plan for the organization, management, coordination, and oversight of supply chain operations is known as a supply chain strategy. The supply chain strategy or design includes decisions of the strategy that each supply chain function will perform. The

three main goals of Apple's supply chain strategy are to maximize efficiency, foster innovation through the use of technology, and provide a seamless customer experience. Apple has made significant investments in its retail locations, which provide consumers with a customized shopping experience.

To ensure the effectiveness and efficiency of its supply chain, the company utilized many strategies, including just-in-time manufacturing, lean manufacturing practices, and a robust transportation network (Maleki, 2023). Apple's supply chain strategy also emphasizes keeping control over its manufacturing processes while leveraging global sourcing and manufacturing to decrease costs and boost efficiency. The company has made significant investments in its retail outlets to provide clients with a personalized shopping experience, as well as in developing a complex and sophisticated supply chain network that allows it to procure components and materials from all over the world.

Apple has to ensure that its strategy decisions are optimal, by considering and analyzing the internal and external factors such as the SWOT and PESTLE factors, and the overall variables that affect its overall supply chain performance. Hence, Apple's supply chain strategy is the outcome of a comprehensive approach that takes into account a variety of criteria and factors Apple maintains a responsive and effective supply chain in the market.

Supply Chain Planning

According to SupplyChainOpz (2013), Apple Inc.'s supply chain planning is a prime illustration of the New Product Development Process (NPD). It's the integration of marketing, R&D, and other supply chain management functions. Based on the figure below, Apple Inc. acquires licensing and third-party firms to expedite the introduction of new products. The entire procedure seems a lot like what other industries do. It's interesting to note that to obtain strategic raw materials, Apple Inc. must pay in advance some suppliers.

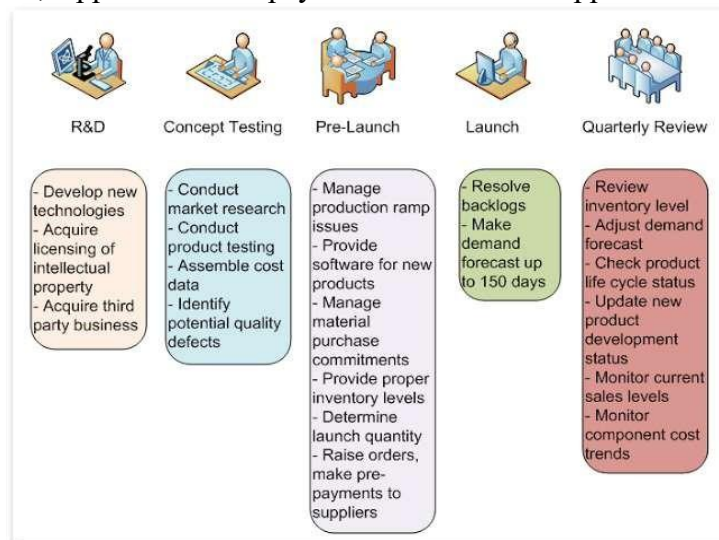


Figure 3. Supply Chain Planning at Apple (Source: www.supplychain247.com)

The research and development segment is responsible for the development of new technologies as well as the acquisition of third-party companies. The idea testing segment is in charge of doing continuing market research and finding actual or potential defects in the product manufacturing cycle (Lockamy, 2014). Long (2014) describes the pre-launch period as "managing production ramp decisions and providing relevant software for new products."

The launch segment clears any existing backlogs and estimates market demand for up to five months. Finally, the quarterly review segment monitors inventory levels and adjusts expected demand as needed (Lockamy, 2014).

Supply Chain Operation

Apple's supply chain operations include keeping an efficient inventory management system, managing the complexity of its supply chain, and making sure vendors adhere to its delivery and quality standards. The business can procure parts and materials from all around the world and transport them to its manufacturing sites thanks to its highly integrated and sophisticated supply chain network. Firstly, Apple products are designed in California, and they are constructed in collaboration with a worldwide network of suppliers, each of whom contributes their exceptional skills and services to the project. Apple evaluates its suppliers' performance regularly to make sure they meet the high criteria and, as necessary, to encourage capability-building. Apple carried out impartial, third-party evaluations in more than 50 countries and regions in 2022. Apple gets its product manufacturing and assembly from more than two hundred suppliers (Aliyah, 2022). A significant portion of Apple's suppliers are located in China. Teams within the organization oversee different aspects of the supply chain. These groups consist of their supply-demand management team, business process management team, business intelligence, and analytics team, and so on. Apple also offers an easy alternative for users to purchase things through its online shop.

