STRATEGIES FOR HANDLING SUPPLY CHAIN DISRUPTIONS.

Denisa Mamillo

Submitted to the
European University of Tirana
Doctoral School

In fulfillment of the obligations for the doctoral program in Economic Sciences, Management Profile, to obtain the scientific degree “Doctor”

Scientific Supervisor: Prof. Dr. Vasilika Kume

Word Count: 56,747

Tiranë, October 2015

STATEMENT OF AUTHORSHIP

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Doctor of Philosophy is entirely my work, and that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

ABSTRACT

Interest in supply chain disruptions increased after 2001, due to the devastating effects of the recent disruptive event and due to the increasing vulnerability of the supply chains. Although research interest on this topic has been increasing, no such research has been done in Albania.

Regarding strategies for handling supply chain disruptions exist different views in the literature, but nearly no one has considered why some companies were successful in handling the supply chain disruptions and some were not. To fill this existing gap, the actual research will attempt to give an answer to the question "Why the severity of the same supply chain disruption is different for companies in the same industry?".

The methodology used was comparative case studies, respectively Dell, Nokia, Daimler, Meggle Albania and Fabjus case study. The analysis and comparison of the case studies concluded that the best strategy for handling supply chain disruptions is a combination of resilience and implementation of robust strategies.

This research is important for managers as it will provide a specific framework for handling the disruptions. Managers should be aware that the severity of a disruption depends on the company background and organizational culture. These factors can increase the company resilience. Also, they determine the success in the execution of the strategies for managing supply chain disruptions.

Keywords: *supply chain disruptions, severity, robust strategies, organizational culture, company's background*

ABSTRAKT

Pas viteve 2001, interesi në menaxhimin e ndërprerjeve të zinxhirit të furnizimit është rritur, për shkak të ndikimeve negative të këtyre ngjarjeve dhe për shkak të rritjes së ndjeshmërisë së zinxhirëve të furnizimit. Megjithëse interesi në këtë fushë është rritur, në Shqipëri nuk është bërë pothuajse asnjë kërkim respektiv.
Ekzistojnë pikëpamje të ndryshme në literaturë lidhur me këtë temë, por shumë pak studiues kanë analizuar pse disa kompani janë të suksesshme në menaxhimin e ndërprerjeve të zinxhirit të furnizimit dhe disa jo. Për të plotësuar këtë hendek në literaturë, kërkimi aktual do të përpiqet ti përgjigjet pyetjes "Pse fenomene të ngjashme të ndërprerjes së zinxhirit të furnizimit kanë impakte të ndryshme në kompani të së njëjtës industri?"

Metodologjia e përdorur bazohet në raste studimorë krahasimorë, përkatësisht rasti i Dell, Nokia, Daimler, Meggle Albania dhe Fabjus. Analiza dhe krahasimi i tyre tregoi se rritja e fleksibilitetit dhe zbatimi i strategjive të duhura, ndihmojnë në menaxhimin e suksesshëm të ndërprerjeve të zinxhirit të furnizimit. Me strategji të duhura nënkuptohen ato strategji që ndikojnë në uljen e kostove dhe rritjen e kënaqësisë së klientit në kushte normale dhe gjithashtu në menaxhimin eficent dhe efikas të këtyre problemeve .

Ky kërkim është i rëndësishëm për menaxherët pasi do të ofrojë një kuadër për menaxhimin e ndërprerjeve të zinxhirit të furnizimit. Menaxherët duhet të kenë parasysh që pasojat e ndërprerjeve të zinxhirit të furnizimit varen në një shkallë të madhe nga kultura organizative dhe eksperiencat e kompanisë në menaxhimin e riskut. Këta faktorë mund të rrisin fleksibilitetin e kompanisë. Gjithashtu, ato përcaktojnë suksesin e zbatimit të strategjive për menaxhimin e ndërprerjeve të zinxhirit të furnizimit.

***Fjalët kyçe**: ndërprerjet e zinxhirit të furnizimit, kultura organizative, eksperiencat e kompanisë, menaxhimi i riskut*

To my son, Mikele

ACKNOWLEDGMENT

I would first like to express my gratitude toward my supervisor Prof. Vasilika Kume, for her guidance, knowledge, availability and support in writing the dissertation.

I am deeply thankful to all the professors of the Department of Management and Economics at the European University of Tirana, whose advices and lessons were very useful.

I would like to thank, Gentian Lile, which has always motivated and supported me during all the process of writing the dissertation and collecting data.

A special recognition goes to my family that supported me during my entire university career.

Finally, I would like to thank my colleagues that have provided constant support and help.

Table of Contents

List of Tables

List of Figures

List of Appendixes

CHAPTER I: INTRODUCTION

The aim of this chapter is to provide a map that will guide the reader through the rest of the dissertation. It will start with a description of the main reasons for doing this research. Then, the research question, aim, objectives, and proposition will be presented. Later the research methodology will be briefly explained. The last section will anticipate the structure and content of each chapter.

1.1 Research rationale

There are three main reasons for doing a research on strategies for handling supply chain disruptions. First of all, although interest on supply chain disruptions has been increasing, no such research has been done in Albania. Secondly, this study will try to fill an existing gap in the literature and lastly the research can be of high importance not only for academicians but even for managers. The next sections will explain in detail these reasons.

An unstudied field in Albania

Supply chain disruptions begun to receive special attention after 2001. The main reason was the recent disruptive events, such as the terrorist attacks, earthquakes, tsunami and many others, which had caused devastating losses to global companies. The terrorist attack on September 2001 was one of the most terrible terrorist attacks of the modern history. After September 2001, many research projects were charted to analyze the supply chain disruptions, especially the intentional disruptions, and their effects (Petit, Croxton & Fiksel, 2013).

A second reason was the vulnerability of the modern supply chains. They have been always vulnerable but today they are more vulnerable, as firms are less vertically integrated, and their supply chain is located all over the world. For many companies, it is convenient to locate their main activities where it cost less, but they do not consider problems such as longer lead-times, taxes, duties, fluctuations of exchange rates and especially government regulations. A global supply chain can be efficient in term of costs, but it is more exposed to a high range of disruptions rather than a local supply chain (Tang & Musa,2011).

The technology is increasing the vulnerability of the modern supply chains. The technology changes quickly, and companies need to be innovative, to introduce into the market new products. As new products are frequently introduced, companies try to reduce inventory. To achieve this, they rely on global sourcing, on lean manufacturing and on just in time inventory management, by increasing their exposure to disruptions (Chopra & Meindl, 2012).

Supply chain disruptions can occur in each part of the supply chain, inbound logistics, outbound logistics and the internal process. They can have different sources from natural disasters to intentional disruptions (Sheffi, 2007). However, all the disruptions have devastating effects and need special attention.

Supply chain disruptions are becoming critical for many companies. A recent global report about supply chain disruptions reported that 81% of the companies considered had faced at least one supply chain disruption (Business Continuity Institution, 2014). It is worth studying supply chain disruptions and strategies to mitigate them.

Although research interest on supply chain disruptions has been increasing, no such research has been done in Albania. The Albanian companies had faced and also are facing many disruptions, and this research could offer to them some recommendations for handling the supply chain disruptions successfully.

Literature gap

Regarding strategies for handling supply chain disruptions exist three different views in the literature. The first view is called supply chain risk management. It refers to the identification, analysis of risks as well as their control (Blome & Schoenherr, 2011; Giannakis & Louis, 2011 and Li, Fan, Lee, & Cheng, 2015). Other authors identified these activities with other names like "pre- disruption" (Behdani, Adhitya, Lukszo, & Srinivasan , 2012), "prevention" (Thun & Hoening, 2009) or "proactive" (Dani & Deep, 2010). After September 2001, supply chain risk management has been studied by many authors. According to them the best strategies for handling supply chain disruptions can be classified in:

Robust strategies: A robust supply chain strategy is a strategy that helps the company to reduce costs and improve customer satisfaction under normal circumstances and also helps the company to manage small disruptions and major disruptions by being both cost and time efficient (Tang, 2006). The author identified nine robust strategies: postponement, flexible supply base, strategic stock, make or buy, supply incentives, flexible transportation, revenue management, assortment planning and silent product rollover. They are explained in detail in Chapter 2.

Security based strategies: The aim of these strategies is to increase the security in all the supply chain, in order to reduce the exposure to severe disruptions.

Resiliency strategies: They help the company to increase the supply chain resilience, which do not merely imply the ability to manage risks but even the capability to do it better than the competitors by gaining competitive advantage (Sheffi, 2005). Their aim is to increase flexibility, redundancy and controls.

The second view is called supply chain disruption management. It is a continuous process that analyzes the impact of disruptions and the best way to handle them (Xiao & Yu, 2005 and Behdani, Adhitya, Lukszo, & Srinivasan, 2012). The same authors used another name "post-disruption activities". Thun and Hoening (2012) called them "response" while Dani and Deep (2010) used the term "reactive."

Supply chain disruption management has not been studied by many authors compared to supply chain risk management. The work of Blackhurst, Craighead, Elkins and Handfield (2005), Sheffi (2007) and Revilla and Saenz (2014) has received the most attention in the literature regarding this topic.

According to Blackhurst et al. (2005) the company should follow three steps when the disruption happen. They are disruption discovery, disruption recovery, and supply chain redesign. It is important that after the firm turns back into normal conditions, it should redesign its supply chain, taking into consideration the lessons from the past disruption.

Sheffi (2007) argued that some companies can handle better disruptions compared to others because they have some cultural traits like the passion for work, continuous communication

and many others. Understanding the relationships between them define the successful handling of supply chain disruptions.

Revilla and Saenz (2014) concluded that the management of disruptions by global firms at the internal and inter-organizational level is universal. National differences have a week impact on disruption management. The same is not true for the local companies, as the supply chain disruption management process is affected by the national culture.

The third view is called the integrative framework. For managing the disruptions, both the proactive and reactive perspective is important. By investing in supply chain risk management, many disruptions can be avoided. But due to cost and time many risks cannot be always predicted, so more attention must be paid to the response strategies. There have been some attempts to offer an integrative framework (Pyke & Tang, 2010 and Behdani, Adhitya, Lukszo, & Srinivasan , 2012) for handling disruptions. The authors did not consider supply chain risk management and supply chain disruption management separately but interconnected.

Summarizing, the first group of authors stresses the importance of increasing the resilience and robustness of the supply chains, which in turn will enable companies to forecast disruptive events and reduce their impacts. The second group of authors argues that a pro-active approach to disruptive events is good, but sometimes the disruptive event can hit the company when and where it is not prepared. In this case, a reactive approach is necessary. Companies should be able to design strategies that enable them to handle supply chain disruptions and to recover quickly after the disruptive event. The last group of authors

argues that both the proactive and reactive perspective is important for managing disruptions.

Sometimes the same disruption hit companies in the same industry. Some recovered quickly from the disruption while the others recovered with huge loses. None of these views can fully explain why some companies were successful in handling the same supply chain disruptions compared to others. To fill this existing gap in the literature the author will try to identify the factors that determine the success in handling the supply chain disruption compared to the competitors.

Research importance

This research is important for academicians because it is filling an existing gap in the literature, and it will also highlight some new areas that need further research. The research is even more important for the Albanian researchers because no such study has been done in Albania.

The research is important for managers, as it will analyze real-life case studies. The analysis of the case studies will provide a framework for handling supply chain disruptions. In the last chapter, a specific section will be dedicated to recommendations for managers.

1.2 Research aim, question and objectives

After the terrorist attack on September 2001, the managers have increased their awareness to supply chain disruptions. Many companies have special departments and specialist that forecast the potential disruptions and prepare the company to face them. Being prepared is the first step in handling supply chain disruptions, but sometimes it is not enough.

Companies like Dell, Nokia, Chiquita, Toyota, faced disruptions and even if they were not totally prepared, they handled the supply chain disruptions successfully. Their competitors faced the same disruptions, but they recovered with significant losses or some did not recover. The research will try to analyze this puzzle, by addressing the following research question: *Why the severity of the same supply chain disruption is different for companies in the same industry?*

To answer the research question, the author will analyze the strategies used by the companies for handling the supply chain disruptions and the factors that determined their success compared to the competitors. To achieve this research aim, the current study will attempt to develop the following research objectives:

1. Identify and analyze the supply chain disruptions and their impacts;
2. Analyze in detail the strategies and actions implemented by the companies under consideration after the disruption occurred.
3. Try to understand why the companies implemented certain actions and strategies and how they differ from the one of the competitors.
4. Identify how the performance of the companies and its competitors was affected by the strategy and actions implemented.

1.3 Research proposition

As mentioned above, three different views exist in the literature regarding strategies for handling supply chain disruptions. The first view argues that companies have to be prepared to face disruptions, by increasing the resilience of their supply chains. The second

view argues that the successful handling of supply chain disruptions depends on the reaction of the company after the disruption happened. The third view considers the first and second view together.

To handle supply chain disruptions, it is not a matter of having a resilient supply chain or having implemented a robust supply chain strategy. To design a strategy is easy but the execution is difficult. The same strategy cannot work well for each company. There are cases when companies operating in the same sector were hit by the same disruption, but some survived and some did not. Their success was based on many factors, like company background and organizational culture. This discussion suggests the following proposition:

> Research proposition: The severity of a disruption depends on the company background[1] and organizational culture.

1.4 Some definitions

It is necessary to provide some definitions for the main concepts of this dissertation.

Supply chain definition: A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves (Chopra & Meindl, 2012).

Supply chain disruption definition**:** A supply chain disruption is an event that might happen in any part of the chain and causes undesired impacts on its (achievement of) objectives and performance (Behdani, Adhitya, Lukszo and Srinivasan, 2012).

[1] With company background the author refers the past experiences of the company in handling disruptions.

The sources of supply chain disruptions are infinite, but for the purpose of this thesis they are summarized in three broad categories: natural disasters, accidents and intentional disruptions.

A natural disaster is defined as any event or force of nature that has catastrophic consequences (Sheffi, 2007). The natural disasters include earthquakes, flood, forest fire, hurricane, lightning, tornado, tsunami, volcanic, avalanche and so forth.

Accidents include unanticipated events such as quality accidents, labor accidents, fire, transportation accidents, communication accidents and so forth (Schmitt, Sun, Snyder, &S hen, 2015)

Intentional disruptions are the ones that are caused by conscious acts by a person or a group. They can be classified in terrorist and non-terrorist. The last ones include labor strike, adverse media coverage, management manipulations, cyber attacks and many others (Steckea & Kumarb, 2009).

1.5 Research methodology

The research strategy employed in this research is cross-comparative by nature and relies on five case studies. The companies chosen for the case study are respectively Dell, Nokia, Daimler, Meggle Albania and Fabjus.

Dell case study: Due to an earthquake in Taiwan, the production of chips in the Hsinchu Park decreased. At the time of the earthquake a high percentage of computer memory chips was produced at this industrial park. Major global companies in the computer industry, like Dell, Apple, Compaq and IBM, were affected by this disruption as they used to buy the

specific chips by the Taiwanese suppliers. Dell handled the disruption successfully as it gained market share after the disruption. Apple, Compaq and IBM saw their revenues and market shares declining after the earthquake.

Nokia case study: Nokia was the leading company in the phone industry for a long time. Many years ago, it faced an inbound disruption, as the plant of its main supplier, Philips, was stroked by a lighting storm. Philips could not fulfill the orders of its main clients, Nokia and Ericsson. At a first sight, it was forecasted that the delay will be a week, but in reality it was more than a week. Nokia gained market share after the disruption while Ericson retreated from the mobile market.

Daimler case study: After the terrorist attack the security in the customs points was increased. Many car manufactures like Daimler, General Motor, Ford and many others relied on just in time inventory by keeping nearly zero inventories. As the shipment of many parts was blocked at the Canadian and Mexican board, these car manufactures were obliged to stop the production. Ford announced the closure of four producing plants and reported financial losses while the market share and profits of Daimler increased after the disruption.

Meggle Albania case study: Three years ago, the Kosovo Food and Veterinary Agency announced that the milk produced by two Albanian milk processing companies, Primalat and Fast (produced by Meggle Albania) contained two to three times higher levels of aflatoxin compared to the level allowed by the European Union. The media was immediately informed and these brands of milk were blocked in the Kosovo custom. The

production was stopped in the two factories. Primalat reported huge losses and was not able to survive to this disruption. Meggle Albania stopped the production for two months, but it returned strongly in the Albanian market later.

Fabjus case study: Fabjus is an Albanian company, operating in different sectors like production of plastic, construction sector and food sector (vinegar and lemon juice production). On June 2012, one client called Fabjus and its other main suppliers to postpone the delay by few days. Short time delays were normal in every business, but a small delay turned into a permanent delay. After three days, they received a second call. The orders were canceled. Fabjus was able to recover quickly from the disruption, because it sold the major part of the products, whose order was canceled. The other companies recovered too late and with financial losses.

The case study is the best research method to answer the questions What, How and Why. So it is compatible with the research objectives of this study. Also, this research method is most used in supply chain disruption literature.

The first three case studies will be analyzed in a separate chapter because the aim of these case studies is to provide some important lessons from the experience of global companies in handling supply chain disruptions. As the saying says "A wise person learns from other mistakes while a fool learns from his experience" (Sheffi ,2007). All the three companies handled the disruption successfully compared to the competitors. What can be learned by their success?

Even, the two Albanian case studies will be analyzed in a separate chapter. Meggle Albania and Fabjus handled the disruption successfully compared to the competitors. The main

reasons why the author has chosen these case studies were the availability of information from the managers of the companies and the compatibility of the cases with the research aim of this study. Due to the sensibility of the topic and the need to get detailed information, in-depth interviews were conducted with the managers of the companies.

The analysis of the case studies will be structured in four main parts. It will start with the analysis of the company before the disruption. The analysis will be focused on the following elements: company background, supply chain, organizational culture and structure. Detailed information will be collected for each element but in the dissertation will be presented only the ones that are relevant for this research. In the second part, the disruption will be analyzed. The author will describe how, when and where the disruptions happened and analyze its effects in the specific industry. The third part is the most important. The author will, firstly, describe in detail and chronological order the actions and strategies undertaken by each company after the disruption happened. Then, she will attempt to understand why the companies have undertaken such actions and strategies. Lastly, the performance of the companies after the disruption and until now will be described. For the first three companies, the financial performance will be analyzed as many financial indicators could be found easily. For the Albanian companies, this part is descriptive because it is difficult to find realistic financial information for this part.

1.6 Outline of the research

The research is organized into six chapters. In Chapter two, the author will make an analysis of the most relevant publications written for one of the following purposes: supply

chain disruptions and strategies for handling supply chain disruptions. The starting point will be the analysis of supply chain vulnerability, as a vulnerable supply chain is more exposed to risk, and normally more exposed to disruptions. Supply chains have always been vulnerable, but in the last years they are becoming more vulnerable. In this chapter, supply chain vulnerability's sources, will be classified in broader categories. A vulnerable supply chain is more exposed to risk, so a specific section will explain in detail the classification of supply chain risks. For the topic of supply chain disruptions, the categories of disruptions their sources and consequences will be described Later, the literature regarding strategies for handling supply chain disruptions will be analyzed. The last section will identify the literature gap.

The aim of chapter three is threefold. Firstly, the author will answer to the question "how shall I conduct my research?" by referring to the research onion structure. Saunders, Lewis and Thornill (2012) compared the research process as an onion with six layers: research philosophy, research approach, time horizon, research design, research strategy, and data collection methods. A specific section will be dedicated to each layer, by explaining the rationale for choosing that specific method compared to other methods. As the research strategy is case studies, the author will explain which case studies were chosen and why they were selected. Also, she will explain how the analysis of the case studies will be structured. Lastly, the research model will be presented and the ethical issues will be discussed.

In chapter four, three case studies, respectively Dell, Nokia and Daimler case, will be presented while the Albanian case studies will be analyzed in chapter five. The case studies

will be structured as mentioned in the previous section. The chapters will end with a comparison between the case studies and some lessons from the experience of these companies.

The last chapter will present the conclusions of the whole project, followed by recommendations for managers and future research. The research findings will be explained and they will be compared with the literature, to emphasize the contribution of the research. This chapter will be concluded with recommendations for managers and for future research.

CHAPTER II: LITERATURE REVIEW

The aim of this chapter is to make an analysis of the most relevant publications written for one of the following purposes: supply chain disruptions and strategies for handling supply chain disruptions. The starting point will be the analysis of supply chain vulnerability, normally after having provided a definition of the supply chain. Supply chains have always been vulnerable, but in the last years they are becoming more vulnerable. In this chapter, supply chain vulnerability's sources, will be classified in broader categories. A vulnerable supply chain is more exposed to risk, so a specific section will explain in detail the classification of supply chain risks. For the topic of supply chain disruptions, the categories of disruptions their sources and consequences will be described. Later, the literature regarding strategies for handling supply chain disruptions will be analyzed. The last section will identify the literature gap.

2.1 Supply chain definitions

Various supply chain's definitions have been provided in the past several years:

Lee (2004) defined supply chain as the process of delivering products of right design, in the right quantity, at the right place, at the right time.

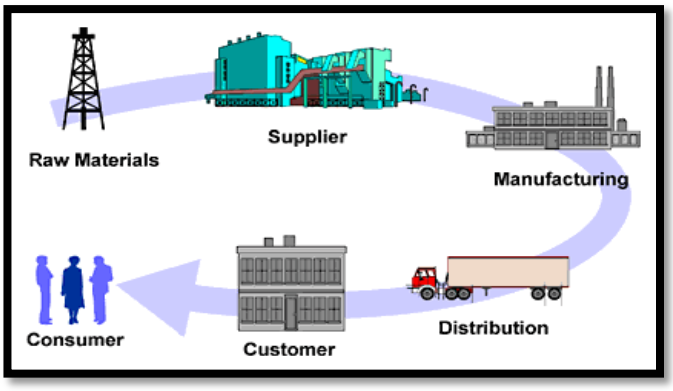
Chopra and Meindl (2012:14) provided the following definition "A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves."

The Supply Chain Council (2014) uses the definition: "The supply chain - a term increasingly used by logistics professionals - encompasses every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer.

According to the Supply Chain Council (2014), four basic processes broadly define these efforts, which include managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer.

The definitions are nearly the same, and they can be summarized in few words: A supply chain includes all the entities, from suppliers to the final customers, and all the activities performed to fulfill the customer request. As we can see from the figure 1 the supply chain includes suppliers of raw materials, the manufacturing plant, where the final product is produced and the distributor which is responsible for the inventory and distribution of the final goods to the customer (retailer). The final chain is the consumer or the final user.

Figure 1: Supply chain



Source: Jumadin (2010)

Chopra and Meindl (2012) stated that most supply chains are networks, as at each stage of them are involved more than one player. For example, companies have different suppliers for raw materials, many manufacturing plants, and distributors, and also they offer their products to different customers. So the supply chain includes suppliers, distributors, manufacturing plants, customers and the final users.

A supply chain is dynamic and involves a constant flow of information, product and funds between different stages. For example, the consumer enters in the Dell website and gets information about the prices, product variety, product availability and product characteristics. After the consumer makes the order, he can enter in the website to check the progress of his order. In all the stages of the supply chain, from suppliers to distributors, the information provided by the consumer, is used to produce the final product. It is obvious that the flow of information is continuous and dynamic in all the stages of the supply chain. The flow of funds has the same direction as the flow of information. The consumer pays in advance for the product, by transferring funds to Dell. It used the funds to pay the suppliers, producers and distributors. Differently, the flow of products starts from the providers and end with the final user, that receive the product requested (Chopra &Meindl, 2012)

2.2 Vulnerable supply chains

Recently, supply chains are becoming more vulnerable especially due to globalization and tendency to reduce costs (Revilla & Saenz, 2014). Companies should understand vulnerability and its drivers before designing strategies for a more resilient supply chain,

Understanding vulnerability

The literature offers different definitions of supply chain vulnerability. Christopher and Peck (2005) defined supply chain vulnerability as an exposure to serious disturbance. Wagner and Bode (2006:304) stated that ‘‘supply chain vulnerability is a function of certain supply chain characteristics and that the loss a firm incurs is a result of its supply chain vulnerability to a given supply chain disruption’’. Sheffi (2007) defined the vulnerability of supply chain as a combination of the likelihood of a disruption and its potential severity. Bakshi and Kleindorfer (2009: 588) defined supply chain vulnerability as “possibility of occurrence of a disruption. It is determined by a combination of the kind of infrastructure already in place for risk mitigation, as well as environmental factors such as political turmoil, proximity to a fault line/volcano, and so forth”.

The definition offered by Sheffi (2007) is the most relevant for the purpose of this thesis because he described supply chain vulnerability as a result of supply chain disruptions. The author stated that companies have to answer to the following questions to assess the vulnerability of their supply chain:

What can go wrong?: Many things can go wrong, and the author suggested that many firms have to follow the example of GM in answering to the question “What can go wrong?” General Motor (GM) constructed a map of the vulnerabilities to understand the vulnerabilities of its supply chain. GM organized the vulnerabilities in four categories: financial, strategic, operations and hazard vulnerabilities. The last two, operations and hazard vulnerabilities, were the most important.

What is the likelihood of that happening*?:* After categorizing the vulnerabilities, companies should forecast the probability of happening of different disruptive events and their consequence. This is not easy, and the author suggested that each company should have a department responsible for supply chain risk management. The department will calculate the probability and consequences of disruptive events based on their historical experience, other companies experience and forecast analysis. The vulnerability of a disruptive event can be calculated as the product of its probability and consequences (Table 1).

Table 1: Dimensions of vulnerability

Disruption probability/Consequences	**Light**	**Severe**
High		
Low	Low vulnerability	**Important!**

Source: Sheffi (2007)

Low probability disruptions with light consequences and high probability disruptions with light consequences are part of the day to day business of each company. The low probability disruptions with severe consequences and high probability disruptions with severe consequences require planning and recovery strategies.

Drivers of supply chain vulnerabilities

Taking into consideration different publications, the drivers of supply chain vulnerability can be categorized in: customer dependence (Wagner & Bode, 2006; Wagner & Neshat, 2010; Waters, 2011), supplier dependence (Hallikas, Puumalainen, Vesterinen, &

Virolainen, 2005; Tang 2006; Wagner & Neshat 2010), and global sourcing (Wagner & Bode 2006; Tang & Musa 2011; Pereira, Christopher, & Da Silva, 2014)

Customer dependence: It has been seen as the extent at which a firm has one or more customers that represent a high volume of sales. Having few customers is good, because it is easier to manage them and to build strong relationships. However, if one of the main customers has a problem or cancels the order, the firm will suffer huge losses and maybe it will not survive.

In 1975, a German wholesaler suddenly canceled its order to Amancio Ortega. He was the main customer, and so his firm went into bankruptcy. He had an entrepreneurial spirit and never gave up. After the bankruptcy, he opened a small shop, called Zara. Today, there are over 650 Zara stores in the entire world. However, this is an extreme case of success, it is better to avoid such bad situations (Ferdows, Lewis, & Machuca, 2004).

Supplier dependence: It increases when a firm buys inputs from one or more suppliers that are difficult to be substituted. As in the case of customer dependence the benefits are easy management and strong relationships. But, in the event of a supplier problem, the firm will suffer losses as it will find difficult finding another supplier. The dependence from suppliers increases when their concentration is low or when the firm relies on single sources.

The Japanese companies, like Toyota or Honda, are well known for their strong relationships with suppliers. However, this does not mean that they depend on a single source for everything, as they have two or more suppliers for every component or raw material (Liker & Choi, 2004).

Global sourcing: Many companies tend to move from local sourcing to global sourcing as it is more convenient in term of costs. Global sourcing, in comparison with local sourcing, is usually characterized by high turbulence and uncertainty. In addition, complicating factors that have to be considered are longer lead-times due to long routes of transportation, reliance on critical infrastructures (ports, communication systems), taxes, duties, fluctuations of exchange rates and especially government regulations. Companies that rely on global sourcing have a more vulnerable supply chain, as their supply chain is more complex and challenging to be managed.

Vulnerable supply chains are more exposed to risks (Waters, 2011). To better understand how to reduce the vulnerability of supply chains, it is important to examine all the supply chain risks and to design mitigating strategies for each of them.

2.3 Supply chain risks

Juttner, Peck and Christopher (2003) defined supply chain risk as a variation in the distribution of possible supply chain outcomes, their likelihood, and their subjective value. Waters (2011) defined it as an unpleasant event that can happen in one or more chains of the supply. The unpleasant event can happen to the supplier, to the focal firm or to the final end-user. The definition that will be used in this dissertation is the later one.

The supply chain risks are various, and their impact on the company is quite different. So it is critical to understand the different categories of risk and mitigate each of them with specific actions and strategies. Finch (2004, cited in Vanany, Zailani, & Pujawan, 2009) categorized the risks in three broad categories relative to three levels: application level,

organization level and inter-organizational level. At the application levels, the main risk drivers were natural disaster, accidents and information systems risk. At the organizational level, the main risk drivers were legal and political risks while at the inter-organizational level were mainly social and economic risk, which are outside the control of the company. Deleris and Erhun (2007) classified the supply chain risks in operational, social, natural, economic and legal. Chopra and Sodhi (2004) provided nine categories of supply chain risks and also some mitigation strategies for each of them. They included delays, systems, forecast, disruptions, intellectual property, procurement, receivables, inventory and capacity risk.

The classification provided by Chopra and Sodhi (2004) is the most relevant, as they stressed the importance of supply chain disruptions in supply chain risk management. They considered supply chain disruptions as a category of supply chain risks. In the following table are explained the types of risks and some mitigation strategies for each of them.

Table 2: Categories of risks and mitigation strategies

Risk	Description	Mitigation strategy
Delays risk	Delay risk is related to the possibility of not delivering the products on time mainly due to a failure of suppliers to respond to quick changes in demand and delays in the border.	✓ Increase capacity and inventories for high - value products ✓ Use different ways of transportation
Systems risk	System risk is related to the possibility of a failure in one or more parts of the system that will cause the failure of all the system. One of the main system risks is the failure of the entire information systems, which is rare but with devastating effects.	The best defense against system risks is well-designed and efficient recovery and backup processes.
Forecast risks	Forecast risk results from a mismatch between the demand forecast of the company and the actual demand. The main drivers of forecast risks are product variety, short life cycles and seasonality.	The best mitigating strategy, in this case, can be the building of a flexible and responsive production and delivery capacity.
Intellectual property risk	Intellectual property risk has gained significant importance, as companies are becoming global, and they outsource components from different countries, especially from China. Due to the globalization, the probability of sharing the same suppliers with the competitors is increasing and so even the intellectual property risk.	✓ Bringing critical stages of the supply chain in - house. ✓ Creating business processes which, cannot be copied easily by one single manufacturer.
Procurement risk	Procurement risk refers to unanticipated increases in acquisition costs. The main reasons are fluctuations of exchange rates or increase in the price of raw materials.	✓ Long term contract with suppliers ✓ Using financial instruments to hedge the exchange risk.
Receivables risks	Receivable risk refers to the possibility of not being able to collect on the account receivables. The main reasons can be bankruptcy of the consumers, financial difficulty of the consumers or sometimes bad creditor consumers.	✓ Make an analysis of the consumers' creditworthiness ✓ Spread the risk among different customers.
Inventory risk	Inventory risk refers to the possibility of having excess inventory. Inventory risk is high for products with great value and short life cycle, like computers.	✓ Postponement ✓ Highly responsive suppliers
Capacity risk	Excess capacity is a strategic choice used by many companies to mitigate supply chain risks. It increases flexibility but hurts financial performance.	✓ Flexible production ✓ Centralizing production in a single plant
Disruption risk	Disruptions in the supply chain are unpredictable but often quite damaging. The drivers of supply chain disruptions include natural disasters, labor strikes, war and terrorism, supply bankruptcy and so forth.	✓ Flexible inventory ✓ Redundant suppliers

Source: Adapted from Chopra & Sodhi, 2004

The disruption risk is the last one, but this does not mean that it is the less important, as the categories of supply chain risk are not put in an order with respect to their importance. The management of supply chain risks is crucial, due to the increase of the importance of the supply chain partners. In the next section, it will be explained more in detail the supply chain disruption, which is the main argument of this research.

2.4 Supply chain disruptions

Craighead, Blackhurst, Handfield and Rungtusanatham (2007:134) defined supply chain disruptions as "unplanned and unanticipated events that disrupt the normal flow of goods and materials within a supply chain and, as a consequence, expose firms within the supply chain to risks".

Another definition is offered by Behdani, Adhitya, Lukszo and Srinivasan (2012:7) " A supply chain disruption is an event that might happen in any part of the chain and causes undesired impacts on its (achievement of) objectives and performance".

Other definitions are offered by Zegordi and Davarzani (2012), Business Continuity Institution (2014), Cantor, Blackhurst and Cortes (2014), Schmitt, Sun, Snyder, and Shen (2015) and Bode and Wagner (2015). All the definitions argue that supply chain disruptions are unpredictable and have enormous financial and non-financial consequences.

Supply chain disruptions can occur in each part of the supply chain, inbound logistics, outbound logistics and the internal process (Sheffi, 2007).

Inbound disruptions refer to supplier disruptions. Many companies do not suffer only the consequences of their direct suppliers' disruptions, but also the impact of indirect suppliers'

disruptions. The company buys components and raw materials from its direct suppliers. If a disruption happens to him, even the company will be affected. For example, the Taiwanese suppliers after the earthquake were not able to produce memory chips. As a result, they were not able to satisfy the demand for memory chips of many companies like Dell, Compaq, and Apple. The indirect suppliers supply the direct suppliers with components and raw materials. If a disruption hit their supply chain, the consequences will be felt by the direct suppliers, and as a result even by the focal company. For example, a chemical spill at a chip plant contaminated a clean room and shut down the production. The little chips were used to produce the automobile keys. Without the chips, the keys could not be produced, and General Motor could not sell the cars. Inbound disruptions do not result only from disasters. In a fast-changing industry, the capacity can be low because of the time to change the plants to produce the new products. For example, Nissan was not able to produce the planned amount of the new cars in 2004, due to a shortage of steels. Inbound disruptions can derive from problems in communication, due to infrastructure problems. For example, the power blackout of 2003 in USA, created problems for many companies in their communication with the suppliers outside the USA territory (Abraham, 2000; Sheffi, 2007 and Sheehan 2013).

Internal process disruptions involve directly the company. They include disruptions in the manufacturing plants and assembly plants if the company does not outsource the manufacturing and assembling phase. The sources of disruptions can vary from natural disasters to incidents. Internal disruptions sometimes are related to human resources. For example, in 2004 Michael Dell resigned, and Kevin Rollins become the CEO while

Michael Dell retained the title of chairman. During the management of Rollins, the performance of Dell was not as excepted. The sales were growing but very slowly. Nowadays, the internal disruptions are increasing due to the vulnerability of the information technology systems. The main examples are the computer viruses, which has caused huge losses to many companies (Dell, 2006; Sheffi, 2007 and Gilanina, Ganjinia, & Asadi , 2013)

Outbound disruptions are related to demand and customers. They include massive decline in demand due to new technology, loss of customer confidence, competition and customer disruption. Polaroid failed because the digital photo substituted the instant photo. Polaroid did not believe the new trend, digital photo, or maybe was too risk averse to invest in the new technology. In 1982, seven people died, after having used the pain reliever of Johnson & Johnson. The company was obliged to retire from the market the entire product, not only in the area where the people died but in all the markets. Due to the loss of customer confidence, Johnson & Johnson lost hundreds of million dollars. More common are the cases when many companies faced demand disruptions due to the strong competition that steal their demand and market share or due to customer disruption (Sheffi, 2007).

Sources of supply chain disruptions

The sources of supply chain disruptions are infinite. The best way to understand them is by classifying them into broader categories. Considering different publications regarding the sources of supply chain disruptions (Juttner, Peck, & Christopher, 2003; Sheffi, 2007; Wagner and Bode 2007; Craighead et al. 2007; Hendricks & Singhal 2009; Steckea & Kumarb, 2009; Schmitt et al., 2010; Busch, 2011; Revilla & Saenz, 2014), they can be

classified in the following categories: natural disasters, accidents and intentional disruptions.

A natural disaster is defined as any event or force of nature that has catastrophic consequences (Sheffi, 2007). The natural disasters include earthquakes, flood, forest fire, hurricane, lightning, tornado, tsunami, volcanic, avalanche, and so forth. The natural disasters can affect any part of the supply chain from suppliers to the customers. Many of the natural disasters are frequent, like tornados or earthquakes, and different statistical models can be used to estimate the likelihood of their happening and the potential impact into the supply chain. However, the experience had shown that many natural disasters are unexpected and with huge adverse effects in the global supply chains. The earthquake and tsunami in Japan (2011), paralyzed the automotive industry, and one month after the disaster the auto production in US decrease by 12% (Farole, 2011).

Accidents include unanticipated events such as quality accidents, labor accidents, fire, transportation accidents, communication accidents, and so forth. Some accidents have catastrophic effect, such as fire or quality problems, and some others have light effects in the supply chain. The best way to deal with them is prevention, by assessing the likelihood of the accident and the potential disruption. The company should design different scenarios for each type of accident that can happen and the best strategy to avoid them (Steckea & Kumarb, 2009 and Schmitt et al., 2015).

