



# **The Responsive Supply Chain: A new road to competitive advantage?**

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## Management summary

This thesis investigates the affect of a responsive supply chain on the market position of a company in the global consumer electronics industry. The theory of competitive advantage is analyzed to determine if the market position is strengthened or weakened by the responsive supply chain. Three different theories are discussed in this thesis. Each has its different view on competitive advantage. Porter explains competitive advantage as above-average performance due to cost leadership, differentiation and focus, whereas Barney states that the basis of competitive advantage is found in the valuable resources a firm possesses which cannot be imitated or obtained by competitors. Li et al. discusses the concepts of competitive advantage with a supply chain management perspective and state that competitive advantage is achieved through being ahead of your competition on price/cost, quality, delivery dependability, product innovation and time to market dimensions.

The concept of the responsive supply chain is explained as a mix between agile manufacturing and supply chain management. The elements speed, flexibility and strategic alliances of agile manufacturing and cost and quality of supply chain management together form the basis of the responsive supply chain. There are three major enablers of a responsive supply chain (i) networking of partnering firms, (ii) information technology and systems and (iii) knowledge management. These enablers can be identified as (i) strategic planning, (ii) virtual enterprise and (iii) knowledge and IT management. Strategic planning focuses on business and operation strategies, (global) outsourcing, strategic alliances with partners, the use of IT and continuous improvement. Because of this a virtual enterprise structure is required for the integration of a network of partners with IT in order to speed up the flow of information and communication. Automation and IT play a dominant role in the development of virtual enterprising. Therefore knowledge and IT is important for all these operation strategies. Eventually, the responsive supply chain will achieve increased speed, more flexibility and reduce costs.

The consumer electronics industry is described as a volatile industry characterized by rapid technological changes, long lead times, seasonal demands, high product variety and short product life cycles. Due to a small number of highly competitive and global players, any mistake can be disastrous for a company within this environment. Risks are divided in supply-related risks and demand-related risks. Also the risk if using IT systems is discussed. And even though the responsive supply chain relies heavily on the intensified use of IT systems in the supply chain network which increases the risk of critical failure within those systems, the responsive supply chain achieves an advantage in a competitive environment by increasing speed, flexibility and reduce costs in a volatile and turbulent market such as the consumer electronics industry due to strategic alliances and continuous (technology) improvement. Because of this a company in the consumer electronics industry will perform above average and if this enhanced performance cannot be imitated by competitors, a sustainable competitive advantage has been achieved.

## Chapter 1: Introduction

With the introduction of the personal computer in the 1980's and the emergence of the Internet and massive growth in cell-phone usage in the 1990's, western society became more and more accustomed to the use of technology. The first decade of the twenty-first century can be characterized by increasing possibilities of communication as it relates to the abundance of information available, particularly on the Internet. Due to the rapid growth of communication technologies such as social media and smart phones, our economic society and life are changing significantly (Garrido Azevedo et al, 2008). Personal and handheld electronic devices are part of our everyday lives. For example, in six years time the global mobile phone subscriptions have risen from 1 billion in 2002 to 4.1 billion subscriptions in 2008 (ITU Corporate annual report, 2008).

Because of this growth in technology, companies are undergoing a revolution in terms of implementing new operations strategies and technologies in response to the challenges and demands of the twenty-first century (Gunasekaran, Lai and Cheng, 2008). In order to gain a competitive advantage a company must offer some sort of value to a product which their competitors cannot (Porter, 1985). With the growing global competition it is difficult for companies to differentiate themselves solely on the traditional aspects of product and price. Therefore companies are forced to search for innovative ways to do business and adding value to their products (Pan and Nagi, 2009).

Within industries characterized by cutthroat competition and impatient, inconstant customers such as the consumer electronics industry, a company's success is dependent on its ability to respond to customers' unique and rapidly changing needs before the competition (Gunasekaran et al, 2008). The understanding and practicing of supply chain management has become an essential prerequisite for staying competitive in the global race and for enhancing profitably (Li et al, 2006). Present-day's customers expect the products they want when they want it and are willing to choose a competitive offering if it meets this need. This commands a new type of supply chain to cope with this need. But what type of supply chain can influence a company's market position positively in comparison to its competitors? This thesis will elaborate on what the supply chain risks and issues are in the consumer electronics industry with a special focus on the responsive supply chain and competitive advantage.

### *1.1 Problem statement*

This thesis will resolve around the following problem statement:

*How does the responsive supply chain affect the market position of a company in the global consumer electronics industry?*

### *1.2 Research Questions*

In order to deal with this problem, the problem statement will be split up into a number of research questions. These research questions will be answered subsequently in order to provide an answer to the problem statement. The research questions are:

- How does a company gain a competitive advantage?
- What is the concept of a responsive supply chain?
- What are the characteristics of the global consumer electronics industry?

### *1.3 Academic and managerial relevance*

As stated in the introduction, the twenty-first century offers a lot of new issues, challenges and opportunities for companies to do business. Also due to social issues such as the growing global competition, the financial crisis and the growing awareness of environmental issues companies have to implement new business strategies. Especially within the consumer electronics industry where technology, trends and competition evolves at an astonishing rate it is important for businesses to be at least one step ahead on their competitors.