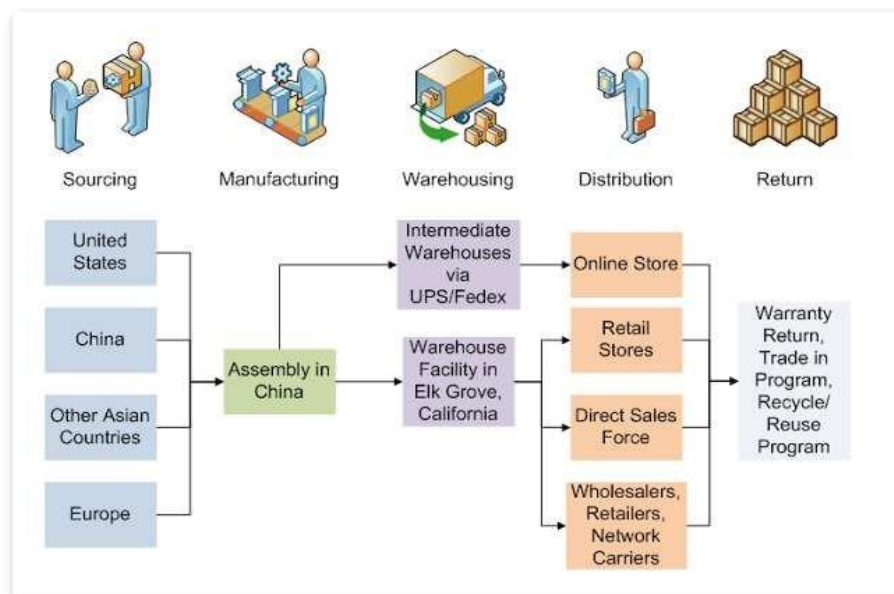


Figure 2. Supply Chain Operation in Apple (Source: www.supplychain247.com)

The majority of Apple products are finalized in China before being shipped to other countries. In this manner, less expensive labor was used in the supply chain network's manufacturing sector. Apple may keep control over its production processes while utilizing global sourcing and manufacturing to cut costs and boost efficiency because the supply chain approach also combines in-house manufacturing with outsourcing to outside manufacturers. Apple's supply chain strategy generally aims to maximize effectiveness, guarantee a flawless customer experience, and spur technological innovation. The network of supply chains is divided. This

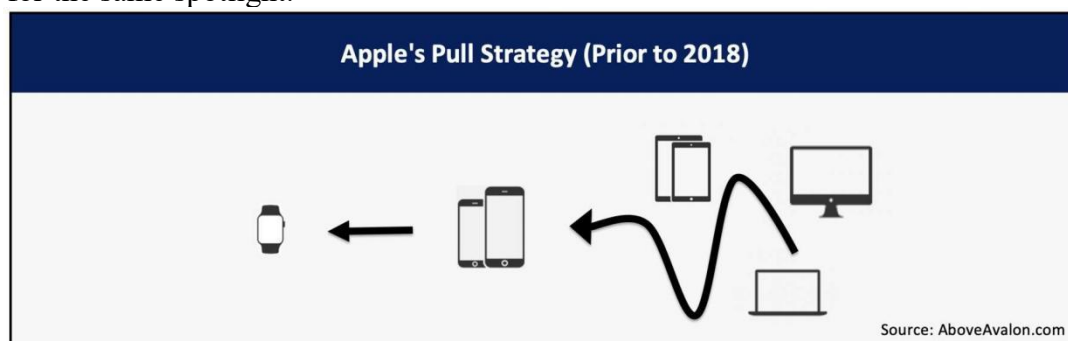
means that Apple gathers necessary materials and sends them to global providers who are divided into different categories. Apple could directly ship the goods from the manufacturers straight to customers (via UPS or FedEx) for those who purchase from Apple's online store, which leads to warehouse cost reduction. Apple will keep inventory at its central warehouse and call center and deliver it to various distribution channels such as retail outlets, direct sales, and other distributors. Customers who have reached the end of their useful life can return devices to the nearest Apple Store or specified recycling sites. Furthermore, Apple has established a strong logistical network that allows it to deliver products to customers promptly and effectively. A Just-in-Time (JIT) inventory system has been put in place by the business to lower inventory expenses and expedite deliveries. In addition, Apple has made investments in robotics and automation to improve efficiency in its manufacturing procedures.

Process View of Apple's Supply Chain

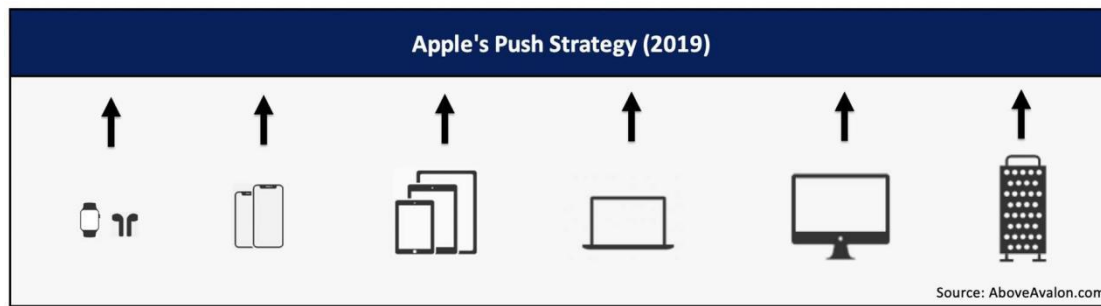
In every supply chain management, companies have to decide which kind of processes they should use. When looking at Apple's supply chain from a process perspective, one can see a smoothly connected system with an emphasis on efficiency throughout. The following are the process strategies Apple used:

Pull and Push View

Before 2018, Apple had been using what is known as a pull system in its product strategy. The company's most aggressive items were those that could personalize and make technology more relevant. To visualize this, consider all of the main Apple product categories as being connected to a rope. The degree to which new workflows and procedures for completing tasks made technology more human dictated which goods were tied to the rope in what order. With its pull system, Apple responds to customer demand—which can often be influenced by new product releases, software upgrades, and user preferences—by manufacturing products. Apple prioritized the iPhone and Apple Watch, while the iPad, Mac desktops, and Mac portables fought for the same spotlight.