Intentional disruptions are the ones that are caused by conscious acts by a person or a group. They can be classified in terrorist and non-terrorist. The last ones include labor strike, adverse media coverage, management manipulations, cyber attacks, and many

others. Some of these attacks take place at the worst time and at the worst place- when the firm is more vulnerable and unprepared. The intentional disruptions are difficult to be predicted and so the best way to reduce their impact in the supply chain is to be always prepared (Steckea & Kumarb, 2009).

Consequences of supply chain disruptions

Supply chain disruptions can have serious negative economic impact, but even the non-economic impacts are devastating in many cases. Table 3 summarizes the most relevant literature regarding the consequences of supply chain disruptions.

Table 3: Consequences of supply chain disruptions

Reference	Consequences of supply chain disruptions
Hendrikcs and Singhal, 2005	✓ Lower stock returns relative to their benchmark ✓ Increase of share price volatility ✓ Drop in operating income ✓ Lower revenues ✓ Increase of costs
Sheffi, 2007	✓ Loss of revenues ✓ Loss of competitive advantage ✓ Restrictive government policies
Zegordi and Davarzani (2012)	✓ Delay materials, information and cash flows ✓ Increase costs ✓ Decrease sales
Bueno-Solano and Cedillo-Campos (2014)	✓ Bullwhip effect- loss of income ✓ Reduce time to enter of new products ✓ Reduce supply chain integration
Business Continuity Institution (2014)	✓ Loss of productivity ✓ Increased cost of working ✓ Loss of revenue ✓ Consumer complaints received ✓ Service outcome impaired ✓ Damage to brand reputation/ damage

The consequences of supply chain disruptions can be summarized in cost increase, decrease of incomes, damage to brand reputation and loss of competitive advantage. The next section presents the result of an international report on the sources and consequences of supply chain disruptions.

A recent report about supply chain disruptions

The Business Continuity Institute (BCI) on November 2014 published a report about supply chain disruptions. The report was based on the results of a survey that BCI had conducted from June 2014 to September 2014. More than 525 companies from 71 countries, which were active across 14 industry sectors, responded to the survey. The aim of the survey was to understand the main sources of supply chain disruptions their consequences and the company practices or factors that are increasing the vulnerability of supply chains. The results of the report are summarized in Appendix 1.

The main finding from the report was that different companies face different disruptions, as they operate in different sectors and different countries. For example, the probability of transport network disruption is higher in retail and wholesale sector rather than in financial service sector. The likelihood of being affected by adverse weather is high for companies operating in USA, Australia rather than for companies operating in Europe. The probability of earthquake/tsunami disruption is high for companies operating in Asian countries.

A supply chain disruption has not only devastating financial effects but even non-financial impacts such as brand reputation, shareholders concerns, and so forth. The financial consequences in many of the cases have a short-term impact while the non-financial effects have a long-term impact. A company that destroys its brand image loses the credibility of

shareholders or customers, and it will find harder to recover quickly after the disruption happened.

From the report, it can be noticed that many companies recorded a disruption in the inbound supply chain. Suppliers are a critical part of the supply chain, so companies should always check if their suppliers are able to manage disruptions. They are the starting point of the chain, if a disruption hit them, all the supply chain will suffer the consequences of the disruption.

2.5 Strategies for handling supply chain disruptions

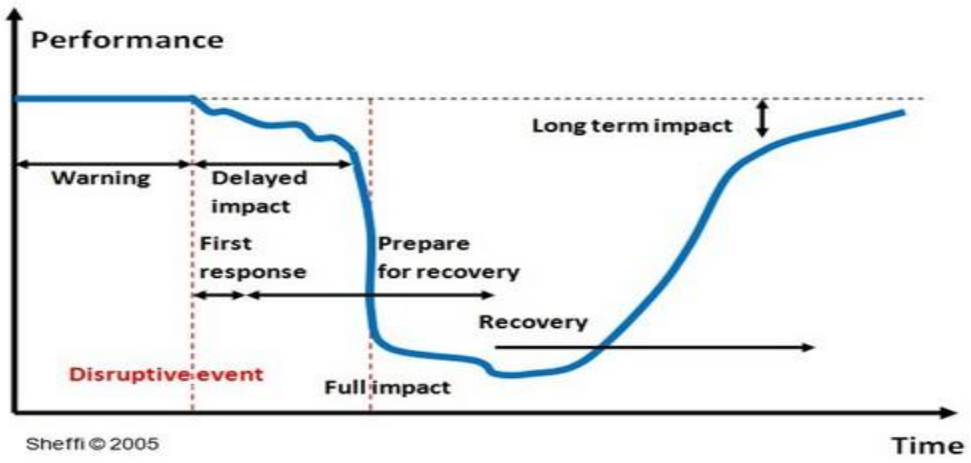
As long as, there have been supply chains, there have been disruptions. But only a few years ago supply chain disruptions begun to receive special attention (Pettit, Croxton, & Fiksel, 2013). The same authors listed the main reasons for such particular attention to supply chain disruptions. The main reason was the recent disruptive events, such as the terrorist attack on September 2001, hurricane Katrina and Rita and lastly the earthquake and tsunami in Japan, had caused devastating consequences to the supply chains.. As it is mentioned before, the consequences can be financial and non-financial. The last one has a long-term impact on the company performance.

Another reason is that firms are less vertically integrated, and their supply chain is located all over the world. A global supply chain is more exposed to a high range of risks. The starting point for designing strategies to handle supply chain disruptions will be a better understanding of the disruption's profile.

Disruption's profile

In Figure 2 it is presented the profile of a disruption.

Figure 2: Profile of disruption



Source: Sheffi (2007)

According to Sheffi (2007) the eight stages of a disruption are:

Warning: In some cases the company can predict or foresee the happening of a disruptive event. For example, the company may be advised before, even 30 minutes before, about natural disasters such as earthquake or tornados. Sometimes it is not possible to foresee the disruptive events such as terrorist attack.

Disruptive events: This is the time when the disruption happened.

First response: It refers to the actions undertaken immediately after the disruption occurs. The first respondents include security forces, employees and corporate resources. The first response differs across different disruptive events. For example in the case of fire, the first

response is to put out the fire while in the event of information technology disruptions, the first response is to shut down the system.

Delayed impact: The impact of disruptions is not always felt immediately. This is more prevalent in cases when the inbound logistic entities are affected by the disruption. For example, the auto industry in US did not feel the effects of the Japanese earthquake immediately. Their main suppliers felt the consequences of the earthquake instantly while their customers later.

Full impact: When the company feels the full impact of the disruption, its performance in most of the cases began to decrease.

Recovery preparations: They start in parallel with the first response or shortly after the full impact is felt by the company. The recovery preparation varies across the business, industries, and countries and by the type of disruption. For example, Nokia after being informed that the plant of its supplier went into flames, it started qualifying other suppliers to produce the components. Dell tried to attract the attention of customers to products that do not have the parts provided by the Taiwanese suppliers after the Taiwan earthquake.

Recovery: It means to return in normal conditions, as before the disruption happened. The time to recovery depends on the consequences of the disruption and on the recovery preparations of the company. For example, Nokia was able to recover more quickly than Ericsson after their supplier plant went into flames.

Long-term impacts: Disruptions that have consequences on customer relationships or company image are long lasting and difficult to recover from.

Managing supply chain disruptions

After the terrorist attack on September 2001, the issue of supply chain security had gained significant importance. The aim of many researches was to increase the resilience of the companies. Everything was focused on the warning stage. The companies should be prepared and supply chain risk management should be a specific department inside the company. Words such as flexibility, aligned and agile supply chains, multiple and reliable suppliers, continuous risk management and resilience were the words most used when supply chain disruption was mentioned (Lee, 2004; Christopher & Peck, 2004; Hendricks & Singhal, 2005; Sheffi, 2007; Vakharia & Yenipazarli, 2009;Farole, 2011; Revilla & Saenz, 2014 and Schmitt, Sun, Snyder, & Shen, 2015). As, it is defined in section 2.4, supply chain disruptions are unplanned and unanticipated events. Forecasting their happening is good, but forecasts are never 100% certain. The disruption will happen and the company should be able to react quickly. Not only it is the warning stage important but even the recovery preparation stage. The first phase prepares the company to face the disruption while the second one enables the company to recover quickly after the disruption occurred.

After reading a wide literature, the author classified the actions and strategies to handle supply chain disruptions in three categories. The first category is called supply chain risk management, the second category is called supply chain disruption management while the third view is called the integrative framework.

Supply chain risk management refers to the identification, analysis of risks as well as their control (Blome & Schoenherr, 2011; Giannakis & Louis, 2011 and Li, Fan, Lee, & Cheng,

2015). Other authors identify these activities with other names like “pre-disruption”(Behdani, Adhitya, Lukszo, & Srinivasan , 2012), “prevention” (Thun & Hoening, 2009) or “proactive” (Dani & Deep, 2010).

Supply chain disruption management is a continuous process that analyzes the impact of disruptions and the way how they are managed (Xiao & Yu, 2005 and Behdani, Adhitya, Lukszo, & Srinivasan , 2012). The same authors used another name “post-disruption activities”. Thun and Hoening (2012) called them “response” while Dani and Deep (2010) used the term “reactive”.

So, a group of authors thinks that the best way to handle supply chain disruption is being prepared, while another group of authors thinks that the response of the company to the disruption define the successful handling of the disruption.

For managing the disruptions, both the proactive and reactive perspective is important. By investing in supply chain risk management, many disruptions can be avoided and the supply chain disruption will be faster if the company has proper planning. However, due to cost and time many risks cannot be always predicted, so more attention must be paid to the response strategies.

There have been some attempts to offer an integrative framework (Pyke & Tang, 2010 and Behdani, Adhitya, Lukszo, & Srinivasan , 2012) to handle disruptions. The authors did not consider supply chain risk management and supply chain disruption management separately but interconnected. The next sections will summarize the relevant literature for each of the three frameworks.

2.6 Supply chain risk management

Many authors have studied the supply chain risk management perspective. We can mention the works of Tah and Carr (2001); Harland, Brenchley and Walker (2003); Hallikas, Karvonen, Pulkkinen, Virolainen and Tuominen (2004); Finch (2004); Hallikas, Puumalainen, Vesterinen and Virolainen (2005); Kleindorfer and Saad (2005); Tang (2006); Wu, Blackhurst, and O'Grady (2007);Sheffi (2007); Manuj and Mentzer (2008); Knemeyer, Zinn and Eroglu (2009); Adhitya, Srinivasan and Karimi (2009); Cigolini and Rossi (2010); Sodhi, Son and Tang (2011); Blome and Schoenherr (2011); Tang, Matsukawa and Nakashima (2012); Li, Fan, Lee and Cheng (2015) and many others.

According to these authors, the main steps in supply chain risk management are risk identification, risk analyzing, risk mitigation and risk monitoring. Different authors have used different terminologies for each step, but the meaning was nearly the same. After having identified the risks, the managers have to analyze the impact of the risk carefully. As it is mentioned above disruptions are an important category of supply chain risks. After the analysis of the risk, the company should handle the disruption. The authors of this perspective suggest the following strategies to handle supply chain disruptions: robustness strategies, security-based strategies and resiliency strategies.

Robust supply chain strategies.

A robust supply chain strategy is a strategy that helps the company to reduce costs and improve customer satisfaction under normal circumstances and also helps the company to manage the small disruptions and major disruptions by being both cost and time efficient.(Tang, 2006). The nine robust strategies are described in Table 4.

Table 4: Robust strategies for mitigating supply chain disruptions

Robust strategy	Description	Main objective	Benefits	
			Normal conditions	After a major disruption
Postponement	All the products share the same components and processes. They differ only in the last phase of production	Increases product flexibility.	Improves capability to manage supply	Enables to change the configurations of different products quickly.
Flexible supply base	Keep more than one supplier for each component and product.	Increases supply flexibility.	Improves capability to manage supply.	Enables to shift production among suppliers promptly.
Strategic stock	Keep inventory of bottleneck and strategic products.	Increases product availability.	Improves capability to manage supply.	Enables to respond to market demand quickly during major disruptions.
Make or buy	Perform inside the critical activities and outsource the low-value activities.	Increases supply flexibility.	Improves capability to manage supply.	Enables to shift production between firm's production flexibility.
Supply incentives	Offer supply chain incentives to maintain the best suppliers.	Increases product availability	Improves capability to manage supply	Enables to adjust order quantities quickly.
Flexible transportation	Use multiple modes of transportation and try to have information for every alternative route .	Increases flexibility in transportation	Improves capability to manage supply	Enables to change the mode of transportation rapidly
Revenue management	Promote the products that are widely available, in order to do not increase the demand for the products that cannot be produced due to the disruption.	Increases control of product demand.	Improves capability to manage demand	Enables to influence the customer product selection dynamically
Assortment planning	Locate the widely available products in the shelves that are easy to be seen.	Increases control of product demand	Improves capability to manage demand	Enables a firm to influence the requirements of different products quickly
Silent product rollover	New products are introduced slowly without formal announcement.	Increases control of product exposure to customers.	Improves capability to manage supply and demand	Enables a firm to manage the demands of different products swiftly.

Source: Adapted from Tang (2006)

Security based strategies

After the terrorist attack of September 2001, many companies focused on developing security based strategies. Still today the focus on supply chain security remains top in mind due to the risk of terrorist attack and an increase in the complexity and challenge to secure the supply chains (Partridge, 2012). Based on different publications: Sheffi (2001); Rice and Caniato (2003); Sheffi and Rice (2005); Sheffi (2007); Audry & Bobbitt (2008); Hilletofth (2009) ;Williams, Lueg, Taylor and Cook (2009); Linton, Boyson and Aje (2014); Genus and Mafakheri (2014) the security based supply chain strategies can be categorized in:

Employee hiring strategies: This strategy is necessary to avoid hiring the "enemy" in the company. In many cases, the terrorist was employed in the companies where the attack happened.

Physical security strategies: To increase the physical security companies can take the following actions: camera, entering in the building only with a badge, guards or security testing by experts.

Non-physical security strategies: These strategies are related mainly to the information system. To increase the information security companies use different firewalls or other security software. Many companies that are more vulnerable to these type of risk spend a lot on training the staff to handle the informatic attacks.

Supply chain partner selection: The" enemy" should not be inside the company but even your partner. A careful screening based on security measures must be performed when selecting suppliers, distributors and the clients (only in the business to business sector).

The first three strategies are necessary to increase the security of the focal company while the last one is necessary to reduce the risks coming from the supply chain partners.

The same authors especially Sheffi (2007) and Rice & Caniato (2003) argued that a secure supply network does not increase the resilience of the supply chain. Increasing supply chain security is one of the first steps for increasing supply chain resilience. Now let's analyze the resiliency strategies.

Resiliency strategies

The resiliency strategies are the ones that help the company to increase the supply chain resilience. Supply chain resilience does not merely imply the ability to manage risks but even the capability to do it better than the competitors by gaining competitive advantage (Sheffi, 2005).

After a critical review of the literature, the resiliency strategies are summarized in Table 5.

Table 5: Resiliency strategies

Strategy	Description	Sources
Increase flexibility		
Flexible supply base	It can be achieved through multiple sourcing or collaboration with suppliers. If the company does not want to build deep relationships with the suppliers than it is better to rely on many suppliers. If the company knows better the supplier, it can monitor them and detect disruptions quickly.	Choi and Krause (2006); Tomlin (2006); Chopra, Reinhardt and Mohan (2007) ;Sheffi (2007);Tang and Tomlin (2008); Deane, Craighead and Ragsdale (2009); Wang, Gilland and Tomlin (2010); Sawik, (2014)
Flexible production	The flexibility of production can be increased by using standard process and parts of production. Many phases of production should be general, meaning identical for all the products, and only the last phase should be customized. This strategy allows the firm to produce the products only when they are requested as they differ only at the last stage of production. Also, it is recommended that the process of production should be identical in all the plants, so if a problem happens in one plant, the other can substitute its production.	Sheffi (2005);Aimi (2006);Babich (2006); Tang (2006);Tang and Tomlin (2008); Manuj and Mnetzer (2008); Yang and Yang (2010); Marques, Alves and Sousa (2013); Boonman, Hagspiel and Kort (2015)
Flexible transportation	It can be achieved by using different means of transportation, multiple distributors and also multiple routes of transportation.	Tang (2006); Steckea and Kumarb (2009); Colichia, Dallari and Melacini (2010); Chen and Kasikitwiwat (2011); Chen, Liu and Yang (2015).
Increase redundancy		
Extra inventory	The company can keep extra inventory to cope with demand fluctuation or extra inventory of raw materials to deal with potential inbound disruptions.	Chopra and Sodhi (2004); Tomlin (2006); Tang (2006);Sheffi (2007); Wilson (2007); Hendricks, Singhal and Zhang (2009); Steckea and Kumar (2009); Kovasc, Egri, Kis, and Vancza (2013)
Low capacity utilization	If the company keeps excess capacity in many plants, in case of an emergency closure of a factory, the products can be produced in the other factory.	Chopra and Sodhi(2004); Sheffi (2007); Goh, Lim, and Meng (2007); Behdani, Adhitya, Lukszo and Srinivasan (2012)
Backup suppliers	To reduce the impact of inbound disruptions the company can keep extra inventory of raw materials or backup suppliers. Each company chooses the best solution based on their conditions.	Sheffi (2005); Tomlin (2006); Deane, Craighead and Ragsdale (2009); Wang and Ip (2009); Sting and Huchzeirmer (2010); Chen, Xiabo and Zhou (2012)

Increase controls		
Suppliers selection	The supplier should be selected based on some quality measures. Also they should be monitored if they are respecting these quality standards. Firms can offer incentives to the suppliers to meet their quality standards.	Sheffi (2007);Wagner and Bode (2007); Ellegard (2008);Manuj and Mnetzer (2008);Tomlin (2009); Carter and Easton (2011); Singh (2014)
Security improvement	This strategy is widely discussed in the previous section.	Sheffi (2001);Rice and Caniato (2003); Sheffi and Rice (2005); Sheffi (2007);Audry & Bobbitt (2008); Hilletofth (2009) ; Williams, Lueg, Taylor and Cook (2009);Linton, Boyson and Aje (2014) ; Genus and Mafakheri (2014)
Demand-responsive supply chain	A demand responsive supply chain can cope quickly and with low cost with demand fluctuations. To increase the firm's responsiveness to demand firms can rely on strategies such as responsive and flexible pricing. For example, firms can use promotions or price reduction to shift demand from the non-available products to the available ones.	Sheffi (2005); Tang and Tomlin (2008); Steckea and Kumar (2009); Ji (2009); Roh, Hong and Min (2014);

One way to enhance the resiliency of the supply chain is increasing its flexibility. Flexibility is the ability to take different positions to respond quickly to an extraordinary situation and turn quickly at normality (Lee , 2004). The flexibility of the supply chain can be increased by having a flexible supply base, flexible production and flexible transportation.

Another way to increase supply chain resiliency is creating redundancies across the supply chain. It can achieve this by keeping extra inventory, backup suppliers or operating at low capacity utilization. All these strategies increase the costs of the company, slow the operations and can also reduce quality. For these reasons, many companies today do not rely on redundancy for increasing supply chain resiliency but on collaboration.

Firms can increase the controls over the supply chain, to detect the disruptions quickly. The controls should start from the upstream part of the supply chain to the downstream part.

Increasing flexibility, redundancy and controls is costly and time-consuming. Many firms do not like to invest in preventing disruption that maybe can never happen. Some disruptions cannot be predicted by the firm, so the recovery from the disruption depends on the reaction of the firm after the disruption happened. This is called supply chain disruption management.

2.7 Supply chain disruption management

Supply chain disruption management has not been studied by many authors compared to supply chain risk management. The work of Blackhurst, Craighead, Elkins and Handfield (2005), Sheffi (2007) and Revilla and Saenz (2014) has received the most attention in the literature on this topic.

Blackhurst et al., (2005) described the supply chain disruption management as a process with three steps. Firstly, the disruption must be discovered and then the managers should think about actions and strategiesto undertake. After the firm recovered from the disruption, it should think how to redesign its supply chain, to become more resilient in the future. So to handle disruptions, the company should follow these steps: disruption discovery, disruption recovery and supply chain redesign.

Sheffi (2007) argues that the main cultural traits that lead some firms to handle better the disruptions and recover profitably are:

Continous communications among informed employees: Keep informed all the employees and managers for the strategic goals, tactical factors, daily problems, and so forth.

Distributed power: The power should be distributed to empower teams and individuals to take actions when it is necessary, without waiting the high manager consensus.

Passion for the work: Motivated employees, are more efficient and available in normal and extraordinary situations.

Conditioning for disruption: The frequency and broad range of normal disruptions exercises help the firms to get ready for any future disruption.

These four cultural traits complement each other. Understanding the relationships between them define the successful handling of supply chain disruptions.

Many organizations do not manifest these cultural traits. Changing the corporate culture is very difficult, but some real life examples, like General Motor process of cultural change, demonstrate that it can be done.

Revilla and Saenz (2014) concluded that the management of disruptions by global firms at the internal and inter-organizational level is universal. National differences have a week impact on disruption management. The same is not true for the local firms, as national culture affects the supply chain disruption management process.

Summarizing, when the disruption happen the firm should react quickly to recover. The corporate culture sometimes imposes limits in handling supply chain disruption, for this reason some firms recover quickly and profitable while some others no. It is important that

after the firm turns back into normal conditions, it should redesign its supply chain, taking into consideration the lessons from the past disruption.

2.8 The integrative framework

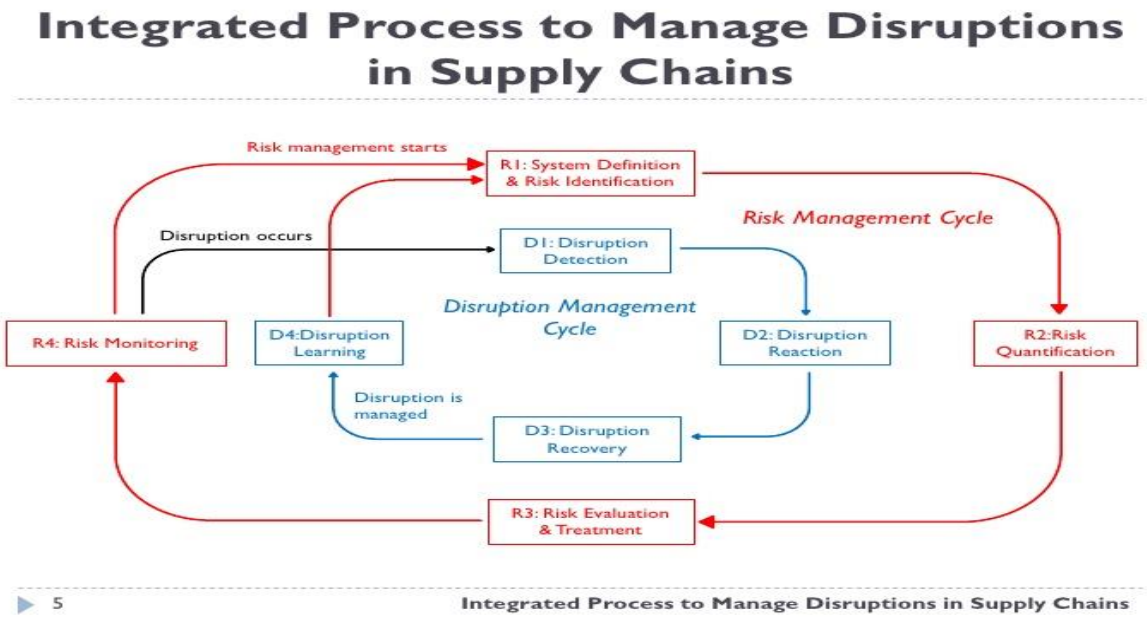
Regarding the integrative framework for handling disruptions, as mentioned above in the literature, the author found only two relevant publications. The first publication was the 3R framework proposed by Pyke and Tang (2010). 3R stands for Readiness, Responsiveness and Recovery. The study was focused on a particular case (product safety risk). The authors suggest that to handle disruptions successfully, firstly the company have to be ready for the disruptions, to create an action plan in order to response quickly to the disruption and to implement strategies and actions to return back to normality. The disruptions should be handled before, during and after their happening.

The next work was the one of Behdani, Adhitya, Lukszo and Srinivasan (2012). Differently from the other authors they offered a general and more detailed integrative framework for handling supply chain disruptions. According to this framework, the handling of supply chain disruptions is an ongoing process with two distinct cycles. The first cycle is called Risk Management Cycle. The cycle starts with risk identification. After the risk is identified the company must evaluate the possible impact on the company performance (its probability of happening and its consequences). If the expert thinks that the risks need to be prevented, actions and strategies must be planned. The authors suggested that the risks must always be monitored, to track possible changes.

The first cycle is necessary to be prepared for the risks that can happen to the company. The second cycle called Disruption Management Cycle is essential when the disruption happens. After detecting the disruption, the company must react quickly to manage the disruption. Companies can use strategies and actions previously defined in the first cycle, but in some cases they can be adequate so an alternative solution must be found quickly to return to normal conditions. The process does not stop here. The company must review the process followed and highlight some lessons for handling future supply chain disruptions.

In other word, the integrative framework suggests that the prevention and reaction strategies must be coordinated between them. They cannot stay as two separate processes. The framework is presented in figure 3.

Figure 3: The integrative framework



Source: Behdani, Adhitya, Lukszo and Srinivasan (2012).

2.9 Literature gap

The table 26, in Appendix 2, summarizes the literature review related with supply chain disruptions and strategies to handle them.

As it can be seen from the table there is no gap in literature review regarding supply chain disruptions. Different authors have developed clear frameworks for understanding supply chain disruptions, their sources and consequences.

Regarding strategies for handling supply chain disruptions exist three different views in the literature. The first group of authors stresses the importance of increasing the resilience and robustness of the supply chains, which in turn will enable companies to forecast disruptive events and reduce their impacts. According to these authors, the best strategy for handling supply chain disruptions is a pro-active strategy, meaning being prepared for the disruption. The second group of authors argues that a pro-active approach to disruptive events is good, but sometimes the disruptive event hit the company when and where it is not prepared. In this case, a reactive approach is necessary. Companies should be able to design strategies that enable them to handle supply chain disruptions and to recover quickly after the disruptive event. For this approach, we can mention the contribution of Blackhurstet et al. (2005) that provide a three-step process for handling supply chain disruption. Sheffi (2007) realized that corporate culture is an important factor in handling supply chain disruptions. For managing the disruptions, both the proactive and reactive perspective is important. By investing in supply chain risk management, many disruptions can be avoided and the supply chain disruption will be faster if the company has proper planning. However, due to cost and time many risks cannot be always predicted, so more attention must be paid to the

response strategies. There have been some attempts to offer an integrative framework (Pyke & Tang, 2010 and Behdani et. al. 2012) to handle disruptions. The authors did not consider supply chain risk management and supply chain disruption management separately but interconnected.

The research gap identified in the literature review is that nearly no one has considered why some companies were successful in handling supply chain disruptions and some no. The author said nearly no one because as it is mentioned above Sheffi (2007) stated that corporate culture defines the success of some companies in handling supply chain disruptions compared to other companies.

It is not a matter of having a resilient supply chain or having implemented a robust supply chain strategy. To design a strategy is easy but the execution is difficult. The same strategy cannot work well for each company. There are cases when companies operating in the same sector were hit by the same disruption, but some survived and some did not. Their success was based on many factors, like company background, organization structure and culture .The evidence showed that the best strategy for handling supply chain disruptions is a combination of being prepared and implementation of robust strategies.

It is important to mention that no research on supply chain disruptions has been conducted before in Albania. The results of this research will be of high practical importance for many Albanian companies. Some failed to handle the disruption, some were successful. Lessons can be learned from both. Be aware not to repeat their mistakes.

2.10 Conclusions

Interest in supply chain disruption management increased in the last years, because companies now compete in global markets, where competition is tough, and to survive they have to be cost efficient. To reduce costs and increase efficiency, companies keep nearly zero inventories (Just in time inventory management) and try to find low-cost suppliers. All these in turn increase their exposure to disruptions. Also, the supply chains of many companies are becoming complex, difficult to be managed and more exposed to risks. Another reason, for this special attention to supply chain disruptions, is that the consequences of many recent disruptions, such as the terrorist attack or recent earthquakes, have been devastating.

Being a resilient enterprise, is the goal of each company. Many companies now have a supply chain risk management department, responsible for the forecast of different disruptive events that can hit the company and all the entities involved in the supply chain. A pro-active approach to disruptive events is good, but sometimes the disruptive event can hit the company when and where it is not prepared. In this case, a reactive approach is necessary. Companies should be able to design strategies that enable them to handle supply chain disruptions and to recover quickly after the disruptive event.

The main trend in the literature review is toward supply chain risk management, strategies that prepare companies to forecast and handle supply chain disruptions. However, disruptions can happen even when the company is unprepared. In this occasion, not only the proactive strategies but even the strategies and actions undertaken by the companies

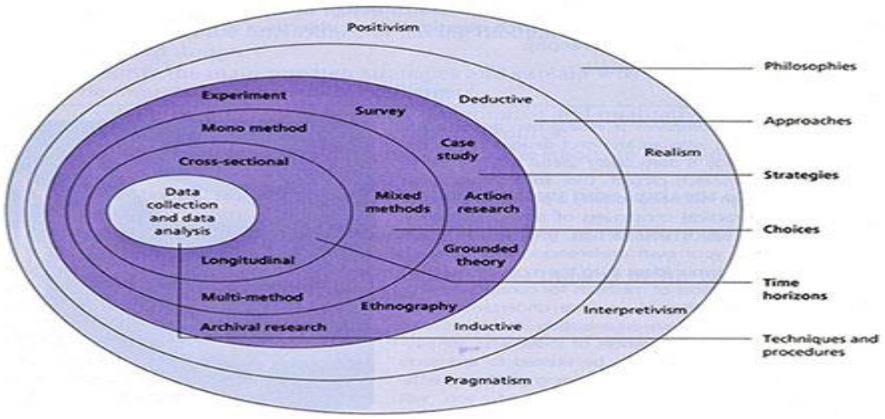
after the disruption occurred (reactive strategies) can define their success in handling supply chain disruptions. This topic is not studied a lot in literature.

There is a gap in literature regarding the factors that determined the success of some companies in handling the supply chain disruptions compared to the competitors. The actual research will try to fill this existing gap.

CHAPTER III: RESEARCH METHODOLOGY

The aim of this chapter is threefold. Firstly, the author will answer to the question "how shall I conduct my research?" by referring to the research onion structure (see Figure 4). Saunders, Lewis and Thornill (2012) compared the research process as an onion with six layers: research philosophy, research approach, time horizon, research design, research strategy, and data collection methods. A specific section will be dedicated to each layer, by explaining the rationale for choosing that particular method compared to other methods. As the research strategy is case studies, the author will explain which case studies were chosen and why they were selected. Also, she will explain how the analysis of the case studies will be structured. Lastly, the research model will be presented and the ethical issues will be discussed.

Figure 4: Research onion



Source: Saunders et.al (2012)

3.1 Research philosophy

The research philosophy is related to the way in which you view the world. The research philosophy will affect the research strategy and research methods that the authors will choose for their research project. Saunders et al. (2012) mention four types of research philosophy: positivism, realism (critical or direct), interpretivism and pragmatism.

Positivism is related to the testing of theories, based on structured and quantitative data. The research is not influenced by the researcher's values.

Like positivism, realism is a philosophical position associated with scientific inquiry. Realism states that the research is influenced by the world and personal views. Researchers reflecting direct realism argue that what is experienced through their senses provide an accurate representation of the reality. Researchers reflecting critical realism try to consider the underlying complexity. Collection techniques and analyzes procedures are different, based on quantitative, qualitative or mixed data. The level of objectivity is high for the last one.

The interpretivism philosophy relates to the study of social phenomena in their natural environment. Collection techniques and analysis procedures are more likely to use qualitative data.

Pragmatic researchers consider that no single viewpoint can give the entire picture. They use different collection and analyzes techniques.

The research philosophy of this study is critical realism, as during all the research the level of objectivity was very high. The author has always tried to collect and analyze information and data from different and reliable sources, to better understand the research topic.

3.2 Research approach

Every research project will involve the use of theory. So it is necessary to understand the research approach, which will affect the methodology and data collection techniques chosen for the study. There are three types of research approaches: deductive, inductive and abduction design. The deductive approach is used to test the validity of a theory, while the inductive approach is used to propose a theory. The abduction approach is a combination of the first two approaches.

The research approach of this research project is inductive. The author has used an inductive approach as she has identified a surprising fact. Companies in the same industry were affected by the same type of supply chain disruption, but some gained market share after the disruption and others lose market share or get out of the market. The author has collected data and information to understand how this could have occurred. So, she has collected data to explore a particular phenomenon, by proposing a theory at the end of the research.

3.3 Time horizon

The time horizon can be cross-sectional (data are collected at a specific point in time) or longitudinal (data are collected at different points in time). In this research project, the data

were collected mainly at a specific point in time: the time of the disruptive event. So the time horizon of the research project is cross-sectional. The best research strategy for cross-sectional data is survey or case study.

3.4 Research design

The research design is a blueprint that is followed to complete a study. It is analogous to an architect's blueprint for a house. "Even though it is possible to build a house without a detailed blueprint, doing so will more than likely produce a final product that is different from that was originally envisioned by the buyer" (Churchill and Iacobucci, 2009:74), and most likely, the result would be poor. Hence, the research needs a clear design to be thorough.

Types of research design

It is important to understand the main features of possible research designs before choosing one. There are many research frameworks, but Saunders et al. (2012) summarized them in three categories: quantitative, qualitative or multiple methods.

The quantitative research design examines the relationship between numerical variables using different statistics techniques. It refers to any data collection technique or data analysis procedure that generate or uses numerical data. Because data are collected in a standard manner, it is important that questions are standard and clear.

The qualitative research design examines the relationship between the participants in the research, using a variety of data collection methods and procedures. It refers to any data collection technique or data analysis procedure that generate or uses non-numerical data.

Contrary to the quantitative research design the data collection is not standardized so that the questions and procedures may alter during the research.

Multiple methods research design includes multi-method research and mixed methods research. In the multi-method research design different data collection techniques, associated with a specific analysis procedure, are used. For example, the researcher can collect quantitative data using questionnaire and structured interviews, and then analyze them by using statistical procedures *(*multi- method quantitative study). Alternatively, he can collect qualitative data using in depth-interviews and diary accounts and analyze these data by using qualitative procedures (multi -method qualitative study). The mixed method research combines quantitative and qualitative research. The mixing of methods may occur at each stage or in a particular stage of the research. However, the most important part is the integration of the two methods. The integration can be used only when the methods are complementary.

Applied research design

The main aim of the actual research is to understand how companies reacted when the supply chain disruptions occurred. The first step is to analyze the disruptive event, and its impact on the companies under consideration.

After analyzing the disruptive event, the author collected information about the strategies and actions that the company and its competitors implemented to recover from the disruption. Lastly, the performance of the company after the disruptive event was analyzed. The performance was achieved in terms of market share of the company or profit compared

to competitors. The author tried to find the relationship between the strategy implemented and the performance after the disruptive event. In other words, she attempted to explore the effect of the disruptive event and the reaction of the company.

In this research, a quantitative research was conducted, by collecting and analyzing numerical data about the impacts of the disruptive event and the performance of the company. Also, a qualitative research was conducted, by collecting qualitative data about the disruptive event and the strategies implemented by the companies to handle the supply chain disruption. Both qualitative and quantitative methods were complementary and supported each other. For example, the quantitative research showed that the performance of the company increased as its market share, profit, revenues or other financial indicators increase while the qualitative research was necessary to understand better why this increase in performance happened.

3.5 Research strategy

The main research strategies include experiment, survey, archival research, case study, ethnography, action research, grounded theory and narrative inquiry. They are presented in table 6.

In the table are described the key features of each strategy and the type of research design with which they are linked. Based on this information the author could decide which is the best research strategy for the actual research.

Table 6: Research strategies

Research strategy	Main characteristics	Research design
Experiment	It studies the probability of a change in an independent variable that cause the change in a dependent variable. Hypotheses are used to study the relationship between variables.	Quantitative
Survey	It is used to collect quantitative data that can be analyzed using statistical methods.	Quantitative
Archival research	It makes use of administrative records and documents. It allows research questions, which focused on the past and changes over time, to be answered.	All research designs
Case study	It explores a research topic or phenomenon within its context or within a number of real life-contexts. It is used when you need to generate answers to the questions what, how and why. It can be used a single case approach, because that single case study is unique and critical, or a multiple case study approach, when it is necessary to develop a research design based on more than one cases as they are expected to give nearly the same results .	Mixed methods
Ethnography	It is used to study people in groups, who interact and share the same space with each other.	Qualitative
Action research	It is an emergent and iterative process of inquiry designed to develop solutions to real organizations problems, using different types of knowledge. The purpose is to promote organizational learning and to produce practical outcomes. It is most suitable for long- term research projects.	All research designs
Grounded theory	It is used to develop a theoretical explanation of social interactions and processes in a wide range of context including business and management.	Qualitative and Quantitative
Narrative inquiry	It is an account of an experience that it is told in a sequenced way.	Qualitative

Source: Saunders et al. (2012)

Applied research strategy

The research design used for this research is mixed methods research. So it can be excluded the experiment, survey, ethnography, grounded theory and narrative inquiry research

strategy. Even the action research strategy is not appropriate for this research as given a certain context it is used to plan and evaluate the company's actions. It requires systematic collaboration and interactions of the researcher with the members of the organization. The main aim is to facilitate the improvement of organizational practices while the purpose of this research is to understand how companies managed supply chain disruptions.