Because of these rapid changes in this industry, there are a lot of new opportunities for companies to differentiate themselves from the competition. From an academic perspective, this thesis investigates which issues and risks there are in the consumer electronics industry and whether the responsive supply chain concept is a valuable asset to a company within this industry. From a managerial perspective this thesis might provide better insight on how to gain a competitive advantage in the consumer electronics market.

#### *1.4 Research method, research design and data collection*

The objective of this paper is to analyze the responsive supply chain phenomenon and the effects of implementing this concept. Also the consumer electronics industry and the competitive advantage theory will be described. Therefore it will be a descriptive research. With the use of current literature the thesis will provide an accurate and distinct description about these subjects.

Data collection will be done by searching through several academic databases, such as the database of the University of Tilburg or ScienceDirect, for relevant and high quality articles, books and papers. Relevant and useful information found in this literature will provide the basis of this thesis.

#### *1.5 Structure of the thesis*

After the first chapter, the thesis will proceed with answering the research questions. First there will be a description of what competitive advantage is using the different theories of Porter, Barney and Li et al.

The second research question will explain the concept of the responsive supply chain. Where does it originate from, what are the concepts and definitions of a responsive supply chain and how does it operate

Thirdly the thesis will analyze the global consumer electronics industry using the information in current literature. What does the industry look like, its characteristics, who are the big participants and what are the threats and opportunities in the twenty-first century.

The fifth chapter will provide the link between competitive advantage, the responsive supply chain and the global consumer electronics industry, how this new supply chain construct can add value to products in the global consumer electronics industry and if this value can lead to a competitive advantage.

The final part of the thesis will include the end conclusions. There will be an answer to the problem statement, a discussion about the findings and recommendations are provided, both on academic and practical level.

## Chapter 2: How does a company gain a competitive advantage?

This section explains the theories competitive advantage of Porter, Barney and Li et al. and discussing their interrelationships. The main focus will lie on the resource based view of Barney.

### 2.1 Porter's generic competitive strategies

In the 1980's the theory of competitive advantage was introduced by Micheal E Porter. With this theory Porter wanted to explain the present day global business environment. This theory attempts to identify the fundamental determinants of the competitiveness of an industry or of a nation and how they interact as a system (Lee and Wilhelm, 2010). Porter distinguishes two basic types of competitive advantage a firm can have, low cost or differentiation. The two basic types of competitive advantage combined with the scope of activities for which a firm seeks to achieve them, lead to three generic strategies for achieving above average performance in an industry: *cost leadership*, *differentiation*, and *focus*. According to Porter, a firm will have a sustainable competitive advantage when it provides above-average performance in the long run (Porter, 1985)

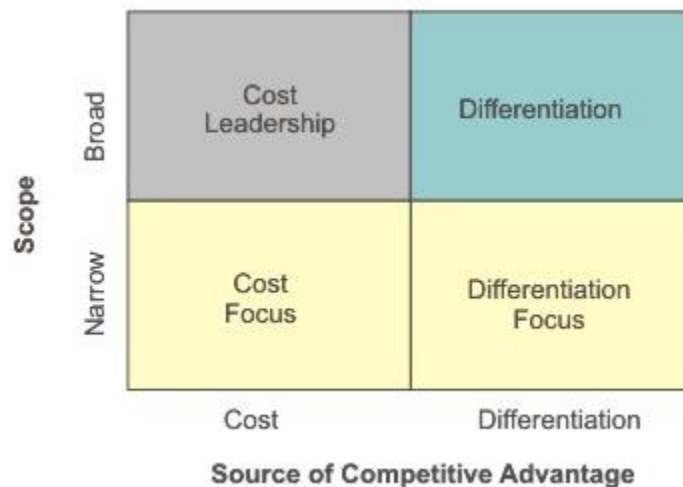


Figure 1: Porter's Generic Strategies (Retrieved from <http://www.mindtools.com/media/Diagrams/GenericStrategies.jpg>)

- In cost leadership a firm sets out to become the low cost producer in its industry. A low cost producer must find and exploit all sources of cost advantage. If a firm can achieve and sustain overall cost leadership, then it will be an above average performer in its industry and will have a competitive advantage (Porter, 1985).

- In a product differentiation strategy a firm seeks to be unique in its industry along some dimensions that are widely valued by buyers. It selects one or more attributes that many buyers in an industry perceive as important, and uniquely positions itself to meet those needs (Porter, 1985).

- The generic strategy of focus rests on the choice of a narrow competitive scope within an industry. The focuser selects a segment or group of segments in the focused industry and tailors its strategy to serving them to the exclusion of others (Porter, 1985).

## 2.2 Barney's resource-based view

In 1991 Barney introduced a widely accepted definition of competitive advantage relative to a company "A firm is said to have a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors (p. 102)". In contrast to Porter, Barney states that a competitive advantage is realized by a company's *valuable, rare, imperfectly imitable and non-substitutable* resources (Barney, 1991). In contrary to Porters view on a *sustained competitive advantage*, Barney states that a firm has a sustained competitive advantage when it has a competitive advantage and its current or potential competitors are unable to duplicate the benefits of the value creating strategy (Barney, 1991). To define a resource, Barney referred to the work of Daft. Daft states that firm's resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc; controlled by a firm, that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Daft, 1983).