Over the past years, it seems that Apple is no longer depending as much on a pull system to advance its product lineup. Rather, all of the major product categories are being pushed ahead at the same time through the use of a push system. The pull process depends only on consumer demand, but the push process is dependent on producer forecasts of how well the products would perform in the market. Apple was struggling to sell items like the Mac and iPad, which was the main motivation behind the change. Apple is more motivated to promote products that can personalize and make technology more relevant when it pushes products designed to handle the most demanding workflows.



Apple is more motivated to promote products that can personalize and make technology more relevant when it pushes products designed to handle the most demanding workflows. It isn't that every product category in Apple's lineup is now prioritized and focused equally. While some items only need upgrades every few years, others need more care because they need updates every year. Furthermore, it seems unlikely that Apple's updated product strategy will alter the sales ratios between product categories, with the iPhone outselling the iPad by a factor of four and the iPad outselling the Mac by a factor of more than two. Rather, each product category is assigned a specific and distinct job to manage inside the Apple ecosystem, signifying the shift from a pull to a push approach.

1. Cycle View

The framework of Apple's supply chain cycle view is as follows:

A) Procurement Cycle

The procurement cycle is the first phase in Apple's supply chain. Apple works with global suppliers to secure the parts needed to manufacture its products. Following that, the parts are delivered to Apple's factories to be assembled into finished products.

B) Manufacturing Cycle

Following the procurement of raw materials, Apple's manufacturing facilities assemble the components to make the finished goods. Apple utilizes lean manufacturing techniques to reduce waste and boost output, as well as just-in-time manufacturing to reduce inventory costs.

C) Replenishment Cycle

Apple's replenishment cycle includes coordination between multiple manufacturers and distributors to ensure timely and cost-effective product delivery to customers. Apple implemented measures to ensure the efficacy and efficiency of the supply chain, such as lean manufacturing techniques to decrease waste and increase productivity and just-in-time manufacturing to cut inventory costs.

D) Customer Order Cycle

The assembled goods are then shipped to Apple's distribution centers. Apple has established a robust logistics network that allows it to deliver products to customers on time and effectively. Apple offers customer service and support through its retail stores, online, and authorized service providers.

Apple Achieving Strategic Fit

Apple's success and ability to maintain operational excellence while providing goods that are in line with consumer preferences is a strong indicator of its strategic fit. Apple must ensure that what they make meets the expectations of their customers. The followings are the steps and aspects that Apple has taken into consideration to achieve fit:

1) Understanding the Customer and Supply Chain Uncertainty

The first stage in Apple's route to strategic fit is a thorough understanding of consumer expectations and preferences. Apple invests much in market research to better understand the changing nature of consumer demand. Apple studies trends, consumer behavior, and feedback to learn about the constantly evolving technology market. Apple can sustain consumer loyalty and satisfaction by offering personalized purchasing experiences through its physical shops and website. Apple, fortunately, is a pioneer in technological innovation devices. Since the introduction of the iPod and the game-changing innovation of the iPhone, Apple has continuously set the industry standard. This differentiation provides the company with a competitive advantage in influencing customer expectations and preferences, as well as reaffirming its position as a market leader.

Apple is committed to a strategic fit and incorporates all the insights into product development, going beyond simply understanding user preferences. Apple guarantees that every new product release resonates with its intended audience by aggressively aligning its products with what buyers want to buy. Excellent customer relationships are the core of Apple's supply chain, and they provide the best prospects for differentiation and competitive advantage. With its supply chain capabilities, which have proven to be strategically crucial to the company's business outcomes and competitive position in the market, Apple has set the standard for all other participants in the technology industry.

2) Supply Chain Capabilities

Apple's supply chain capabilities are another important factor that contributes to its strategic fit. The business performs a thorough evaluation of its manufacturing capacities, distribution networks, supplier relationships, and internal strengths. Because of its vertically integrated supply chain, Apple can tightly regulate every step of production, guaranteeing effectiveness and quality. Being the most valuable company in the world, Apple's supply chain network is exceptionally sophisticated and well-integrated. The Apple supply chain is a worldwide network of businesses and individuals collaborating to create the greatest product on the planet (www.apple.com, 2023). The supply chain involves over 3 million individuals, more than 50 countries, and thousands of businesses and facilities around the globe.

Suppliers, manufacturers, and logistics companies are just a few of the numerous parties involved in Apple's intricate and highly interconnected supply chain network. The business has put in place several measures to guarantee the efficacy and efficiency of the supply chain, including lean manufacturing techniques to cut waste and increase productivity and just-in-time manufacturing to minimize inventory costs. Moreover, Apple maintains long-term, strategic ties with its suppliers. By cultivating cooperative partnerships, the business guarantees a dependable and steady supply of superior components. With a better grasp of its supply chain skills, Apple can more effectively play to its advantages and raise its level of competitiveness overall.