The actual research is based on past events, and maybe the archival research strategy can be used. However, this logic is wrong, as an archival research focuses on changes over the time, from the past until now while this research focuses on a specific period, the ones when the disruption occurred. So the case study is the best research strategy as it will enable to answer to the research questions*: What* strategies and actions have been implemented by the companies to handle supply chain disruptions? *Why* the companies have implemented such strategies and actions and *How* effective they were?

The case studies chosen were five, respectively Dell, Nokia, Daimler, Meggle Albania and Fabjus case study. The next sections will explain the rationale for selecting these case studies. There have been selected more than one case study as they are expected to give nearly the same results.

3.6 Dell, Nokia and Daimler case study

A wise person learns from others mistakes while a fool learns from his experience (Sheffi, 2007). This phrase explains the reason for dedicating a separate chapter to Dell, Nokia and Daimler case studies.

The lessons from the experience of these companies in handling supply chain disruptions are crucial in the academic and real world. Many researchers have mentioned these case studies, as an example of success in handling supply chain disruptions, but very few have analyzed them in detail. Also, the lessons from their experience have been of critical importance for managers in different companies.

Real life examples have shown that the severity of disruptions is different for companies in the same industry. Many companies have handled the supply chain disruptions successfully. Their competitors faced the same disruptions, but they recovered from the disruptions with significant losses or some did not recover. There is a gap in the literature regarding this topic, as it has been studied how the companies have handled disruptions, but very few have analyzed why the severity of a disruption was different for companies in the same industry. So, the author analyzed these case studies from this perspective, trying to fill the existing gap in the literature.

Dell, Nokia and Daimler faced a supply chain disruption, respectively in 1999, 2000 and 2001. On September 2001, two planes stroked and toppled the twin towers of New York City. It was one of the most terrible terrorist attacks of the modern history. After the terrorist attack, many research projects were charted to analyze the supply chain disruptions, especially the intentional disruptions, and their effects. The aim of the research projects were how to be prepared for handling supply chain disruptions. After the terrorist attack, companies increased their awareness to supply chain disruptions, they created a special department for managing supply chain disruptions and also they spent time and money to build a resilient supply chain (Pickett, 2003). But, how did the companies handle supply chain disruptions before 2001, when the focus on supply chain management

disruptions was low compared to now? The case studies refer to years very near to 2001 but before 2001, so they are three perfect case studies for the purpose of this thesis.

The next subsection will present the reasons for choosing two electronics companies (Nokia and Dell) and one automotive manufacturing company.

Why electronics companies?

First of all, the electronics companies produce products that are necessary for the society of nowadays. For example, Dell produces computers while Nokia telephones, two products that each person have.

Second, electronic companies have complex supply chains and organizational structures. To produce a computer or a telephone many small components are needed and the companies buy these components from different suppliers. A delay of one of the components will cause the delay of the entire production.

Third, the electronics companies are more vulnerable to supply chain disruptions as the electronic industry is very competitive and innovative. The innovations are frequent, and if the company is not able to introduce always innovative products, it will lose market share or go bankrupt. A disruption in the supply chain will increase the time to enter of the innovations.

Lastly, the electronics companies have global supply chains. Their supply chain is global from the beginning, suppliers, to the end, final customers. They buy components from all over the world, where they are best available, in terms of cost and quality. Also, they sell their products to customers worldwide, and the new era of Internet is making easier this.

Everyone can order a Dell computer or a Nokia telephone, from every corner of the world. As it is explained in the previous chapter, a global supply chain is more exposed to supply chain disruptions.

Why an automotive manufacturer?

The automotive corporations have manufacturing plants all over the world. The benefit of this strategy is low cost and high demand responsiveness. However, the main disadvantages are loss of control by the mother company and increased exposure to disruptions. Damages to one production facilities can result in a global shortage.

Like the electronics companies, the automotive manufacturers have global and complex supply chains, which in turns are more exposed to disruptions.

The supply chains of the electronics and automotive companies are more exposed to disruptions, so they are two perfect choices for this research. There are many electronics and automotive companies, but the author has selected Dell, Nokia and Daimler for the reasons mentioned in the next subsection.

Why Dell, Nokia and Daimler?

The supply chain disruptions can be classified into three broader categories: natural disasters, accidental and intentional (Sheffi, 2007). Dell suffered a natural disaster disruption, Nokia suffered an accidental disruption while Daimler-Chrysler faced an intentional disruption. Hence, these case studies cover all the three types of disruptions.

Secondly, all the three companies were able to handle the supply chain disruptions successfully, and also they gained market share after the disruption occurred. Dell became

the number one in the computer industry in terms of market share. Nokia do not only gained market share but also brought out of the market one of its biggest competitors, Ericson. Daimler was able to satisfy the increasing demand, unlike Ford and GM. Why the severity of the same supply chain disruption was different for companies in the same industry? The case studies will address this question that is the research question of this dissertation.

Moreover, lastly, their success in handling the supply chain disruptions was due to the organizational culture and company background, therefore the lessons from their experience are really important for the objective of this research.

Summarizing, Nokia, Dell and Daimler case studies do not only bring important lessons for managers and researchers but also they are relevant to the research question of this study.

3.7 Albanian case studies

As mentioned above, in this research will be analyzed even two Albanian case studies (Meggle and Fabjus case studies). The next two sections will explain the reasons for choosing these case studies and not others.

Meggle Albania case study

There are three main reasons for choosing Meggle Albania case study.

Firstly, the aflatoxin scandal faced by Meggle Albania, was widely discussed in media.

Secondly, this case study was compatible with the research aim of the study, as the same disruption hit two companies in the same industry, but one handled the disruption successfully while the other did not.

Also, the author was able to conduct in depth-interviews with the managers of the company. The plant manager Mrs. Meraj was very collaborative and provided all the information required.

Fabjus case study

The aflatoxin scandal was a disruption well known by all while the disruption faced by Fabjus and other companies were not well known by the public. The author got information about these case studies by her previous researches and by word of mouth.

Previous researches: The author has made research about supply chain management in different industries in Albania, like beer industry, milk processing industries and so forth. The methodology used for these researches was semi-structured interviews. This type of research strategy allows to meet face to face the managers and to earn their credibility which in turns gave the possibility to get information about sensitive topics.

Word of mouth: The author's previous researches could provide some information for disruptions in some industries, but the disadvantage is that many industries are excluded and you are not sure that all the managers interviewed will provide information for sensitive topics like disruptions. So, to get informed for other disruptions faced by the Albanian companies, the author used to ask colleagues, relatives and other persons that could have information.

At the end of this primary research, the author ended up with a list of 10[2] relevant case studies. But the most difficult part was getting detailed information for the disruptions. Five companies did not accept to provide information. One manager said "Why remembering a disruption that nearly destroyed our business", while someone else said "Why revealing our strategies for handling disruptions?"

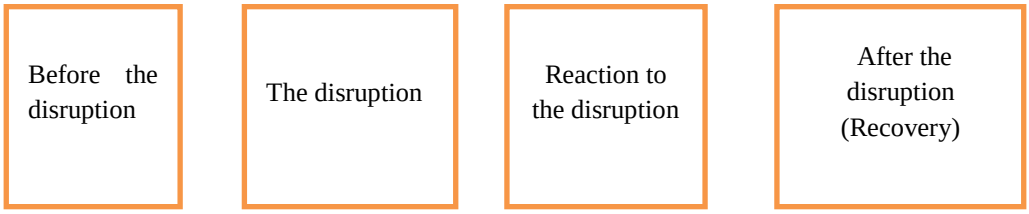
The other five companies kindly offered the information asked to them, but only one of these five cases was fully compatible with the research question of the study. All the information for Fabjus case study was provided by the owner of the company Mr. Kalemi. The sale and purchasing manager were available to provide detailed information for some topics that were of their competence.

So the main reasons why Fabjus case study was chosen was the availability of information from the managers of the company and the compatibility of the case with the research aim of this study.

3.8 Case study analysis

The analysis of the case studies is structured in four main parts, as shown in the Figure 5.

Figure 5: Structure of case studies analysis



[2] To respect the anonymity the names of the companies that were not part of this research will not be mentioned.

The study will start with the analysis of the company before the disruption. The analysis will be focused on the following elements: company background, supply chain, organizational culture and structure. Detailed information will be collected for each item but in the thesis will be presented only the ones that are relevant for this research.

In the second phase, the disruption will be analyzed. It will be described how, when and where the disruption happened and it will be analyzed its effects in the specific industry.

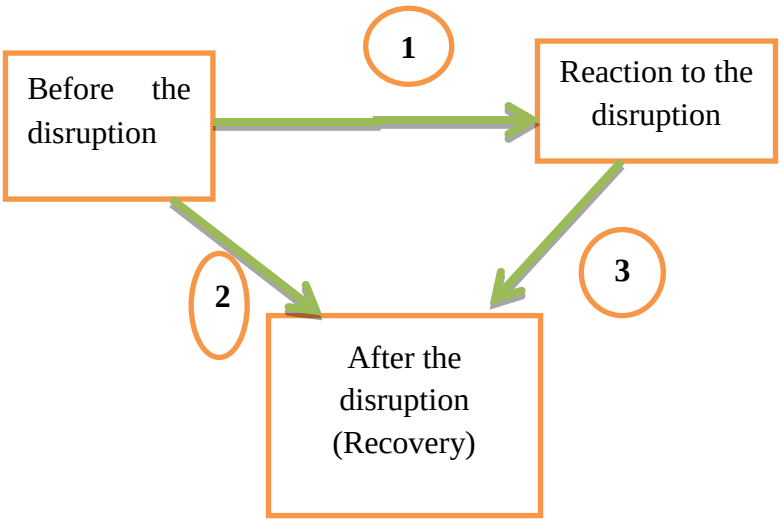
The third phase is the most important. The author will, firstly, describe in detail and chronological order the actions and strategies undertaken by each company after the disruption happened. Then she will try to understand why the companies have undertaken such actions and strategies, attempting to relate them to the elements of the first part (company background, supply chain, organizational culture and structure).

Lastly, the performance of the companies after the disruption and until now will be described. For the first three companies, the financial performance will be analyzed as many financial indicators could be found easily. For the Albanian companies, this part is very short because it is difficult to find realistic financial information for this part.

3.9 Research model

The research model is presented in Figure 6.

Figure 6: The research model



As, it can be noticed from the figure, the research model of this study highlights three important relations. Let's analyze the three relations of the model.

The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's organizational culture, business model, supply chain collaboration and many other factors.

The second relation states that if the company was resilient or prepared the recovery will be fast and less costly and vice versa.

The third relation states that the actions and strategies undertaken by the company after the disruption occurred are important for handling the disruption successfully. The analysis of the case studies will show if these relations hold on.

3.10 Data collection

Well-defined data collection process is essential, as it ensures that the findings of the research are valid. There are three ways to obtain data of the study: from records, that already exist; by sampling to obtain new data; or by carrying out an experiment. The author has used the first way, by collecting data that were previously collected by others for a different purpose and the second way.

Secondary Data

Records that already exist (secondary data) were used for the first part of the research, to collect the information relevant to the literature review. Books, articles, previous researches and cases were used at this stage of the research. Data was retrieved mainly from internet databases and books. The data were collected, analyzed and recorded precisely, following all the steps of studied concept and comparing different points of view of previous researches.

The secondary data were used even for the first three case studies, as they focus on the past and the data could be found easily. For the first part of the cases studies, information about the disruptive event, it was easy to find reliable information and all the data collected were not contradictory.

It cannot be said the same thing for the second part: how the company reacted to the disruption. To answer this question, the author collected data from Business and Management journals, from the databases of the University of Bologna and European University of Tirana, from the website of the companies and also from different search engines, such as Google Scholar. The problem was that the information was too much and sometimes contradictory. The author made a list of all the information, and then she has chosen the ones that were more relevant and reliable. Creativity was necessary to analyze all the information and data. For example, going through the financial statements of the companies, the author noticed that the dividends were reduced in the period after the disruption happened. She had to understand if this was part of the strategy to handle the supply chain disruption and also to understand why this action was undertaken.

For the last part, the performance of the company after the disruption, data and information were collected from the financial statements of the companies and the financial reviews of the industries where they operated. All these were necessary to understand how the market shares and competitiveness of the companies changed after the disruption compared to their competitors.

Primary data

The primary data were used for the two Albanian case studies. Primary data can be collected through observation, questionnaires or interviews. Interviews can be structured, semi-structured or in-depth interviews. The most relevant data collection technique for this research is in-depth interviews face to face, for the following reasons:

- Interview is a data collection method used to gather qualitative data and this research is based mainly on qualitative information.
- For the topic of the actual research, not every person in the company has full information. Only the high level managers have all the necessary information for the disruptive event and the reaction of the company. So in each company, the author could interview only the high level managers.
- A supply chain disruption is a sensible topic, and many managers do not like to talk about an event that causes them many losses. Some can say: Why telling you how I handled the disruption? These are confidential information. The interview cannot be the same for everyone, as someone can provide information freely, some are more conservative and each company reacted differently to the disruption. So, the researcher cannot have a list of questions, but only a clear idea of the topics he wants to explore (they are presented in Appendix 3). The interviews were conducted face to face in the period January 2015–June 2015, as sensitive information cannot be provided via phone or internet.
- In-depth interviews are the best data collection techniques for exploratory studies, to find out what has happened and to gain new insight.

In depth interviews

A good preparation before the interview can help in the data collection as a good preparation prevents poor performance. The main issues considered for the interviews were:

Good knowledge: Before doing the interview, the author collected information for the research topic, the company and the managers to be interviewed.

Location: The location may affect the quality of data collection. As the persons interviewed were high managers, which have their own personal office, the best place for interviewing them was office.

Researcher appearance and presentation: The way how you are presented and the first few minutes of discussion will have a significant impact on the outcome of the interview. So, it was adopted a similar way of dressing to the person interviewed. Also, taking into consideration the information gathered before about the persons to be interviewed, the author tried to personalize the presentation phase.

Listening skills: When doing in- depth interview, you should be carefully in listening everything, as every piece of information could be very important. The participants could provide more information if they noticed that you are very interested in listening them.

3.11 Data analysis

After ending the interviews, you have to analyze the data. The author used to take detailed notes during the interviews. After the interview, she read carefully the notes and summarized them, highlighting the key points. With every manager, the author made more than one interview, so it was necessary to read carefully the notes before the next interview, in order to do not repeat the same questions and to clarify the answers that you have not understood in the previous interview. Data were categorized in the following categories:

- Information about the company: history, organizational culture, organizational structure and human resources
- Data for the disruptive event: when it happened and what was its immediate effect.
- Information about the strategies and actions implemented by the company immediately after the disruptive event.
- Data about the performance of the company after the supply chain disruption.

Lastly, the case studies were written, following the chronological order, from disruption to recovery.

3.12 Ethical issues

"Ethics refer to the standards of behavior that guide your conduct in relation to the rights of those who become subject of your work or are affected by it" (Saunders et. al., 2012: 226) . Ethical issues are critical for the success of any research project. Their criticality increase when human participants are involved. The most relevant ethical issues for this research project were:

Integrity and objectivity of the researcher: The quality of research depends on the integrity and objectivity of the researcher. This means avoiding deception, dishonesty, misrepresentation and partiality. During all the research, the author has avoided deception, especially during the online research. In many cases, researchers join online communities with the intention of collecting data rather than participating, and this is a form of deception. The author has always declared her real intention while collecting data.

Confidentiality of data: This is a critical ethical issue not only for primary research but even for secondary research, as now many research projects are published and can be used by everyone. In papers, books or other internet sources where names of organizations or people taking part in surveys, experiments or individual interviews were written, in this research project were not mentioned, to ensure the anonymity and confidentiality. Names were mentioned, only if the interviewees provided full consent.

Responsibility in the analysis of data and report findings*:* The data were fully reported, they were not changed, altered or falsified. The source of data has been acknowledged accurately, using detailed references.

Lacking respect and causing harm: In many internet databases was required to mention the reason for collecting data and also it was necessary to get permission for using that data. The author avoided causing stress or embarrassment to the interviewers.

Informed consent: Participants gave consent to answer the questions, and also they gave full approval to use the information provided by them.

Consent for publication: The author promised the interviewed, that she will send the full research to him/ her and that the research will be published only if they consent that what she has written is true.

Recording data: There are different ways of recording data from audio recording to write-recording, but none of them can be used without the consent of the participants. Due to the sensitivity of the topic, recording was not used. Instead, the author took hard copy notes.

3.13 Conclusions

This chapter describes how the research was conducted. The author used the "research onion "of Saunders et.al (2012) to have more structured this chapter. It describes the stages through which the research must pass for formulating an effective research methodology. The authors compared the research process as an onion with six layers: research philosophy, research approach, research strategy, research design, time-horizon and data collection methods. For each layer, a specific section was written. In each section, firstly the author described the different approaches and then she presented the option chosen for the actual research, explaining carefully why choosing it and not another. Summarizing the main elements of the research methodology for this study were:

1. Research philosophy: Critical realism
2. Research approach: Inductive
3. Time horizon: Cross sectional
4. Research design: Mixed methods
5. Research strategy: Case studies
6. Data collection method: In depth-interviews

The case studies chosen were respectively, Dell, Nokia, Daimler, Meggle Albania and Fabjus case studies .The first three case studies were compatible with the research aim and also they were not analyzed from the perspective that this research offer. These case studies are analyzed in a separate chapter, in order to provide some lessons for researchers and managers, because as the saying says "A wise person learns from others mistakes while a fool learns from his experience (Sheffi, 2007).

The main reasons why Fabjus and Meggle Albania case studies were chosen, was the availability of information from the managers of the company and the compatibility of the cases with the research aim of this study.

The analysis of the case studies will start with the analysis of the company before the disruption, with a special focus on the following elements: company background, supply chain, organizational culture and structure. After, the disruptive event and its impact on the industry will be analyzed. The next step will be the analysis of the reaction of the companies after the disruption occurred. In the last part, it will be analyzed how effective the reaction was.

The final objective of this chapter is the research model. The successful handling of supply chain disruptions depends on the company resiliency and its reaction after the disruption. The last one is affected by various elements like company background, business model, organizational structure and so forth.

CHAPTER IV: LEARNING FROM THE EXPERIENCE OF GLOBAL COMPANIES

The aim of this chapter is to present three case studies, Dell, Nokia and Daimler case. The case studies will be structured as follow.

Firstly, the most important elements of the companies will be analyzed. Only the elements of the organization that are relevant for the case studies will be mentioned. The next step will be the analysis the disruptive event and its effects on the companies under consideration and on their competitors.

The most important part will be the description and analysis of the actions implemented by the companies after the disruption occurred. It will be explained why such actions and strategies were implemented and how effective they were. Lastly, the performance of Dell, Nokia, and Daimler from the year of the disruption until now will be analyzed.

The chapter will end with a comparison between the case studies and some lessons from the experience of these global companies.

CASE STUDY: DELL AND THE EARTHQUAKE IN TAIWAN.

4.1 Company background

Companies in the computer industry, in the 19th century, were vertically integrated, they created all the components themselves. Many companies, like Compaq, followed this strategy: develop everything within their walls, because if they do not do so they are not a real computer company (Magretta, 1998). So to produce computers requires a lot of time and costs that discourage entrepreneurs who want to enter in this industry, but this was not the case for Michael Dell. In an interview he declared:

> "At the time I could not afford to create every piece of the value chain. But more to the point, why should we want to? We concluded, we would be better off leveraging the investments others have made and focusing on delivering solutions and systems to customers. Now, if you have got a race with 20 players that are all vying to produce the fastest graphic chip in the world , do you want to be the twenty-first horse, or do you want to evaluate the field of 20 and pick the best one?" (Magretta, 1998: 74)

From his words, we can understand that it is better to focus and invest in activities that add value to the customers than in activities that need to be done. After doing a detailed list of all the activities to be done, you have to decide which are the ones that create real value for the customers. Satisfied customers mean more earnings, reputation, in other words, more value to the company. The activities that are not essential should be outsourced.

Based on this idea, Michael Dell in 1984 started his direct business model. He bypassed the dealer channel and sold directly to the final consumers. The resell markup was eliminated and also the costs and risks associated with carrying large inventories. All this brought to cost advantage.

How does the model work? After a customer places an order, either by phone or through the internet, Dell processes the order through financial evaluation and configuration assessments which take two to three days. Then it sends the request to one of its manufacturing plants. Dell typically plans to ship all orders no later than five days, after the receipt of the order. The company outsources all the components, but it still performs the assembly (Surbakti, 2011).

From 1984, Dell expanded its operations abroad. It has manufacturing plants in 20 countries and it is one of the top leaders in the computer industry (Dell, 2015).

The direct business model was the one that determined the successful handling of the disruption faced in 1999, so let's analyze its distinctive characteristics.

4.2 The direct business model

The distinctive characteristic of the direct business model of Dell is the virtual integration, meaning that it is treating all the business partners as part of the company. The most important business partners are suppliers and customers.

The close relationship with clients is the key to the success and competitive advantage of Dell against the indirect sale models. To maintain and enforce this relationship, Dell organizes meetings with the customers, to understand their needs because a product that no one wishes to buy or do not satisfy any need, has no value. Customer's feedbacks stress the importance of things that the company had considered as unimportant. By staying closer to the customers, Dell can have real-time information about the demand and also focus on

what create real value (Magretta, 1998). It offers to the customers a wide array of services and options in a short period, an average of five days.

The other best business partners are the suppliers. Dell keeps only suppliers who are able to maintain their leadership in quality, technology and performance. It is obvious that everyone will like to have the best suppliers. However, with best suppliers Dell do not intend only the leaders in the specified field but also the ones that trust the company and contribute to the reduction of inventory, because for Dell it is important to move the inventory quickly and to carry less inventory as possible (Magretta, 1998). With this strategy both Dell and the suppliers benefit. Dell because it reduces the costs of carrying large inventory and also the risk of carrying obsolete inventory, as in the computer industry everything changes quickly. But the major benefit is that Dell delivers new products in the market faster than the competitors and also it has not to sell the old products at a discount because it has none. The direct business model helps Dell to forecast the demand in real time, and so for the suppliers there are no surprises as there is a consistent and predictable order for components.

Summarizing, the direct business model allows Dell to have full control of the supply chain and strong relationships with suppliers and customers.

4.3 Dell's build to order supply chain

Dell has implemented the build to order supply chain successfully. It offered customized computers using the internet as an order fulfillment vehicle. The supply chain of Dell is agile, meaning flexible and responsive. Being agile is very important in the computer

industry, as it is a fast changing industry. The most difficult task is to forecast demand and manage inventory. Technology changes very quickly and new products enter the market very frequently. If the supply chain is not flexible, the company can lose significant market share.

New products require new components, so if the company is not able to manage the inventory, it will have obsolete components in the inventory and it will be obliged to sell at large discounts the old fashioned products. Dell overpass these problems because it has no inventory and there is no need to make demand forecast as the computers are sold before being produced. Not only Dell benefits from its agile supply chain, even customers benefit. They can have their customized computers, with high quality, reasonable price in a short period of time. A key success factor for implementing a build to order supply chain is to build strong relationships with suppliers, and to manage the information system. Dell can manage both the information systems and the suppliers in an efficient and effective way (Surbakti, 2011). Let's analyze all the parts of the supply chain, from suppliers to customers.

Suppliers: The main suppliers are the component suppliers, third party hardware and software suppliers. For major and important components like microprocessors and software, Dell has global suppliers that are leader in the industry, like Intel, Microsoft, Sony, Samsung, and Toshiba. For the other components, especially low-tech components, Dell looks for low cost suppliers. The majority of the components come from Asia. The main requirements that Dell asks to the suppliers includes (Kraemer & Dedrick, 2002):

Location: Dell requires that the suppliers are near to the production plants, each region has its suppliers. The reason is that the suppliers after receiving the orders have to ship the components within few days to the manufacturing plants.

Price reduction: Dell requires that the suppliers continually reduce the price of components. The ones that succeed in selling to Dell components at low price are awarded with long term contracts and larger orders. The suppliers that are not able to reduce the price will not be the suppliers of Dell in the future.

Flexibility: As Dell build computer to order, it is necessary that the suppliers have enough inventory to meet the demand of Dell in real time. Some suppliers keep the inventory near the facilities of Dell, some produces near the production facilities or some are able to manage the inventory in order to meet Dell's demand without producing near its plants but where it is more convenient. Why the suppliers agree to take all the responsibility of keeping enough inventories to meet Dell's demand, as it does not keep inventory? Maybe they trust Dell and its business model. It can make a careful forecast of demand, so the suppliers are not worried about having unsold inventories.

So, Dell chooses the best and reliable suppliers, as the suppliers are the best business partners. They are part of the company.

Manufacturing plants: Dell organizes manufacturing by regions. Each region has its own assembly plants that serve to the major markets of computer. The main manufacturing locations are Texas, Tennessee, Eldorado Do Sul, Ireland, Bracknell, Penang, and so forth. According to Kraemer and Dedrick (2002) the main factors considered by Dell about the location of the manufacturing plants are:

Market considerations*:* They include the potential market size, growth and the requirements to enter these markets. For example, when Dell went in Europe, it entered first in the English speaking countries such as UK, Ireland, Sweden. These markets do not have only the same speaking language but nearly the same culture. Dell entered in China and Japan as the computer market in these countries was rapidly growing.

Strategic location: Texas is central to all of US markets, Tennessee has a central location to East Coast markets, Malaysia is central to Asia –Pacific markets.

Labor cost and quality: Texas and Tennessee are cheaper than Silicon Valley, but remember that not only labor cost is important but even labor quality. Maybe the wages in Silicon Valley are higher but there you can find more skilled people. China is the cheapest location, as the wages are very low. Everyone goes to produce in China. It is becoming the most desired production location and also is attracting new talented people. Ireland, Portugal and Greece are the cheapest countries in Europe and also they have well-educated and skilled people. In brief, after Dell decides in which market is more profitable to enter in terms of growth and strategic position, it considers the labor factor, where it is cheaper to produce and also where you can find skilled employees.

Infrastructure: It includes transportation consideration, telecommunication cost and quality. Many of the manufacturing locations are near to highways and ports (Tennessee, Ireland). The direct business model requires a well-developed information technology platform, so telecommunication quality is important. Quality comes first and then costs.

Supplier proximity: As Dell manufactures the products within five days, it is necessary that the manufacturing centers are near to the suppliers of components.

Taxes and regulations: The last factor that Dell considers for the manufacturing locations is government incentives, where the taxes are lower, the land cheaper and the facilities are easier to construct. The government offers a package of incentives to Dell in Texas and Tennessee. In Ireland the corporate taxes are very low, and also Ireland can ship to the EU without paying the value added tax.

The rule is to produce the computers close to the customers, so you can deliver them within five days.

*Distribution**:*** It includes all the activities performed from the company to get the products from the factory to the final customer. The first step of the logistic system of Dell is the customer order. The customer enters to the Dell website or makes a call and order the computer. The customers can choose specific features for the computer they intend to purchase. After the order is received, Dell sends the order to the suppliers, which has a limited time to ship the components to the assembly plants. Normally the suppliers and the manufacturing plants that are near to the customers are chosen for the order. The last step of assembly and configuration is performed by Dell, as according to Michael Dell the execution of the build to order model is strategic to a company, therefore the final assembly and configuration must be done at home.

Customers: The customers of Dell include business and families. At the time of the disruption discussed in this case study, the main customers were businesses but the family base was at the growing stage. The company collaborates with customers, as it is explained in detail in section two.

Summarizing, Dell's build to order supply chain is agile and flexible, so more resilient to unpredictable events. Dell is very careful in selecting the supply chain partners, as supply chain collaboration is easy when you have the right partners.

4.4 The Taiwanese earthquake.

On 21 September 1999, around 2 am, an earthquake of a magnitude 7, 6 occurred on the island of Taiwan. Abraham (2000) reported that after the disaster two thousand and four hundred five people were killed, and more than ten thousand were injured, eight thousand and five hundred buildings were destroyed and the damages caused by the earthquake were valued $US 10 billion. The same author reported that about nine thousand industrial plants in fifty-three industrial parks had fewer damages but if the epicenter would have been further north or south the damages would have been huge. Little building damages were experienced at the Hsinchu Science Park, an industrial park built by the government on 1980. The former Finance Minister was inspired by the Silicon Valley in the United States, and so he decided to build an industrial park in Taiwan. Now it is one of the most significant areas of semiconductor manufacturing. After the earthquake, Taiwan electronic power system was damaged, and this brought problems to the industrial parks as the semiconductor manufacturers are heavy power users. As a result of this, the production of semiconductors decreased quickly.

4.5 The impact of the earthquake in the computer industry

Baum (cited in Papadakis, 2002) estimates that at the time of the earthquake about 10% of computer memory chips were produced in the Hsinchu Industrial Park. In this industrial

park were also produced in high quantities motherboards, notebook displays and other components. After the earthquake, as it is said before the damages were few, but the production decreased due to the lack of a continuous power system. The market reacted quickly by increasing the price of chips.

In Table 7 are presented some financial indicators of the four major computer producers at the year of the disruption.

Table 7: Financial performance in the computer industry after the Taiwan earthquake

	Revenue ($ million)	**Change over 98**	**Earnings ($ million)**	**Earnings over revenue**	**Reason cited**
Dell 3Q 99	6.784	41%	483	7%	Memory supply
Dell 4Q 99	6.801	32%	486	7%	Memory supply, Y2k
Gateway 4Q 99	2.451	6%	126	5%	Memory supply ,Y2K
Compaq 4Q 99 commercial	3.133	-19%	-79	-2,5%	Y2K
Compaq 4Q 99 consumer	1.966	24%	69	3,5%	
IBM 4Q 99 Personal system	4.131	-7%	-246	-6%	Y2K

Source: Papadakis (2002)

Papadakis (2000) gathered data about the revenues, earnings and changes in revenues from 1998 to 1999. From the financial statements of Dell, it can be seen that the fiscal year ends on January 29th, so that the third quarter ends on October 29th. For this reason in the table there are data for the third and fourth quarter of Dell. For Gateway are depicted only the financial performance of the fourth quarter, which start on September and end on

December. Compaq results are shown by customer group, considering the segment of commercial customers and single product customers. For IBM are shown only the results of the personal system division as the major part of the revenues came from this division.

Before analyzing the numbers, it is better to have a look at the companies' background. Gateway was founded in 1985 by Ted Waitt. Starting with a $10,000 loan guaranteed by his grandmother, a rented computer and a three-page business plan, Ted Waitt turned Gateway into a revolutionary innovative company (Gateway, 2014). It used to sell its products using a direct sale model, like Dell. On the first years, it was successful, but unlike Dell, it was acquired by Acer in 2007. The acquisition gave end to the direct sale model, the Gateway products could be bought only from the retailer and the online shops. From 2011 the Gateway brand was replaced by the Acer brand (Kunert, 2011).

Compaq was founded on February 1982 by Rod Canion, Jim Harris and Bill Murto, ex-senior managers in a semiconductor company (Compaq, 2014). It started in the field of personal computers. In 1998 the company had some quality problems, later on the existent CEO was forced to resign. All these events caused a reduction of the earnings in the second quarter of 1999. In a brief statement announcing Mr. Pfeiffer's (CEO) resignation, Mr. Rosen said. "As a company engaged in transforming its industry for the Internet era, we must have the organizational flexibility necessary to move at Internet speed" (Lohr, 1999: 2). By this statement it is clear that Compaq was not a flexible company like Dell. However, the most important thing that relates even to our case is the fact that the decrease in revenues started just a few months before the earthquake. In 2002, the company was merged with Hewlett Packard.

IBM was founded in 1911 as a merger of three companies that has invented the computing scale, electric tabulating machine and the time clock record (Lee, 1998). It manufactures and sells computer hardware and software and also offers consulting services. IBM is one of the most largest and profitable firms in the computer industry.

From the table 7, it can be noticed that the earnings over revenue ratio of Dell is 7% for the third and fourth quarter. Comparing the results with the previous year we had a 41% increase of revenues in the third quarter and 32% increase of revenues in the fourth quarter. Normally the results of the earthquake are more visible in the fourth quarter. Even Gateway had positive earnings over revenue ratio of 5%, but from the table we can see that Gateway was not growing a lot as the difference in revenue from the previous year was just 6%. Compaq had a loss of 79 million in the fourth quarter of 1999, and a decrease in revenue from the previous year of 19%. These results were about the commercial segments as in the consumer segment Compaq saw its revenues increasing by 24% and it had an earnings over revenue ratio of 3,5%. The impact of the earthquake was more visible in the commercial segment. IBM had the worst results, negative earnings over revenue ratio of 6%, due to the lack of memory chips. We can conclude that the earthquake has affected more the commercial segment as in the case of Compaq.

Concluding Dell and Gateway had an increase of revenues from the previous year while Compaq and IBM commercial segments, saw their revenues decreasing compared with the previous year before the earthquake. From an accounting point of view, it is not an accurate comparison as the companies had different size, operated in different segments and also they had a different way of selling the goods. IBM and Compaq used the

traditional channels for selling their products while Dell and Gateway use the direct sale model. However, by using a relative performance ratio, the earnings over revenues ratio, the comparison is more accurate. The earnings over revenue ratio tell what part of revenues is profit. So for Dell 7% of revenues were profits and for Gateway 5% of the revenues were profits. In the case of Compaq and IBM, the ratio was negative, and the reason was that they had a loss in the fourth quarter. The costs they incurred, costs of raw materials, wages, other direct costs and indirect costs were bigger than the revenues of the same accounting period. It is obvious that Dell and Gateway had a good economic performance after the earthquake compared to Compaq and IBM.

4.6 How Dell handled the disruption?

After the Taiwan earthquake, the price of the memory chips increased by 25%, and in the computer industry this is rare, as the price of components tends to decrease (Veverka, 1999). Immediately after the earthquake, many major computer companies declared that they were pessimistic about their performance and ability to satisfy customer's demands. Dell was more optimistic and this can be noticed by the interviews of its Chief Financial Officer:

"Dell is a preferred customer of our supply base," Tom Meredith, Dell Computer Corp.chief financial officer, told to CNN. "That gives us a great deal of leverage. We're hopeful that there will be a full flow of materials this quarter and next. We're guardedly optimistic, but there are no guarantees" (Moore, 1999:1).

"We are managing the memory situation carefully and are working to offset the cost increases with efficiencies in other parts of our business," said Thomas J. Meredith, Dell's chief financial officer (Moore, 1999:1)

Dell was not like the other companies that just say “we cannot do anything, hope that the things will go well”. The sense of urgency can be seen clearly in this company. Just a few days after the earthquake, they decide what to do: offsetting cost increase with efficiencies in other parts of the business.

From the annual report of Dell (2000) it can be noticed, that its gross margin in 1999 was 20,7% while in 1998 was 22,5%. Dell spent 1,1 billion in 1999 to repurchase common stock , nearly 0,4 billion less than in 1998. Looking these numbers, we can conclude that the price increase was not all suffered by the customers but also by the investors. The losses from input price increase were offset with the increase of the prices of the computers that have the limited components and with less common stock repurchase. Customers are part of the company, customer satisfaction is more important than profits so that it is unjust that they suffer all the losses from the input price increase.

As Dell build computers by order and customers can choose the configuration of their computers, it can influence their configuration decisions. The marketing strategy used to do this was promoting and reducing the price of low memory computers. This strategy is called revenue management via dynamic pricing and promotion. By promoting and reducing the price of computers with low memory, it shifted consumer purchases toward the low memory computers (Veverka, 1999)

Dell (2000) announced $300 million losses due to unrealized sales. It was ready to introduce an innovative computer, which used the new memory chips that were not available after the earthquake. It was obliged to delay the introduction of the innovative computer. It had economic losses, but not losses in market share as even the competitors were not able to introduce the new computer.

Michael Dell visited Taiwan after the earthquake and was surprised to see the workers cleaning and restoring production just a few hours after the earthquake. As the main memory producing companies had facilities even outside Taiwan, Dell found quickly the needed suppliers that would supply the memories. Michael Dell trusted his suppliers, and he was sure that they will recover quickly after the earthquake by bringing production at the normal levels (Rueppel, 1999).

The sense of urgency, revenue management via dynamic pricing and promotion, strong relationship with suppliers and its business model were the determinant of the successful handling of the disruption compared to the competitors.

4.7 Dell's performance after the earthquake

Table 8 summarizes the performance of the top five computer companies according to market share from 1999, the year of the earthquake; to 2001(the data are taken from the tables in Appendix 4). The top leading companies were the same in these three years. In the table, there are data about their position in the global market of computers, their market share and the changes in market share from year to year.