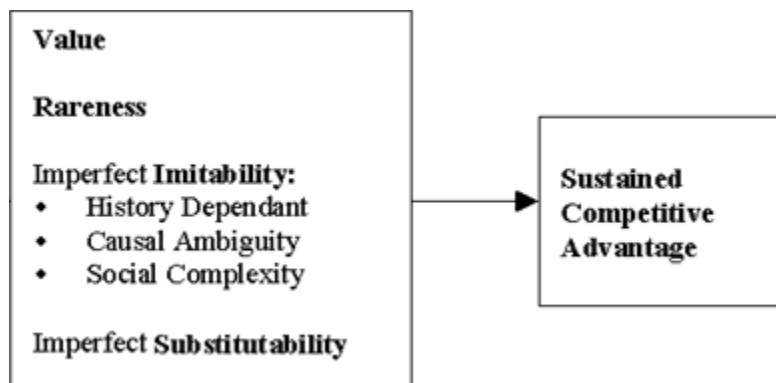


Figure 2: The relationship between Value, Rareness, Imperfect Imitability, Imperfect Substitutability and Sustained Competitive Advantage (Barney, 1991 p.112)



- A valuable resource can be defined as a resource that enables a firm to conceive of or implement strategies that improve its efficiency and effectiveness in the sense that it exploits opportunities and/or neutralizes threats in a firm's environment (Barney, 1991).
- Valuable resources possessed by competing companies or potentially competing companies cannot be seen as sources of competitive advantage. In order for resources to be valuable they, must be rare among a firm's current and potential competition (Barney, 1991).
- Rare and valuable resources can only be sources of sustainable competitive advantage if competing firms can not duplicate them. Firm resources can be imperfectly imitable for three reasons: through *unique historical conditions* that have developed over time as the firm has developed (Fiol, 1991), that are aligned with the firms' strategy (Wright et al., 1994) and that have been affected by the culture and values within the firm (Barney 1991), through *causal ambiguity* in that the firm itself only understands the link between the resources controlled by the firm and a firms' sustained competitive advantage, as a result of which other firms cannot identify or ascertain, and thus cannot imitate (Barney, 1991), or through *social complexity* in its functioning, social networks and interrelationships. When competitive advantages are based in such complex social structures, it is virtually impossible to imitate or replicate these resources (Barney, 1991). Especially intangible resources are important resources of competitive advantage because they are difficult to imitate (Lee and Wilhelm, 2010).
- The last requirement for a resource to be a source of sustainable competitive advantage is that it must not have any strategically equivalents or substitutes. Barney states that "valuable firm resources are equivalent when they each can be exploited separately to implement the same strategies" and therefore nullifying the existence of competitive advantage (Barney, 1991).

### 2.3 Li et al. dimensions of competitive advantage constructs

Li et al. described competitive advantage in 2006 as "the extent to which an organization is able to create a defensible position over its competitors (p. 111)". Based on other studies from Tracey et al. (1999), Roth and Miller (1990), Skinner (1985), Stalk (1988), Vesey (1991), Handfield and Pannesi (1995), Kessler and Chakrabarti (1996), Zhang (2001) and Koufteros et al. (2002), Li et al. describe *price/cost, quality, delivery dependability, product innovation* and *time to market* as the dimensions of (sustainable) competitive advantage constructs from a supply chain managerial perspective (Li et al. 2006).

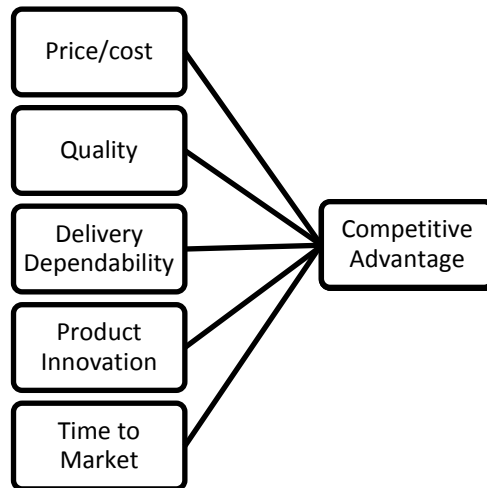


Figure 3: The relationship between Price/cost, Quality, Delivery Dependability, Product Innovation, Time to Market and Competitive Advantage (Li et al., 2006 p.109)

- A firms' ability to offer competitive prices or command premium prices is influenced by the costs it incurs within the supply chain as well as the level of accompanying service it is able to offer. Price affects both market share and profit. The price and value trade-off is one of the main determinants of customer satisfaction (Tracey et al., 1999). An organization is capable of competing against major competitors based on its pricing strategy (Li et al., 2006).

- Quality measures the capability of the firm to design and produce products that would fulfill customer expectations (Li et al, 2006). Quality has become one of the key competitive issues in the global marketplace (Flynn et al., 1994). Quality is described as fitness for use and includes product performance, durability and reliability. Quality is influenced by product design, incoming quality from suppliers, manufacturing performance, and delivery performance. Quality can affect the number of units sold and it is a key element of value-to-customer (Tracey et al., 1999).