Responsive-wise, Apple has adopted a more advanced "agile supply chain strategy" to be adaptable and responsive to the demands of its customers (Hettiarachchi, 2017). An agile supply chain refers to the consistent prioritization of empowered employees and effective processes. Agile supply chains can react quickly and effectively to fluctuations in supply and demand (Koepke, 2022). Apple can react swiftly to changes in the market, the introduction of new products, or shifts in client demand because its supply chain is on the responsive end of the responsiveness spectrum.

3) Achieving Strategic Fit

Apple deliberately aligns its operations to establish a seamless match between supply chain performance and consumer expectations, building on a foundation of knowing customer demands and assessing supply chain capabilities. The illustration of a strategic fit can be seen in the figure below:

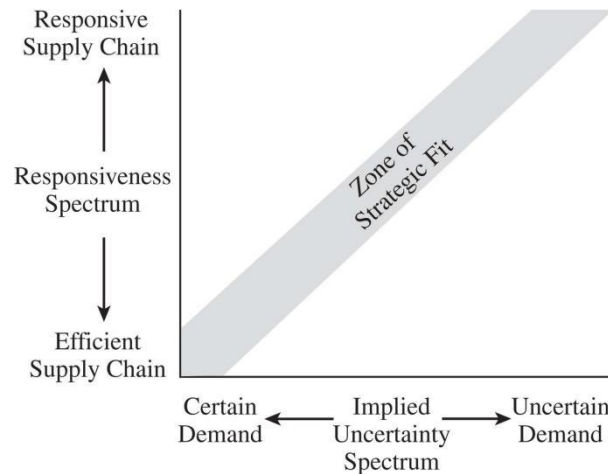


Figure 4. The Illustration of Strategic Fit (Source: Chopra, S., and Meindl, P., 2013. Supply Chain Management. 5th edition)

Apple successfully fits into this zone by strategically integrating its capabilities and having an in-depth understanding of the dynamics of the external market. A dynamic and complex approach that combines innovation, agility, quality control, and attentive customer engagement is used by Apple to achieve strategic fit. This all-encompassing strategy guarantees that Apple will continue to be a leader in technology innovation as well as a brand that easily adapts to the shifting needs and ideals of its wide range of customers.

Expanding Apple's Strategic Scope

The functions within the company and the phases in the supply chain that create an integrated strategy with a common goal are known as the scope of strategic fit (Chopra and Meindl, 2013). The following are the strategies to expand the scope that Apple has leverage to enhance its supply chain value:

1. Intraoperation Scope

Optimizing internal operations processes to cut costs and increase efficiency is known as intraoperation scope. Apple's vertically integrated supply chain places a strong emphasis on intraoperation scope. The corporation is in charge of all major parts, including manufacturing, retail, and the design of hardware and software. Through this connectivity, Apple can reduce dependencies, optimize workflows, and guarantee a unified and effective supply chain.

2. Interfunctional View

An interfunctional strategy reduces organizational barriers to better coordination by emphasizing communication and collaboration among different functional areas of the business. Apple's supply chain management entails a diverse set of supply chain participants operating on a worldwide scale. Apple's efforts to optimize its supply chain systems to reduce costs and deliver competitive rates to consumers, allowing it to maintain its market leadership position, reflect the interfunctional scope.

3. Intercompany Scope

Collaboration with other parties like as distributors and suppliers to optimize supply chain surplus is an example of intercompany scope. Apple can get components and materials from all around the world and ship them to its manufacturing sites thanks to its extensive global supply network. Apple can acquire superior materials and components because of its global reach, guaranteeing that its customers receive the best products possible.

4. Agile Intercompany Scope

The ability of a corporation to interact with supply chain stages that change over time while preserving strategic fit is referred to as agile intercompany scope. Apple's supply base is diverse, with agile intercompany depth. Natural disasters or geopolitical problems may be managed by Apple by distributing manufacturing among multiple suppliers. Furthermore, this strategy allows Apple to respond fast to market changes, such as the introduction of new Apple goods and shifts in consumer demand. As a result, Apple's supply chain is adaptable, allowing it to respond to changing market conditions while maintaining its market position, allowing Apple to become competitive.

Overall, Apple broadens the strategic scope of its supply chain primarily through the use of agile intercompany scope. The supply chain strategy of the firm is centered on leveraging technology to improve customer experience, efficiency, and innovation. It also intends to manage the complexities of its global supply chain and ensure that its vendors meet delivery and quality expectations. Furthermore, Apple maintains strategic relationships with its suppliers that extend beyond simple economic transactions. By working closely with its suppliers and investing in their skills and sustainability practices, the organization creates a cooperative ecosystem that improves the supply chain's overall resilience and responsiveness. This cross-company collaboration is consistent with Apple's commitment to quality, innovation, and meeting the demands of its customers.

iCommerce

Apple is one of the giant tech companies that heavily leverage the internet for its lucrative online sales. Apple utilizes the Internet to market its products and improve the shopping experience for its customers as part of its supply chain strategy for e-commerce. Apple's online store, which provides customers with direct-to-consumer transactions, while also providing convenience and customized shopping experiences, is a crucial part of its supply chain strategy. In this strategy, Apple may reap the benefits of both traditional retail distribution channels and Internet sales. Apple's supply chain strategy focuses on control over manufacturing processes while using global sourcing and manufacturing to reduce costs and increase competitiveness. Apple may gain more control over its supply chain through its online sales platform, ensuring timely and cost-effective delivery of merchandise, ensuring customer satisfaction, and ensuring future Apple purchases. The following are some key components for marketing Apple's products on the Internet:

1. Apple Online Store

The Apple online store (www.apple.com/store) was released in 1997, during the early internet ages. Apple provides a platform for direct-to-consumer e-commerce through its vast online store. Customers can use the online shop to browse, buy, and customize a broad variety of Apple products such as iPhones, MacBooks, iPads, and accessories from the comfort of their own homes.