Table 8: Top leaders in the computer industry

	1999		2000			2001		
Company	**Ranking**	**Market share(%)**	**Ranking**	**Market share(%)**	**% change from 1999**	**Ranking**	**Market share(%)**	**% change from 2000**
Dell	2	9,8	2	10,8	2 %	1	13,2	+22%
Compaq	1	13,2	1	12,8	-3%	2	11,2	-12,5%
Hewlett Packard	5	5,2	3	7,6	4,6%	3	7,2	-5%
IBM	4	6,4	4	6,8	6%	4	6,4	-6%
Packard Bell NEC	3	7,9	5	4,3	-4,5%	5	3,8	-12%

Dell in 1999 was the second computer company in the world according to market share, in 2000 it kept the same position while in 2001 it became the leader in the computer industry with market share of 13,2%. In 2000, the year after the Taiwan earthquake, the market share of Dell increased by 2 % while the market shares of Compaq and Packard Bell decreased relatively by 3% and by 4,5%. In 2001, Dell outperformed the other computer companies. While its market share increased by 22% relative to the previous year, the market share of the other companies decreased from 5% to 12,5%. It can be concluded that Dell handled the disruption successfully compared to the competitors as it gained market share after the earthquake, becoming the leader in the computer industry. Another reason for the great performance of Dell was the growing of the home segment, whose consumers now where buying their second or third PC and needed less hand holding, so they come to Dell.

In Appendix 4, there are data about the market share of the top five companies from 1999 to 2013. By using the data from the tables in appendix 4, the table 9 summarizes the Dell's position in the global market of computers, its market share and the changes in market share from year to year.

Table 9: Market share of Dell from 2002 to 2013

Year	**Ranking**	**Market share(%)**	**% change from the previous year**
2002	2	13,2	0%
2003	1	14,9	13%
2004	1	16,4	10%
2005	1	16,8	2%
2006	1	15,9	-5%
2007	2	14,3	-10%
2008	2	14,3	0%
2009	3	12,2	-14%
2010	3	12	-1,6%
2011	3	12,1	0,8%
2012	3	10,7	-1,3%
2013	3	11,6	7%

In 2002, Dell moved from the first position to the second in terms of market share, and the reason was the merger of Hewlett Packard with Compaq. The merger increased the market share of the merged company to 14,2% while the market share of Dell did not change.

However, Dell from 2003 until 2006 remained the leader in the global computer industry. It began to lose market share after 2006, moving from the first to the third position, but in

2011 it gained market share and they are optimistic about their performance in the coming years. To understand the reasons of the declining market share of Dell after 2006, the financial statements of Dell and different publications in the Dell website were analyzed (Dell, 2000; 2001; 2002; 2003 ;2004; 2005;2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014).

In 2004 Michael Dell resigned, and Kevin Rollins become the CEO, while Michael Dell retained the title of chairman. During the management of Rollins, the performance of Dell was not as excepted. The sales were growing but very slowly. In 2006, Dell had problems with its reputation as one of its laptop went on fire due to a problem in battery. The PC market was becoming a mature market. Due to this performance Rollins resigned in 2007 and Michael Dell became the CEO. We can see from the financial statements of Dell that Michael Dell has invested in mergers and acquisition to enter in new markets, like software, computer peripherals, servers, and so forth. The sales started increasing. He started a new marketing campaign to strength the band reputation. During 2012, Dell invested in merger and acquisitions, alliances and innovation. Nowadays, Dell is one of the top five companies in the computer industry and Michael Dell is optimistic for the future.

4.8 Dell case study and the research model

The analysis of Dell case study was organized into four main parts. The study started with the analysis of the company before the disruption. The analysis was focused on the following elements: company background, supply chain, and organizational structure.

The direct business model implemented by Dell enabled the company to have full visibility of the supply chain and also to facilitate the collaboration with the supply chain partners. Dell's build to order supply chain was agile and flexible, so more resilient to disruptions. The selection of supply chain partners was made with prudence, as if you have the right partners the collaboration is easier and you can work as a team in time of disruptions.

In the second part, the disruption was analyzed. Dell faced an inbound disruption, as after the Taiwan earthquake, the suppliers informed Dell that they would not be able to deliver computer components. The market responded to this shortage in supply with an increase in the computer component price. The impact of the earthquake was low for Dell as its revenues and market share did not decrease. The performance of the other computer companies, like Apple, Compaq, IBM was not good at the year when the earthquake happened.

In the third part, the author described in detail and chronological order the actions and strategies undertaken by the company after the disruption happened.

When the disruption happened, Dell supported suppliers and customers. Michael Dell, immediately, after the earthquake visited the suppliers and offered his help. The price of computers increased after the earthquake. Very differently from the others, Dell spread this price increase between customers and the company. The losses from input price increase were offset by increasing the price of computers and by repurchasing less common stock. The consumers of Dell did not notice any component shortage problem, as Dell offered incentives, low prices and promotions, for computers that did not use the components that

were not available. The strategy of Dell was "sell what you have" by using revenue managing through dynamic pricing and promotion strategy. Its strategy had all the characteristics of a robust strategy: enable the company to manage small supply chain disruptions in normal conditions; increase the resilience of the company during major disruptions, and satisfy the customers before and after a major disruption.

Lastly, the performance of the company after the disruption and until now was analyzed. Dell over time has remained the leader in the computer industry.

Now let's analyze the three relations proposed by the research model. The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's organizational culture, business model, supply chain collaboration and many other factors.

We can say that Dell is a resilient company, as it has an agile and flexible supply chain, and also its direct business model allowed Dell to detect quickly the weakest links in the supply chain. Resilient companies react quickly to the disruption, and Dell showed a high sense of urgency in handling the supply chain disruption. Dell was able to implement the revenue management robust strategy as its business model enabled him to do so. The first relation holds on for this case study.

The second relation states that if the company was resilient or prepared the recovery will be fast and less costly and vice versa. As discussed above, Dell had all the characteristics of a

resilient company, so the impact of the disruption was low for Dell compared to the competitors. Even, the second relation holds on for this case study.

The third relation states that the actions and strategies undertaken by the company after the disruption occurred are important for handling the disruption successfully. The success of Dell in handling the supply chain disruption was the robust strategy that it implemented, revenue management, and the sense of urgency shown. So, all the three relations of the research model hold on for Dell case study.

4.9 Conclusions

After the Taiwan earthquake, the suppliers informed Dell that they would not be able to deliver computer components. Dell immediately found other suppliers for the same components, but it had to pay a high price because the market responded to the earthquake with an increase of the computer component price. The consumers of Dell did not notice any component shortage problem, as Dell offered incentives, low prices and promotions, for computers that did not use the components that were not available. The strategy of Dell was "sell what you have" by using the revenue managing through dynamic pricing and promotion strategy. Its strategy has all the characteristics of a robust strategy: enable the company to manage small supply chain disruptions in normal conditions; increase the resilience of the company during major disruptions, and satisfy the customers before and after a major disruption.

Dell did not only handle the supply chain disruption successfully but even gained market share after the earthquake (+22%). The result of this success was the robust strategy that it

implemented, revenue management. Dell was able to implement that specific strategy as it business model enabled him to do so. The organizational culture was another important factor of success.

The sense of urgency, the direct business model, organizational culture and supply chain collaboration were the factors that determined its success in handling the disruption compared to the competitors.

CASE STUDY: NOKIA AND THE ALBUQUERQUE FIRE

4.10 Company background

From the foundation in 1871 until now, Nokia had evolved from a riverside paper mill in Finland to a global electronic company. During these years they have made rubber boots and car tires; they have generated electricity; they have manufactured TV and lastly they focused only on the phone industry. Nokia adapted to the world evolvement. It saw that the paper mill, rubber and electricity industry were not very profitable and it focused on the phone industry, an entirely different industry. Why this change? The answer was written on the Nokia website: "Changing with the times, disrupting the status quo – it's what we've always done" (Nokia Corporation, 2014). In few words, the business strategy followed by Nokia could be defined as "strategy as fit" (fitting the external environment with the internal environment). It started in the paper mill industry as it had access to the Finish forest. However, with the passing of time the forests were decreasing while labor cost and environmental issues were increasing, so Nokia decided to focus on a more profitable industry, electricity and later on the phone industry.

Nokia was good in connecting people, and it was the largest mobile phone manufacturer in the world. In 2006, its revenues were greater than the Finland's state budget. In 2014, Nokia had eight production facilities in eight different countries and recorded high sales in more than 150 countries. It was a multinational company that kept growing through merger and acquisitions and innovations (Nokia Corporation, 2014).

4.11 Nokia's supply chain

Suppliers: They were an important part of their supply chain. They included direct suppliers for hardware, parts, components and software and indirect suppliers which provided services and equipment necessary for their operations. Nokia required that its suppliers were socially and environmentally responsible, innovative and flexible. It always checked if with the passing of time they were improving and if they were able to follow Nokia's growth. Nokia collaborated with suppliers, by helping them to do better. As its suppliers were very different in technology and size, it used different collaborative approaches for each of them. If suppliers had a problem, Nokia helped them to solve it, because they were part of the company (Fourtane, 2014).

Manufacturing plants and distribution: The manufacturing was very critical, so most of it was done in-house. Nokia tried to locate the manufacturing plants near the suppliers and other partners. This strategy decreased costs and respected the environment. Even at the year of the disruption (the fire in Philip's plant) it had nearly all the manufacturing plants near the suppliers. All the plants followed the same quality standards. As the plants were near to the suppliers and clients, the distribution costs were low and they did not face many disruptions from the transportation system (Nokia Corporation, 2014).

Customers: But the most critical part of the supply chain were the customers. Customer satisfaction had always been the core value of Nokia (Nokia Corporation, 2014).

The supply chain of Nokia was long, complex and global, like the supply chain of many global electronics companies. This gave Nokia more responsibility to manage it and to ensure that there were no weak links. The weakest link in a supply chain, destroy all the

supply chain, so Nokia always tried to identify the weak links and did the best to strengthen them.

4.12 Corporate culture

Nokia was a Finish company, so its corporate culture was affected by the Finish culture. The main cultural elements of the Finish culture are low power distance and individualism (Hofstede, Hofstede, & Minkov, 2010).

Power distance is the extent at which less powerful members of an organization expect that power is distributed equally. It is true that all societies are unequal, but some are more unequal. In high power distance countries, there is no consultation between higher and lower levels and hierarchy is the fundamental principle on which all the relationships are based. Power is centralized and formal methods are preferred (Hofstede, 1994). Individualism is the degree at which people are integrated in the society. In individualist societies, ties between people are low, and everyone act according to his interest. In general, countries with low power distance are individualistic (Hofstede, Hofstede, & Minkov, 2010).

It is obvious that the power distance was low at Nokia, as the employees freely communicated with the high levels. This was reflected on the Nokia values: Engaging You, Achieving Together, and Passion for Innovation and Very Human (Nokia Corporation, 2014). But Nokia had an aggressive and individualistic culture. It collaborated and helped the others, but its interest was dominant. As mentioned before, one of the core values of

Nokia was achieving together. In individualistic companies the degree of achievement is high.

Nokia's corporate culture stressed the importance of speed and flexibility in decision-making. This is difficult for a company of its size, as the size sometimes impose a certain amount of bureaucracy, but not impossible for Nokia (Nokia Corporation, 2014).

Summarizing, the most relevant elements of the company for this case study are ability to adapt to the external environment, aggressive and individualistic culture and speed and flexibility in decision-making.

4.13 The fire in Philips' plant

On Friday night, 27 March 2000, a lightning storm rolled through the Albuquerque city, in New Mexico. Lighting struck a Philip's industrial building. The furnace in Fabricator No.22 caught on fire. Immediately the smoking detectors were activated and the Philip's trained staffers rushed into action. When the fire-fighters of the Albuquerque Fire Station arrived, they had nothing to do as the fire was out. The staff of Philip's had extinguished the fire in less than 10 minutes. The fire-fighters just checked the place and filled the report. The first investigation showed that the damages caused by the fire were minor. They did not send any report for the fire to the corporate headquarters of Philips. Even in the Albuquerque newspapers the event was not mentioned. The fire was extinguished, the damages were minor at the first sight, but the real drama has just started (Sánchez Garcí, 2010).

The area that caught fire was a chip manufacturing plant. Chips are small electronic devices that are very sensitive to dust and dirty. The rooms were they are produced, have to be always kept clean. Not only the clean rooms of the Fabricator No.22 were contaminated but even the clean rooms of the neighbourhood fabricator, because the smoke was spread over all the facility and the fire-fighters entered in any clean room to inspect for damages. The smoke, the tramping of staffers and fire-fighters left the clean rooms dirty. Every single clean room had to be carefully cleaned and sanitized (Sheffi, 2007). It was immediately clear that repairing the damage would take at least a week, possibly longer. "It's as if the devil was playing with us," said one senior Philips manager who was involved in the clean-up. "Between the sprinklers and the smoke, everything that could go wrong did" (Latour, 2001: 3).

On March 30, they called their customers, and, in particular, their two main customers Nokia and Ericsson, which accounted for 40% of the affected orders at the plant that caught fire. They told them that for one week they will not be able to deliver the radio frequency-chips (Latour, 2001). But in reality the delay was more than one week. A disruption that in the beginning seemed small had caused significant damages to Philips, Nokia and especially to Ericsson.

4.14 How Nokia reacted to the disruption?

Nokia's officials in Finland noticed that some numbers were appearing on their computer screens, showing that the shipment of some components from Philips was delayed. On Monday, three days after the fire, Philips called Tappio Markki, Nokia's chief component

purchasing manager, to explain the delay. Philips representatives gave detailed information to Nokia about the fire, telling them that the production would turn to normal levels within a week. One-week delay is normal for global companies, so it would not be a serious problem as Nokia had some components in inventory and the customers would not notice the shortage of components (Sheffi, 2007).

Mr.Markki was not very alarmed, but however he reported the event to Mr.Korhonen, Nokia's chief supply trouble-shooter. He always used to say "We encourage bad news to travel fast. We don't want to hide problems" (Latour, 2001:3). The first thing that Mr.Korhonen did was to send two engineers to the Philip's plant, to help them to recover quickly from the disruption. But Philips did not accept their help as according to them visitors would add confusion. Then Mr.Korhonen agreed with the officials of Philips to monitor and check daily their situation, especially the situation of the five components that Nokia sourced from Philips. In normal times, the monitoring and checking of components were done on weekly basis. Mr.Korhonen organized a meeting in Helsinski with Philips, and during the meeting he stressed the importance of strong and determined action to handle the disruption. The Philip's officials understood that he was angry about the disruption more than them. It was a matter of life or death for Nokia (Sheffi, 2007).

Two weeks later Philips called Nokia again, to say that they have just realized that they would need more than two weeks to restore everything. The production would have turned to normal levels after one or more months. If Nokia would not have the components, it would not be able to produce four million handsets, counting for more than 5% of their total sales at the time. They were really in a bad situation, but Mr.Korhonen did not give

up. He organized an extraordinary meeting, to analyse more in detail the situation and to find a solution. Three of the five components were not critically as other suppliers could provide them, but the others two were critical as only Philips could produce them. He asked to Philips if any of their facilities could provide the components. Some Philip's facilities in US and Japan could provide them but not in the quantity required by Nokia. The next action undertaken by Mr. Korhonen was the redesign of some chips, in order that they could be produced by other suppliers. Also he worked on a project together with Philips. The aim of the project was to find new ways to boost the chip production, so when Philips would recover from the disruption, it could be able to produce more chips than before (Latour, 2001).

4.15 How Ericsson reacted to the disruption?

On March 20, Philips called even Ericsson, to explain the situation. They gave to them detailed information and told that the delay would last one week. The chief component purchasing manager of Ericsson was not alarmed for the disruption and did not inform the bosses. As we said before, one-week delay is normal (Sheffi, 2007).

After one week they noticed that the delay was more than one week, but the low-level employees did not inform their bosses, as they bothered their bosses only for important news. Two weeks, after the fire, Philips told them that the delay will be at least one month. This was a big problem, the session of high sales was coming and they have to introduce the new phones. The bosses discovered slowly what was happening, as they were informed

only at the beginning of April. They immediately asked help to Philips, but it was collaborating with Nokia and it could not help them (Sheffi, 2007).

Ericsson was not prepared for the disruption, it didn't have any reserve supplier for the components and all the other available suppliers were collaborating with Nokia. It was not able to handle the supply chain disruption (Latour, 2001). How much did it cost to Ericsson the slow reaction? In the other section, it will be described the performance of Nokia and Ericson after the disruption.

4.16 Nokia and Ericsson after the disruption

In Appendix 5, there is a summary of the main financial indicators of Nokia from 2000 to 2013. Why these financial indicators have been chosen? Starting from the first one, net profit over total revenues, which shows what percentage of revenues is profit. To calculate it, the net profit is divided with the revenues of the respective year. This ratio shows how profitable is the company, and in this case it will show if the profits of the company increased or decreased after the disruption. The dividends have been considered, to see if due to the disruption, the board of directors decided to reduce the amount of dividend distributed. The last financial indicator, Research and Development (R&D) over net profit, shows the incidence of R&D costs over net profit. It has been chosen as Nokia is an innovative company, and it will be interesting to see how the disruption affected its innovation costs. Table 10 provides information about the change of revenues and the financial indicators mentioned before, from 2000 to 2001.

Table 10: Nokia's financial performance in 2001

Year	Change in revenues(%)	Change in NP/Revenues	Change in DIV(%)	Change in R&D/NP
2000/2001	2,6%	-0,45	-3%	+13

Source: Nokia Corporation (2001;2002)

It can be seen from the table that the revenues of Nokia in 2001 were 2,6% higher than in 2000. It can be said that the sales of Nokia did not decrease after the disruption. The net profits (expressed as a percentage of total revenues) in 2001 were 0,45 times less than in 2000. The board of directors in 2001 had decided to reduce the dividends distributed to shareholders of 3%, while they had decided to invest more in R&D. It is clear that the reason for a decline in profit were the increasing expenses in R&D.

The performance of Nokia in 2001 compared to 2000, the year of disruption, was better. But let's analyse more in detail the year 2000, the year of the disruption. From the annual report of Nokia in 2000, it can be noticed that the net sales increased by 54% compared to the previous year while the net profit 52%. The net sales of the mobile phone division increased by 66% while the operating profits by 57%. The mobile phone division was not affected by the disruption, it even performed better compared to the previous year. The disruptive event did not affect the financial performance of Nokia. But how it affected the financial performance of Ericsson?

From the financial statement of Ericsson 2001, the most relevant financial indicators are summarized in the table 11. For Ericsson the indicators considered are the same financial indicators as Nokia, except the R&D over the net profit. Instead of it, it has been calculated the change in the number of employees from 2000 to 2001.

Table 11: Ericsson's financial performance in 2001

Financial indicators	2000	2001	Change
Revenues	221,6[3]	210,8	-5%
Net profit/ Revenues	9,4%	-10%	-220%
Dividends	0,5	0	-100%
Number of employees	105,100	85,200	-19%

Source: Ericsson (2002)

The revenues of Ericson decreased with 5% from 2000 to 2001, while the net profit (expressed as a percentage of revenues) decreased drastically, -220%. Ericsson decreased the number of employees in 2001 and also it did not distribute any dividend.

The performance of Ericsson was negative after the disruptive event. However, it cannot be said that this negative performance was due to the disruptive event, so it is necessary to gather more information to understand if the disruptive event was the main reason of the negative performance of Ericsson.

On July 2000, Ericsson declared that its mobile phone division posted operating losses of 1,8 billion crowns, because of component shortage. It also declared that the component shortage was due to the fire in Philips' plant. Ericsson admitted that the losses from the fire would be between 3 billion to 4 billion crowns (BBC News, 2000). At the end of 2000, Ericsson posted a loss of 16,2 billion crowns in the mobile phone division. In January 2001, the company announced that it would outsource all the handset production to Flextronix Inc. which could produce them at lower costs. Three months later, Ericsson signed a deal

[3] Data expressed in million. Currency=crown

with Sony to create a 50/50 joint venture to design, manufacture and sell handsets. From the joint venture Sony-Ericsson, the new mobile phone company was created (Williams, 2001).

So, the negative performance of Ericsson was related to the negative performance of the mobile phone division that was caused by the disruptive event.

Table 12 provides information about the market shares of the top five mobile phones manufactures.

Table 12: Top five mobile phone manufacturers in 2001

	2000		2001			2002		
Company	**Ranking**	**Market share(%)**	**Ranking**	**Market share(%)**	**% change from 2001**	**Ranking**	**Market share(%)**	**% change from 2000**
Nokia	1	30,7	1	35	+14%	1	35,1	0,28%
Motorola	2	14,6	2	14,8	1,3%	2	16,9	14%
Ericsson	3	12,6	5	6,7	-46%	5[4]	5,4	-19%
Siemens	4	6,3	3	7,4	17%	4	8,0	8,1%
Samsung	5	6,2	4	7,1	15%	3	9,7	37%

In 2001, the market share of Nokia increased by 14% compared to 2000 while the market share of Ericsson decreased by 46%. Concluding, the financial performance and competitiveness of Ericsson was affected negatively by the disruptive events while the financial performance and competitiveness of Nokia improved after the disruptive event.

[4] Sony-Ericsson

4.17 Nokia versus Ericsson

Although, Nokia and Ericsson were hit by the same disruption, one recovered while the other retreated from the mobile phone market. This happened as Nokia reacted quickly to the disruption while Ericsson was more passive. The success of Nokia was a result of each single step that it undertook after the disruption happened.

Nokia noticed that something had happened to Philips, as shipments were delayed, while Ericsson did not notice anything. They noticed that something was happening to Philips before it called them, due to the advanced technology they used. The advanced technology allowed them to share information in real time with their suppliers. If something happened to them, they would notice it. As it mentioned in the case, the chief component purchase managers saw that some puzzling numbers were appearing on their monitors, before receiving the call. Even Ericsson was using the same advanced technology, but the background and the corporate culture of Nokia had learned them to be more cautious and aware to disruptions.

On March 20, Philips called the chief component purchase managers of Nokia and Ericsson, to explain the situation. The chief component purchase manager of Nokia was not very alarmed, as one week delay is normal in the global mobile phone industry, but he informed the high levels management about the event. The chief component purchase manager of Ericsson did not inform the bosses, as he did not want to bother them for small problems. This difference in their actions depends on their corporate culture. Nokia has an individualistic and aggressive corporate culture that encourages bad news to travel fast. Also, the power distance is low in Finland, so the communication between low and high

level management is less formal and continuous. While Sweden is a country with a friendly, consensual and passive culture (Hofstede, 1994). The Swedish culture is reflected in Ericsson (as it a Swedish company).

The first thing that Nokia did, after the call, was to send two engineers to help Philips to recover quickly from the disruption while Ericsson did not do anything, but just wait for parts. Nokia had built deep relationship with suppliers. This strong relationship was not reflected only when they offered their help, but even when they agreed to exchange information in real time about Philips' situation.

When Nokia discovered that the component shortages will last more than two weeks, it immediately organized a meeting to find a solution, while Ericsson employees did not even informed the bosses immediately. The sense of urgency characterized the Nokia's corporate culture. Nokia undertook some important actions immediately after the second call:

- Asked Philips to help in finding the needed components, maybe by asking other Philips' plants to provide them. It could do this, as Nokia and Philips were operating as one single company, trying to help each other.
- Searched for other suppliers, and it found them within five days. It was able to find other suppliers quickly as it had good knowledge of the supplier markets. Nokia has been always cautious and aware that something can happen to their suppliers, so it has been informed about the supplier market.
- Redesigned some chips, so that some other suppliers could produce them. The postponement strategy allowed Nokia to do so, as its products shared the same

components, processes and they differed only at the last stage. So Nokia could change their design very quickly (Tang, 2006).

- Designed a project that would have enabled Philips to boost production when the situation would turn in normal conditions. Even here the strong relationship with supplier is noticed.

Ericsson asked help to Philips very late. It was not able to find other suppliers, as the suppliers of the chips at that period were operating at full capacity and many of them were providing components to Nokia. The end results was 16,2 billion crown losses in the mobile phone division at the end of 2000, 400 billion crowns losses from the disruption followed by an exit in 2001 from the mobile phone division (joint venture with Sony Ericsson).

The net sales and profits of Nokia increased after the disruption. It gained market share and brought out of the market one of its strongest competitors. Mr.Korkohen played a crucial role in handling the disruption. He was always searching a solution for the problem, he encouraged the others to do not give up, he was the creative mind. He did not only design a strategy to handle the supply chain disruption, but he was able to execute the strategy successfully.

Lastly, the background of Nokia determined their success. As it is mentioned before Nokia has been always able to change with the time, to adapt to the external environment and to handle supply chain disruptions. A few years ago, before the disruption event, the company lost millions of dollars in potential sales due to a disruption (components shortage). After

this disruptive event, Nokia officials had been more aware to supply chain disruptions (Latour, 2001).

4.18 Nokia, the leader in the mobile phone industry

Nokia had been the leader in the mobile phone industry before the disruptive event and also after the disruptive event. Its market share had changed negatively or positively over time, but its ranking had been unchanged, the top mobile phone manufacturer in terms of market share. Table 13 analyses how the market share of Nokia has changed from 2003 to 2012.

Table 13: Nokia's market share from 2003 to 2012

Year	**Ranking**	**Market share (%)**	**% change from the previous year**
2003	1	34,7	-1%
2004	1	30,7	-12%
2005	1	32,5	6%
2006	1	34,8	7%
2007	1	37,8	9%
2008	1	38,6	2%
2009	1	36,4	-6%
2010	1	28,9	-20%
2011	1	23,8	-17%
2012	2	19	-20%

2004 was a difficult year for Nokia. It can be seen from Appendix 5, that its revenues and profits decreased, and also it lose market share of 12%. But in 2005 its revenues, market share and profits increased as it introduced in the market the new phone Nokia 6680 (Gartner, 2006).

The troubles of Nokia started in 2009, when it saw its market share dropping, due to the growing use of smart phones. Nokia was not good in producing smartphones like Apple or Samsung. To increase its competitiveness in the smart phone division, it had a strategic partnership with Microsoft. The smartphones of Nokia from October 2011 incorporated Microsoft Window Phone System. The results of this partnership were not seen yet as in the second quarter of 2012, as Samsung became the top mobile phone manufacturer, displacing Nokia, which has held the number one since 1998 (Gartner, 2012). In September 2013, Nokia was bought by Microsoft.

Nokia had been able to maintain its leader position in the mobile phone industry, due to its strong background and corporate culture, which had helped the company to handle the supply chain disruptions successfully.

4.19 Nokia case study and the research model

The analysis of Nokia case study was organized into four main parts The study started with the analysis of the company before the disruption. The analysis was focused on the following elements: company background, supply chain and organizational culture.

Nokia was a well-established company at the time of the disruption. During it existence, Nokia had experienced many disruptions and had been able to adapt to the external environment. Nokia had a long supply chain and it relied on supply chain collaboration to achieve full visibility of the supply chain. The corporate culture of Nokia stressed the importance of sense of urgency.

In the second part, the disruption was analyzed. Nokia faced an inbound disruption, as one of its strategic supplier's plant got fire and the supplier could not deliver the specific chips to Nokia and Ericsson. The impact of the disruption was low for Nokia, as it gained market share after the disruption while Ericsson abandoned the mobile market.

In the third part, the author described in detail and chronological order the actions and strategies undertaken by the companies after the disruption happened. Firstly, Nokia detected the disruption before Ericsson. Immediately it offered its help to the supplier and analyzed the situation carefully. When Philips called to say that the delay of the components would last more than one week, Nokia organized an extraordinary meeting, and found a solution. Ericson reacted very late and was not able to find other suppliers. Nokia implemented the postponement strategy, which allowed the company to design and produce the new chips quickly.

Lastly, the performance of the company after the disruption and until now was analyzed. Nokia has remained the leader in the computer industry, until 2013 when it was bought by Microsoft.

Now let's analyze the three relations proposed by the research model. The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's

organizational culture, company background, supply chain collaboration and many other factors.

The corporate culture of Nokia and its past experiences had increased its awareness to risks, which in turned allowed Nokia to detect immediately the disruption and react on time. Nokia was able to implement the postponement robust strategy, as its corporate culture that enhances a high level of uncertainty avoidance enabled it to do so. The first relation holds on for this case study.

The second relation states that if the company was resilient or prepared the recovery would be fast and less costly and vice versa. As discussed above, Nokia had many characteristics of a resilient company, so the impact of the disruption was low for Nokia compared to Ericsson. Even, the second relation holds on for this case study.

The third relation states that the actions and strategies undertaken by the company, after the disruption occurred, are important for handling the disruption successfully. The success of Nokia in handling the supply chain disruption was due to the robust strategy that it implemented and the sense of urgency shown. So, all the three relations of the research model hold on for Nokia case study.

4.20 Conclusions

On Friday night, 27 March 2000, a lightning storm rolled through the Albuquerque city, in New Mexico. Lighting struck a Philip's industrial building. Philips could not fulfill the orders of its main clients, Nokia and Ericsson. At a first sight, it was forecasted that the delay will be a week, but in reality it was more than one week. The delay would have

caused significant losses to Nokia and Ericsson. Nokia reacted immediately to the disruption while Ericsson reacted very late. As a result, Nokia gained market share (+14%) after the disruption while Ericsson abandoned the mobile market.

The success of Nokia in handling the supply chain disruption was a result of its corporate culture, strong relationship with suppliers, company background, sense of urgency, postponement strategy and Mr.Korkohen capabilities.

CASE STUDY: DAIMLER CHRYSLER AND THE TERRORIST ATTACK

4.21 Company background

When you hear the name Daimler, everyone think of the luxury car Mercedes- Benz. But Daimler does not only produce luxury cars, it is also the largest producers of trucks in the world and also operates in different sectors, like financial services, military sector, and so forth.

Everything started in 1880 when two engineers Carl Benz and Gottlieb Daimler worked hard for the development of the internal combustion engine. They never met each other. Carl Benz called his first car Benz while Daimler called his first race car Mercedes (the name of the daughter of his sponsor). The brand name Mercedes was patented in 1902. To satisfy the increasing demand for his cars Daimler expanded the production in other cities. The request of commercial cars was always high, and so they focused more on this sector. However, the First World War changed everything, as they had to satisfy the government demand and not the private demand. In 1924, Daimler and Benz started the coordination of their activities and they finally merged in 1926. The merger was the only way to save them from bankruptcy. The new company was called Daimler-Benz AG, with its headquarter office in Berlin (Daimler, 2014).

The strategy followed by the new company was: flexible production and limited car models. Mercedes- Benz was the most successful race car, and this achievement was used

as propaganda by Adolph Hitler. The Mercedes- Benz became the transportation vehicle of Hitler, which used the factories of the company to produce military products during the Second World War. Due to its importance, the production factories were the primary target of the enemies. 70 % of the factories inside and outside Germany were destroyed. After the war, the factories recovered quickly and the company became one of the most successful auto producers in the world (Business Reference, 2014).

The company implemented a conservative strategy after the war. Its main elements were conservative growth, concentration on areas of expertise, foresight, and willingness to sacrifice short-term sales and earnings for long-term benefits. In 1985, Daimler Benz acquired in quick succession three big conglomerates: Motoren-und-Turbinen-Union, which made aircraft engines and diesel motors for tanks and ship; Dornier, a privately held manufacturer of spacecraft systems, commuter planes, and medical equipment and AEG, a high-technology manufacturer of electronic equipment such as turbines, robotics, and data processing, as well as household appliances. Many were skeptic for this acquisition, which was contradictory with its conservative strategy (Business Reference, 2014). The CEO explained that these acquisitions were necessary, to survive in the new business environment. The auto-vehicle sector was becoming unpredictable and unstable and access to key technologies and growth sectors like electronics, aviation and services was necessary for safeguarding the company's earning power in the long term. Managing a big corporate portfolio was not easy, and so the hoped results were not achieved. For this reason in 1995, the integrated group was restructured. The business units that did not join a favorable competitive position were sold. The Daimler Group focused only on the automotive

mobility, transportation and financial service. New manufacturing plants were built in different countries (Daimler, 2014).

In 1998, Daimler announced the merger with Chrysler Corporation. This merger did not deliver the promised results and synergies in production and development. The main problem was differences in culture including their level of formality, operating styles, and so forth. The German culture became dominant and employee satisfaction at Chrysler plant dropped down. One unhappy joke circulating at Chrysler at the time was "How do you pronounce DaimlerChrysler?… 'Daimler'—the 'Chrysler' is silent" (Jacobsen, 2012). In 2007, Daimler sold Chrysler to Cerberus Capital Management for $6 billion.

The sales of Daimler were affected by the global crisis, but it continued to develop and expanded in emerging countries like Asian ones. Even after 125 years, Daimler carries on the pioneering spirit and outstanding quality standards of the original founders and is the leader in the automotive industry. Actually Daimler Group has 5 Business Units, respectively Mercedes –Benz Cars, Mercedes- Benz Vans, Daimler Trucks, Daimler Buses and Daimler Financial services, located in different countries. (Daimler, 2014).

4.21 Daimler's supply chain

Suppliers: Like the other car producers Daimler has many suppliers. Suppliers are very important and Daimler considers them as partners. In the website, there is a specific area for the suppliers, called "Supplier Portal". When you click on this portal you read "Partners have common goals and share knowledge. Therefore we inform in our Supplier Portal

about business processes, relevant changes, current projects, and everything else, that simplifies our collaboration. Registered users can access their personal Daimler applications and messages" (Daimler, 2014).

Daimler uses the multiple sourcing strategies. For every component, it keeps more than one supplier to secure the flow of components. In the last years, it started to implement the supply incentive strategy. Daimler honored each year the best suppliers based on their outstanding performance. If the suppliers performed above the average performance (measured in terms of quality, cost, delivery reliability and innovative strength) they are automatically the winner of The Daimler Supply Reward. The partnership between Daimler and its suppliers is based on trust and open communication (Daimler, 2014).

Manufacturing plants: For the Business Unit Mercedes- Benz Cars the main manufacturing country is Germany but the division also has production facilities in the United States, China, France, South Africa, India, Vietnam and Indonesia, nearly 17 production facilities worldwide. The division Daimler Truck has 27 production facilities worldwide. 14 production facilities are in the NAFTA region (14, thereof 11 in the United States and 3 in Mexico), Asia (3), Europe (7), South America (2) and Africa (1). For the business unit Daimler Buses the most important of the 15 production sites are in Germany, France, Spain, Turkey, Argentina, Brazil, Canada, Mexico and the United States. Moreover, the Daimler Financial Services division supports the sales of the Daimler Group's in nearly 40 countries (Daimler 2014).

Distribution: The transportation costs have always been unpredictable, as the fuel price always changed and because Daimler sells its products worldwide. Transport logistics is the only cross-departmental supply chain function and due to its importance the headquarters spend much time to appoint a good transport logistics manager. If the transportation takes longer than predicted an alternative solution must be implemented as the customers cannot wait. Transportation has to be competitive, and the company achieves this by treating the providers as partners, so they can do special works for them even if this is not their job. Summarizing Daimler tries to have extremely healthy logistics partners, a strong mix of providers and to have always second solutions (Ludwing, 2010).

Customers: Daimler's customers are all over the world. They include young people, senior citizens, singles, and parents with children, frequent business travelers, professional truck drivers, and cabbies. The company has built up quality management systems to increase customer satisfaction. Daimler obtains data for customer satisfaction by portals, surveys, interviews and forums. These data are necessary to know in which area the company has to work more to increase customer satisfaction. The performance of each business unit is evaluated based on the customer satisfaction index.

Concluding, all the members in the supply chain are treated as partners and their relationship is based on commitment, trust and collaboration. Daimler tries always to have a complete supply chain view to prevent disruptions before happening.

4.22 Daimler's corporate culture

Daimler is a German company, so its corporate culture is affected by the German culture. The main cultural elements of the German culture are high power distance and high uncertainty avoidance.

The power distance at Daimler is at low levels, emphasizing equality and opportunity for everyone. When communicating with supervisors the employees tend to be clear and precise. Even if there is a high hierarchy, employee satisfaction is crucial. The following sentence, retrieved from Daimler website, show it: "A company's greatness depends on its employees' enthusiasm and ideas – that's why employee satisfaction is a strategic success factor for Daimler" (Daimler, 2014).

Due to the company background and disruptions faced, Daimler does not like uncertainty. To avoid uncertainty, it relies on many rules and tries to plan everything if it is possible. To deal with the unpredictable, emergency teams are built up (Daimler, 2014).

Diversity is welcomed at Daimler. In order to benefit from the diversity of the employees, it focused in three main areas: gender diversity (more women in the leading positions); work-life balance (trying to create a balance between work and family); generation management (ensure that all group ages work well together) (Daimler, 2015).

Summarizing, the most important elements of Daimler corporate culture relevant for the case study are formality, diversity, discipline, uncertainty avoidance and sense of urgency.

4.23 The terrorist attack

The terrorist attack of September 2001 was one of the most terrible terrorist attacks. The consequences of this attack were felt in all the business sectors worldwide**.** The National Commission on Terrorist Attacks upon the United States (2001) reported:

> "At 8:46 on the morning of September 11, 2001, the United States became a nation transformed. An airliner traveling at hundreds of miles per hour and carrying some 10,000 gallons of jet fuel plowed into the North Tower of the World Trade Center in Lower Manhattan. At 9:03, a second airliner hit the South Tower. Fire and smoke billowed upward. Steel, glass, ash, and bodies fell below. The Twin Towers, where up to 50,000 people worked each day, both collapsed less than 90 minutes later. At 9:37 that same morning, a third airliner slammed into the western face of the Pentagon. At 10:03, a fourth airliner crashed in a field in southern Pennsylvania. It had been aimed at the United States Capitol or the White House, and was forced down by heroic passengers armed with the knowledge that America was under attack. More than 2,600 people died at the World Trade Center; 125 died at the Pentagon; 256 died on the four planes. The death toll surpassed that at Pearl Harbor in December 1941. This immeasurable pain was inflicted by 19 young Arabs acting at the behest of Islamist extremists headquartered in distant Afghanistan. Some had been in the United States for more than a year, mixing with the rest of the population. Though four had training as pilots, most were not well-educated. Most spoke English poorly, some hardly at all. In groups of four or five, carrying with them only small knives, box cutters, and cans of Mace or pepper spray, they had hijacked the four planes and turned them into deadly guided missiles".