- Delivery dependability is used to monitor a suppliers' performance in terms of delivering the product required by customers on time, orders delivered complete and with the best quality possible (Harrison and van Hoek, 2008)

- The capability of organizations to develop and implement new products and features can be described as product innovation. The rapid pace of technological change and the demands of customers for new and better products requires firms to innovate continually and bring these innovations to market as quickly as possible (Koufteras et al, 2002). The faster a firm can develop a new product, the greater the likelihood that they can be first to market and reap pioneering advantages (Kessler & Chakrabarti, 1999)

- Time to market is defined as the elapsed time between product definition and product availability on the market (Vesey, 1991). An organization that has a short time-to-market and rapid product innovation can be the first in the market and thus may enjoy a higher market share and sales volume (Li et al., 2006).

Three theories have been discussed in the chapter. Each has their different view on competitive advantage. Porter explains competitive advantage as above-average performance due to cost leadership, differentiation and focus, whereas Barney states that the basis of competitive advantage is found in the valuable resources a firm possesses which cannot be imitated or obtained by competitors. Li et al. discusses the concepts of competitive advantage with a supply chain management perspective and state that competitive advantage is achieved through being ahead of your competition on price/cost, quality, delivery dependability, product innovation and time to market dimensions.

## Chapter 3: What is a responsive supply chain?

After discussing several concepts of competitive advantage, a closer look is taken on the responsive supply chain. Where does it originate from, what are the concepts and definitions of a responsive supply chain and how does it operate<sup>1</sup>.

### *3.1 The origin*

In the beginning of the 1990s, agile manufacturing gained momentum and received the interest of both practitioners and researchers. Halfway the '90s, supply chain management started to attract attention (Gunasekaran et al., 2008). Both concepts differ in philosophical emphasis; agility manufacturing focuses more on strategic alliances and partnerships to achieve speed and flexibility (Naylor et al., 1999), whereas supply chain management gives a great deal of attention to cost and aims more at the integration of suppliers and customers to achieve an integrated value chain (Gunasekaran et al., 2008). Today, companies have to deal with the challenges of satisfying the demand of customers for products and services of high quality, but low price. Firms also need to be responsive to customers' unique and swiftly changing needs. Combining the positive features of agile manufacturing and supply chain management addresses a new strategy to cope with these challenges. This strategy is called the responsive supply chain (Gunasekaran et al., 2008).

### *3.2 Supply chain management*

Harrison and van Hoek define supply chain management as "a network of partners who collectively convert a basic commodity into a finished product that is valued by end-customers and who manage returns at each stage (Harrison & van Hoek, 2008, p.7)". "Supply chain management is the coordination of resources and optimizations of activities across the value chain to obtain competitive advantages (Gunasekaran et al., 2008, p. 550)". Three traditional objectives are described to compete; product quality, the speed with which the product is delivered and the price at which a product is offered (Harrison and van Hoek, 2008). Functional products with low product variety and stable demands are supplied by a physical efficient supply chain (Fisher, 1997). Since supply chain management is primarily developed for lean production with the focus on achieving cost reduction by elimination non-value adding activities, it lacks speed and flexibility (Gunasekaran et al., 2008).

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<sup>1</sup> Note to the reader; Angappa Gunasekaran is one of the precursors of the responsive supply chain. He took part in almost all the research done on this subject. This chapter mostly refers to his work.

### *3.3 Agile manufacturing*

Youssef described in 1994 agile manufacturing as “a manufacturing system with extraordinary capability to meet the rapidly changing needs of the marketplace. A system that can shift rapidly amongst product models or between product lines, ideally in real-time response to customer demands (Yoessef, 1994, p. 5)”. Quick response requires companies to adapt to the strategic requirements of the supply chain (Perry et al., 1999). Strategic agility planning focuses on attaining high responsiveness to the market through the management of a dynamic supply network. The key issues are quality, speed of delivery and flexibility which are achieved through strong and dynamic partnerships, rich information sharing and the coordination of physical flows without fixed investments in order to reconfigure rapidly if necessary (Cagliano, R et al., 2004; Naylor et al., 1999). Gunasekaran and Yusuf have defined agility manufacturing as “the capability of an organization, by proactively establishing virtual manufacturing with an efficient product development system, to (i) meet the changing market requirements, (ii) maximize customer service level and (iii) minimize the cost of goods, with an objective of being competitive in a global market and for an increased chance of long-term survival and product potential. This must be supported by flexible people, processes and technologies (Gunasekaran & Yusuf, 2002, p. 1362)”. Innovative products with volatile demands and high product variety are supplied by a market responsive or an agile supply chain (Fisher, 1997). An agile supply chain has to respond to whatever pressure is imposed to it, with the risk of compromising on speed, cost and quality. Therefore agility should not only focus on responsiveness and flexibility, but also on cost and the quality of the product. An integration of agility manufacturing and supply chain management is required to develop a responsive supply chain in order to achieve agility in a supply chain environment (Gunasekaran et al., 2008).