2. Personalized Shopping Experience

Offering customization choices for specific products, like iPhone variations, is part of Apple's online retail strategy. Consumers can customize their purchases to fit specific needs by selecting features, colors, and accessories. The engagement and pleasure of customers are increased by this individualized approach.

3. Supply Chain Integration

Apple creates a seamless and integrated system by proactively coordinating its supply chain management with its e-commerce platform. Because supply chain data is integrated into the e-commerce interface, customers are guaranteed that they will receive precise information regarding product availability thanks to real-time inventory management. Additionally, with the help of optimized supply chain processes and just-in-time and lean manufacturing techniques, Apple can operate with flexibility and agility. By using an integrated approach, Apple can quickly respond to changes in the market and offer competitive prices as well as timely product releases.

4. Global Distribution Network

Apple swiftly completes online orders by utilizing a global distribution network. Distribution centers positioned strategically allow for fast shipping to customers anywhere in the world. The organization optimizes product shipping by collaborating with reputable logistics suppliers, guaranteeing prompt delivery of goods to customers.

5. Customer Support and Education

Beyond purchases, Apple's e-commerce approach includes customer service and education. The website offers a wealth of resources, such as customer forums, tutorials, and product guides. This strategy lessens the need for in-person support by empowering and satisfying customers.

In addition to its core hardware devices, Apple offers a number of online-only add-on services and digital content. The following are some of the complimentary goods and services available through Apple's web store:

- Apple Music
- Apple TV
- AppleCare
- iCloud Storage Plans
- Apple News
- iTunes and AppStore
- Apple Fitness

In short, Apple's e-commerce approach is one of the key components in its supply chain and is aligned with its supply chain strategy core, which is centered on giving consumers a smooth, customized, and effective online purchasing experience. Its online store's connection with the larger supply chain guarantees that buyers can access a large selection of products, get precise information, and receive excellent service while also maintaining the business's competitiveness in the worldwide market.

Apple's Drivers of Supply Chain Performance

Apple's supply chain strategy is defined by a comprehensive approach that meticulously handles important supply chain drivers to achieve its goal of supply chain strategic fit. The following are the components of Apple's supply chain drivers:

a) Facilities

As we know, Apple's supply chain has expanded greatly and covers a huge part of the global business. Over 3 million people, more than 50 nations, and thousands of companies and facilities worldwide are all involved in Apple's supply chain. Facilities play a crucial role in the supply chain, Apple places its manufacturing and distribution sites in key locations to maximize its worldwide reach and responsiveness to market demands. The locations of facilities are chosen to enable timely delivery and effective manufacturing.

Control of the facilities guarantees manufacturing flexibility, quality control, and adaptability to shifting market demands. It lessens reliance on outside parties and improves Apple's capacity to quickly modify its manufacturing procedures. Based on Apple's company report and published resources (2022), the following are the key facilities and their role in the Apple supply chain:

- Corporate Headquarters

Located in Cupertino, California, also known as "Apple Park", it has research labs, design studios, and executive offices in addition to acting as Apple's corporate headquarters. It serves as a focal point for top executives and design teams to collaborate, innovate, and make strategic decisions. This is where the product design of Apple is fabricated. The company's headquarters is crucial in determining the general course of the enterprise, cultivating a creative culture, and influencing important choices concerning corporate strategy and product development.

- Apple Campus

Also located in Cupertino, California, is known as "Apple's Infinite Loop Campus", and is one of the icons of Silicon Valley. It was formerly used as the main headquarters before Apple Park, nevertheless, the original Infinite Loop campus is still an important building. It has a visitor center, labs, and offices.

- Manufacturing Facilities

The majority of Apple's manufacturing facilities is located in China mainland, as part of Apple's supply chain cost-cutting strategy, here is where Apple products are manufactured and assembled including MacBooks, iPads, iPhones, and more. The Chinese site stores inventory and handles the selection, packing, and shipping parts of Apple Incorporation's fulfillment process. Apple Incorporation's complete product inventory is done in China to ensure that there is a flow between sourcing raw materials, production processes, and finalization of new items at any given time (www.ivypanda.com, 2021).

Production plants are essential to the creation of Apple's hardware. Because it has complete control over its manufacturing processes, the company can guarantee high standards of quality, flexibility in meeting customer requests, and quick response times to shifts in demand. Apple realizes its high standards through its Apple Supplier Code of Conduct.