The impact of the attack in the financial industry, Wall Street, was enormous. 2000 employees in this industry were dead. The offices were destroyed or badly damaged. Many companies suffered a complete loss of information technology infrastructure (Pickett, 2003).

In all the custom points the security increased. Each truck was carefully controlled and the air transportation was stopped for some days. This disrupts the normal flow of goods. For

companies that rely on just in time inventory systems, like the car producers, this was a big problem. If the parts did not arrive at the right time, the production has to be stopped (Martha & Subbakrishna, 2002).

Daimler Chrysler and Ford were affected by this disruption. Daimler Chrysler handled the disruption successfully while Ford no. The next sections will describe in detail the reaction of Daimler Chrysler and Ford to the disruption.

4.24 How Daimler Chrysler and Ford handled the disruption?

The next day after the disruption, the Daimler's Michigan base logistics staff conducted a detailed analysis of the situation. Information was gathered for the following items (Pickett, 2003):

1. Inputs needed to produce according to the plan.
2. Availability of components in the inventory.
3. The items blocked at the Canadian and Mexican border.
4. Which customs were opened, which were closed, and which were operating very slowly.

The analysis showed that they would be out of stock for steering gears. This part was normally air transported from Virginia to the Chrysler plant in Mexico. Immediately they called the supplier of this part. The best solution was the transportation of some parts via an expedited truck service. Daimler Chrysler was able to take advantage of a previous agreement with the Canadian Pacific Railroad. It sent 110 trailers through a tunnel between Windsor, Ontario and Detroit, Michigan, avoiding the delays of passing all those trailers by truck across the busy Ambassador Bridge (Martha & Subbakrishna, 2002).

Ford did not show the same sense of urgency like Daimler. The shipment of parts was delayed and Ford did not have or did not implement an emergency plan. On September 14th, 2001, it announced the closure of 5 plants in USA while Daimler Chrysler announced the closure of only one manufacturing plant. After a week, everything turned in normality, as the board inspection wait time was reduced as before the attack.

4.25 Daimler Chrysler and Ford after the disruption.

Table 14 and 15 provide information about Daimler Chrysler revenues. The total revenues from 2000 to 2001 fall by 6%. It can be seen from the first table that the major decrease in sales was in Germany compared to USA. In 2001 economic growth slowed in USA and Europe, but everyone would have expected low sales in USA due to the terrorist attack. Mercedes Benz division saw its revenues increasing from 2002 to 2001, while Chrysler group and other activities saw their revenues decreasing, especially the last division. Other activities include aero engine, real estate activities and holding and finance companies. How it is possible that the revenues decreased less in USA compared to the EU countries, after the terrorist attack? After the attack the consumer confidence fell by 10 points, this in turn brought a decrease in auto sales. Buying a car was the last thing people were wishing to do after the terrorist attack. Immediately after September 2001, auto vehicle sales fall by 35%. GM reacted by offering zero interest financing for all its products. The same strategy was followed by other car producers. Due to this strategy, sales on October 2001 and November 2001 increased (Mohaterem, 2003). This is the reason why revenues decreased less in USA.

Table 14: Daimler's revenues by region

	2000	2001	Change
Total Revenue	162,384 euro	152,873 euro	-6%
Revenue USA	84,503 euro	81,132 euro	-4%
Revenue Germany	25,988 euro	23,157 euro	-11 %
Revenue EU	50,348 euro	45,640 euro	-9 %
Revenue North America	95,939 euro	91,916 euro	-4%
Other markets	16,097 euro	15,137 euro	-6%

Source: Daimler Chrysler (2002)

Table 15: Daimler's revenues by divisions

	2000	2001	Change
Total Revenue	162,384 euro	152,873 euro	-6%
Mercedes Benz Division	43,700 euro	47,705 euro	9%
Chrysler Group	68,372 euro	63,483 euro	-7%
Commercial Vehicles	29,804 euro	28,752 euro	-3%
Services	17,526 euro	16,851 euro	-4%
Other activities	10,615 euro	4,570 euro	-55%

Source: Daimler Chrysler (2002)

Table 16 provides information about the total operating profits and the operating profit of each division in 2000 and 2001. The total operating profit decreased by 73% in 2001 compared to 2000. The main reason for this decrease was the bad performance of the Chrysler Group. The Mercedes Benz division was the best performing division in 2001. It can be noticed even by the data in table 17 that Chrysler Group reduced its number of employees by 14 % while the last division by 55%. The merger with Chrysler was not a

good idea, as the performance of Chrysler decreased a lot after the merger. Even the decision to operate in another uncorrelated business was not a good idea. It is better to focus on what you can do well. Some years later, Daimler sold Chrysler to Cerberus Capital Management for $6 billion.

Table 16 : Daimler's operating profit by divisions

	2000	2001	Change
Total operating profit	5,213	1,345	-73%
Mercedes Benz Division	2,874	2,961	3%
Chrysler Group	531	(2,183)	-500%
Commercial Vehicles	1,253	51	-95%
Services	641	578	-9%
Other activities	67	205	200 %

Source: Daimler Chrysler (2002)

Table 17: Daimler's number of employees by division

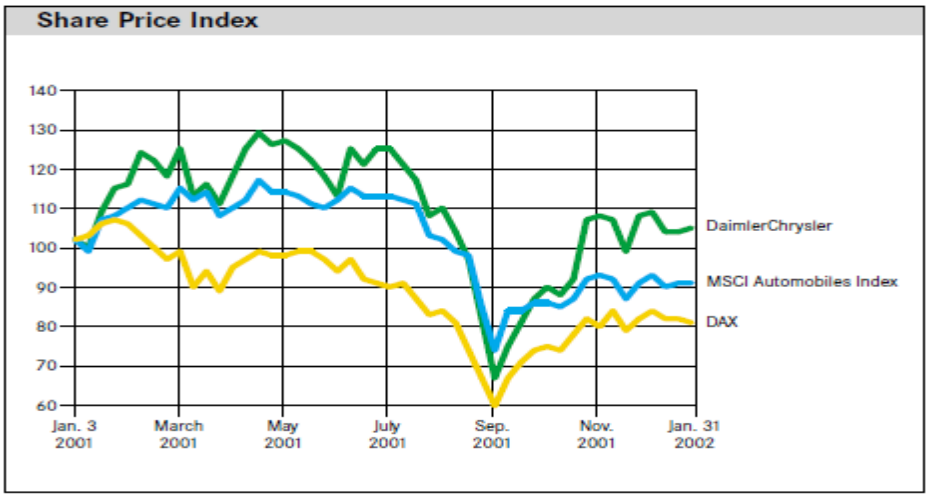
	2000	2001	Change
Total Employees	416,501 employees	372,470 employees	-11 %
Mercedes Benz Division	100,893 employees	102,223 employees	1,3%
Chrysler Group	121,027 employees	104,057 employees	-14%
Commercial Vehicles	101,027 employees	96,644 employees	-4%
Services	9,589 employees	9,712 employees	-1,2%
Other activities	47,108 employees	21,101 employees	-55%

Source: Daimler Chrysler (2002)

The monthly price of Daimler Chrysler share is presented in Figure 7. The share price reached its minimum in September, but in November the share prices increased again. The

increase was big but not to the levels before the terrorist attack. This increase was due to the help of the Federal Reserve, which lowered the interest rate to 1, 75% and due to the cutting costs of The Bush government. All these actions helped not only the auto industry but all the economy to recover quickly after the terrorist attack

Figure 7: Daimler Chrysler share prices



Source: Daimler Chrysler (2002)

The slow reaction of Ford to the disruption showed its results in the automotive sector. The operating profit in the automotive sector decreased drastically from 2000 to 2001 (-260%). In 2001, the market share of Ford was improved in the EU market while decrease slightly in the USA market. All these data are presented in table 18.

Table 18: Ford financial performance 2000 and 2001

	2000	2001	Change
	2000	**2001**	Change
Automotive sector			
Operating profit	5323	-8862	-260%
Revenues	140,777	130,827	-7%
Financial services			
Operating profit	2976	1440	-51%
Sales	28,314	29,927	5,6%
US market share	23,7 %	22,8%	-0,9%
EU market share	10%	10,7%	0,7%

Source: Ford (2002)

4.26 Comparison of Daimler and Ford reaction to the disruption

On September 14th, 2001, Ford announced the closure of 5 plants in USA while Daimler Chrysler announced the closure of only one manufacturing plant. After a week, everything turned in normality, but Ford performance after the disruption was not very good compared to Daimler Chrysler. Its operating profits decreased drastically in 2001 compared to 2000. Even the operating profit of Daimler Chrysler decreased, but this was mainly due to the bad performance of the Chrysler Group. The merger with Chrysler was not functioning as expected. What was called merger of equals was showing up many problems. Why Daimler Chrysler handled the disruption successfully while Ford did not?

First of all, Daimler immediately implemented a robust strategy (flexible transportation).

Secondly, Daimler organizational culture emphasizes the sense of urgency and uncertainty avoidance. This helped the company to plan quickly a solution and implement it.

Thirdly, the collaboration with the supply chain partners and its high supply chain visibility helped Daimler Chrysler to detect and handle the disruption quickly.

Lastly, the help provided by the Federal Reserve and the government reduced the effects of the disruption in the USA economy. The Central Bank reduced the interest rates, and offered its support in zero interest financing strategy for many products. Also, the government reacted quickly to return the economy in normality.

Ford did not react quickly and so the effects of the disruption were greater for him compared to the other car producers.

4.27 Daimler case study and the research model

The analysis of Daimler case study was organized into four main parts. The study started with the analysis of the company before the disruption. The analysis was focused on the following elements: company background, supply chain, organizational culture and organizational structure.

Daimler is a company with a strong background. Its supply chain is complex and global, so it is difficult to have full visibility of all the parts of the supply chain. To achieve this, Daimler strongly collaborates with the supply chain partners, especially with suppliers and distributors that are selected based on quality, reliability and commitment. The main elements of Daimler corporate culture are uncertainty avoidance and sense of urgency.

In the second part, the disruption was analyzed. Daimler faced an inbound disruption, as the disruption happened at the distribution part. Due to the terrorist attack the trucks were blocked in the customs and the raw materials and products could not arrive in time. The impact of the disruption was low for Daimler as its revenues increased after the disruption while Ford was obliged to stop the production in four plants.

In the third part, the author described in detail and chronological order the actions and strategies undertaken by the company after the disruption happened. Immediately after the disruption happened, Daimler conducted a detailed analysis of the situation and found a solution. It implemented the flexible transportation robust strategy. This strategy allowed the company to get the product distributed on time.

Lastly, the performance of the company after the disruption and until now was analyzed. Daimler over time has remained the leader in the automobile industry.

Now let's analyze the three relations proposed by the research model. The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's organizational culture, company background, supply chain collaboration and many other factors.

We can say that the company is prepared to face disruptions as it has a full visibility of the supply chain and also it shows a high awareness to risks. Daimler was able to implement

the flexible transportation robust strategy as its past experience had increased its awareness to risk. Also, one of the main elements of Daimler's corporate culture is high uncertainty avoidance. To avoid problems of transportation, the company had signed some agreement that can be executed in case of disruptions. The agreement with the Canadian Pacific railroad enabled Daimler to send 110 trailers through another road, avoiding the busy Ambassador Bridge. The first relation holds on for this case study.

The second relation states that if the company was resilient or prepared the recovery will be fast and less costly and vice versa. As discussed above, Daimler had all the characteristics of a resilient company, so the impact of the disruption was low for Daimler compared to Ford. Even, the second relation holds on for this case study.

The third relation states that the actions and strategies undertaken by the company after the disruption occurred, are important for handling the disruption successfully. The success of Daimler in handling the supply chain disruption was the robust strategy that it implemented, flexible transportation, and the sense of urgency shown. So, all the three relations of the research model hold on for Daimler case study.

4.28 Conclusions

The terrorist attack of September 2001 was one of the most terrible terrorist attacks. The consequences of this attack were felt in all the business sectors worldwide. In all the custom points the security increased. Each truck was carefully controlled and the air transportation was stopped for some days. This disrupts the normal flow of goods. For companies that rely on just in time inventory systems, like the car producers, this was a big problem. As the

shipment of many components was blocked at the Canadian and Mexican board, many car producers stopped the production. Ford was obliged to close five plants, and its operating profits decreased by 260 % in the automotive sector. Daimler was hit by the same intentional disruption, but its operating profit did not decrease so drastically.

The success of Daimler in handling the supply chain disruption compared to Ford was due to the sense of urgency shown, supply chain collaboration, organization culture and the help provided by the government and the Federal Reserve .

COMPARISON OF DELL, NOKIA AND DAIMLER CASE STUDY

4.29 Comparison of the case studies

Firstly, a comparison of the disruption that the companies faced will be made and then the strategies and actions implemented to handle the supply chain disruption will be compared.

Supply chain disruption

Dell, Nokia and Daimler faced an inbound disruption, as the disruption happened to their suppliers and distributor. The source of the disruption in the case of Dell was natural disaster (an earthquake), in the case of Nokia the source of disruption was accident (fire) and the source of disruption for Daimler was intentional (terrorist attack). Natural disasters in all the cases are major disruptions, and their effects on the economy are high. The Taiwan earthquake caused a component (memory chip) shortage, which was followed by an increase in the price of components. The component shortage and price increase affected all the computer industry. The disruption that happened to Nokia was small. However its effects were more than expected. This disruption affected only Philips and its two main clients, Nokia and Ericsson, while the impact in the mobile phone industry was low. The impact of the intentional disruptions can be small or big, depends on the type of the disruption. The terrorist attack had devastating effects not only in the automotive industry but in many other industries.

Handling the supply chain disruption

Nokia, Dell and Daimler handled the supply chain disruption successfully. They gained market share after the disruption. Dell become the leader in the computer industry, Nokia's

market share increased by 14% while Daimler's market share increased by 45%. Nokia gained even more as its main competitor, Ericsson retreated from the mobile phone industry. Their success relied on the following factors:

Strong relationship with suppliers: The business model of Dell requires considering the suppliers as part of the company, so it continuously work on strengthening the relationship with suppliers. In case of problems, they work as a single company. Nokia immediately after the fire sent two engineers to help Philips to recover, while Michael Dell, CEO of Dell, visited their supplier after the earthquake, to offer to them help. Even Daimler strongly collaborates with suppliers.

Awareness to risk: The degree of awareness to risk was high in all the three companies. They have invested in information system technology, to have under control all the supply chain, especially the suppliers. Nokia noticed immediately that something had happened to Philips, as the technology allowed them to have real-time information about their suppliers. As it is explained in the Dell case study, its information system was very advanced. The awareness to risk at Nokia and Daimler is influenced even by their background. They have faced many risks and disruptions, so their awareness to disruptions was high.

*Sense of urgency***:** Dell, Nokia and Daimler reacted immediately to the disruption, obviously following different strategies. The sense of urgency in case of disruptions is crucial for handling them successfully.

Robust strategy[5]: Dell implemented the revenue management via dynamic pricing and promotion strategy**.** By promoting and reducing the price of computers with low memory, it shifts consumer purchases toward the low memory computers. It was able to implement this strategy as its business model enabled the company to do so. Nokia implemented the strategy of postponement that allowed it to redesign the chips quickly so that they can be produced by other suppliers. Daimler implemented the flexible transportation strategy. As the roads were blocked, Daimler used alternative routes and means of transportation.

Knowledge of the supplier market: Dell and Nokia found other suppliers quickly, as they have been informed well before about the supplier market.

Agile supply chain: Agile supply chains are the ones that are able to respond quickly to short-term changes in demand and supply, or the ones that are able to handle external disruption smoothly (Lee, 2004). All the companies had an agile supply chain, which allowed them to implement the robust strategy and to react quickly to the external disruption.

Human resources: In every organization human resources are crucial. They are an indispensable element of the company success. The success of Dell and Nokia mainly relied on the abilities of two wise persons, Michael Dell and Mr. Korkohen. They were great leaders, which encourages the other people to be optimist and to work hard to handle the disruption.

*Corporate culture***:** The corporate culture of Dell, Nokia and Daimler influenced their road to success. The importance of corporate culture was more critical in the case of Nokia and

[5] Robust strategies are explained in the literature review chapter

Daimler. It was Nokia's individualistic and aggressive culture that encourages bad news to travel fast and also it encourages speed and flexibility in decision-making. The corporate culture of Daimler like the one of Nokia stresses the importance of sense of urgency.

*Business model***:** The direct business model was critical for the success of Dell, as it enabled Dell to implement and execute the robust strategy (revenue management).

Table 19 summarizes all the differences and similarities between Dell and Nokia case study.

Table 19: Comparison of Dell, Nokia and Daimler case study

	Similarities	**Differences**		
Supply chain disruption	Inbound disruption	**Dell**	**Nokia**	**Daimler**
		Natural disaster disruption. Affected all the computer industry	Incidental disruption. Affected only Nokia and Ericsson.	Intentional disruption. Affected many industries.
The factors that determined the successful handling of the disruption	Awareness to risk. Agile supply chain. Corporate culture. Company background.	**Dell**	**Nokia**	**Daimler**
		Business model. Revenue management strategy. Strong relationship with suppliers. Human resources.	Postponement strategy. Strong relationship with suppliers. Human resources. Sense of urgency.	Flexible transportation Sense of urgency.

4.30 Research findings/ lessons

Nokia, Dell and Daimler handled the supply chain disruption successfully. What can be learned from their experience?

First of all, supply chain disruptions small or major merit special attention, companies should not under evaluate them. The Nokia case study is the best example, a small disruption happened but its consequences were very severe.

The severity of supply chain disruptions depends on a number of factors. For example, Nokia and Ericsson faced the same disruption, but the severity of the disruption was high for Ericsson. Dell and the other companies in the computer industry faced the same disruption, but the severity of the disruption was low for Dell. Even Ford and Daimler faced the same disruption, but the severity of the disruption was low for Daimler. Considering the case studies, it can be concluded that the severity of supply chain disruptions depends on how prepared is the company to face disruptions and on how the company reacted when the disruption happened.

The preparedness of companies to face disruptions depends on:

Supply chain collaboration and flexibility: Supply chains are becoming more vulnerable nowadays, so when dealing with supply chain disruptions, the first thing to do is to be prepared to face disruptions. It is necessary that the company monitor and manage the weakest link in the supply chain, as Nokia and Daimler did. The experience of these companies showed that the best solution is continuous communication and collaboration with all the partners of the supply chain, from the suppliers to the final consumer and flexibility.

Flexibility in production, in finding suppliers, in inventory and in transportation make the supply chain agile, meaning more able to recover after sudden setbacks. Nokia had designed a flexible production process, as all its products shared the same components and process at the initial phase and differed only at the last stage of production. The production of Dell was flexible, as it produced customized products after the customer orders. Daimler had a flexible distribution system as it tried to have healthy logistic partners and to had always second best solutions.

With flexibility in finding suppliers, it is intended the ability of firms to find other suppliers quickly. Nokia and Dell were flexible in finding suppliers because they have good knowledge of the supplier market, and so they find quickly other suppliers.

Flexibility in inventory, means keeping inventory of critical components and products. This can be noticed more at Nokia, as Dell keeps nearly no inventory.

Flexibility of distribution means to have alternative means and routes of transportation and also to check always the situation of the distributors.

Company's background: Companies that have experienced disruptions or problems before are more aware to disruptions, and the severity of disruption will be lower for them, as they are always prepared for disruptions. Disruptions are part of their day to day business.

Corporate culture: Companies that have a collaborative and aggressive culture can handle better supply chain disruption as their culture stress the importance of flexibility in decision making and sense of urgency. These elements are critical for handling supply chain disruption.

Organizational structure: A rigid structure could impose limits in handling supply chain disruptions as it does not allow a high degree of flexibility. It is necessary to be aware of the limits and opportunities imposed by the organizational structure.

The success of the company in handling supply chain disruption depends even on the strategies and actions that it implemented after the disruption occurred. Companies design different robust strategies to handle supply chain disruptions. One size cannot possibly fit all, as one strategy can work well for one company, but cannot work well for the other. The success in executing the robust strategies depends on:

Human resources: Human resources are an important part of the company. They are the "software and hardware" that move the company in good and bad times. The first thing that has to be done, when a disruption happen, is to organize and mobilize the company/human resources, which will answer to the external disruption.

Working together: More are better than one in handling supply chain disruptions. Companies in the supply chain have to work as a team.

Business model: Dell implemented the revenue management strategy as its direct business model helped it to influence the acquisition decision of customers.

Corporate culture: Nokia would not have been able to execute such strategy, but it was able to implement the postponement strategy as it culture and organization enabled it to implement such strategy. Daimler executed the flexible transportation robust strategy, as its agile supply chain and corporate culture allowed it to do so.

Sense of urgency: And lastly, but not less important, react immediately to supply chain disruptions. One day, one week, one month can make the difference, as the Nokia case study has shown.

4.31 Conclusions

In this chapter, three case studies were analysed, respectively Dell, Nokia and Daimler case study. All these companies faced an inbound disruption. The disruption hit even their competitors, but these three companies saw their revenues and market shares increasing after the disruption compared to the competitors. What's behind their success?

The detailed analysis of the case studies and the comparison between them showed that the success of the companies in handling the supply chain disruptions depends on the strategies implemented after the disruption occurred. All the three companies implemented different robust strategies. Their company background, organizational structure and organizational culture determined the successful execution of the strategy.

Also the analysis of the case studies revealed that the severity of a disruption depends on the company background and organizational culture. These factors can decrease company resilience. Also, they determine the success in the execution of these strategies for handling supply chain disruptions.

CHAPTER V: ALBANIAN CASE STUDIES

The aim of this chapter is to analyze two Albanian case studies, Meggle Albania and Fabjus case study. The analysis of the case studies will be structured as follow:

Firstly, the most important elements (company background, supply chain, organizational structure and culture) of the companies will be analyzed. Only the elements of the organization that are relevant to the case studies will be mentioned.

The next step will be the analysis of the disruptive event and its effects on the companies under consideration and on their competitors.

The most important part will be the description and analysis of the actions implemented by the companies after the disruption occurred. It will be explained why such actions and strategies were implemented and how effective they were.

Lastly, the reaction of all the companies will be compared trying to emphasize the factors that determined the successful handling of the supply chain disruptions compared to the competitors.

CASE STUDY: MEGGLE ALBANIA AND THE AFLATOXIN SCANDAL

5.1 Company background, Meggle Group

In 1887, Jakob Meggle opened a cheese factory. This factory laid the foundation of today's firm. The family business continued growing over time. The motto of the business at that time was "Only with high-quality products you can survive in the market". During the world wars, the business was run successfully by the women of the family. The current owner of the company, Joseph Anton Meggle III, called Toni, was born on 1931. His parents invested a lot in his education and in 1956 he came on board. After the Second World War Meggle invested heavily and tried to catch up the new technology trends. When Toni Meggle became the sole managing director, the managing style changed from patriarchal to cooperative management. In 2002, the company was called Meggle AG, a group which included (Meggle AG, 2015):

MI MEGGLE International: It's aim was to expand the distribution of the powdered products internationally. In 1997 was formed the Japanese subsidiary. Other subsidiaries included in this sub-group are the ones in Vienna, Shangai, San Paulo etc.

Molkerei MEGGLE Wasserburg: The head office of this group is in Wasserburg, where it is produced 100 % of the butter, convenience products for consumers, products tailored to the hospitality market, as well as functional powdered products for the food, pharmaceutical and animal feed industries. This is the core business of the Meggle Group, centered in the birthplace of the company.

MEGGLE Eastern Europe: It is headquartered in Wasserburg and its responsibility is securing a key position to the Meggle products in the growing markets of the Eastern Europe. The biggest branch in Eastern Europe is the dairy business Rajo a.s. in Bratislava, Slovakia. Other Meggle production sites in Eastern Europe include Osijek (Croatia), Kragujevac (Serbia), Rrogozhinë (Albania) and Shumen (Bulgaria). Each company is run by a team of local managers as they have good knowledge of the market.

The vision of the company is the same from the foundation till now: Geared for expansion while also committed to tradition. Meggle's brand is related with quality, creativity, sustainability, innovation, long-term customer satisfaction and collaboration with the upstream and downstream part of the supply chain (Meggle AG, 2015)

5.2 Company background, MEGGLE Albania

The Eastern Europe was considered an important market for Meggle AG. Considering the growth potential of the Albanian dairy market, Meggle AG decided to enter the Albanian market. There are various entry modes, from export to licensing, joint venture, acquisition of an established company in the host country or setting up a wholly owned subsidiary. The optimal enter mode depends on various factors like political risks, trade barriers, transportation costs, country risk, and many others. One entry mode can be successful for one company but cannot work well for another company, as one size cannot possibly fit all. After making a careful analysis, the company decided that the best entry mode was the acquisition of an established company in Albania, for the following reasons:

Firstly, this entry mode is quick and profitable. Meggle AG considered the Albanian market very profitable, so there was no time to loose.

Secondly, there were many well established dairy companies in Albania, so the establishing of a wholly owned subsidiary would be time and cost consuming.

Thirdly, in the Eastern Europe Countries it is necessary to have a local partner, due to differences between these markets and markets of developed countries.

On August 2010, Meggle AG took over Ferlat sh.p.k., which had 57% market share in the consumer milk marke, at that time. Ferlat had many problems with the human resource management. 50% or more of the employees were family related, and they were not hired for their capabilities and competences, but due to family relations. The company had gained a significant market share, due to its location, financial availability and the timing of entry. The headquarter of the company was in Rrogozhine, when it had a big milk processing factory. The owner invested a lot in technology and he entered the market at the time when it was at the growing phase and there were few competitors. Meggle AG decided to acquire Ferlat, as according to the high managers, the company could have high growth and capacity enlargement potential if it was well managed.

After the acquisition, many changes were made. A new team of managers was created. The employees of Ferlat were not fired while the high managers were trained according to their rules. The new acquired company was called Meggle Albania. Now, let's analyze Meggle Albania supply chain and organizational culture.

5.3 Meggle Albania's supply chain

Suppliers: The first tier suppliers for milk are the milk collection centers while the second tier suppliers are the farmers. As the company sells UHT milk, the packaging supplier is Tetra Pak located in Serbia and Croatia. It is the supplier of many milk processing companies in Albania and it is a reliable one. The difficulty of Meggle Albania is the management of the suppliers, especially of the milk suppliers. In this industry, the quality of milk is important. The company regularly tests the milk supplied by the collection centers.

Collaboration with suppliers is very important, not only with the first tier suppliers but even with the second tier suppliers. Meggle Albania chooses the milk suppliers based on costs, quality and reliability. In the milk processing industry, costs are important, especially due to the competition from the informal market. But quality is the key success factor. The company requires a certification of quality from the suppliers and also it has a list of criteria regarding quality. If one supplier did not meet one of these criteria, Meggle Albania helps them, by making easier the compliance with the quality criteria. Meggle Albania had built strong relationships with suppliers. When a disruption hit them, Meggle Albania is there to help them. Three years ago the animals of the farmers were affected by brucellosis. Meggle did not abound them but offered financial help.

Production firm: Meggle Albania has only one production firm, located in Rrogozhine, Albania. The standards of production are the same as of the mother company. The

sterilization process is very important. Due to the investment in the latest technology, the milk reaches 140 grades Celsius in 3 seconds[6] .

Distribution: Meggle Albania did not outsource this function, like other companies. All the warehouses are under the property of Meggle. The company decided not to outsource this function, in order to have real-time information about the availabilities of the products in inventory.

Customers: They include families and private or public institutions. To increase customer satisfaction Meggle has built up a quality management system (mentioned above), to secure the quality of milk from the suppliers and from the sterilization and packaging process.

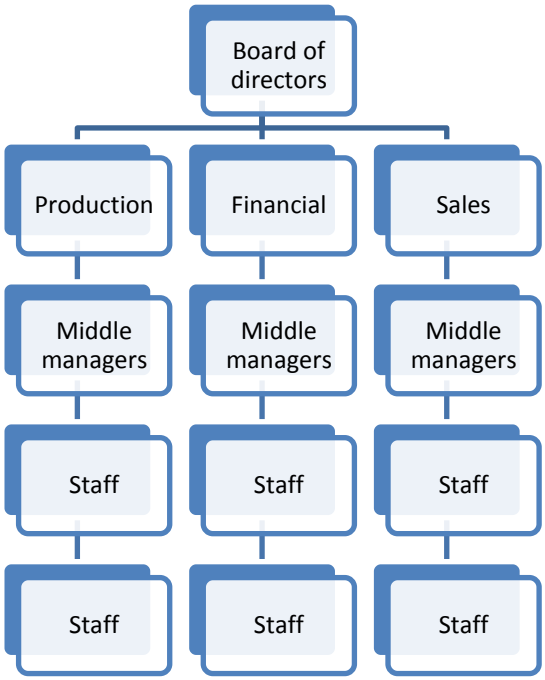
Summarizing, Meggle Albania has a full visibility of the upstream part of the supply chain. It also strongly collaborates with suppliers, in order to increase reliability (We are in together). It is nearly vertically integrated. This in turn allows the company to have a full visibility even of the downstream part of the supply chain.

5.4 Meggle Albania's organization structure and culture

Meggle Albania has a functional structure (see Figure 8), best suited for low cost, standardized and high volume products.

[6]More than 3 seconds in such high temperature will make milk to loose many of its nutritive components.

Figure 8: Meggle Albania's organizational structure

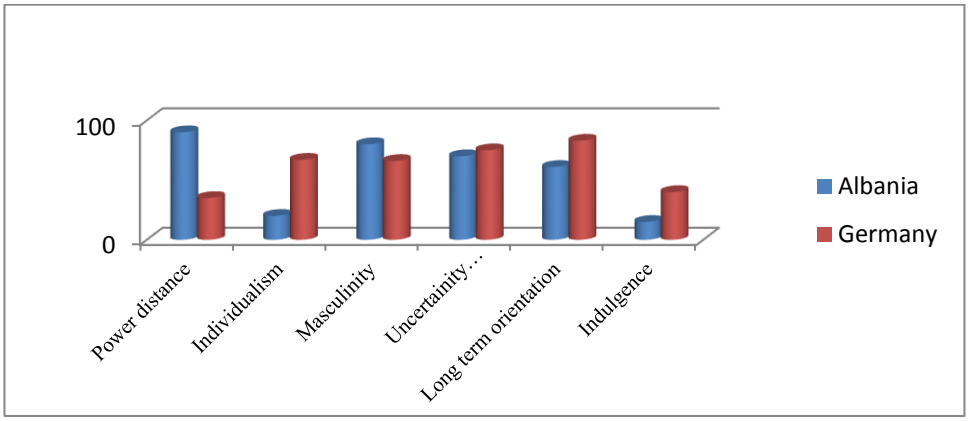


The company is very hierarchical. All the three levels of management (high, medium and low) are present. Even if it has a hierarchical culture, the information moves freely from high-level managers to low-levels managers and vice versa. The work group is preferred versus individual work.

The organizational culture is affected in some ways by the national culture. Many of the high managers of Meggle Albania are from Germany while the middle and low levels managers are Albanian. There are many distinctions between the German and Albanian culture. To compare these cultures, the author will refer to the Hofstede study. According to Hofstede, Hofstede and Minkov (2010) the six dimensions of culture are power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence. These dimensions are discussed in the previous chapters.

Each dimension can be scored from 0 to 100. Figure 9 presents the scores for each dimension for Germany and Albania.

Figure 9: Differences in culture, Albania versus Germany



Source: Hofstede, Hofstede, & Minkov (2010)[7]

The power distance is very high in Albania compared to Germany. This justifies the fact why Meggle Albania has a hierarchical structure while other subsidaries even the mother company have a less hierarchical structure.

Albanian's people are collectivist, long term committed to the group they belong. These elements make difficult the hiring and promotion of people based on their capabilities and competencies. The German people are individualist, loyalty is based on sense of duty and responsibility and the process of recruitment is based only on the competences and capabilities not taking into consideration the family relation or the employees in group (Hofstede Center, 2015). The collectivist nature of the Albanian culture explains the

[7] The results for Albania are - partially or fully - based on an educated guess derived from data representing similar countries in combination with our practitioner experience. The scores for this country are not derived from proper comparative academic research.

problems with the management of human resources at Ferlat. After the acquisition of Ferlat the German individualistic culture predominated in the hiring and promotion process.

Germany and Albania are a masculine society. All the employees work hard to be the best, as promotion is based on their performance. The status you have in the company is very important. The managers of Meggle Albanian declared that they tend to work in group but taking into consideration the masculinity dimension of their culture this is not very easy.

Both countries do not like uncertainty so they work a lot on planning , to avoid the unpredictable. Also, both countries are long-term oriented , making easier the adoption to the environmental changes.

Lastly, the German and Albanian cultures are restrained in nature. Peoples feel that they are restrained by social norms and they tend to be pessimist.

The main values of Meggle Albania are tradition, quality, success, social responsibility and long-term customer satisfaction. Each subsidiary is independent, but when major problems happen the mother company will offer her help. Uncertainty is not tolerated, so they work a lot in the planning process and act quickly when problems happen, small or big being them.

Summarizing, the main elements of Meggle Albania's organizational culture, relevant for this case study, are uncertainty avoidance, sense of urgency and proper planning.

5.5 How the milk processing companies handle the supply chain disruptions?

The author has done a research on strategies for handling supply chain disruptions in the milk industry (Mamillo, 2015). There are many milk processing companies in Albania,

nearly 400 that are registered, but only nine of them have gained the most significant part of the market. These nine companies have invested heavily in technology and operate with a daily capacity of 10-40 ton of milk (Instat, 2014).

From the main nine milk processing companies, only seven become part of her study. The managers of one company didn't accept to provide information for the topic of the research, while the author was not able to conduct the interview with the other company as it faced a disruption (river floods).

The author conducted semi-structured interviews with the managers of these companies. The persons interviewed were plant managers, purchasing managers and in some cases the owner of the business. All interviews were conducted face to face, and the confidentiality of data was promised. A guide questionnaire was prepared to support the semi-structured interviews. It had two main parts. The aim of the first part was to identify the sources and consequences of supply chain disruptions. Many of the questions for the first part were taken by the questionnaire that the Business Continuity Institute uses every year to identify the sources and consequences of supply chain disruptions all over the world. The aim of the second part was to identify the strategies that companies use to handle supply chain disruptions. The results of the study are presented in Appendix 7. In this section, the author will focus only on the answers of Meggle, comparing them with the general results in the industry.

In the last five years, Meggle had faced at least 11 disruptions, like the majority of the milk processing companies. The main source of supply chain disruption was adverse media coverage, animal disease and energy scarcity. It does not have problems of consumer

insolvency or unplanned outage of information systems. Table 20 lists in the first column the sources of supply chain disruptions for Meggle (from the most to the less important) while in column two are listed the sources of supply chain disruptions for the other big milk processing companies.

Table 20: Sources of supply chain disruptions, Meggle versus other milk processing companies

Meggle Albania	Other milk processing companies
Adverse media coverage Energy scarcity Animal diseases Transportation problems Product quality incidents Failure in service/ good provision of high quality from the suppliers New laws	Energy scarcity Consumer insolvency Unplanned outage of IT Failure in service/ good provision of high quality from the suppliers Transport network disruptions Product quality incidents Adverse weather Animal diseases Environmental incidents Adverse media coverage Tighter credit insurance conditions Intellectual property violation Loss of talented people

The managers of Meggle Albania declared that the disruptions in the supply chain happened to their clients and second tier suppliers. The major disruptions did not originate at the first tier supplier, like the other milk processing companies declared, as Meggle collaborates with its suppliers and have full visibility of the upstream part of the supply chain.

Table 21 summarizes the main consequences of the supply chain disruptions for Meggle Albania and other milk processing companies. Damage to brand reputation was a light

consequence for the milk processing companies in the last 5 years while for Meggle Albania this was the main consequence of the supply chain disruptions that it has faced in the last 5 years. All the consequences mentioned in table 21 are mainly related with the aflatoxin scandal, which caused a financial loss of one million euro.

Table 21: Consequences of supply chain disruptions, Meggle versus other milk processing companies

Meggle Albania	Other milk processing companies
Damage to brand/reputation Loss of revenue Increase in regulatory scrutiny Product withdrawal Loss of productivity Fine by the regulator for non-compliance	Fine by regulator for non- compliance Increase in regulatory scrutiny Loss of revenue Product release delay Product withdrawal Loss of productivity Damage to brand/reputation

To handle supply chain disruptions, Meggle Albania work hard to be prepared when the disruption happened. It has a special department, that analyses the risks and disruptions that the company can face in the future. For each risk or disruption, a recovery plan is formulated. Very few milk processing companies in Albania has a risk department, maybe due to high costs.

When the disruption happens and find the company unprepared, Meggle Albania like the other milk processing companies relies on robust strategies, like flexible supply base, strategic stock and assortment planning.

Meggle Albania knows that the Achille heel in the milk processing supply chain is the supplier, so it strongly collaborates with them, to secure continuous fresh and high-quality

milk. One of the major disruptions that Meggle faced was the aflatoxin scandal. It caused many financial and non financial losses to the company. The same disruption hit even another Albanian milk processing company, Primalat. The last company did not survive to the disruption.