### *3.4 The responsive supply chain*

Agility can be interpreted as using market knowledge and virtual corporation to exploit profitable opportunities in a volatile market place (Naylor et al, 1999). Supply chain management incorporates the entire exchange of information and movement of goods between suppliers and end-customers, including all players within the extended supply chain. In an agile/virtual setting this includes (i) the development of an interconnected information network, (ii) an effective balance between low level stocks with high quality delivery service, (iii) the designing of innovative products with the active cooperation of suppliers and (iv) cost effective delivery of the right products to the right customer at the right time (Gunasekaran et al, 2008). As mentioned earlier, agile manufacturing only aims on flexibility and speed, cost and quality are less important objectives. However, an effective supply chain demands all of these competitive performance objectives. Gunasekaran et al. define this responsive supply chain as

“a network of firms that is capable of creating wealth to its stakeholders in a competitive environment by reacting quickly and cost effectively to changing market requirements (Gunasekaran et al., 2008, p. 551)”. The concept of a responsive supply chain is illustrated in figure 4.

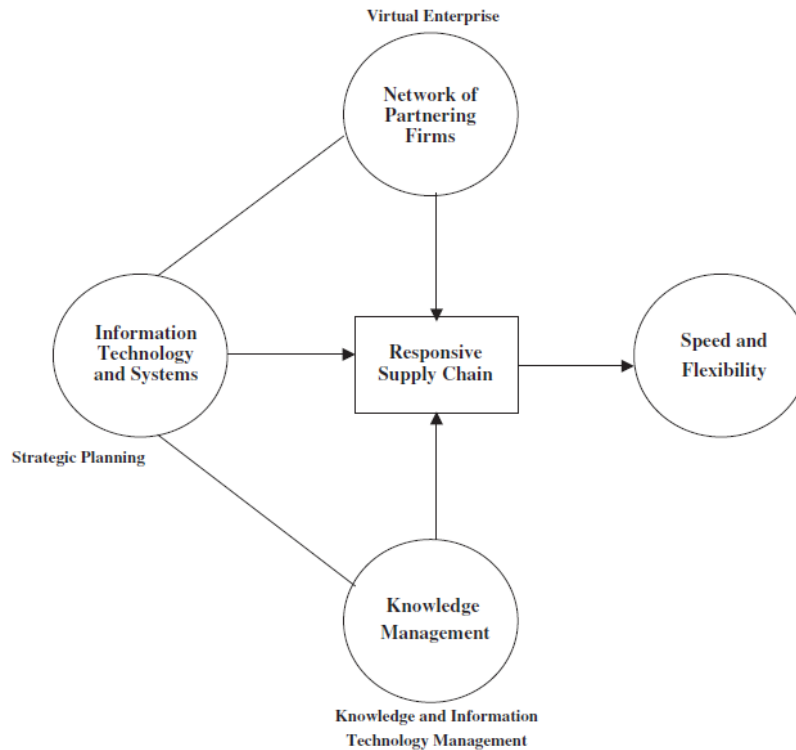


Figure 4: The responsive supply chain concept (Gunasekaran et al., 2008, p.551 / p. 561)

Gunasekaran et al. describe three major enablers of the responsive supply chain (i) networking of partnering firms, (ii) information technology and systems and (iii) knowledge management. According to the same paper the enablers can be identified as (i) strategic planning, (ii) virtual enterprise and (iii) knowledge and IT management (Gunasekaran et al., 2008).

### 3.5 Strategic planning

As can be seen in figure 4, strategic planning is the beginning of the responsive supply chain and stands at the base of virtual enterprising and knowledge and information management. Strategic planning takes the long term interests of a company into account to determine suitable business and operational policies (Gunasekaran et al, 1999). This involves a lot of elements of agile manufacturing and supply chain management.

Agility in manufacturing can be attained through multidisciplinary teams, supply chain partners, a network of collaborative companies/partners firms and knowledge and information systems.

A supply chain information system can be used to connect all players in a supply chain network in order to collaborate quickly and simply. These strategic alliances and the integration of complementary core competencies and the use IT systems are the basis for a virtual enterprise and knowledge and IT management (Gunasekaran, 1999; Gunasekaran et al, 2008). The development of this virtual enterprise includes, (i) formulating corporate and business strategies based on global competitiveness for manufacturing goods and services, (ii) a decision support system to select suitable partners, (iii) information technology for controlling the operations within the virtual enterprise and (iv) some sort of performance measurement system for continuous improvement (Gunasekaran et al, 2008).

Implementing supply chain construct requires the total support of top management in terms of providing the necessary technical and financial funds together with employee empowerment. This reflects the recognition of the importance of human interactions in information-driven product processes. An agile workforce needs to be skilled in IT, knowledgeable in team working and negotiation, advanced manufacturing strategies and technologies, multifunctional, multilingual and self-directing (Forsythe & Ashby, 1996).

On an operation strategy level, concurrent engineering principles can be employed in the product development process in order to reduce time to market in agile manufacturing, (Love et al., 1998).