- Research and Development (R&D) Centers

Located in California, Germany, Israel, and other regions, this facility is one of the key strengths of Apple's business operation. The research and development of new goods and technology is handled by these facilities. They collaborate closely with Apple's engineering and design teams to produce cutting-edge products that push technological boundaries.

- Data Centers

Primarily based in Maiden, North Carolina, Apple makes investments in data centers to support online services like iCloud and the App Store, as well as to provide cloud services and data storage. An essential component of Apple's expanding online service ecosystem is data centers. They guarantee the scalability, dependability, and security of digital services, which are becoming more and more essential to Apple's entire operations. To guarantee adequate data

center capacity, Apple utilizes a mix of in-house infrastructure, colocation facilities, and cloud service providers like Amazon Web Services (Zhang, 2022).

- **Distribution Centers**

Apple's supply chain operations are supported by several distribution centers spread across the globe to its designated market. Delivering goods to merchants, distributors, and customers directly depends in large part on distribution facilities operating well and on schedule. Apple's supply chain optimization and lead time reductions are achieved through the use of these hubs in its logistics strategy. The primary distribution is located in Elk Grove, California, it serves as a central location for the nationwide delivery of Apple goods in the United States.

- **Retail Stores (Apple Store)**

The Apple stores function as the main points of sale for Apple goods, providing consumers with a distinctive shopping experience and the chance to test out Apple goods before making a purchase. Retail locations are dispersed across multiple nations, guaranteeing patrons' accessibility and convenience.

b) Inventory

Just-in-time (JIT) inventory management is the methodology used by Apple. As a result, Apple minimizes waste and lowers carrying costs by ordering materials and components only as needed. The business enhances its inventory management through the use of cutting-edge technologies like automation and data analytics. Apple has a lean retail strategy as well, holding little inventory and depending primarily on online order fulfillment. Apple outsources the majority of its manufacturing, thus to know how much is needed when its inventory management system needs to be connected to the producers. Moreover, according to Black (2015), the company holds assets in cash rather than a very high inventory level because demand and sales are projected and monitored regularly. Additionally, the majority of its suppliers are situated close to its Chinese manufacturing facility, which minimizes time wastage, lessens the effects of supply chain disruptions, boosts logistical efficiency, and ensures a prompt and efficient response to unexpected spikes in demand.

As an illustration, Tim Cook decided in 2012 to close the warehouses and shorten the inventory every five days. It is incredibly brief in comparison to other giants in the electronics business; Dell replenishes its inventory every 10 days, while Samsung does so every 21 days. Given the intense competition in this sector and the rapid advancement of technology, it is crucial for technology manufacturers (Chen, 2017). Additionally, to sell the majority of its older models before new ones are introduced to the consumer electronics market, the corporation also employs the first in, first out (FIFO) strategy. Managers at Apple Stores are also in charge of their respective stores' inventories (Rowland, 2023). All things considered, Apple's inventory management strategy aims to cut expenses, eliminate waste, and guarantee prompt and economical product delivery to consumers.

c) Transportation

The transportation in Apple's supply chain acts as the flow of movement of Apple products through the chain to the end customer. Apple understands the importance of an efficient and optimal transportation strategy to ensure the time and quality of its goods during movement. Effective transportation enables Apple to meet customer requests across different regions and ensures timely product availability. It also enhances the whole customer experience by providing rapid and dependable deliveries.

With its vast supply chain management that spreads to various markets globally, Apple utilizes a mix of ground, sea, and air freight modes of transportation. Apple plans its transportation strategy based on the variables and factors of the regions to achieve optimal results. As an illustration, Apple is one of the major clients of Cathay Pacific Airways' air freight services for the delivery of its goods. This was thought to be a very costly procedure. But it's quicker, and it helps Apple save more on inventory costs. The transportation of an airplane from America to China took fifteen hours, whereas the sea route took almost thirty days. To prevent stockouts, Apple must ensure that it has an adequate supply of items before they are released. This will significantly lower inventory costs and lower the likelihood of stockouts. Additionally, flying is a safer way to prevent mishaps like flooding and robberies (Chen, 2017).

In addition, Apple uses third-party logistics (3PL) firms and logistics providers to oversee and plan the transportation of its supplies and goods. Apple could guarantee the prompt and economical delivery of goods to consumers with this strategy, which focuses on cutting expenses and boosting productivity (www.supplychaintoday.com, n.d.). Overall, by using these strategies of transportation, Apple could save expenses, enhance productivity, and track every step of the process as best it can across its vast supply chain network.

d) Information

To build a coordinated supply chain, information is the driver that acts as the "glue" (Chopra and Meindl, 2007). To ensure the flow of information is effective and optimal for the supply chain, the infrastructure of Information Technology (IT) needs to be adequate. Information technology (IT) is the creation, processing, storing, securing, and exchanging of all types of electronic data through the use of computers, networking, storage, and other physical devices, infrastructure, and procedures (Castagna and Bigelow, 2021). The extent to which supply chain management uses information technology (IT) is a critical distinction in today's global business climate. As companies face issues such as increased consumer demands, the need to adapt to a global market, and rapid technological change, the emphasis on how efficient the information technology application affects the entire supply chain flow. The availability of timely and precise information allows better decision-making, reduces response times, and improves overall supply chain effectiveness.