Summarizing, Meggle Albania has a special risk department and works hard to increase the resilience of the company from disruptions. Being prepared is a good start for handling supply chain disruptions.

5.6 The aflatoxin scandal

On 22 February 2013, the Kosovo Food and Veterinary Agency announced that the milk produced by two Albanian milk processing companies, Primalat and Fast (produced by Meggle Albania) contained two to three times higher levels of aflatoxin (the exact percentage was never declared) compared to the level allowed by the European Union. The media was immediately informed and these brands of milk were blocked in the Kosovo custom. The Ministry of Agriculture repeated the test in Tirana and also sent the samples for further verification in Brescia (Italy). The Italian laboratory testing showed that the level of the aflatoxin was not at very high levels (Habilaj, 2013). But what is aflatoxin and what are its effects on the human health?

Aflatoxins are toxic metabolites produced by certain fungi. It occurs mainly in crops if they are not stored in a dry place. If the animal consumes the contaminated crop, a high level of aflatoxin will be noticed in milk, meat and other related products. Aflatoxin causes many

negative effects on the human health, when the most fatal is liver cancer (Cornell University, 2014) .

The continuous testing showed that aflatoxin came from the animal feed, especially the crop imported from Serbia. The milk produced by Meggle Albania and Primalat was blocked in Kosovo. The companies withdraw the milk even from the Albanian market and the Ministry of Health did not allow the nurseries and kindergartens to use these brands of milk. The production was stopped in the two factories. Primalat reported huge losses and was not able to survive to this disruption. Meggle Albania stopped the production for two months, but it returned strongly in the Albanian market later. Why Meggle Albania handled the intentional disruption successfully while Primalat did not? The next sections will analyze the reaction of Meggle Albania and Primalat to this scandal.

5.7 Meggle Albania's reaction to the disruption

Immediately after the notice was published in the media, the high managers in Germany were called. They came in Albania the same day and brought with them the ELISA Test. This is a test used to measure the quantity of aflatoxin and other carcinogens substances in foods. It has a high costs, nearly 9000 euros.

The Ministry of Agriculture and the National Food Authority are the only ones that analyze the quantity of aflatoxin in agriculture food for all the Albanian producers. These two authorities have never asked before the milk processing companies to do this test.

Meggle Albania did not only used the ELISA test for its milk, but even came in help to the other milk processing companies, by testing their milk. The next day they brought the

results of the test for their milk and the milk produced by other companies to the responsible authorities. But the authorities did not accept to publish these results, because they were waiting the results from the Italian laboratory.

The waiting for the results caused many losses to the firm. Firstly, Kosovo followed a protectionism policy, by not allowing the milk produced by Meggle Albania in its territory, even if they showed the results of the test. The company used to send three trailers with milk every week in Kosovo. At the moment of the disruption, the company had 400 ton of milk in inventory. The managers decided to sell it at half price. But even with a half price the people were not buying it. The loyalty to this brand was very low. The public institutions were obliged by the Ministry of Agriculture to do not buy this brand of milk. The financial losses were huge and the government didn't make anything to help the company to recover.

The Albanian government did not help the company, but the mother company offered her help, especially the financial and managerial help. Even if the production was stopped for two months, the company did not fire the workers. It paid them regularly.

The managers made a careful analysis of the disruption. From the test, only a small quantity of milk present in the market contained a high level of aflatoxin. How it is possible they were asking, because they always ask for a certification of quality from the suppliers. The researchers revealed that the crop used as a food for the cows contained a high level of aflatoxin. This crop was imported from Serbia and they have assured the quality of this product with the necessary certifications. All the animals of the milk suppliers were

checked, in order to identify the level of aflatoxin present on their blood. Meggle Albania did not abandon the suppliers which animals have high levels of aflatoxin in blood but gave to them Myfix, a medicinal that help to reduce the level of aflatoxin.

Summarizing, Meggle Albania reacted immediately after the disruption, by calling the high managers and testing the milk personally. It did not abandon the workers and suppliers, especially the last ones. It offered huge financial and managerial help to the suppliers. The plant manager of the company played a crucial role in organizing and coordinating all the actions and strategies undertaken after the disruption occurred. After two months, Meggle returned in the market with a new improved product. The sales were not as before the disruption.

5.8 Primalat's reaction to the disruption

Primalat was an important Albanian milk processing company. The owners of the company have invested a lot in the company. They have not only invested in technology but even in infrastructure and electricity and water network in the city where the company was located. 2000 farmers had long term terms with Primalat, which always tested the milk of the producers to assure that it was of a high quality. At the time before the aflatoxin scandal the company recorded high sales in the Albanian, Macedonian and Kosovo market. But the things changed after the Kosovo Food Authority declared that the milk produced by Primalat contained high levels of aflatoxin.

The owners of the company were shocked by this notice. Their presence in media increased the week after the scandal. They always declared that the Kosovo Food Authority was

doing this to help the national milk processing companies from the strong Albanian competition. Also, they blamed the Albanian institutions (National Food Authority and Ministry of Agriculture) for not doing anything to help the national companies.

The owners declared that the losses from the disruption were huge. The production was stopped. Many workers lose their work and the farmers were obliged to throw away tons of milk. The disruption caused not only financial losses but even non financial losses, where the most important was damage to brand reputation.

The owners have relied on a loan to build up this business. As the production was stopped, the company was not able to pay the loan.

Summarizing, the owners of Primalat instead of analyzing the problem and trying to find a solution lose time blaming the others for the intentional disruption. The situation in which Primalat was (the loan) made more difficult the recovery from the disruption. He declared the bankruptcy.

5.9 Comparison of Meggle Albania and Primalat reaction to the disruption

Although Meggle Albanian and Primalat were hit by the same intentional disruption, the first one recovered quickly from the disruption while the other went bankrupt. This happened because Meggle reacted quickly, trying to find the source of the problem and then a strategy of recovery. The success of Meggle was a result of each single step the company undertook after the disruption happened. The success of Meggle in handling the disruption compared to Primalat was due to:

Sense of urgency*:* Immediately after the notice about aflatoxin was published the high managers were called and they came in Albania the same day.

Robust strategy: Meggle Albania used the revenue management robust strategy by selling the milk in inventory at half price.

A detailed analysis of the disruption*:* Very differently from Primalat, Meggle Albania did not lose time in media but carefully analyzed the situation to find the root of the problem.

Strong relationships with suppliers: Meggle did not abandon the suppliers but offered its financial and managerial help.

Awareness to risk: The awareness to risk was high at Meggle Albania as its culture emphasizes uncertainty avoidance and the mother company has trained the managers of the subsidiaries to deal with unanticipated disruptions. The company has a specific department that analyses risk.

Human resources: In every organization human resources are very important. They are an indispensable element of the company success. The competencies of the plant manager of Meggle Albania and of the high managers of the multinational company were critical for the successful handling of the disruption.

Full supply chain visibility: This allowed Meggle Albania to find the root of the problem quickly.

The organizational culture of Meggle Albania stresses the importance of sense of urgency and collaboration. These elements determined the successful handling of the supply chain disruption.

5.10 Meggle Albania case study and the research model

The analysis of Meggle case study was organized into four main parts. The study started with the analysis of the company before the disruption. The analysis was focused on the following elements: company background, supply chain, organizational culture and organizational structure.

Meggle Albania is a new company, but Meggle AG, the mother company, has a long history of success. Meggle Albania is nearly vertically integrated, which allowed the company to have full visibility of the supply chain. To increase the visibility and the satisfaction of the supply members, it strongly collaborates with suppliers. The main elements of Meggle Albania organizational culture are awareness to risk and sense of urgency. The company had a special risk department that work hard to increase the resilience of the company to the disruptions.

In the second part, the disruption was analyzed. Meggle Albania faced an intentional disruption. It was discovered a high level of aflatoxin in the milk produced by Meggle and Primalat. Due to the adverse media coverage their products were blocked in the Kosovo Custom and in all the public and private institution. Primalat went bankrupt while Meggle Albania returned in the market after two months.

In the third part, the author described in detail and chronological order the actions and strategies undertaken by the companies after the disruption happened. Meggle Albania reacted immediately after the disruption, by calling the high managers and testing the milk personally. It did not abandon the workers and suppliers, especially the last ones. It offered huge financial and managerial help to the suppliers. The plant manager of the company played a crucial role in organizing and coordinating all the actions and strategies undertaken after the disruption occurred. The company implemented the revenue management robust strategy to sell many of the products.

The owners of Primalat instead of analyzing the problem and trying to find a solution lose time blaming the others for the intentional disruption. Due to the loan, Primalat could not recover from the disruption. It declared the bankruptcy.

Lastly, the performance of the company after the disruption and until now was analyzed. After two months, Meggle returned in the market with a new improved product. The sales were not as before the disruption.

Now let's analyze the three relations proposed by the research model. The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's organizational culture, company background, supply chain collaboration and many other factors.

We can say that Meggle Albania is prepared to face disruptions as it has a full visibility of the supply chain and it shows a high awareness to risks. The company was able to implement the revenue management due to the managerial and financial help provided by the mother company. The first relation holds on for this case study.

The second relation states that if the company was resilient or prepared the recovery would be fast and less costly and vice versa. As discussed above, Meggle Albania invested in increasing the resilience of the supply chain, so the impact of the disruption was low for Meggle compared to Primalat. Even, the second relation holds on for this case study.

The third relation states that the actions and strategies undertaken by the company after the disruption occurred, are important for handling the successfully the disruption. The success of Meggle Albania in handling the supply chain disruption was the robust strategy that it implemented, revenue management, the sense of urgency shown and the help offered by the mother company. So, all the three relations of the research model hold on for Meggle Albania case study.

5.11 Conclusions

On 22 February 2013, the Kosovo Food and Veterinary Agency announced that the milk produced by two Albanian milk processing companies, Primalat and Fast (produced by Meggle Albania) contained two to three times higher levels of aflatoxin compared to the level allowed by the European Union. The media was immediately informed and these brands of milk were blocked in the Kosovo custom. The companies withdraw the milk even from the Albanian market and the Ministry of Health did not allow the nurseries and

kindergartens to use these brands of milk. The production was stopped in the two factories. Primalat reported huge losses and was not able to survive to this disruption. Meggle Albania stopped the production for two months, but it returned strongly in the Albanian market later. Why Meggle Albania handled the intentional disruption successfully while Primalat did not?

The analysis of this case study showed that the success of Meggle compared to Primalat was due to its organizational culture, human resources, strong relationships with suppliers, full visibility of the supply chain and the execution of a robust strategy. When a disruption happens do not lose time blaming the others, but try to analyze the situation and implement a proper strategy of recovery.

FABJUS CASE STUDY

5.12 Company background

Fabjus is an Albanian company established in 1992. At that time, the owner of the company, used to import different products from Bulgaria and sold them in Albania. In 1993, the company started producing the plastic bottles for oil. They were the first to bring this product in the Albanian market. After two years, they saw that this business was profitable, so they bought the necessary machineries to produce all types of plastic bottles. The raw materials for producing the plastic bottles were imported from Bulgaria.

This business was very profitable and promising so the owner decided to start recycling the plastic. In this way, the business was vertically integrated and also, taking advantage of the first mover advantage, the company gained and still has a significant market share.

Actually, Fabjus produces different plastic products, vinegar and lemon juices, dried fruits and some other products, where the first one is the most important product.

The road to success was full of ups and downs, but the company was able to adapt quickly to the external environment by forecasting the trends and being the first mover in some markets. This success was due to the hard work and the capabilities of the owner.

5.13 Supply chain

Suppliers: They are an important part of their supply chain. The suppliers of Fabjus include the direct suppliers of plastic and the direct suppliers of dried fruits and vinegar and lemon

juices. The suppliers of plastic are small collection centers in Albania while the suppliers of the raw material[8] for the production of vinegar and lemon juices are big suppliers from Albania and Bulgaria. The main suppliers of the dried fruits are from Bulgaria. The suppliers are chosen based on costs, quality and reliability.

Production firm: Fabjus has only one production firm, located in Berat Albania. According to the owner, it is better to have one production facility, located at the best place and with the best technology.

Distribution: Fabjus did not outsource this function, like other companies. All the warehouses are under the property of Fabjus. This allows the company to have real-time information about the availabilities of the products in inventory.

Customers: The company operates in the business to consumers market and in the business to business market (B2B), so its customers include families and businesses. To increase the customer satisfaction in the first market, the company offer high-quality products with low prices. In the B2B market, the company competes at low prices and promotions. Its main clients are construction and production companies.

So, Fabjus is a company vertically integrated. This in turns allow the company to have full control over the supply chain. As the orders from the suppliers are made informally, the risk of disruption from the upstream part of the supply chain is high. To reduce the consequences of this disruption, the company keeps high inventories of the raw materials and chooses the suppliers carefully.

[8] The only raw material for these products are the essences and the labels

The company relies on the postponement strategy for the plastic products to reduce the risk of customer insolvency. All the products share the same components, they differ only in the last phase of production.

Summarizing, Fabjus has full visibility and control of all the supply chain. To reduce the consequences of the disruptions from the upstream and downstream part of the supply chain, it keeps inventory of strategic stocks and uses the postponement strategy.

5.14 Organizational culture

Fabjus is an Albanian company, so its organizational culture is affected by the national culture. The main elements of the Albanian culture were mentioned in the previous case study (high power distance, collectivism, masculinity, high uncertainty avoidance, long-term orientation and low level of indulgence).

The power distance is very high at Fabjus, and so it is obvious that the organizational structure is very hierarchical. The company is risk averse and it invests a lot in planning, forecasting and back up plans.

The autocratic leadership allows to have full control and to be sure that everything is done on time and according to the directions.

The main elements of Fabjus' organizational culture relevant for this case study are autocratic leadership and high uncertainty avoidance.

5.15 The disruption

On June 2012, the manager of a construction firm called his main suppliers. One of these suppliers was Fabjus. He told them that it was necessary to postpone the order made two weeks ago by some days. The justification for this delay was a small problem during the construction of the buildings. The manager assured his suppliers that everything would turn in normality within few days.

After three days, Fabjus and the other companies received a call from the same client. The order was canceled. This was a big problem for both the companies as the order from this client was one of the biggest orders they had. How it is possible they were asking, as it was a reliable client.

Later it was discovered that the construction of the buildings was blocked due to financial and legal problems. Fabjus was able to sell the biggest part of the order canceled while the other companies suffered huge losses. Why Fabjus was able to handle the outbound disruption successfully while the other company did not? The next sections will analyze their reaction to the disruption.

5.16 Fabjus reaction to the disruption

Immediately after the first call Mr. Kalemi, the owner of the company, went to meet the client. The reason of the meeting was to know in detail what was happening, because if something happened to this client the financial losses would be huge. Some years ago an important client cancelled an order, and the company was unprepared. He learned a lesson

from this disruption. The lesson was: You must have full visibility over all the supply chain. You must control the movement of the product from the raw material to the final customer. You can say that the product is sold when the client receives it and pay for the product.

The client explained to Mr. Kalemi that the construction was not respecting the deadlines due to small problems with the documentation. He explained that he had everything under control and he would retire the order within three days.

Mr. Kalemi was not convinced by the explanation provided by the client. So he investigated and discovered that his client has some legal problems, so it was likely that the construction will be blocked for a long time. The result would be huge stock in the inventory.

He organized a meeting with the managers of the company and explained the situation. A solution should be found quickly, because if the products were not sold, the problems will start. The meeting ended up with a solution. The first thing to do was to look the market for other possible clients. If it was necessary the products would be sold even at the cost price. The second thing to do was to increase the flexibility of the production process in order to decrease the inventory. Due to the postponement strategy this was not difficult.

The next day, they start to search for possible clients. Due to the low prices and promotions offered, a considerable part of the product was sold. The other part of the order was kept in the warehouses.

After three days when the client called to cancel the order, Fabjus was not shocked by the notice. This disruption caused some significant losses to the company, but the financial losses would have been bigger if Mr. Kalemi would not have reacted quickly.

Summarizing, Mr. Kalemi reacted immediately after the client call to postpone the order. This sense of urgency allowed the company to prevent and reduce the impact of the outbound disruption. The postponement strategy, the capabilities of Mr. Kalemi, the company past experiences and the sense of urgency determined the successful handling of the disruption.

5.17 The reaction of the other companies

On March 2012, even the other companies[9] received a call from their client. They were not alarmed as some days delay was normal in their daily business. Also, the client has always been reliable and regular with the payments.

They were shocked when after three days the client called them to cancel the order. This was a big problem, as it was one of their biggest orders. Moreover, one of the companies was waiting the payment to pay the loan.

The disruption found the companies unprepared. They start searching for other clients to sell the products. One part of the products was sold with low prices while the other part was kept in the warehouses for a long time. This caused financial problems to the companies.

[9]There were two companies, but for privacy reasons their names will not be mentioned.

The first company stopped the production until the majority of the products were sold. Some products were sold even below the costs as it has to pay the loan.

Compared to Fabjus the other companies did not show the same sense of urgency, which in turn caused to them huge financial losses.

5.18 Comparison of the reactions to the disruption

Although Fabjus and the other two companies were hit by the same outbound disruption, Fabjus recovered quickly from the disruption while the other companies with huge losses. The success of Fabjus in handling the disruption compared to the other companies was due to:

Sense of urgency: Immediately after Fabjus received the first call, the owner met the client to get detailed information while the other companies were not alarmed by the delay.

Company background: The past experiences of the company had increased the awareness to supply chain disruptions.

Organizational culture: The organizational culture of Fabjus stresses the importance of planning and controlling to avoid uncertainty. These elements make the company more prepared to handle disruptions.

Good knowledge of the market: Fabjus was able to find quickly other clients because it had good knowledge of the market for its products.

Full supply chain visibility: This allowed the company to discover the disruption quickly.

Human resources: The success of Fabjus relied on the capabilities of its owner, Mr. Kalemi. He is a great leader. Today autocratic leaders are not preferred, because according to different researchers they are unsuccessful. But the practice has shown that in certain situations, an autocratic leadership is the best solution.

Robust strategies: Fabjus implemented the postponement and revenue management strategy. The first one allowed the company to manage the unpredictable demand and reduce the level of inventory while the second strategy enabled the company to sell the products remained in the warehouse due to the canceled order.

5.19 Fabjus case study and the research model

The analysis of Fabjus case study was organized into four main parts. The study started with the analysis of the company before the disruption. The analysis was focused on the following elements: company background, supply chain and organizational culture.

The company has a long history, full of ups and downs. It adapted quickly to the external environment by being the first mover in some markets. The owner of the company did not forget the lessons of many past experiences. He said "If you repeat the same mistake, you are a fool". The company is vertically integrated, in order to have full control of the supply chain. It's organizational culture emphasizes the importance of risk awareness.

In the second part, the disruption was analyzed. Fabjus faced an outbound disruption, as one of its biggest clients canceled an order to Fabjus and two others companies. Fabjus was able to sell the majority of the products while the other companies reported huge losses.

In the third part, the author described in detail and chronological order the actions and strategies undertaken by the companies after the disruption happened. Fabjus reacted immediately to the first sign of the disruption. This sense of urgency allowed the company to prevent and reduce the impact of the disruption. The company implemented the postponement robust strategy, to manage the demand for the other products. The other companies did not evaluate well the potential signs of the disruption, and so they experienced considerable losses.

Lastly, the performance of the company after the disruption and until now was analyzed. The successful handling of the disruption allowed Fabjus to enforce its position in the market compared to the competitors.

Now let's analyze the three relations proposed by the research model. The first relation states that the company reaction to the disruption depends on how the company was before the disruption. If the company was prepared for the disruptions, meaning that it has invested in increasing the supply chain resilience, the reaction would be quick. Also, the strategies implemented after the disruption happened, depend on the company's organizational culture, company background, supply chain collaboration and many other factors.

We can say that Fabjus is prepared to face disruptions as it has a full visibility of the supply chain and it shows a high awareness to risks due to its organizational culture and past experience. The company was able to implement the postponement strategy to reduce the impact of sudden outbound disruptions. The first relation holds on for this case study.

The second relation states that if the company was resilient or prepared the recovery will be fast and less costly and vice versa. As discussed above, Fabjus was prepared to handle disruptions, so the impact of the disruption was low for Fabjus compared to the other two companies. Even, the second relation holds on for this case study.

The third relation states that the actions and strategies undertaken by the company after the disruption occurred, are important for handling the disruption successfully. The success of Fabjus in handling the supply chain disruption was the robust strategy that it implemented, postponement and the sense of urgency shown. So, all the three relations of the research model hold on for Fabjus case study.

5.20 Conclusions

On June 2012, one client called his main suppliers to postpone the delay by few days. Short time delays were normal in every business. But a small delay turned into a permanent delay. The orders were canceled. Fabjus reacted immediately after the first call while the other two companies reacted only when the order was cancelled. It was able to find quickly other clients for the products. The sense of urgency showed by Fabjus, helped the company to recover quickly from the disruption. The other companies recovered too late and with financial losses.

The success of Fabjus in handling the outbound supply chain disruption compared to the other companies was a result of the company background, organizational culture, postponement and revenue management strategy, sense of urgency and Mr. Kalemi capabilities.

Both Fabjus and Meggle Albania handled successfully the disruption compared to the other companies. What's behind their success? The next sections will compare the two case studies, in order to highlight some lessons from the experience of these companies.

5.21 Comparision of Meggle Albania and Fabjus case study

Firstly, a comparison of the disruption faced by Meggle and Fabjus will be made and then the strategies and actions implemented to handle the disruption will be compared.

Supply chain disruption

Meggle Albania faced an inbound disruption, as the disruption happened to their second tier suppliers while Fabjus faced an outbound disruption, as the disruption happened to its main client. The source of the disruption for Meggle and Fabjus was intentional, and they affected only a few companies. But the impact of the first disruption was huge as one company went bankrupt and the panic was spread.

Handling the supply chain disruption

Both Meggle and Fabjus handled the disruption successfully, compared to their competitors. Their success relied on the following factors:

Sense of urgency: Meggle reacted immediately after the notice was published while Fabjus reacted even before the disruption happened.

Company background: The past experiences of Meggle and Fabjus had increased their awareness to supply chain disruptions.

Organizational culture: The organizational culture of Meggle stresses the importance of sense of urgency and collaboration while the organizational culture of Fabjus stresses the importance of planning and controlling to avoid uncertainty. These elements make the company more prepared to handle disruptions.

Human resources: The success of Meggle and Fabjus in handling the disruption was due to their human resources, respectively Mrs. Meraj and Mr. Kalemi.

Full supply chain visibility: Meggle and Fabjus were vertically integrated, by having full visibility of their supply chain. This allowed the companies to detect quickly the disruption and to find a solution.

Robust strategy: Meggle used the revenue management robust strategy while Fabjus used the revenue management and postponement robust strategy.

The success of Meggle in handling the disruption was due even to its collaboration with suppliers. The success of Fabjus was due to the factors mentioned above and also this success was due to the good knowledge of the customer market. Table 22 summarizes all the differences and similarities between the case studies.

Table 22: Comparison of Meggle and Fabjus case study

	Similarities	**Differences**	
Supply chain disruption	Intentional disruption Affected directly only on few companies	**Meggle**	**Fabjus**
		Inbound disruption	Outbound disruption
Factors that determined the success in handling the supply chain disruption	Sense of urgency Company background Organizational culture Human resources Full supply chain visibility Revenue management strategy	**Meggle**	**Fabjus**
		Strong collaboration with suppliers	Postponement strategy Good knowledge of the customer market

5.22 Research findings/lessons

First of all, the companies should not under evaluate any sign of a possible disruption, as a small problem can be the source of a big disruption, like the Fabjus case study had shown.

Meggle Albania and Fabjus faced the same disruption as their competitors, but the severity of the disruption was low for them. They recovered quickly while their competitors had huge financial losses or went bankrupt. Considering the analysis of the case studies, the severity of supply chain disruptions depends on how prepared was the company before the disruption and how it reacted when the disruption happened. Supply chain collaboration, company background, organizational culture, flexibility in production and vertical integration increases company's resiliency. A resilient company is more prepared to face disruptions.

Supply chain collaboration: The case studies have shown that if you collaborate with all the supply chain members, especially with the critical one, you can detect quickly the disruptions and handle them together. Meggle Albania strongly collaborates with suppliers and so it discovered quickly the root of the problem and the best strategy to recover.

Company background: Companies that have faced many disruptions in the past are more aware to disruptions, so they do not under evaluate any signal of a possible disruption. Fabjus had faced a disruption before, so to do not repeat the same mistakes, he reacted immediately when the order was postponed. Meggle is a company with a huge global experience. It has a special risk department that analyzes and makes contingency plans for possible disruptions.

Organizational culture: The analysis of the case studies revealed that cultures that emphasize the importance of quick reaction, collaboration and risk awareness are more prepared to face the disruptions successfully.

Flexible production: If it possible, the company should increase the flexibility in production, as today they are more exposed to disruptions and volatile demand. Fabjus uses the postponement strategy to increase the flexibility of production. This strategy was very useful when the disruption happened.

Vertical integration: Today, very few companies are vertically integrated. But, companies that are vertically integrated have full control of their supply chain, so they detect the disruptions in the supply chain quickly. This result can be achieved even with collaboration, but the national culture sometimes imposes limits to collaboration, so vertical integration is the best solution to have full visibility on the supply chain.

Being prepared is the first step in handling supply chain disruptions. The success of the company in handling the disruptions depends on the actions and strategies implemented after the disruption happened. The case studies have shown that there is no unique strategy, as it depends on the type of disruption and individual characteristics of the firm. Robust strategies should be implemented in normal and especially in case of disruptions. They help the company to recover quickly from sudden disruptions. Each company should implement and execute the best robust strategy, taking into consideration the main characteristics of its company. For example, Meggle implemented the revenue management robust strategy

while Fabjus the postponement strategy. The success in executing the robust strategy depends on:

Human resources: They play a crucial role in handling the supply chain disruptions. The success of Meggle Albania and Fabjus in handling the disruption relied on two important figures Mrs. Meraj and Mr. Kalemi

Sense of urgency: When the disruption happens, react immediately, as one day can make the difference. The sense of urgency is a must in handling the supply chain disruptions. Meggle and Fabjus reacted immediately when the disruption happened. This determined their success in handling the disruption

Good knowledge of the company: The companies should be aware of the limits imposed by their business model, organizational structure and culture before implementing and executing a strategy to handle supply chain disruptions.

The first case study offered an important lesson for the government: The government should not allow the spread of panic. The local companies should be protected in normal and bad times.

COMPARISION OF DELL, NOKIA, DAIMLER, MEGGLE ALBANIA AND FABJUS CASE STUDY

5.23 Comparison of all the case studies

Firstly, the author will compare the disruptions faced by the five companies and then the strategies used for handling the supply chain disruptions.

Supply chain disruption

All the companies studied in this research faced different types of disruptions. Dell, Nokia, Daimler and Meggle Albania faced an inbound disruption as the disruption happened to their suppliers and distributors (in the case of Daimler) while Fabjus faced an outbound disruption, as the disruption happened to its main customer.

The sources of disruptions varied from natural disaster (Dell case study), accident (Nokia case study) and intentional disruption (Daimler, Meggle Albania and Fabjus case study).

Natural disasters in all cases are major disruptions, so the impact was huge in many industries. The impact of accidents depends on their size. In the case of Nokia the accident happened in the Philips' plants and the effect of this disruption were felt mainly by Nokia and Ericsson. Even the impact of the intentional disruptions depends on the size of the disruption. Terrorist attacks had devastating effects in many industries. The intentional disruptions that were faced by Meggle Albania and Fabjus affected only a few companies not all the industry.

So, all the five companies faced different type of disruptions. Each disruption happened in different part of the supply chain and their impact sometimes was spread in all the industry and sometimes just on few companies.

Handling supply chain disruptions

Dell, Nokia, Daimler, Meggle Albania and Fabjus handled the disruption successfully compared to their competitors. Their success relied on different factors. In table 23 are presented these factors for each company.

Table 23: Comparison of all the case studies

	Dell	**Nokia**	**Daimler**	**Meggle Albania**	**Fabjus**
The factors that determined the successful handling of the disruption	Awareness to risk Agile supply chain Company background Organizational culture Human resources Business model Robust strategy: revenue management Strong relationships with suppliers Human resources	Awareness to risk Agile supply chain Sense of urgency Company background Organizational culture Human resources Robust strategy: postponement Strong relationships with suppliers	Awareness to risk Agile supply chain Sense of urgency Company background Organizational culture Robust strategy: Flexible transportation	Sense of urgency Company background Organizational culture Human resources Full supply chain visibility Robust strategy: revenue management Strong collaboration with suppliers	Sense of urgency Company background Organizational culture Human resources Full supply chain visibility Robust strategy: revenue management and postponement Good knowledge of the customer market

Some companies handled the disruption successfully compared to the competitors due to the capabilities of their managers in analyzing the problem, finding a solution and

executing it quickly. Global companies have agile supply chains and manifest a high degree of supply chain collaboration and risk awareness. These factors determined their success in handling the disruption. The Albanian companies do not rely on supply chain collaboration but on vertical integration to have full visibility over the supply chain. However, there are two factors that determined the success of the five companies in handling the supply chain disruption successfully compared to the competitors:

Company background: All the companies have faced at least one disruption during their life. It is important that after you have recovered from the disruption, you have to learn from this experience. Companies that have faced disruptions before are more aware to disruptions, so they try to be always prepared for future disruptions.

Organizational culture: The analysis of the case studies have shown that cultures that manifest the following elements: high level of uncertainty avoidance, high level of collaboration and sense of urgency can handle better disruptions. In many of the cases the national culture manifests itself in the organizational culture. For the Albanian people collaboration is more difficult that for other national culture. For these reasons the Albanian companies differently from the other global companies relied on vertical integration versus supply chain collaboration to increase the supply chain visibility.

When the disruption happen, you have to react quickly as the time is the scarce resource. You have to analyze the situation and find quickly an alternative solution. It was noticed, from the analysis of the case studies, that many companies have not reacted quickly to the

disruptions, mainly because their culture was a passive one or because they did not have a leader that encourage people to work together and quickly when the disruption happened.

All the companies analyzed in this research have implemented a robust strategy to handle the disruption. Robust strategies help the companies to increase customer satisfaction and profits in normal conditions and to handle small or big disruptions. Each company implemented the strategy that best fitted with its organization. Dell implemented the revenue management strategy as its business model allowed the company to impact directly the customer choices. Nokia implemented the postponemnet strategy as it had a flexible supply chain, while Fabjus implemented this strategy because it was the best strategy for the type of products it produced. So each company designs the robust strategy that according to them is the most suitable with their organization. To design a strategy it is easy but the execution it is difficult. This research revealed that the execution of the robust strategies depended on company background and organizational culture.

Dell, Nokia, Daimler and Meggle Albania had faced an inbound disruption. Due to the strong relationships they had with suppliers before and after the disruption the recovery was quick and with few losses.

5.24 Conclusions

In this chapter Meggle Albania and Fabjus case studied were anlayzed. Both the companies have faced a disruption but they handled the disruption successfully compared to the competitors. The severity of the disruption was low for these companies because they were

more prepared and aware of disruptions and also they showed a high sense of urgency and implemented a robust strategy when the disruption happened.

The last section compared all the five case studies. Although Dell, Nokia, Daimler, Meggle Albania and Fabjus had faced different type of disruptions, the factors that determined their success in handling the disruption compared to the competitors were company background, and organizational culture. These factors influenced the succes in the execution of different robust strategies.

CHAPTER VI: CONCLUSIONS AND RECOMENDATIONS

This chapter will present the conclusions of the whole research, followed by recommendations for managers and future research. Firstly, the main findings will be disccussed and they will be compared with the literature review in order to emphasize the theoretical contribution of the research. Also in the first section, the author will be able to answer to the research question and to verify if the research proposition of this study holds on. Later, the overall conclusions will be translated into a framework that will help the managers to handle better supply chain disruptions. Lastly, the limit of the study and the recommendations for future research will be presented.

6.1 Research conclusions

Nowadays, companies are more vulnerable to supply chain disruptions. These disruptions can happen in different parts of the supply chain and they can have different sources but in many of the cases they have devastating negative impacts and need special attention.

The research interest on supply chain disruptions increased after 2001. Many authors had studied the different types of supply chain disruptions, their sources, consequences and mitigating strategies. Regarding strategies for handling supply chain disruptions exists three different views in the literature. The first view stresses the importance of increasing the resilience and robustness of the supply chains, which in turn will enable companies to forecast disruptive events and reduce their impacts. The second view argues that a pro-active approach to disruptive events is good, but sometimes the disruptive event hit the company when and where it is not prepared. In this case, a reactive approach is necessary.

Companies should be able to design strategies that enable them to handle supply chain disruptions and to recover quickly after the disruptive event. The authors of the third view argues that for managing the disruptions, both the proactive and reactive perspective are important. Which view is the best one? The experience has shown that resilient companies sometimes were not able to handle supply chain disruptions successfully. Other companies were not totally prepared to handle supply chain disruptions but the way how they reacted when the disruption happened, defined their success in handling the disturbance compared to the competitors. Dell, Nokia, Daimler, Meggle Albania and Fabjus were hit by the same disruption as their competitors, but they recovered quickly while their competitors recovered with huge losses or some did not recover. To find the reasons behind their success, this research attempted to give an answer to the following question: Why the severity of the same disruption is different for companies in the same industry.

To answer this question, the research strategy used was case studies. Five case studies were analyzed, respectively the success of Dell, Nokia, Daimler, Meggle Albania and Fabjus in handling the supply chain disruptions compared to their competitors. The first three case studies provided some important lessons from the experience of the global companies while the last two case studies explored an unstudied field in Albania, as no such research has been done in Albania.

The severity of supply chain disruptions depends mainly on the company reaction when the disruption happened. Normally, the severity of the disruptions is low for resilient companies, as they are prepared to face disruptions. Resiliency can be increased through supply chain flexibility and supply chain collaboration. The analysis of the case studies

revealed that some factors can increase company resilience and also can help the company to recover quickly after the disruptions happened. These factors are:

Company background: It refers to the company past experience in handling disruptions. Every company had faced at least one disruption. The disruptions small or big need special attention. After the recovery phase, each company should highlight the most important lessons from its experience in handling the disruption. Obviously, the company can face different types of disruptions, and there is no unique strategy to manage each of them. However, companies that have faced before disruptions, are more aware to risk so they invest more in increasing company resilience. Morever, these companies react quickly when the disruption happen and they did not under evaluate any possible sign that can bring to a serious problem.

Organizational culture: The analysis of the case studies has shown that cultures that manifest the following elements: high level of uncertainty avoidance, high level of collaboration and sense of urgency can handle better disruptions. Companies that do not like uncertainty, try to increase the visibility over the supply chain. In this way, they can detect the weakest links in the supply chain quickly. Supply chain visibility can be increased through collaboration, but not every culture is collaborative. Some societies tend to work in group and to collaborate, while some other companies are more individualistic. The last one can increase supply chain visibility by relying on vertical integration. It a costly and time-consuming option for global companies but maybe not for local ones.

Dell, Nokia, Daimler, Meggle Albania and Fabjus reacted quickly when the disruption happened while their competitors did not give the same importance to the disruption by reacting too late. The sense of urgency showed by these companies defined their success in handling the supply chain disruptions. Aggressive and active cultures tend to react more quickly than passive cultures.

Dell, Nokia, Daimler, Meggle Albania and Fabjus executed a robust strategy to handle the supply chain disruption. A robust strategy is a strategy that help the company to reduce costs and improve customer satisfaction under normal conditions and also help the company to manage small or big disruptions by being both cost and time efficient. The main robust strategies are postponement, flexible supply base, supply incentives, strategic stock, make or buy, flexible transportation, revenue management, assortment planning and silent product rollover. Every company can design one of these strategies, but the execution is not easy. The execution of a robust strategy depends on many elements like company's culture, structure, human resources, and so forth. There is no unique strategy. Each company should implement the robust strategy, which is most suitable with its organization. You should ask the following questions before implementing a robust strategy: Taking into consideration my business model, organizational culture and the competencies of the managers can I execute efficiently and effectively this strategy?

Summarizing, the severity of a disruption depends on the company background and organizational culture. These factors can increase the company resilience. Also, they determine the success in the execution of the strategies for handling supply chain

disruptions. The research proposition of this study holds on, based on the analysis of the five case studies.

The best strategy for handling supply chain disruptions is a combination of resilience and implementation of robust strategies. The last one depends on company background and organizational culture.

6.2 Theoretical contribution

The aim of this research was to analyze the strategies used by the companies to handle supply chain disruptions and the factors that determined their success compared to their competitors. Companies in the same industry were hit by the same disruption, but some handled the disruption successfully while some did not. By conducting a cross comparative case study analysis, the research revealed that the severity of supply chain disruptions depends on company background and organizational culture. These two factors increase the company resilience and also help the company to execute the best strategy for handling the disruptions.

Sheffi (2007) had analyzed why some companies handled better disruptions compared to the other companies. He concluded that companies that manifest certain cultural traits like continuous communication, passion for work, distributed power, and so forth can handle better the disruptions. In few words, collaborative cultures can handle better disruptions. This research showed the same results. The severity of a disruption is low for companies with collaborative cultures.