### *3.6 Virtual enterprise*

The virtual enterprise is considered as an important enabler of agility within a supply chain environment. A virtual enterprise is based on developing partnerships founded on core competencies for achieving agility in a supply chain environment (Martinez et al, 2001). The emphasize lies on the integration of complementary core competencies distributed among a number of carefully chosen organizations all with comparable supply chains and a focus on market responsiveness, cost reduction and quality (Rudberg and West, 2008). These core competencies strategic alliances or partnerships will help to enhance the flexibility and responsiveness of an organization (Gunasekaran et al., 2008). In order to speed up the flow of information in this integrated network, advanced inter-organizational technology is needed such as high-level information and communication systems. In order to implement virtual enterprising in a responsive supply chain the following steps can be taken; (i) identify the companies objectives, (ii) based on multiple competitive performance objectives, identify the product/service requirements from suppliers, (iii) choose partners based on the core competencies using a suiting ranking system, (iv) link all the partners as a virtual enterprise with the help of automation and IT.

### *3.7 Knowledge and IT management*

Automation and IT play a dominant role in the development in virtual enterprising. As described earlier, virtual enterprises demand high-level information and communication systems such as internet, electronic data interchange and e-commerce to exchange information. The role of automation and IT can be identified in multiple areas of the responsive supply chain development process. There are four important elements; (i) strategy formulation, (ii) tactical management, (iii) operations control and (iv) systems (Gunasekaran et al., 2008). The strategies that are selected to meet market requirements will decide the selection of technologies for the responsive supply chain.

A responsive organization must possess the capability of a learning organization. Because of this, IT can be used simultaneously with an organizational structure that promotes innovation, education and training (Gunasekaran, 1998). The workforce should therefore be flexible, proactive and capable of coping with technological advance and challenges, designing their workplaces, solving quality related problems, developing mistake proof processes, team-to-team learning, improving the availability of equipment and helping labor unions construct harmony between their members and the organization (Plonka, 1997).

The elements speed, flexibility and strategic alliances of agile manufacturing and cost and quality of supply chain management together form the basis of the responsive supply chain. There are three major enablers of a responsive supply chain (i) networking of partnering firms, (ii) information technology and systems and (iii) knowledge management. These enablers can be identified as (i) strategic planning, (ii) virtual enterprise and (iii) knowledge and IT management. Strategic planning focuses on business and operation strategies, (global) outsourcing, strategic alliances with partners, the use of IT and continuous improvement. Because of this a virtual enterprise structure is required for the integration of a network of partners with IT in order to speed up the flow of information and communication. Automation and IT play a dominant role in the development of virtual enterprising. Therefore knowledge and IT is important for all these operation strategies. Eventually, the responsive supply chain will achieve increased speed, more flexibility and reduce costs (Gunasekaran et al, 2008).



## Chapter 4: An overview of the global consumer electronics industry

Consumer electronics can be described as electronic equipment intended for everyday use. Consumer electronics are most often applied as entertainment, communications and office products. Examples of consumer electronics include personal computers, telephones, MP3 players, audio equipment, televisions, digital cameras and playback and recording of video media such as DVD-players or camcorders (Consumer Electronics Association Website, 2010).

### 4.1 An overview of the industry

The consumer electronics industry was worth \$ 600 billion annually worldwide in 2007 with 60% of revenues resulting from mobile phones, televisions and personal computers (Report CEA/GfK, 2008). The industry covers a quarter of the broader electronics sector (Market Watch, 2008). The industry is truly global with Asia and the Pacific region having 35% market share, Europe having 31,5%, the US having 23% and the rest of the world having the remaining 10,5% (Report CEA/GfK, 2008). Major players in this industry are names like Sony, Samsung, Philips, LG and Sanyo (Fig. 5).

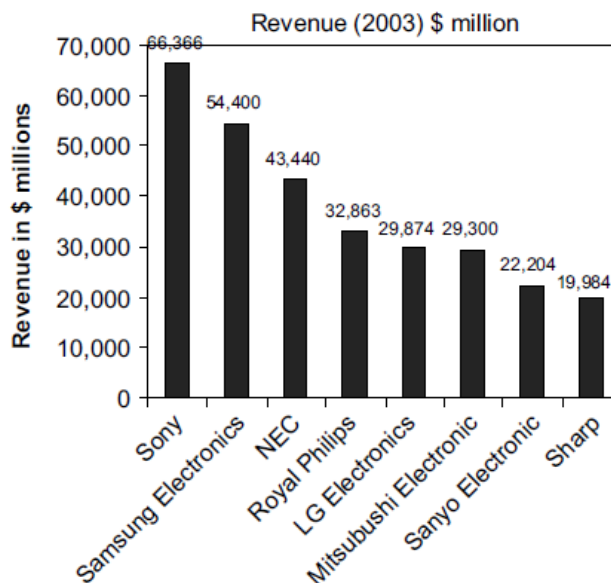


Figure 5: 2003 Revenue of Global Electronics Company (Sodhi & Lee, 2007, p.1431)

This volatile industry is characterized by long lead times, seasonal demands, high product variety and short product life cycles. It faces consumers with unpredictable taste on the demand side, supplier-related delays or disruptions on the supply side and production and

innovation challenges in the middle. Due to the rapid advancements in technology, large investments are required without any guarantee of proportional returns. As a result of this, the major players need global markets to attain economies of scale (Sodhi & Lee, 2007).