Apple must choose an IT system that takes into account the main success elements of the business. Apple can respond swiftly to shifts in supply, demand, or other market conditions as a result of it. Apple utilizes a number of information technological practices to streamline its supply chain, the following are the key components of IT in Apple's supply chain:

- **Advanced Analytics**

Apple uses advanced data analytics to learn more about the logistics, production efficiency, and inventory control of its supply chain (www.everythingsupplychain.com, 2023). Apple is able to recognize any concerns and take appropriate action before they worsen by utilizing data from its suppliers. Metrics such as demand forecast, frequency of updates, and forecast horizon, aid Apple in guaranteeing the prompt and optimal quality delivery of its products. Furthermore, Apple has integrated predictive analytics to forecast client requirements and modify its supply chain correspondingly. Additionally, Apple has integrated its data analytics with Artificial Intelligence (AI), making its machine learning technology and automated system easier to spot any possible issues and take the necessary steps to address them before they worsen.

- **Customer Relationship Management (CRM)**

CRM is a tactic used by businesses to keep track of their contacts with both present and future

clientele. Key processes include marketing, order management, and customer service/after-sales management. Through CRM, Apple is able to monitor demand from customers, uphold customer relationships, and increase customer satisfaction.

Apple's CRM strategy can be traced from the very beginning of customers' purchase, customers are prompted to create an Apple ID—a distinct identification that syncs with all of their Apple devices. Data on customers is automatically gathered by Apple's CRM after they register an Apple ID. Apple's CRM approach aims to educate and enlighten its clients about the advantages of owning this fantastic product after they have registered (Binns, 2023). Additionally, Apple has a vigorous and effective customer retention program through its digital marketing and personalized customer content, giving an optimized customer experience. As a result, Apple brands itself as having a loyal clientele that very much enthusiastically enjoys Apple products.

- **Internal Supply Chain Management (ISCM)**

The internal operations of Apple, such as transportation, inventory, and production planning, are the emphasis of ISCM, this includes every process needed to prepare and complete an order for a customer. It enables the effective transformation of raw materials into finished goods. These processes include strategic, demand, and supply planning, order fulfillment, and field service. Apple also employs a variety of tools to oversee its worldwide supply chain. Among these technologies are:

- *Supply Chain Management (SCM) and Enterprise Resource Planning (ERP) systems*, which assist Apple in managing its supply chain procedures and tracking and controlling its inventory levels (www.everythingsupplychain.com, 2023).
- Apple also makes use of cutting-edge technologies like *GPS monitoring and RFID (Radio-Frequency Identification)* to improve its logistical processes (www.supplychaintoday.com, n.d.). Inventory movements can be tracked in real-time with the use of RFID tags on products and components. This raises total supply chain visibility, lowers the possibility of errors, and increases inventory management accuracy.

In short, Apple's information systems and supply chain management (ISCM) approach includes controlling the movement of goods, information, and finances across the organization to guarantee prompt and economical product delivery to clients, with an emphasis on cutting expenses and boosting productivity.

- **Supplier Relationship Management (SRM)**

SRM includes managing supplier relationships to produce a trustworthy and responsible supply of materials. Key processes include design collaboration, negotiation, source, and buy. According to Apple's 2022 supplier list, Apple listed more than 600 production facilities and more than 200 suppliers. IT is crucial in monitoring supplier engagement and communication for optimal results.

Apple's SRM is based on the usage of IT tools, such as ERP, supplier management, and relationship management software, to enhance user experience, efficiency, and innovation through technology. Although specific information on Apple's IT systems in SRM is not readily available, the company's supply chain policies heavily rely on the use of IT to guarantee the timely delivery of essential components, promote innovation and sustainability, and maintain its position as a major player in the global tech industry.

e) Sourcing

Securing the resources required for production depends on strategic sourcing. As the most valuable company, Apple has high standards and control over its sourcing while maintaining its vast and large-scale supplier network. As a result, Apple has its own supplier standards and code to ensure control over cost, lowering risks, and the supply of high-quality components. Apple has a number of essential components that define its sourcing strategy:

- **Sourcing Process**

Apple makes strategic selections in its sourcing process to guarantee that its suppliers share its values and sustainability commitment. It encourages the development of a morally and responsibly run supply chain. In order to be involved in the sourcing process, suppliers must register through Apple's Prospective Supplier Portal, a safe online database that Apple keeps for prospective suppliers. Apple procurement experts can obtain essential details about possible suppliers through the Prospective Supplier Portal, such as supplier diversity certifications, product/service descriptions, industry classification codes, and contact details (www.apple.com, n.d.).

- **Diversification**

Apple makes a conscious effort to diversify its supply base in order to minimize dependence on any one provider. Encompassing more than 200 suppliers around the globe, while most of its suppliers come from China mainland and Taiwan, Apple diversifies the supplier companies, this improves Apple's capacity to handle ambiguities and keep a consistent supply of parts. For instance, Apple still depends heavily on a large number of its domestic U.S businesses, such as 3M, Broadcom, Qualcomm, Intel, Jabil, On, Micron, and Texas Instruments, even though it relies heavily on a worldwide supply chain (www.apple.com, 2022).