As mentioned many times in this research, regarding strategies for handling supply chain disruptions exists three different views in the literature. The first group of authors stresses the importance of increasing the resilience and robustness of the supply chains, which in turn will enable companies to forecast disruptive events and reduce their impacts. The second group of authors argues that a pro-active approach to disruptive events is good, but sometimes the disruptive event hit the company when and where it is not prepared. In this case, a reactive approach is necessary. Companies should be able to design strategies that enable them to handle supply chain disruptions and to recover quickly after the disruptive event. The last group of authors argues that for managing the disruptions, both the proactive and reactive perspective are important.

The results of this research are more compatible with the third view. Disruptions must be prevented before happening. But some disruptions are unpredictable, so in this case the actions and strategies you implement, define the success in handling the disruption.

The companies analyzed in this research have implemented many of the robust, security and resiliency strategies mentioned in the literature. But why some companies have implemented a certain strategy and not others? This topic was not studied a lot in the literature. The actual research showed that the main factors that determined the choice of a certain strategy were company's background and organiztional culture.

This research has a high theoretical importance because it is filling an existing gap in the literature and is exploring an unstudied topic in Albania.

Filling a gap in the literature: The research had analyzed the main factors that determined the success of some companies in handling the disruption compared to the others.

An unstudied field in Albania: Although research interest in handling supply chain disruptions has increased no such research has been done in Albania.

6.3 A framework for handling supply chain disruptions

The research concluded that the best strategy for handling supply chain disruptions is a combination of resilience and implementation of robust strategies. The last one depends on the company's background and organizational culture. Now let's see how these conclusions can be translated into a framework for handling supply chain disruptions.

Every company has to be prepared to face disruptions, as in this way it will reduce its vulnerability to disruptions. This is the first step for handling supply chain disruptions. The author recommends the following actions to decrease supply chain vulnerability:

Identify and prioritize vulnerabilities: The likelihood and consequences of a disruption are different for different companies, so each company should have a specific department that analyze the possible disruptions that can happen, their likelihood and their consequences. As Sheffi (2007) said a company must ask three questions: What can go wrong? What is the likelihood of that happening? What are the consequences if it does happen? The companies can create a disruption catalog, which will categorize the disruptions based on their sources, consequences, likelihood of happening, and so forth. It is important that the information is updated at least on a yearly basis. For some companies, it is a costly option, but if they are long term oriented this is the best thing to do. A large investment now in

decreasing supply chain vulnerability can bring huge profits in the future. It will be perfect if all the supply chain partners will have a disruption catalog. Based on this information the company can decide which disruption has the priority compared to the others.

After you have identified and prioritized the disruption you should decide how you can reduce the probability of the disruption happening and its consequences.

Increase flexibility: Flexible companies can handle better disruptions. Companies should increase flexibility in production, inventory, supply and distribution

Flexible production: It is important that the production is flexible, in order to adapt to the sudden changes in supply and demand side. The flexibility of production is increased when products share the same components and process and they differ only at the last stage of production (postponement). In this way when there is a component shortage, the products can be redesigned quickly or when the demand is unstable, companies can produce standard semi-finished products and customize them when the demand is more certain.

Flexible inventory: Always keep inventory of critical components. Critical components are the ones that can be produced only by few suppliers and are difficult to be found. Keep always redundant capacity, for important products that have unstable demand.

Flexible supply: We are living in an uncertain world, and it is better to have more than one supplier. Many companies keep one supplier to meet their normal demand of components and one other supplier in case of sudden increase in demand for

components. Some companies rely on many suppliers, as they want to secure the flow of components. If something happens to one supplier, the other supplier is available. But having many suppliers, means “destroying money and relationships”. Destroying money as to find and maintain many suppliers requires a big investment of money. If the company relies on many suppliers, it cannot build strong relationships with each of them.

Ericsson relied on one supplier and was not able to handle the disruption. Even Nokia relied on one supplier and it was able to handle the disruption. By having one supplier companies can build strong relationships with him and they can work as one single company when a disruption happens (this is what Nokia did).

Before deciding to rely on one or more suppliers, analyze the competition to see if any of your competitors rely on the same supplier. If you share the same supplier with your competitors, it is necessary to create strong relationships with your suppliers and to analyze the supplier market in case of any inconvenience by the supplier side.

Flexible distribution: Like in the case of suppliers, the company should decide if it should have many distributors or just one. If the company could not collaborate with the distributors it is better to rely on many, so in case you always have a reserve distributor.

Flexible transportation: The companies should rely on different routes and means of transportation.

The author would like to stress that each company, based on its financial position, industry and type of product it produces, should decide in what part of the supply chain to increase flexibility. For example, flexible transportation is important for companies that sell products in different countries while flexible production is easier for firms that sell nearly standardized products.

Increase supply chain visibility: Today many supply chains are global and complex, so it is difficult to monitor and manage them. If one part of the supply chain is weak, all the supply chain will be weak.

The best suggestion to discover the weakest link quickly is collaboration and continuously information exchange with all the companies in the supply chain. By collaborating with all the partners in the supply chain, the company can help them to meet its objectives and also it will know them better. Companies need to collaborate in normal times and especially in difficult times.

If companies exchange real time information about demand and supply with their partners in the supply chain, they will notice immediately if something happen to them and vice versa. A small problem can bring big problems, so it is better to discover and solve it immediately.

If supply chain collaboration is not easy, companies can try to not outsource the critical parts of the supply chain or to be nearly vertically integrated. In this way, they can have full control and visibility over the supply chain, and the disruptions can be detected quickly.

Increase supply chain security: All the people in the company have to be trained in handling disruptions, and emergency teams have to be created. When the disruption will happen the emergency team will be focused on handling the disruption while the company will be focused on what it is good doing (producing or selling).

Understand your business model and culture: Companies have different culture and different business model, which sometimes help them to face disruptions and sometimes impose limits in handling disruptions. So it is suggested to understand who are the strengths and limits of the company's business model and organizational culture. When managers have to design strategies for handling supply chain disruptions, they have to consider these strengths and limits as the last ones will determine the success of the strategy execution.

Learn from the other companies' experience: A wise person learns from the experience of others while a fool learns from his experience (Sheffi, 2007). A successful company avoids doing the same mistakes done by its competitors. So, managers have to be kept informed about their industry and competitors. They have to analyze how the other companies in the industry reacted to several disruptions and what can be learnt from the other's experience.

Being prepared is the first step to handle a disruption successfully. But what managers can do when the disruption happens?

Organize internally and then externally: When the disruption happens the first thing to do is to analyze the potential effects of the disruption and the best strategy to handle it. You have to find the root of the problem and the possible solution. For example, Nokia first redesigned the chips (organize internally) and then it started to search for alternative suppliers (organize externally).

Teamwork: Work as a team not as a group. In a team people communicate freely with each other, give their opinion, have the same interests and objectives and trust each other. Nokia has worked as a team while Ericsson as a group.

Time is the scarce resource: When the disruption happens, there is no time to loose, every second is a matter of death or life. Companies have to react quickly when the disruption happens. A company that is prepared to handle disruptions can react quickly.

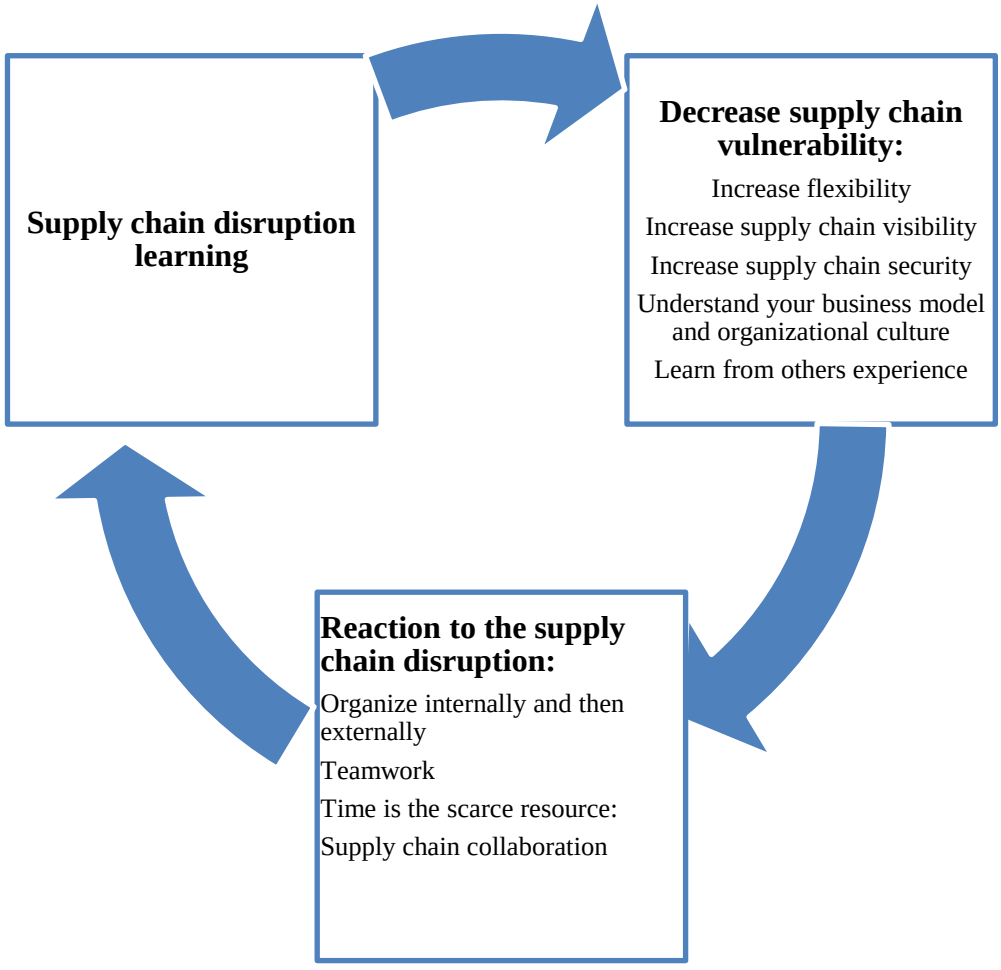
Supply chain collaboration: Supply chain disruption in many of the times did not happen to the focal company but to the supply chain partners. The actions and strategies of each partner should be coordinated and the decision-making process should involve all of them. This in turn will help the companies to recover quickly, and the collaboration efforts will be increased in the future.

The disruption happened, the company reacted and everything turned back into normality. However, the process of supply chain management should not stop here. The managers should ask: What can be learned from this experience?

In Figure 10 it is presented the framework for handling supply chain disruptions, discussed in the previous paragraphs. Firstly, the company should invest in decreasing the supply chain vulnerability. This can be achieved by increasing flexibility, increasing supply chain visibility, increasing security, understanding the opportunities and limits imposed by the business model and organizational culture and learning from others experience in handling disruptions. All these steps can decrease supply chain vulnerability but also they can help the company to react effectively and efficiently to the disruptions. Secondly, the company should react quickly when the disruption happens, and it should collaborate with all the

supply chain partners. Lastly, the company must be able to highlight the most important lessons from this experience, as they will help the company to improve its resiliency The process of handling supply chain disruptions, is an ongoing process, when each step must be coordinated with the other steps.

Figure 10: The framework for handling supply chain disruptions



6.4 Investment directions to improve supply chain disruption management in the Albanian companies

Albania is considered a country with a high level of risks regarding natural disasters and accidents. Moreover, there is a low degree of awareness concerning disruptions and the strategies to handle them. All the steps proposed in the framework presented in the previous section have to be considered by the Albanian managers. However, the author thinks that there is need to invest in three specific directions in order to increase the efficiency and effectiveness of the process of supply chain disruption management.

Investment in knowledge: Many Albanian managers were not accustomed with the term supply chain disruption. Supply chain disruption management was confused with crisis management or risk management. These processes are related with each other but supply chain disruption management very differently from the others involves all the supply chain members in the process of handling the disruption. The performance of the production firm depends on the performance of suppliers, customers and distributors. The managers should follow specific courses in supply chain disruption management. In Albania these courses are not present and this can be a limit.

Investment in human resources: Each company should have a supply chain trouble-shooter manager. This person would be engaged in the process of handling supply chain disruptions. He will work to increase the supply chain resilience and to recover quickly when the disruption happens.

Investment in collaboration: The analysis of the case studies has shown that the Albanian companies do not prefer to collaborate with the supply chain partners. Many global companies handled the disruptions successfully because the level of supply chain collaboration was high. Collaboration can increase supply chain visibility. This in turn can help to detect quickly the weakest link in the supply chain. Also, collaboration in cases of supply chain disruptions can help to recover quickly and profitably. Supply chain collaboration includes many elements like information sharing, incentive alignment, decision synchronization and so forth. These elements are interrelated with each other, so the Albanian companies should invest in all the elements not just in one of them. For example the previous researches of the author on supply chain collaboration concluded that the Albanian companies preferred to synchronize decisions but they do not prefer to share information especially with customers due to lack of customer education in this field. Collaboration is easy when you have the right supply chain partners, so invest more in the phase of supply chain partner selection. They should be selected not just on cost basis. Other factors should be considered like degree of integrity and existence of synergy.

6.5 Research limits

The main limit of this research is related with the Albanian case studies. It would have been better if more Albanian case studies would have been analyzed, especially case studies related to outbound disruptions.

Another research limit is the analysis of the case studies from the focus of the focal company due to cost and time. The impact of the disruption and the reaction of the other companies in the supply chain was not analyzed.

In the actual research was analyzed the success of five companies in handling supply chain disruptions. These companies were from different industries. This can be a limit because the result would have been more reliable, if they were related with a certain industry.

The last limit, but not the least, is related with the methodological choice. As the results derive from the analysis of only five case studies, they have a high degree of specificity. The results should be handled carefully, taking into consideration their specificity. Also, the data were collected using in depth interviews, a method that is affected by subjectivism.

6.6 Recommendations for future research

As inbound disruptions were studied more in this research, it is better that the future researches focus on outbound disruptions. One option could be to analyse separately each type of disruption, or to analyse together cases of outbound and inbound disruptions to see if companies handle in the same way these types of supply chain disruptions.

Future researches could analyse a certain disruption during all the supply chain. In this case, it will be studied the impact and reaction to the disruption of all the companies in the supply chain from the suppliers to the customers.

During the research, it was discovered that two companies (Nokia and Ericsson) relied on one single supplier, that in the literature it is not suggested. But, Nokia handled the disruption successfully even if it relied on one single supplier while Ericsson did not. So, one interesting area for future research will be the problem of single sourcing versus multiple sourcing. The research will answer to the question “Companies that rely on one supplier are more vulnerable to disruptions compared to companies that rely on more

suppliers"? Also this research will be useful in helping managers to understand, which is the best option for their company, single sourcing or multiple sourcing.

Future researches could be more industry specific. A disruption can happen more often in one industry compared to another and some strategies for handling disruptions could be more successful in some industries, so it would be better to focus the analysis on a particular industry.

Bibliography

Abraham, J. (2000). *Event report : Chi-Chi, Taiwan, earthquake.* Taiwan:RMS

Adhitya, A., Srinivasan, R., & Karimi, I. (2009). Supply chain risk identification using a HAZOP- based approach. *AICHE Journal, 55*(6), 1447-1463.

Aimi, G. (2006). *Advantages of postponement*. Retrived June 25, 2013 from Forbes http://www.forbes.com/2006/12/08/amr-product-postponement-biz-logistics-cx_ga_1208postpone.html

Audry, C., & Bobbitt, M. (2008). Supply chain security orientation: conceptual development and a proposed framework. *International Journal of Logistics Management, 19*(1), 42-64.

Babich, V. (2006). Vulnerable options in supply chains: Effect of supplier competition. *Naval Research Logistics, 53*(7), 656-673.

Bakshi, N., & Kleindorfer, P. (2009). Co-opetition and investment for supply-chain resilience. *Production and Operations Management, 18*(6), 583-603.

BBC News. (2000). *Ericsson's Mobile Worries*. Retrieved June 25, 2013, from BBC http://news.bbc.co.uk/2/hi/business/845619.stm

Behdani, B., Adhitya, A., Lukszo, Z., & Srinivasan , R. (2012). *How to Handle Disruptions in Supply Chains –An Integrated Framework and a Review of Literature.* Retrived October 15, 2014 from Social Science Research Network: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2114201

Blackhurst, J., Craighead, C., Elkins, D., & Handfield, R. (2005). An empirically derived agenda of critical research issues fo managing supply-chain disruptions. *International Journal of Production Research, 43*(19), 4067-4081.

Blome, C., & Schoenherr, T. (2011). Supply chain risk management in financial crises—A multiple case-study approach . *International Journal of Production Economics, 134*(1), 43-57.

Bode, C., & Wagner, S. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management,* In Press, Corrected Proof.

Boonman, H., Hagspiel, V., & Kort, P. (2015). Dedicated vs product flexible production technology: Strategic capacity investment choice. *European Journal of Operation Research, 1*(1), 141-152.

Bueno-Solano, A., & Cedillo- Campos, M. (2014). Dynamic impact on global supply chains performance of disruptions propagation produced by terrorist acts. *Transportation Research Part E: Logistics and Transportation Review,* 61(1), 1-12.

Busch, J. (2011). *Getting to the Bottom of Supply Chain Disruptions: Causes, Industries, Impacts (Part 1)* - Retrieved November 17, 2014, from Spend Matters: http://www.spendmatters.com/index.cfm/2011/11/14/Getting-to-the-Bottom-of-Supply-Chain-Disruptions-Causes-Industries-Impacts-Part-1?adminview=true

Business Continuity Institution. (2014). *Supply chain resilence.* Zurich

Business Reference (2014). D*aimler-Benz AG - Company Profile, Information, Business Description, History, Background Information on Daimler-Benz AG*. Retrieved February 19, 2014, from Reference for Businesses: http://www.referenceforbusiness.com/history2/4/Daimler-Benz-AG.html

Cantor, D., Blackhurst, J., & Cortes, J. D. (2014). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Transportation Research Part E: Logistics and Transportation Review, 72 (2),* 159-172.

Carter, C., & Easton, L. (2011). Sustainable supply chain management: evolution and future directions. *International Journal of Physical Distribution & Logistics Management, 41*(1), 46-62.

Chen, A., & Kasikitwiwat, P. (2011). Modeling capacity flexibility of transportation networks. *Transportation Research Part A: Policy and Practice, 45*(2), 105-117.

Chen, J., Xiabo, Z., & Zhou, Y. (2012). A periodic-review inventory system with a capacitated backup supplier for mitigating supply disruptions. *European Journal of Operational Research, 219*(2), 312-323.

Chen, L.-M., Liu, Y.-E., & Yang, S. (2015). Robust supply chain strategies for recovering from unanticipated disasters. *Transportation Research Part E: Logistics and Transportation Review, 77 (1)*, 198-214.

Choi, T., & Krause, D. (2006). The supply base and its complexity: Implications for transaction costs, risks, responsiveness and innovation. *Journal of Operations Management, 24*(5), 637-652.

Chopra, S., & Meindl, P. (2012). *Supply Chain Management. Strategy, Planning and Operations.* London: Prentice Hall.

Chopra, S., & Sodhi, M. (2004). Managing risk to avoid supply chain breakdown. *MIT Management Review*, 46(1), 50-61

Chopra, S., Reinhardt, G., & Mohan, U. (2007). The importance of decoupling recurrent and disruption risks in a supply chain. *Naval Research Logistics, 54*(5), 544-555.

Christopher, M., & Peck, H. (2005). Building the resilient supply chain. *International Journal of Logistics Management, 15*(2), 1-14.

Churcill, G., & Iacobucci, D. (2009). *Marketing Research. Methodological foundations.* NY: Cengage Learning.

Cigolini, R., & Rossi, T. (2010). Managing operational risks along the oil supply chain. *Production Planning and Controling, 21*(5), 452-467.

Colichia, C., Dallari, F., & Melacini, M. (2010). Increasing supply chain resilience in a global sourcing context. *Production Planning and Control, 21*(7), 680-694.

Compaq (2014). *Company overview*. Retrieved November 5, 2014, from Compaq: www.compaq.com

Cornell University. (2014). *AFLATOXINS : Occurrence and Health Risks*. Retrieved March 15, 2015, from http://www.ansci.cornell.edu/plants/toxicagents/aflatoxin/aflatoxin.html

Council of Supply Chain. (2014). *Supply chain definition*. Retrieved November 14, 2013, from http//www.supply-chain.com/info/faq.html.

Craighead, C., Blackhurst, J., Handfield , R., & Rungtusanatham, M. (2007). The severity of supply chain disruptions: Design characteristics and mitigation capabilities. *Decision Sciences Institute, 38*(1), 131-156.

Daimler (2014). *Company History*. Retrieved February 19, 2014, from Daimler: http://www.daimler.com/dccom/0-5-1324882-1-1324893-1-0-0-1345593-0-0-135-0-0-0-0-0-0-0-0.html

Daimler (2014). *Daimler Corporate Culture*. Retrieved March 2, 2015, from http://www.daimler-financialservices.com/dfs/corporate-culture

Daimler (2015). *Diversity*. Retrieved March 02, 2015, from http://www.daimler.com/career/thats-us/diversity/

Daimler Chrysler (2002). *Annual Report 2001*. Retrieved March 2, 2015, from: www.daimler.com

Dani, S., & Deep, A. (2010). Fragile Food Supply Chains: Reacting to Risks. *International Journal of Logistics Research, 13*(5), 395-410.

Deane, J., Craighead, C., & Ragsdale, C. (2009). Mitigating environmental and density risk in global sourcing. *International Journal of Physical Distribution and Logistics Management, 39*(10), 861-883.

Deleris, L., & Erhun, F. (2007). Risk management in a supply network: A case study based on enginnering risk analysis concepts. *Handbook of Production Planning*.

Dell (2000). *Fiscal year 1999*. Retrieved November 14, 2014, from www.dell.com

Dell (2001). *Fiscal year 2000*. Retrieved November 14, 2014, from www.dell.com

Dell (2002). *Fiscal year 2001*. Retrieved November 14, 2014, from www.dell.com

Dell (2003). *Fiscal year 2002*. Retrieved November 14, 2014, from www.dell.com

Dell (2004). *Fiscal year 2003*. Retrieved November 14, 2014, from www.dell.com

Dell (2005). *Fiscal year 2004*. Retrieved November 14, 2014, from www.dell.com

Dell (2006). *Fiscal year 2005*. Retrieved November 14, 2014, from www.dell.com

Dell (2007). *Fiscal year 2006*. Retrieved November 14, 2014, from www.dell.com

Dell (2008). *Fiscal year 2007*. Retrieved November 14, 2014, from www.dell.com

Dell (2009). *Fiscal year 2008*. Retrieved November 14, 2014, from www.dell.com

Dell (2010). *Fiscal year 2009*. Retrieved November 14, 2014, from www.dell.com

Dell (2011). *Fiscal year 2010*. Retrieved November 14, 2014, from www.dell.com

Dell (2012). *Fiscal year 2011*. Retrieved November 14, 2014, from www.dell.com

Dell (2013). *Fiscal year 2012*. Retrieved November 14, 2014, from www.dell.com

Dell (2014). *Fiscal year 2013*. Retrieved November 14, 2014, from www.dell.com

Ellegard, C. (2008). Supply risk management in a small company perspective. *Supply Chain Management: an International Journal, 13*(6), 425-434.

Ericsson. (2002). *Annual report 2001*. Retrieved November 14, 2014, from http://www.ericsson.com/res/investors/docs/annual-reports-1970-2002/annual01_financial_en.pdf

Farole, T., & Oliver, J. (2011). *Shoe molds and scuba divers: How natural disasters affect our supply chains*. Retrieved November 17, 2014, from World Bank: http://blogs.worldbank.org/eastasiapacific/shoe-molds-and-scuba-divers-how-natural-disasters-affect-our-supply-chains

Fawcett, S., Fawcett, A., Watson, B., & Watson, G. (2012). Peeking inside the black box: Toward an understanding of supply chain collaboration dynamics. *Journal of Supply Chain Management, 48*(1), 44-72.

Ferdows, K., Lewis, M., & Machuca, J. (2004). Rapid- fire fulfillment. *Harvard Business Review*, 31-36.

Finch, P. (2004). Supply chain risk management. *Supply chain management, 9*(2), 183-196.

Ford (2002). *Annual report 2001.* Retrived November 14, 2014 from: www.ford.com

Fourtane, S. (2014). *Supply chain agility: Nokia's supply chain management success*. Retrieved January 5, 2015, from EDN Network: http://www.edn.com/electronics-blogs/supply-chain-reaction/4430478/Supply-chain-agility--Nokia-s-supply-chain-management-success

Gartner (2000). *Gartner Group's Dataquest says worldwide PC market topped 21 percent growth in 1999.* Retrieved November 15 2014, from http://www.gartner.com/5_about/press_room/pr20000124a.html

Gartner (2001). *Gartner Dataquest says worldwide PC market growth was less than 15% in 2000*. Retrieved November 15, 2014, from http://www.gartner.com/5_about/press_room/pr20010119a.html

Gartner (2002). *Gartner Dataquest says mobile phone sales in 2001 declined for first time in industry's history*. Retrieved November 15, 2014, from

http://banners.noticiasdot.com/termometro/boletines/docs/ti/gartner/2002/gartner_Mobile%20_Phone_Sales-2001.pdf

Gartner (2003). *Gartner Dataquest says PC market experienced slight upturn in 2002*. Retrieved November 15, 2014, from http://www.gartner.com/press_releases/pr17jan2003a.html

Gartner (2004). *Gartner says PC vendors experienced a happy holiday session with fourth quarter worlwide shipment increasing 12 %*. Retrieved November 15, 2014, from http://www.gartner.com/press_releases/pr15jan2004.html

Gartner (2005). *Gartner says strong mobile sales lift worlwide PC shipments to 12 % percent growth in 2004*. Retrieved November 15, 2014, from http://www.gartner.com/press_releases/asset_117925_11.html>

Gartner (2006a). *Gartner says EMEA region became largest PC market in the world based on unit shipments in 2005*. Retrieved November 15, 2014, from http://www.gartner.com/press_releases/asset_143584_11.html

Gartner (2006b). *Gartner says top six vendors drive worlwide mobile phone sales to 21 percent growth in 2005*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=492248

Gartner (2007). *Gartner says Hewlett-Packard takes clear lead in fourth quarter worlwide PC shipments and creates a virtual tie with Dell for 2006 year-end results*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=500384

Gartner (2008a). *Gartner says worlwide PC market grew 13 percent in 2007*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=584210

Gartner (2008b). *Gartner says worlwide mobile phone sales increased 16 percent in 2007*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=612207

Gartner (2009). *Gartner says in the fourth quarter of 2008 the PC industry suffered its worst shipment growth rate since 2002*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=856712

Gartner (2010a). *Gartner says worldwide PC shipments in fourth quarter of 2009 posted strongest growth rate in seven years*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=1279215

Gartner (2010b). *Gartner says worlwide mobile phone sales to end users grew 8 percent in fourth quarter 2009; Market remained flat in 2009*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=1306513

Gartner (2011). *Gartner says worlwide PC shipments in fourth quarter of 2010 grew 3,1 percent; Year-end shipments increased 13,8 percent*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=1519417

Gartner (2012a). *Gartner says worlwide PC shipments in fourth quarter of 2011 declined 1,4 percent;Year-end shipments increased 0,5 percent*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=1893523

Gartner (2012b). *Gartner says worlwide smartphone sales soared in fourth quarter of 2011 with 47 percent growth*. Retrieved November 15, 2014, from http://www.gartner.com/it/page.jsp?id=1924314

Gartner (2013a). *Gartner Says Declining Worldwide PC Shipments in Fourth Quarter of 2012 Signal Structural Shift of PC market*. Retrieved November 15, 2014, from http://www.gartner.com/newsroom/id/2301715

Gartner (2013b). *Gartner Says Worldwide Mobile Phone Sales Declined 1.7 Percent in 2012*. Retrieved November 15, 2014, from http://www.gartner.com/newsroom/id/2335616

Gartner (2014). *"Gartner Says Worldwide PC Shipments Declined 6.9 Percent in Fourth Quarter of 2013*. Retrieved November 14, 2014, from http://www.gartner.com/newsroom/id/2647517

Gateway (2014). *Company Overview*. Retrieved November 14, 2014, from Gateway: http://ca.gateway.com/gw/en/CA/content/company

Genus, A., & Mafakheri, F. (2014). A neo-institutional perspective of supply chains and energy security: Bioenergy in the UK. *Applied Energy, 123*(15), 307-315.

Giannakis, M., & Louis, M. (2011). A multi-agent based framework for supply chain risk management. *Journal of Purchasing and Supply Management, 17*(1), 23-31.

Gilanina, S., Ganjinia, H., & Asadi , B. (2013). Difference between internal and external supply. *Singaporean Journal of Business Economics and Management Studies, 1*(8), 12-18.

Glock, C. (2012). Lead time reduction strategies in a single-vendor–single-buyer integrated inventory model with lot size-dependent lead times and stochastic demand. *International Journal of Production Economics, 136*(1), 37-44.

Goh, M., Lim, J., & Meng, F. (2007). A stochastic model for risk management in global supply supply chain networks. *European Journal of Operational Research, 182*(1), 164-173.

Habilaj, E. (2013). *Aflatoxin in milk "fatal" for businesses.* Retrieved March 20, 2015, from http://investigim.al/en/aflatoksina-ne-qumesht-vdekjeprurese-per-biznesin/

Hallikas, J., Karvonen, I., Pulkkinen, U., Virolainen, V.-M., & Tuominen, M. (2004). Risk management processes in supplier networks. *International Journal of Production Economics, 90*(1), 47-58.

Hallikas, J., Puumalainen, K., Vesterinen, T., & Virolainen, V.-M. (2005). Risk-based classification of supplier relationships. *Journal of Purchasing and Supply Management, 11*(3), 72-82.

Harland, C., Brenchley, R., & Walker, H. (2003). Risks in supply networks. *Journal of Purchasing and Supply Management, 9*(2), 51-62.

Hendricks, K., & Singhal, V. (2005). An Empirical Analysis of the Effect of Supply Chain Disruptions on Long-Run Stock Price Performance and Equity Risk of the Firm. *Journal of Production and Operation Management, 14*(1), 32-52.

Hendricks, K., Singhal, V., & Zhang, R. (2009). The effect of operational slack, deiversification and vertical relatedness on the stock market reaction to supply chain disruptions. *Journal of Operations Management, 27*(3), 233-246.

Hilletofth, P. (2009). How to develop a differeanted supply chain strategy. *Industrial Management & Data Systems, 109*(1), 16-33.

Hofstede Center (2015). *Albania versus Germany*. Retrieved March 15, 2015, from http://geert-hofstede.com/albania.html

Hofstede, G., Hofstede, G., & Minkov, M. (2010). *Cultures and organizations.* NY: MC Graw Hill.

Jacobsen, D. (2012). *6 big merges that were killed by culture*. Retrieved February 2015, 2015, from Globoforce: http://www.globoforce.com/gfblog/2012/6-big-mergers-that-were-killed-by-culture/

Ji, G. (2009). Ecological supply chains performance evaluation and disruption risk management strategies. *Human and Ecological Risk Assesment: An International Journal, 15*(2), 351-370.

Jumadin, Z. (2010). *KeyBiz, a management session*. Retrieved October 14, 2014, from http://zjumadin.webs.com/apps/blog/show/4149635-definition-of-supply-chain-management

Juttner, U., Peck, H., & Christopher, M. (2007). Supply chain risk management:outlining an agenda for future research. *International Journal of Logistics : Research & Applications, V, 6*(4), 197-210.

Kleindorfer, P., & Saad, G. (2005). Managing disruption risks in supply chain. *Production and Operations Mangement, 14*(1), 53-68.

Klibi, W., Martel, A., & Guitouni, A. (2010). The design of robust value-creating supply chain networks: A critical review. *European Journal of Operation Research, 203*(2), 283-293.

Knemeyer, A., Zinn, W., & Eroglu, C. (2009). Proactive planning for catastrophics events in supply chains. *Journal of Operations Management, 27*(2), 141-153.

Kovasc, A., Egri, P., Kis, T., & Vancza, J. (2013). Inventory control in supply chains: Alternative approaches to a two-stage lot-sizing problem. *International Journal of Production Economics, 143*(2), 385-394.

Kramer, K., & Dedrick, J. (2002). Dell Computer: Organization of a global production network. *Center for Research on Information Technology and Organizations*.

Kunert, P. (2011). *Acer to murder Gateway brand*. Retrieved November 15, 2014, from The Channel: http://www.channelregister.co.uk/2011/11/04/gateway_brand_to_disappear/

Latour, A. (2001). Trial by fire: A blaze in Albuquerque setts off major crisis for cell-phone giants. *Wall Street Journal*, 29 January.

Lee, H. (1998). *Trouncing the dow: A value based method for making huge profits.* NY: MC Graw Hill.

Lee, H. (2004). The triple A supply chain. *Harvard Business Review*, 2-14.

Li, G., Fan, H., Lee, P. K., & Cheng, T. (2015). Joint supply chain risk management: An agency and collaboration perspective. *International Journal of Production Economics, 164*(2), 83-94.

Liker, J., & Choi, T. (2004). Building deep supplier relationships. *Harvard Business Review*, 38-47.

Linton, J., Boyson, S., & Aje, J. (2014). The challenge of cyber supply chain security to research and practice – An introduction. *Technovation, 34*(7), 339-341.

Lohr, S. (1999). Compaq computer ousts chief executive. *New York Times,* April 19

Ludwing, C. (2010). *Daimler wants a total supply chain view*. Retrieved February 20, 2015, from Automotive Logistics: http://www.automotivelogisticsmagazine.com/intelligence/daimler-wants-a-total-supply-chain-view

Magretta, J. (1998). The power of virtual integration: An interview with Dell Computer's Michael Dell. *Harvard Business Review*, March-April Issue

Mamillo, D. (2015). Strategies for handling supply chain disruptions in the Albanian milk industry. *Referred paper in the 4-th International Multidisciplinary Conference on Integrating Science in New Global Challenges* (pp 273-280), Dubrovnik 27- 29 March

Manuj, I., & Mentzer, J. (2008). Global supply chain risk management strategies. *International Journal of Physical Distribution and Logistics Management, 38*(3), 192-223.

Marques, A., Alves, A., & Sousa, J. (2013). An Approach for Integrated Design of Flexible Production Systems. *CIRP*, (586-581).

Martha, J., & Subbakrishna, S. (2002). Targeting a just in case strategy for the next disaster. *Supply Chain Management Review,* 18-23.

Meggle AG (2015). *Company philosophy*. Retrieved March 15, 2015, from http://www.meggle.com/en/company/philosophy/

Meggle AG (2015). *Meggle's history*. Retrieved March 15, 2015, from http://www.meggle.com/en/company/history/

Meggle AG (2015). *The Meggle Group*. Retrieved March 15, 2015, from http://www.meggle.com/en/company/the-group/

Moore, J. (1999). *Taiwan earthquke could affect chip and PC supplies during holidays*. Retrieved June 25, 2013, from CCN: http://money.cnn.com/1999/10/07/technology/chips_taiwan/

National Comission on Terrorist Attack upon the United States. (2001). *Final Report of the National Commission on Terrorist Attacks Upon the United States*. Retrieved March 02, 2015, from http://www.9-11commission.gov/report/911Report_Exec.htm

Nokia Corporation (2002). *Annual report 2001*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2001

Nokia Corporation (2003). *Annual report 2002*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2002-

Nokia Corporation (2004). *Annual report 2003*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/264150/data/1/-/Request-Nokia-in-2003-pdf.pdf

Nokia Corporation (2005). *Annual report 2004*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263666/data/1/-/Request-Nokia-in-2004-pdf.pdf

Nokia Corporation (2006). *Annual report 2005*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/264184/data/1/-/Request-Nokia-in-2005-

Nokia Corporation (2007). *Annual report 2006*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2006-pdf.pdf

Nokia Corporation (2008). *Annual year 2007*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2007-pdf.pdf

Nokia Corporation (2009). *Annual year 2008*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2008-pdf.pdf

Nokia Corporation (2010). *Annual year 2009*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2009-pdf.pdf

Nokia Corporation (2011). *Annual year 2010*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2010-pdf.pdf

Nokia Corporation (2012). *Annual year 2011*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2011-pdf.pdf

Nokia Corporation (2013). *Annual report 2012*. Retrieved November 14, 2014, from http://i.nokia.com/blob/view/-/263692/data/1/-/Request-Nokia-in-2012-pdf.pdf

Nokia Corporation (2014). *Company overview*. Retrieved November 14, 2014, from http://www.nokia.com/global/about-nokia/

Norrman, A., & Jansson, U. (2004). Ericsson's proactive supply chain risk management approach after a serious sub-supplier accident. *International Journal of Physical Distribution & Logistics Management, 34*(5), 434-456.

Pagell, M., & Hu, Z. (2009). Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars. *Journal of Supply Chain Management, 45*(2), 37-56.

Papadakis, Y. (2002). Operation risk & supply chain design: An event study. Philadelphia: Le Bow College of Business, Drexel University

Partridge, A. (2012). *Scrutinizing Supply Chain Security*. Retrieved April 20, 2015, from Inbound Logistics: http://www.inboundlogistics.com/cms/article/scrutinizing-supply-chain-security/

Pereira, C., Christopher, M., & Da Silva, A. (2014). Achieving supply chain resilience: the role of procurement. *Supply Chain Management: An International Journal, 19*(6), 626-642.