#### *4.2 Supply chain risks and issues in the industry*

Sodhi & Lee identified several different types of supply chain risks within the consumer electronics industry categorized in supply-related and demand-related risks. The supply-related risks are divided in capacity and inventory risk, single sourcing risk, supplier delay risk and production quality risk. The demand-risk can be classified as technology change and forecast risks (Sodhi & Lee, 2007).

#### *4.3 Supply-related risks*

- The consumer electronics industry is characterized by a high degree of competition and especially short life cycles (Hu and Bidanda, 2009). Therefore capacity can easily be too much or too little. Both situations are costly due to misapplied investments in the first case and lost sales in the latter case. Especially with short product life cycles, excess inventory can hurt a company's financial performance as prices drop when 'old' products become obsolete due to new technology developments (Chopra and Sodhi, 2004).
- Single sourcing can be defined as the fulfillment of all corporate requirements for a particular product by one selected supplier (Treleven and Schweikhart, 1988). This is attractive in terms of achieving lower costs due to one large contract with a single supplier (Costantino and Pellegrino, 2010). However, lower costs go with higher risks due to the dependency of only one supplier (Sodhi & Lee, 2007).
- Delays in material flows occur mostly when a supplier cannot respond to demand changes. Within the electronics industry this is not uncommon since the market is turbulent and volatile. These market conditions make demand hard to predict which may cause high fluctuations in demand. (Christopher, 2000; Sodhi & Lee, 2007)
- "Quality is the most visible aspect of supply chain performance (Harrison and van Hoek, 2008, p. 16)". Defects or errors are symptoms of quality problems in the supply chain process that are clearly visible to the end-customer. For instance, a supplier with quality problems represents a common, recurrent disruption. Without much effort, the customer can demand improvement or find a substitute (Chopra and Sodhi, 2004). If quality problems are identified to late, it will result in rework and rising costs (McIvor et al, 2006)

#### 4.4 Demand-related risks

- The technology in the consumer electronics industry is changing rapidly. It is very difficult to forecast where the technology in the industry will be in the next 2–3 years. However, technological changes provide big opportunities in for the industry (Trkman and McCormack, 2009). Therefore, as said earlier, large investments are required to keep up with the rapid technological pace. These investments are risky because they do not guarantee the same return. The risk is not only about the availability of technology, but also about which technologies people will adopt or not (VHS vs. Betamax).

- Forecasting risk stems from the mismatch between a firm's forecast and the actual demand. If forecasts are too low, products might not be available to sell. If forecasts are too high, the result will be excess inventories. Long lead times, seasonal demands, high product variety and short product life cycles increase the chance of forecast errors. Forecasting errors will decrease service, return on investment and increases cycle time (Ganeshan et al., 2001).

Another risk, which is not part of supply- or demand-related risks, is the IT systems risk. Due to the globalization of the industry and therefore also the supply chain, the use of network IT systems for information sharing and communication increased drastically (Ovalle and Marquez, 2003). The more a company networks its systems, the greater treat of failure within the system. A defect in an IT system can cause huge damage in highly networked environments (Sodhi & Lee, 2007).

The consumer electronics industry is a volatile industry characterized by rapid technological changes, long lead times, seasonal demands, high product variety and short product life cycles. Due to a small number of highly competitive and global players, any mistake can be disastrous for a company within this environment. Therefore companies should be aware of the issues and risks that are present in the industry.

## **Chapter 5: Linkage between competitive advantage, the responsive supply chain and the global consumer electronics industry.**

In the last three decades the use of information technology and communication devices increased exponentially. Even our economic society and social lives are changing significantly due to the rapid growth of communication technologies such as social media and smart phones (Garrido Azevedo et al, 2008). This phenomenon also has a major impact on the consumer electronics industry. Increasing demand for electronic products is one of the reasons for the astonishing growth of the consumer electronics industry. The industries worth grew from \$ 72 billion in 1986 to \$ 600 billion in 2007 (Report CEA/GfK, 2008).

Currently, a few big players control the consumer electronic market in a highly competitive and volatile environment (Sodhi & Lee, 2007) and each player must distinguish itself in order to respond to customers' unique and rapidly changing needs before the competition. They are implementing new business and operation strategies in order to avoid risks and to gain a competitive advantage on their competitors (Gunasekaran et al., 2008). These strategies also may contain the development of a new supply chain construct. A combination of different supply chain strategies, such as agile manufacturing and supply chain management, could be the resource for strengthening or enhance the market position of a company. The responsive supply chain is a supply chain structure which focuses on flexibility, speed, cost and quality and it might be a solution for companies within the consumer electronics industry to achieve a competitive advantage over the competitors.

To determine whether the responsive supply chain has a positive effect on the market position of consumer electronics manufacturer, all the aspects of the supply chain structure must be compared with the market environment of the consumer electronics industry. If the responsive supply chain enhances the performance of the company for a longer period of time (and that enhanced performance cannot be imitated by its competitors), then it can be stated that the company has achieved a sustainable competitive advantage (Porter, 1985; Barney 1991)

## Chapter 6: Conclusion, discussion and recommendations

### 6.1 Conclusion

The main question this thesis revolved around was: How does the responsive supply chain affect the market position of a company in the global consumer electronics industry? In order to answer this question an analysis has to be done on the effects the responsive supply chain has on the characteristics, issues and risks within the global consumer electronics industry.