- **Long-Term Relationships**

Apple is well known for having enduring ties with its suppliers, which enables the business to establish and uphold strict quality standards and guarantee the prompt delivery of essential components (Poszywak, 2023). Partnerships that last a long-term period encourage cooperation, mutual respect, and trust. It benefits Apple and its suppliers by enabling cooperative investments in technology, quality enhancement, and capacity expansion.

- **Supplier Collaboration and Innovation**

Apple works closely with its suppliers to produce innovative products and streamline processes. Working together keeps Apple at the forefront of technical innovation. It makes it possible to incorporate novel features, components, and production techniques, which supports product differentiation and industry leadership. For example, Apple and Foxconn, Apple's long-standing collaboration with Foxconn, a significant multinational electronics contract manufacturer based in Taiwan. A large number of Apple goods, such as the iPad and iPhone, are made by Foxconn. Through cooperation, Apple has been able to meet the enormous demand for its products, maintain quality control, and realize economies of scale (Altaf, 2023).

f) Pricing

Apple's pricing strategy is based on a number of important components, such as product differentiation and premium pricing. In order to market its products as premium and project a superior image, Apple uses a premium pricing strategy, setting prices higher than rivals. Apple's ability to command greater pricing for its innovative and high-quality products is made possible by its strong brand value and product differentiation (Cuofano, 2023). Additionally, Apple also uses Value-Based pricing, which allows Apple to price its products at a premium, reflecting the brand's reputation for innovation, superior design, and user experience, as

opposed to basing prices only on manufacturing costs. Thus, for the reasons above, Apple's branding of innovation and quality supports its capacity to make money, keep customers loyal to the brand, and establish itself as the industry leader in the technological sector.

Apple's Supply Chain Performance

To truly observe the effectiveness of Apple's supply chain, its overall performance has to be measured. We will measure Apple's supply chain performance using two metrics; cash-to-cash cycle and gross margin. According to Bodie and Merton (2000, p.89), the cash-to-cash cycle refers to the duration of days that separates the date on which the company needs to start paying its suppliers in cash from the date on which it starts receiving cash from customers. The following are the data of the C2C cycle of Apple for the last 3 years (Source: www.finbox.com):

- 2020 (-61 days, -17.9%)
- 2021 (-53 days, -12.6%)
- 2022 (-62 days, +18.0%)

Companies with a negative cash-to-cash cycle, such as Apple, are able to collect payments for their goods ahead of time, a sign of a high level of demand for their items on the market. In the span of three years, Apple's cash-to-cash cycle averaged -57 days, demonstrating both its effective cash management and the robust demand for its products in the market. The other measurement that can be used to evaluate Apple's supply chain performance is the gross profit margin. The following represents Apple's gross margin from 2020 to 2022 (Source: www.statista.com):

- 2020: 38.2%
- 2021: 41.8%
- 2022: 43.3%

It appears that Apple has been able to increase the effectiveness of its supply chain based on the higher trend in gross margin. This could entail improving inventory management, negotiating advantageous terms with suppliers, and simplifying the production process. The ability to boost gross margin in the face of international difficulties—such as the pandemic—indicates a robust supply chain. We can assume that the employed strategies by Apple to manage issues, safeguard its supply chain, and uphold the caliber of its products are proven to be effective.

Overall, analyzed using gross margin and cash-to-cash cycle indicators, Apple's supply chain performance demonstrates robustness and efficiency. The last three years' negative cash-to-cash cycle is indicative of both robust market demand and efficient cash management. Increased supply chain performance, attributable to better inventory management, supplier agreements, and streamlined production procedures, is shown in the growing gross margin from 38.2% in 2020 to 43.3% in 2022. Apple continues to have strong supply chain tactics even with global issues.

CONCLUSION

In conclusion, from the result of this study, Apple's capacity and capability of its supply chain management has proven to be one of the key factors in its historic success. Overcoming obstacles like the COVID-19 epidemic and ongoing challenges with the supply chain, Apple

has continuously shown that it is resilient and adaptable. Based on the paper's findings, the takeaways from Apple's supply chain management have significant implications for companies. The company is at the forefront of technological innovation because of its dedication to sustainability, strategic fit, and innovation. Companies may learn a lot from Apple's dedication to customer insight, strategy harmony, and operational efficiency.

A combination of factors, including an awareness of customer preferences, efficient management of supply chain uncertainties, and optimization of internal capabilities, contribute to Apple's supply chain success. The commitment of Apple to maintaining its competitive advantage in a dynamic market is exemplified by its capacity to attain strategic fit, broaden its strategic scope, and utilize information technology. Apple's supply chain strength translates into a competitive advantage and it can be shown in its supply chain strategies and performance such as well-managed facilities, efficient inventory management, strategic transportation, solid information systems, effective sourcing tactics, and a premium pricing approach that ultimately leads to Apple's success. Apple maintains a strong market position by continually improving its supply chain performance, as evidenced by its expanding gross margin and negative cash-to-cash cycle, which are indicators of both successful cash management and high market demand. Overall, Apple's supply chain journey serves as a model for other companies that seek quality, innovation, and long-term competitiveness. Companies can overcome hurdles and position themselves as market leaders by embracing strategic fit and prioritizing consumer satisfaction. Apple's supply chain success demonstrates the value of optimal management and strategic alignment in the ever-changing global business.

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