Pettit, T., Croxton, K., & Fiksel, J. (2013). Ensuring Supply Chain Resilience: Development and Implementation of an Assessment Tool. *Journal of Business Logistics, 34*(1), 46-76.

Pickett, C. (2003). *Strategies for maximizing supply chain resilence: learning from the past to prepare for the future*. Masachusets Institute of Technology.

Pyke, D., & Tang, C. (2010). How to mitigate product safety risks proactively? Process, challenges and opportunities. *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management, 13*(4), 243-256.

Revilla, E., & Saenz, M. J. (2014). Supply chain disruption management: Global convergence vs national specificity. *Journal of Business Research, 67*(6), 1123-1135.

Rice, J., & Caniato, F. (2003). Building a secure and resilient supply chain. *Supply Chain Management Review, 7*(5), 22-31.

Roh, J., Hong, P., & Min, H. (2014). Implementation of a responsive supply chain strategy in global complexity: The case of manufacturing firms. *International Journal of Production Economics Part B, 147(1),* 198-210.

Rueppel, P. (1999). *Perspective: Don't let Taiwan shake you*. Retrieved November 12, 2014, from CNET: http://news.cnet.com/Dont-let-Taiwan-shake-you/2010-1071_3-281263.html>

Sanchez Garcia, J. (2010). *Nokia Y Ericsson.* New Mexico: ISEE Publishing

Sanders, N. (2011). *Supply chain management. A global perspective.* NY: Wiley.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students.* London: Finacial Times/Prentice Hall.

Sawik, T. (2014). Optimization of cost and service level in the presence of supply chain disruption risks: Single vs. multiple sourcing. *Computers and Operations Research, 51(2),* 11-20.

Schmitt, A., Sun, S., Snyder, L., & Shen, Z.-Y. (2015). Centralization versus decentralization: Risk pooling, risk diversification, and supply chain disruptions. *Omega, 52 (1),* 2001-2012.

Schmitt, T., Kumar, S., Stecke, K., Glover, F., & Ehlen, M. (2010). *Modeling economic consequences of supply chain disruptions.* Colorado

Sheehan, L. (2013). *Preparation: Your Best Asset in Managing Supply Chain Disruptions*. Retrieved April 28, 2015, from Inbound Logistics: http://www.inboundlogistics.com/cms/article/preparation-your-best-asset-in-managing-supply-chain-disruptions/

Sheffi, Y. (2001). Supply chain management under thet threat of international terrorism. *The International Journal of Logistics Management, 12*(2), 1-11

Sheffi, Y. (2005). Building a resilient supply chain. *Harvard Business Review, 1*(8), 1-14

Sheffi, Y. (2007). *The resilient enterprise: Overcoming vulnerability for competitive advantage.* Massachusets: The MIT Press.

Sheffi, Y., & Rice, J. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review, 47*(1), 41-48.

Simchi-Levi, D., Schmidt, W., & Wei, Y. (2014). From Superstorms to Factory Fires: Managing Unpredictable Supply-Chain Disruptions. *Harvard Business Review* (January issue).

Singh, A. (2014). Supplier evaluation and demand allocation among suppliers in a supply chain. *Journal of Purchasing and Supply Management, 20*(3), 167-176.

Sodhi, M., Son, B.-G., & Tang, C. (2011). Researchers' Perspectives on Supply Chain Risk Management. *Production and Operation Managements, 21*(1), 1-13.

Stadtler, H. (2014). *Supply chain management: an overview.* Berlin: Springer Berlin Heidelberg.

Steckea, K., & Kumarb, S. (2009). Sources of supply chain disruptions. Factors that bread vulnerability and mitigating strategies. *Journal of Marketing Channels, 16*(3), 193-226.

Sting, F., & Huchzeirmer, A. (2010). Ensuring responsive capacity: How to contract with backup suppliers. *European Journal of Operational Research, 207*(2), 725-735.

Surbakti, H. (2013). *Dell's inventory management: a short review*. Retrieved November 15, 2014, from GoBlog: http://goblog.herisonsurbakti.com/2011/01/21/dell%E2%80%99s-inventory-management-a-short-review/

Tah, J., & Carr, V. (2001). Towards a framework for project risk knowledge management in the construction supply chain. *Adavnces in Engineering Software, 32*(10), 835-846.

Tang, C. (2006). Robust strategies for mitigating supply chain disruptions. *International Journal of Logistics, 9*(1), 33-45.

Tang, C., & Tomlin, B. (2008). The power of flexibility for mitigating supply chain risks. *International Journal of Production and Economics, 116*(1), 12-27.

Tang, O., & Musa, S. (2011). Identifying risk issues and research advancements in supply chain risk management. *International Journal of Production Economics, 133*(1), 25-34.

Tang, O., Matsukawa, H., & Nakashima, K. (2012). Supply chain risk management. *International Journal of Production Economics, 139*(1), 1-358

Thun, J.-H., & Hoening, D. (2009). An empirical analysis of supply chain risk management in the German automotive industry. *International Journal of Production Economics, 131*(1), 242-249.

Tomlin, B. (2006). On the value of mitigation and contigency strategies for managing supply-chain disruption risks. *Management Science, 52*(5), 639-657.

UMTS World. (2004). *3G market shares*. Retrieved November 14, 2014, from http://www.umtsworld.com/industry/user_equipment.htm

Vakhary, A., & Yenipazarli, A. (2009). Managing supply chain disruptions. *Technology, Information and Operation Management, 2*(1), 243-325.

Vanany, I., Zailani, S., & Pujawan, N. (2009). Supply Chain Risk Management:Literature Review and Future Research. *Journal of Information Systems and Supply Chain Managment, 2*(1), 16-33.

Veverka, M. (1999). *A dram shame.* New York: Barron's.

Wagner, S., & Bode, C. (2007). An imperical investigation into supply chain vulnerability. *Journal of Purchasing and Supply Chain Management, 12*(6), 301-3012.

Wagner, S., & Neshat, N. (2010). Assessing the vulnerability of supply chains using graph theory. *International Journal of Production Economics*, 126(1),121-129.

Wang, D., & Ip, W. (2009). Evaluation and analysis of logistics network resilience with application to aircraft servicing. *IEEE Systems Journal, 3*(2), 166-173.

Wang, Y., Gilland, W., & Tomlin, B. (2010). Mitigating supply risk: Dual sourcing or process improvement. *Manufacturing and Service Operations Management, 12*(3), 489-510.

Waters, D. (2011). *Supply chain risk management: Vulnerability and resilience in logistics.* London:Kogan Page.

Williams, Z., Lueg, J., Taylor, R., & Cook, R. (2009). Why all the changes? An institutional theory approach to exploring the drivers of supply chain security (SCS). *International Journal of Physical Distribution & Logistics Management, 39*(7), 595-618.

Wilson, M. (2007). The impact of transportation disruption on supply chain performance. *Transportation Research Part E: Logistics and Transportation Review, 43*(4), 295-320.

Wu, D., Blackhurst, J., & O'Grady, P. (2007). Methodology for supply chain disruption analysis. *International Journal of Production Research, 45*(7), 1665-1668.

Xiao, T., & Yu, G. (2005). Supply chain disruption management and evolutionarily stable strategies of retailers in the quantity-setting duopoly situation with homogeneous goods. *European Journal of Operation Research, 2*(1), 648-668.

Yang, B., & Yang, Y. (2010). Postponement in the supply chain risk management: A complexity peerspective. *International Journal of Production and Research, 48*(7), 1901-1912.

Zegordi, S. H., & Davarzani, H. (2012). Developing a supply chain disruption analysis model: Application of colored Petri-nets. *Expert Systems with Applications, 39*(2), 2102-2111.

Appendix 1: BCI Resilience Report, 2014

The report was based in a survey that was conducted in 2014. More than 525 companies participated. 81% of the respondents recorded at least one supply chain disruption in the last 12 months while 19% of the respondents said that they hadn't suffered any significant supply chain disruption in the last year. In table 24 are presented the results of the survey, about the sources of supply chain disruptions. As it can be seen unplanned outage of IT or telecommunication system was the source of most supply chain disruptions. It was followed by adverse weather and outsources service failure. The main reason of transport disruptions was the extent of business in developing countries where the infrastructure is not good. In the fourth place as a source of supply chain disruptions were earthquakes and tsunami, as many companies were affected by the earthquake and tsunami that hit Japan on March 2011. The following table summarizes the results of the report.

Table 24: Sources of supply chain disruptions

Sources of supply chain disruption	**Percentage**	**Sources of supply chain disruption**	**Percentage**
Unplanned outage of IT or telecommunication system	57,7%	Currency exchange rate volatility	15,4%
Adverse weather	48,8%	Fire	14%
Outsource service failure	41,4%	Energy scarcity	14%
Transport network disruptions	41,4%	Business ethics incidents	14%
Loss of talented skills	37,2%	Lack of credit	13,5%
New laws or regulations	36,3%	Civil unrest or conflict	12,6%
Cyber attack	27,4%	Human illness	12,6%
Data breach	27%	Product safety incident	12,1%
Insolvency	19,5%	Insolvency in the supply chain	11,6%

Source: BCI (2014)

After a supply chain disruption hits the company, it faces different consequences. The BCI discovered that the main consequence of supply chain disruption was loss of productivity. 58, 5% of the respondents said that they were less productive after the disruption. Increased cost of working (47,5 %) was in the second place. As the productivity decreases, the cost of working increases, so it is not strange that "increased cost of working "came after "loss of productivity". In the third and fourth place (44%) were "loss of revenues" and "consumer complaints". The first is a logical consequence of the second. In the list, there were other obvious consequences such as stakeholder/shareholder concerns, delayed cash flows and product introduction, decrease of stock price, and so forth. From these results, we can conclude that not only the financial consequences were important but even the non-financial consequences. The main consequences of supply chain disruptions are summarized in the table 25.

Table 25: Consequences of supply chain disruptions

Consequences	**Percentage**
Loss of productivity	58,5 %
Increased cost of working	47,5 %
Loss of revenue	44, 7 %
Consumer complaints received	40,6 %
Service outcome impaired	37, 8%
Damage to brand reputation/ damage	34,6 %
Delayed cash flows	34,1 %
Stakeholder/ shareholder concerns	26,7%
Product release delays	24 %
Loss of regular customers	18%
Expected increase in regulatory scrutiny	17,5 %
Payment of service credits	7,4 %

Source: BCI (2014)

Almost a quarter of the respondents (23.6%) reported annual cumulative losses of at least €1 million due to supply chain disruptions. When asked about the largest losses arising from a single incident, more respondents have recorded losses of at least €1 million (13.2% from last year's 8.6%). The largest single loss was in the range of €51-100 million.

Appendix 2: Summary of literature review

Table 26: Summary of literature review

Authors and year	Research focus	Main idea
Understanding supply chain disruptions		
Sheffi(2007)	Relation between vulnerability and disruptions in the supply chain.	Vulnerable supply chains are more exposed to disruptions and more probably the consequences of disruptions will be bigger for them. The author also presented a framework to understand and analyze vulnerability.
Hallikas et. al (2005); Wagner and Bode (2006);Wagner and Neshat (2010);Waters (2011);Tang and Musa (2011); Pereira, Christopher and Da Silva (2014)	Discussed the sources of supply chain vulnerability.	Global sourcing, increase of bargaining power of suppliers and customers are the main sources of supply chain vulnerability.
Chopra and Sodhi (2004); Sodhi, Son and Tang (2011)	Discussed the different categories of supply chain risks and mitigating strategies for each category of risk. They gave special attention to supply chain disruptions as an important category of supply chain risk.	Supply chain disruptions are an important category of supply chain risks, and the best strategy for mitigating them is having flexible inventory and redundant suppliers.
Juttner et.al. (2003) ; Sheffi(2007);Craighead et. al. (2007); Schmitt (2010);Busch (2011);Revilla and Saenz (2014)	Discussed the sources of supply chain disruptions.	The main sources of supply chain disruptions include natural disasters, incidents and intentional disruptions.
Hnedricks and Singhal (2005); Zegordi and Davarzani (2012); Bueno-Solano and Cedilla- Campos (2014); BCI (2014)	Analyzed the consequences of supply chain disruptions.	Different companies face different disruption as they operate in different sectors and different countries. A supply chain disruption has not only devastating financial effects but even non-financial effects such as brand reputation, shareholders concerns, and so forth. The financial consequences in many of the cases have a short term impact, while the non-financial effects have a long-term impact. The consequences of supply chain disruptions can be

		summarized in cost increase, decrease of incomes, damage to brand reputation image and loss of competitive advantage.
Strategies for handling supply chain disruptions		
Supply chain risk management/pro-active approach		
Tang (2006)	Robust strategies	Robust strategies work well in normal times and enable the company to recover quickly after the disruption occurred. The robust strategies are postponement, flexible supply base, make and buy, supply incentives, flexible transportation, revenue management, dynamic assortment planning and silent product rollover.
Sheffi (2001);Rice and Caniato (2003); Sheffi and Rice (2005); Sheffi (2007);Audry & Bobbitt (2008); Hilletofth (2009) ; Williams, Lueg, Taylor and Cook (2009);Linton, Boyson and Aje (2014) ; Genus and Mafakheri (2014)	Security based strategies	These strategies are necessary to increase the security in all the supply chain. The security checks should happen inside the company and outside the company, when choosing the supply chain partners.
Sheffi (2005); Aimi (2006); Ragsdale (2009); Hendricks, Singhal and Zhang (2009); Steckea and Kumar (2009); Wang and Ip (2009); Ji (2009); Colichia, Tomlin (2010); Carter and Easton (2011);Chen and Kasikitwiwat (2011); Chen, Xiabo and Zhou (2012); Kovasc, Egri, Kis, and Vancza (2013);Marques, Alves and Sousa (2013); Roh, Hong and Min (2014); Chen, Liu and Yang (2015).	Resiliency strategies	The resiliency strategies are the ones that help the company to increase the supply chain resilience. They can be categorized in: Strategies that increase supply base, production and transportation flexibility. Strategies that increase redundancy over capacity, high strategic inventory and backup suppliers. Strategies that increase control over the supply chain The control should start from the selection of the suppliers to the increasing of demand responsiveness in the supply chain.
Supply chain disruption management/reactive approach		
Blackhurts et.al (2005)	The process of supply chain disruption management	Blackhurst et. al. (2005) describes the supply chain disruption management as a process with three steps. Firstly, the disruption must be discovered and then

		the managers should think for actions and strategies to undertake. After the firm recovered from the disruption, it should think how to redesign its supply chain, to become more resilient in the future. So to handle disruptions, the company should follow these steps: disruption discovery, disruption recovery and supply chain redesign.
Sheffi (2007)	Corporate culture as the key factor for handling supply chain disruptions.	The main cultural traits that lead some firms to handle better the disruptions and recovery profitably are: Continous communications among informed employees, distributed power, passion for the work and conditioning for disruptions. These four cultural traits complement each other. Understanding the relationships between them define the successful handling of supply chain disruptions.
Revilla and Saenz (2014)	Supply chain disruption management: global versus local firms.	The management of disruptions by global firms at the internal and inter-organizational level is universal. National differences have a week impact on disruption management. The same is not true for the local firms, as national culture affects the supply chain disruption management process.
Integrative framework		
Pyke and Tang (2010)	3R farmework	3R stands for Readiness, Responsiveness and Recovery. The study was focused on a specific case (product safety risk). The authors suggest that to handle disruptions successfully first you have to be ready for the disruptions, to create action plan in order to response quickly to the disruption and to implement strategies and actions to return back to normality. The disruptions should be handled before, during and after their happening.
Behdani et al. (2012)	The integrative framework for handling supply chain disruptions.	According to this framework the handling of supply chain disruptions is an ongoing process with two distinct cycles. The first cycle is called Risk Management Cycle while the second cycle called Disruption Management Cycle is necessary when the disruption happen. The integrative framework suggests that the prevention and reaction strategies and actions must be coordinated between them. They cannot stay as two separate processes.

Appendix 3: Interviews

In this appendix, the author will briefly present the main topics/questions that were discussed during the in-depth interviews with the managers of Meggle Albania and Fabjus.

Topic 1: A short history of the company from the foundation until now.

Topic 2: The analysis of the supply chain

The main parts of the supply chain are suppliers, manufacturing plants, distributors and customers. Each of these parts was discussed separately.

Suppliers: Who are the suppliers and what type of relationships have you built with them? Who are the main selection criteria for suppliers? If a supplier did not meet the company's requirements, do you abandon or help him to meet the requirement?

Manufacturing plants: How many manufacturing plants do you have and where they are located? Do you own the manufacturing plants or do you outsource the production function? For each answer can you explain the " why" ?

Distribution: Do you outsource this function? How many routes and means of transportation do you use?

Customers: Who are your customers and what do you do to increase customer satisfaction?

What do you do to increase the control over the supply chain? Do you prefer collaboration or vertical integration? Why?

Topic 3: Organizational structure

Would you explain how the tasks are allocated, coordinated and supervised in your company? Are present all the levels of managers in your organizational structure?

Topic 4: Organizational culture

How does the following element of the national culture: power distance, individualism, masculinity, uncertainty avoidance, long term orientation and indulgence, manifest themselves in your organizational culture?

Who are the main values in your company? Can you define your culture as collaborative, aggressive or individualistic?

Topic 5: Handling the disruption

All the companies have faced at least one disruption. In many cases the disruption can hit many companies in the same industry. Some companies have handled the disruption successfully while their competitors have not. Have you experienced such disruptions?

After gaining the credibility of the managers, the author asked them to describe the disruption and all the actions that they undertook to handle the disruption in chronological order.

Appendix 4: The top five computer companies according to market share from 1999 to 2013.

Table 27: Leaders in the computer industry, 1999-2002

	1999		2000		2001		2002	
Ranking	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)
1.	Compaq	13,2	Compaq	12,8	Dell	13,2	HP-Compaq	14,2
2.	Dell	9,8	Dell	10,8	Compaq	11,2	Dell	13,2
3.	Packard Bell NEC	7,9	Hewlett Packard	7,6	Hewlett Packard	7,2	IBM	5,2
4.	IBM	6,4	IBM	6,8	IBM	6,4	Packard Bell NEC	3,8
5.	Hewlett Packard	5,2	Packard Bell NEC	4,3	Packard Bell NEC	3,8	Toshiba	2,8
	Others	57,5	Others	57,7	Others	58,2	Others	60,8

Source: Gartner (2000;2001;2003;2004)

Table 28: Leaders in the computer industry, 2003-2006

	2003		2004		2005		2006	
Ranking	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)	Company	Market share (%)
1.	Dell	14,9	Dell	16,4	Dell	16,8	Dell	15,9
2.	HP	14,6	HP	14,6	HP	14,5	HP	15,9
3.	IBM	5,3	IBM	5,5	Lenovo	6,9	Lenovo	7,0
4.	Fujitsu	3,7	Fujitsu	3,8	Acer	4,6	Acer	5,8
5.	Toshiba	2,9	Acer	3,4	Fujitsu	3,8	Toshiba	3,8
	Others	41,4	Others	56,3	Others	53,3	Others	51,6

Source: Gartner (2005;2006a;2007)

Table 29: Leaders in the computer industry, 2007-2010

	2007		2008		2009		2010	
Ranking	Company	Market share	Company	Market share	Company	Market share	Company	Market share
1.	HP	18,2	HP	18,4	HP	19,3	HP	17,9
2.	Dell	14,3	Dell	14,3	Acer	13,0	Acer	12,9
3.	Acer	8,9	Acer	11,1	Dell	12,2	Dell	12,0
4.	Lenovo	7,4	Lenovo	7,2	Lenovo	8,1	Lenovo	9,7
5.	Toshiba	4,0	Toshiba	4,5	Toshiba	5,1	Toshiba	5,4
	Others	47,1	Others	44,5	Others	42,3	Others	42,1

Source: Gartner (2008a;2009;2010a;2011)

Table 30: Leaders in the computer industry, 2011-2013

	2011		2012		2013	
Ranking	**Company**	**Market share (%)**	**Company**	**Market share (%)**	**Company**	**Market share (%)**
1.	HP	17,2	HP	16,1	Lenovo	16,9
2.	Lenovo	13,0	Lenovo	14,9	HP	16,2
3.	Dell	12,1	Dell	10,7	Dell	11,6
4.	Acer	11,2	Acer	10,2	Acer	8,1
5.	Assus	5,9	Assus	6,9	Asus	6,3
	Others	40,7	Others	41,2	Others	40,9

Source: Gartner (2012a; 2013a; 2014)

Appendix 5: Financial performance of Nokia from 2000 to 2011

Table 31: Nokia financial performance, 2000-2005

Fiscal year	2000	2001	2002	2003	2004	2005
Total revenues	30.376[10]	31.191	30.016	29.455	29.371	34.191
Net profit	3.938	2.200	3.381	3.592	3.192	3.616
NP/ Revenues	13,0	7,1	11,3	12,2	10,1	10,5
Dividends	1.315	1.279	1.340	1.439	1.539	1.641
R&D expenditures/Net sales (%)	8,5	9,6	10,2	12,8	12,9	11,2

Source: Nokia Corporation (2001; 2002; 2003; 2004; 2005; 2006; 2007)

Table 32: Nokia's financial performance, 2006-2013

Fiscal year	2006	2007	2008	2009	2010	2011	2012	2013
Total revenues	41.121	51.058	50.710	40.984	42.446	38.659	15.400	12.709
Net profit	4.306	6.746	3.889	260	1.341	-1.488	-821	519
NP/ Revenues	10,5	13,2	7,7	0,6	3,1	-4,0	-0,05	0,04
Dividends	1.761	2.111	1.520	1.498	1.498	749	0	1386
R&D expenditures/Net sales(%)	9,5	11,1	11,8	14,4	13,8	14,5	15,8	20.6

Source: Nokia Corporation (2008; 2009;2010; 2011; 2012; 2014)

[10]Expressed in millions

Appendix 6: Market share of top five mobile phone manufacturers from 2000 to 2013

Table 33: Leaders in the phone industry, 2000-2003

	2000		2001		2002		2003	
Ranking	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)	Company	Market share%)
1.	Nokia	30,6	Nokia	35	Nokia	35,1	Nokia	34,7
2.	Motorola	14,6	Motorola	14,8	Motorola	16,9	Motorola	14,5
3.	Ericsson	10	Siemens	7,4	Samsung	9,7	Samsung	10,5
4.	Siemens	6,5	Samsung	7,1	Siemens	8,0	Siemens	8,4
5.	Samsung	5	Ericsson	6,7	Sony-Ericsson	5,4	Sony-Ericsson	5,1
	Others	33,2	Others	29	Others	24,9	Others	26,8

Source: Gartner (2002); UMTS World (2004)

Table 34: Leaders in the phone industry, 2004-2007

	2004		2005		2006		2007	
Ranking	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)
1.	Nokia	30,7	Nokia	32,5	Nokia	34,8	Nokia	37,8
2.	Motorola	15,4	Motorola	17,7	Motorola	21,1	Motorola	14,3
3.	Samsung	12,6	Samsung	12,7	Samsung	11,8	Samsung	13,4
4.	LG	6,3	LG	6,7	Sony-Ericsson	7,4	Sony-Ericsson	8,8
5.	Sony-Ericsson	6,2	Sony-Ericsson	6,3	LG	6,3	LG	6,8
	Others	28,8	Others	24,1	Others	18,6	Others	18,9

Source: Gartner (2006;2008b)

Table 35: Leaders in the phone industry, 2008-2011

	2008		2009		2010		2011	
Ranking	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)	Company	Market share(%)
1.	Nokia	38,6	Nokia	36,4	Nokia	28,9	Nokia	23,8
2.	Samsung	16,3	Samsung	19,5	Samsung	17,6	Samsung	17,7
3.	LG	8,4	LG	10,1	LG	7,1	Apple	5,0
4.	Motorola	8,7	Motorola	4,8	HTC	3,1	LG	4,9
5.	Sony-Ericsson	4,5	Sony-Ericsson	7,6	Apple	2,9	ZTE	3,2
	Others	24,7	Others	20,3	Others	40,4	Others	45,4

Source: Gartner (2010b;2012b)

Table 36: Leaders in the phone industry, 2012

	2012	
Ranking	**Company**	**Market share(%)**
1.	Samsung	22
2.	Nokia	19
3.	Apple	7,5
4.	ZTE	3,9
5.	LG	3,3
	Others	55,7

Source: Gartner (2013b)

Appendix 7: An analysis of the strategies for handling supply chain disruptions in the Albanian milk industry

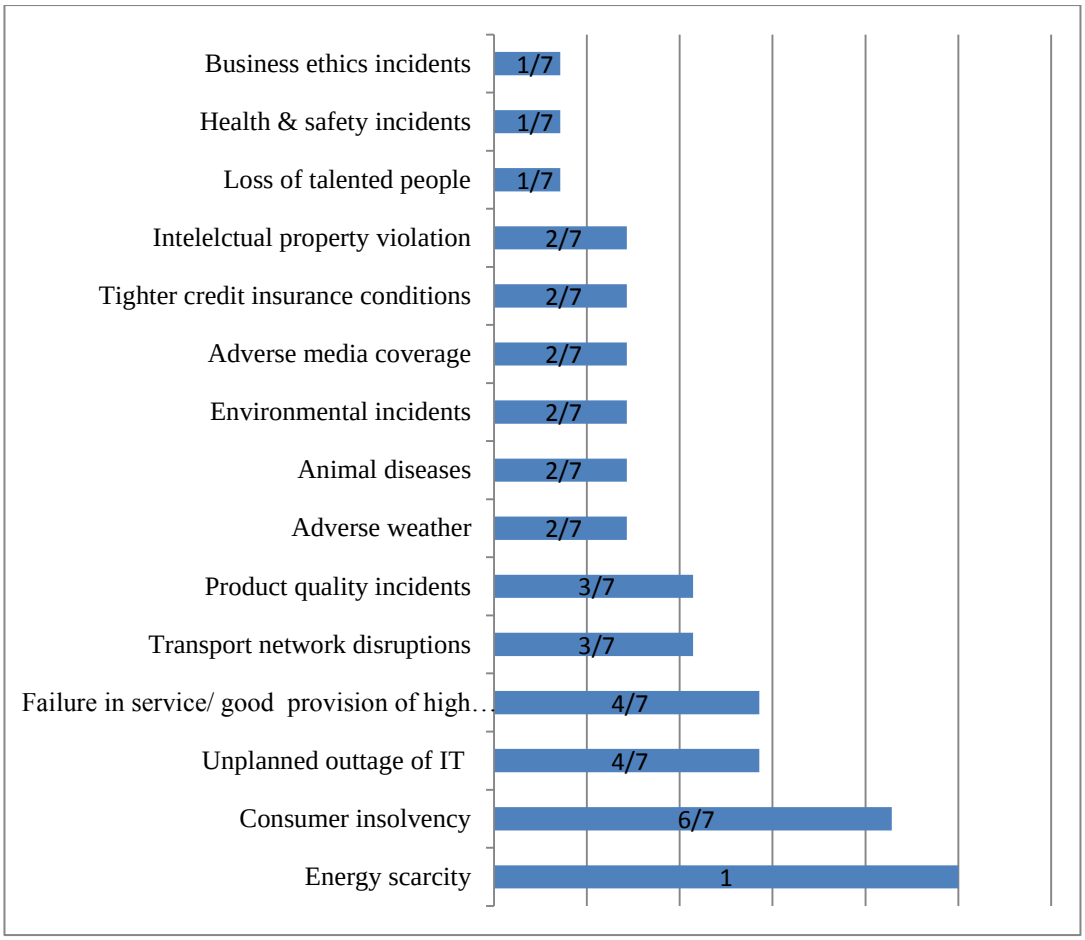
In the following paragraphs there will be presented the results of the research conducted in the Albanian milk processing industry regarding strategies for handling supply chain disruptions. The main seven milk processing companies were part of this study.

Question one: How many supply chain disruptions have faced your company in the last four years? All the milk processing companies faced at least one disruption. Five companies reported at least 11 disruptions, two of them reported more than 51 disruptions while the others faced at least 20 disruptions in the supply chain in the last four years.

Question two: What were the major sources of disruption in the supply chain? Energy scarcity was the main source of disruption for all the companies. The price of energy had increased a lot the last years and there was no continuous energy power supply. Six companies declared that many of their clients were not able to pay for the products, and this brought financial difficulties to the companies. Five of them had a common client, which have not paid them for more than one year. The judiciary solution is costly and time - consuming. Three of the companies interviewed declared that disruptions were caused by transportation problems, due to a lack of good road infrastructure in Albania. Two companies declared that the adverse media coverage, especially for the aflatoxin scandal, was the major source of disruption for them. The other sources are presented in Figure 11[11].

[11] The data in Figure 11, 12, 13 and 14 are presented as number of companies that responded yes to that option dived for the total number of the companies interviewed (7)

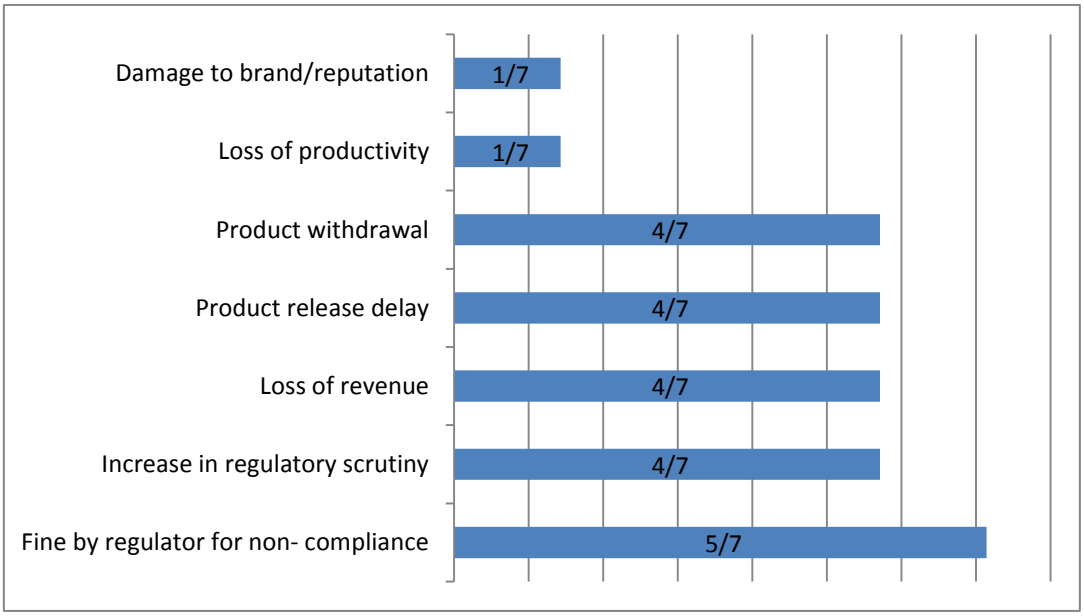
Figure 11: Sources of supply chain disruptions



Question three: Where did the problem originate? Five companies declared that the disruptions happened to the first tier supplier while three of them declared that the disruption happened at the customer level. The others declared that the problem originated at the second and third tier supplier. These results show that the companies had analyzed the disruption carefully, to identify its origin.

Question four: What were the consequences of the disruptions faced in the last four years? The major consequences of the disruptions were fine by the regulator and increase in regulatory scrutiny. One of them said: “We faced a disruption and were near bankruptcy. The government instead of helping us to survive made the things more difficult”. In the last years, the taxes have been increased and the prices of product controls/tests have been doubled. The consequences were financial and nonfinancial. They are presented in Figure 12.

Figure 12: Consequences of supply chain disruptions

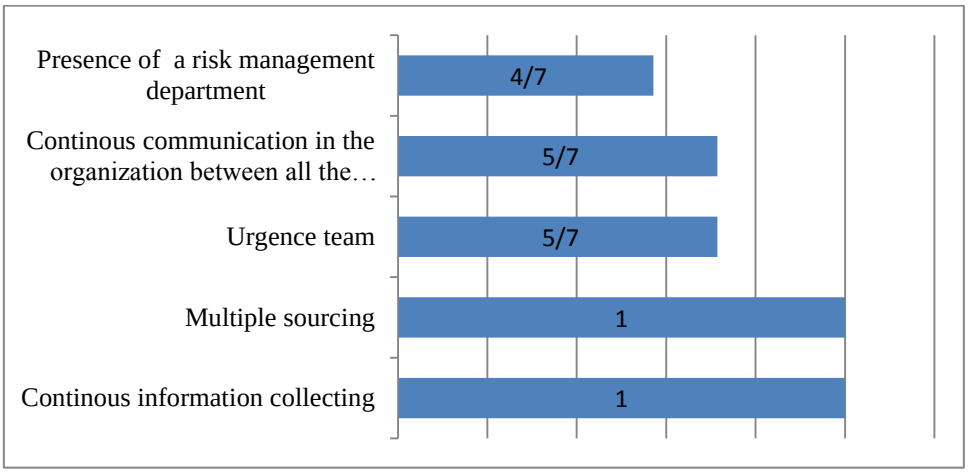


Question five: Considering the most significant disruption in the last four years, what was the approximate financial cost? Looking at the most significant disruptions, three of the respondents declared that the financial loss was more than 350.000 euro. However, for two of them the cost was between 70.000 euro– 700.000 euro and for the others the loss was

between 78.000 euro and 350.000 euro. Considering their size, the financial cost of the disruption was considerable.

Question six: What actions and strategies are implemented to increase the resilience of the company to disruptions? The results are presented in Figure 13. All of them declared that they rely on multiple suppliers for many components they continuously collect information from different sources in order to be more prepared if the disruption happens. Many of the supply chain disruptions originated at the first tier supplier, so it is better to have a reserve supplier for every component. Five companies declared that they have an urgency team, trained to deal with major disruptions, and allows the information to move freely from the low to the high levels of the organization and vice versa. Only four of the companies interviewed had a supply chain risk management department.

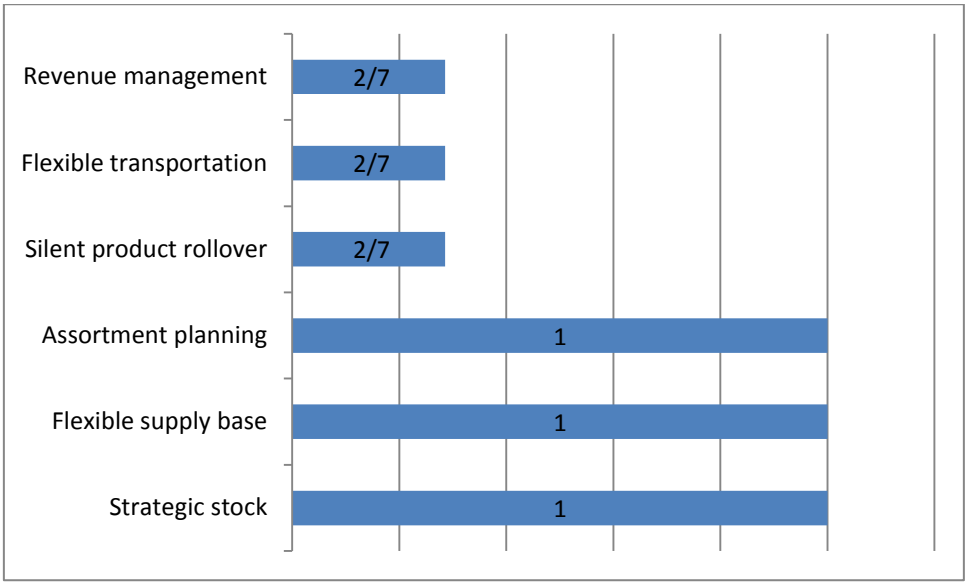
Figure 13: Strategies to increase resilience



Question seven: Which of the following robust strategies have you commonly used to face the disruptions of the last four years? As it can be seen in Figure 14, all the companies have

executed one of the robust strategies (the one mentioned in the literature review) to handle the supply chain disruptions. The most used strategies were strategic stock, flexible supply base and assortment planning.

Figure 14: Robust strategies



Summary of results

All the main Albanian milk processing companies have faced at least one supply chain disruption in the last four years. Many of them had analyzed carefully each disruption to identify its origin. The disruptions mainly have occurred to their first tier supplier and clients. The sources of the disruptions were different from natural disasters (adverse weather) to accidents (product quality incidents, transport disruption) and to intentional disruptions (consumer insolvency, adverse media coverage). The main sources of

disruption was energy scarcity and consumer insolvency. The government instead of helping the domestic companies to be more competitive and to meet the European standards, made the things more difficult by increasing the regulatory scrutiny and fines. These last two were the main consequences of supply chain disruptions.

All the companies declared that their survival in many cases depended on the success of handling the disruptions. The first step is to build a resilient company, able to face supply chain disruptions. According to them this can be achieved through multiple sourcing, as their suppliers face more disruptions, continuous sharing and collection of information and presence of a risk supply chain management department. They were realistic that all the disruptions cannot be foreseen, as time and resources are limited and because it is not possible. For this reason they implemented different robust strategies. Normally, one size cannot possibly fit all, so each of them taking into consideration their structure, culture and type of disruption faced, decided to execute one of the robust strategies. So the best strategy to handle supply chain disruptions, is being prepared and implementing a robust strategy to face the disruption.