The responsive supply chain has three main enablers; strategic planning, virtual enterprising and knowledge and IT management to achieve increased speed, flexibility and reduced costs. These enablers focus on elements such as strategic alliance/partnerships based on core competencies, networks of partners integrated by IT, continuous IT/technology improvement and learning and a flexible workforce. A lot of these elements can assist companies in the consumer electronics industry coping with or avoiding risks present in the market.

Strategic alliances or partnerships may enable cooperation's between companies to reduce risks on expensive technology innovation investments. This also boosts innovation within the industry to attain a technological advantage over the competitors. An integrated (IT) network between partners within the supply chain makes the supply chain more efficient by reducing both lead times and costs due to increased visibility and more effective communication. The use of integrated supply chain networks will improve forecasting methods as well due to more transparency of demand information. This reduces the possibility of excess or redundant capacity and inventory. This immediately enhances flexibility because a company's capacity can be used more efficiently for e.g. higher product variety or high level orders. Partnerships also reduce cost because of long-term contracts and more supply and demand certainty.

Time, money and other funds saved by the responsive supply chain employed in product innovation to enhance technological advantage, product (quality) development, educate the workforce to make use of improved IT and communication systems and other purposes.

But does all this strengthens the market position of a company? A competitive advantage can be achieved by implementing a responsive supply chain because cost reduction is realized, differentiation can be achieved due to e.g. higher quality and product variety (Porter). Strategic alliances and enhanced technological advantage can be seen as valuable and rare resources if other companies within the industry are not able to attain or imitate them (Barney). Finally, all the competitive advantage constructs of Li et al. are improved if a responsive supply chain is implemented.

Even though the responsive supply chain relies heavily on the intensified use of IT systems in the supply chain network which increases the risk of critical failure within those systems, the

responsive supply chain achieves an advantage in a competitive environment by increasing speed, flexibility and reduce costs in a volatile and turbulent market such as the consumer electronics industry due to strategic alliances and continuous (technology) improvement. Because of this a company in the consumer electronics industry will perform above average and if this enhanced performance cannot be imitated by competitors, a sustainable competitive advantage has been achieved.

## *6.2 Discussion*

The conclusion of this thesis is clear; a responsive supply chain realizes a competitive advantage which strengthens the market position of a company within the consumer electronics industry. But there are some aspects of the responsive supply chain which are not discussed in the thesis.

First of all the implementation a responsive supply chain is not taken into account thoroughly. Each company has a different culture, values and social structure and operates in a certain setting within the market. Also the costs of introducing new IT and communication systems and the schooling and reforming of the workforce for using this technology are not considered in this report. Due to the conversion of a company's business and operation strategies when implementing a new supply chain construct, each company has to design its own unique responsive supply chain to make it work for that company. This requires a lot of time and money to specialize the system to a company's needs.

Furthermore, as already mentioned in the conclusion, responsive supply chains depend on highly integrated IT networks and communication systems. The use of technology makes the network vulnerable, especially when all the players in the supply chain apply these systems. The risk of failure within the network or leaking of sensitive information increases when the supply chain depends heavily on automation and IT.

Since the consumer electronics industry is such a volatile and unpredictable industry with rapid technological changes, the concept of the responsive supply chain may become outdated when major technological innovations occur in the future. Great consideration is needed when implementing this construct.

Finally it must be emphasized that the concept of the responsive supply chain described in this thesis is primarily based on research and works of Angappa Gunasekaran. Although he is one of the top researchers in agile manufacturing, management information systems, e-procurement, competitiveness of SMEs, information technology/systems evaluation, performance measures and metrics in new economy, technology management, logistics, and supply chain management, other views on responsiveness must be considered to gain a better perspective on the subject.

### *6.3 Recommendations*

In this paper an attempt has been made to study the literature on competitive advantage, the responsive supply chain and the consumer electronics industry in order to explain the effect of a responsive supply chain on the market position of a consumer electronics company. The concepts of both agility and supply chain management are discussed to describe the essence of responsiveness. However, effective performance measures and metrics still need to be developed for the responsive supply chain, especially for productivity of IT and information systems, speed and the flexibility of the supply chain.

When performance measures and metrics are developed, more research can be done on categorize and profiling responsive supply chains for different types of markets and organizations. This will help clarify and accelerate the implementation of responsiveness.

Also better insight is needed on the criteria for selecting partners within the supply chain. As discussed, strategic alliances and partnerships are one of the major elements within the responsive supply chain. How can you tell which players will enhance the overall performance of the value chain and which players are reliable enough to integrate within the virtual enterprise.

In conclusion, research on the consumer electronics industry must continue to anticipate on trends, risks and issues. Because of turbulent consumer demand, technological progress and volatile environment of the industry new ways of gaining a competitive advantage over the competitors must be identified quickly to ensure or even strengthen a company's market position.

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