ISCTE Business School
Instituto Universitário de Lisboa

GLOBAL SUPPLY CHAIN RISK MANAGEMENT: AN APPROACH ON HOW GLOBAL FIRMS MANAGE THE COMPLEXITY OF THEIR WORLDWIDE OPERATIONS

Perycles dos Santos Moraes

Dissertation submitted as partial requirement for the conferral of

Master in Management

Supervisor:
Professor PhD. Eurico Brilhante Dias, Auxiliary Professor, ISCTE Business School, Department of Management

September 2016

Resumo

O campo da gestão do risco na cadeia global de abastecimento é fundamental para a sua sustentabilidade, entretanto, ainda figura um campo pouco explorado, principalmente quando se trata de avaliar se a teoria se adequa à prática. A complexidade inerente a essas cadeias faz com que o estudo dos seus riscos seja cada vez mais significante para construir uma cadeia de abastecimento resiliente e sustentável.

A fim de desenvolver uma contribuição relevante para a literatura, este trabalho apresenta três estudos de caso de três empresas de diferentes indústrias. Para esta metodologia foi utilizada uma abordagem qualitativa para compreender a perceção do risco por parte das empresas, e suas respetivas estratégias para os gerir. Segue-se à exposição do cenário da cadeia de abastecimento das três empresas uma análise dos estudos de caso, com base no que é aconselhado pelos pesquisadores desta área.

Por fim, os resultados deste trabalho indicam que as três empresas não dominam o arcabouço teórico do campo da gestão do risco na cadeia de abastecimento, nem mesmo aplicam a fundo as estratégias propostas pelos pesquisadores. Todavia, as empresas parecem conhecer detalhadamente os riscos aos quais estão expostas e, ainda, as estratégias adotadas para gerir estes riscos mostram-se eficientes tanto em evitar disrupções quanto em superar barreiras e dificuldades.

Contudo, a mentalidade dos pesquisadores e empresas convergem em apostar na cooperação e comunicação como pontos chave para desenvolver a visibilidade, flexibilidade e agilidade numa cadeia de abastecimento, aprimorando, em última instância, sua resiliência e diminuindo sua exposição aos riscos.

Classificação JEL: M11 e L22

Palavras-chave: Cadeia de Abastecimento, Cadeia Global de Valor, Gestão do Risco, Estudo de Caso

Abstract

The global supply chain risk management field is crucial for the supply chain sustainability, however, it is yet poorly explored, especially when it comes to matching the literature studies with empirical observations. The complexity inherent to these supply chains turn the studies and analyzes of risk-related issues, such as risk exposure, perception and its management strategies, time-to-time more significant to building a resilient and sustainable chain.

In order to develop a coherent and relevant contribution for the literature, this dissertation provides three case studies of three companies from different industries. These case studies provide a qualitative approach of the firms' risk perception and their management strategies. After the exposure of each of the three firms supply chain scenario, it is developed an analysis of the case studies, taking into account what is suggested and advised by former researchers in this field.

The findings of this research indicate that the three companies do not dominate the existing supply chain risk management theoretical framework, nor fully apply risk management dynamics and strategies proposed by researchers. Instead, on average, they know in detail what are the risk-related events likely to have impacts onto their supply chains; moreover, their risk management strategies seem to be effective on both avoiding impacts and overcoming barriers and disruptions.

On the other hand, the researchers' and companies' mindset converge on betting on cooperation/collaboration and communication/information sharing as builders of visibility, flexibility and agility into a supply chain, finally improving its resilience and reducing its risk exposure.

JEL Classification: M11 e L22

Keywords: Supply Chain, Global Value Chain, Risk Management, Case Study

Acknowledgements

The present dissertation represents the final, yet hardest, effort on concluding my Master degree in Management. This two-year period living and studying in Portugal were tough and intense; living abroad, away from our people and our home require especial focus and resilience. Besides, many people helped me throughout my Master studies, to whom I must extend my sincere gratitude. Without these people my academic and social life in Portugal would have been more difficult.

I thank my mom and dad for believing in me and supporting me into this challenge. The lessons and principles my parents introduced me are elements that helped me to reach this important step in my life and made myself who I am today, a loyal, honest, persistent, and organized individual.

I also appreciate and thank the rest of my family for their frequent words of motivation. Being far from home I could see the most important side of the family in one's life: no matter what is happening and where something is happening, these people are the ones who will always give their best to help you and wait for you with arms wide open whenever necessary.

Thanks to my girlfriend, who was always open to help me during my personal effort on concluding the degree and developing the thesis. The patience and comfort you always provided me was crucial to succeed in this further stage. Special thanks also to my girlfriend's family – my family overseas –, who were always concerned about my adaptation in Portugal and whose effort on helping me to develop this thesis was really admirable.

Acknowledgements to my supervisor, Professor Eurico Brilhante Dias, for the clever recommendations and suggestions. Your knowledge and expertise was certainly a key point for this research.

To conclude this degree lots of interactions and group assignments were necessary. Therefore, I must thank all my colleagues from ISCTE, especially those who directly built this path with me during the first year, sharing group tasks and assignments together.

My gratitude to all ISCTE-IUL Professors who lectured the subjects in this Master Program, which were always helpful, open for discussions and solving problems and doubts tirelessly. Special thanks to Professor José Dias Curto, Professor Álvaro Rosa, Professor Rui Vinhas da Silva for the amazing classes lectured, and to Professor Cristina Machado Guimarães for having fostered in me the interest for the Supply Chain Management field.

Finally, my acknowledgements for the interviewees and the companies for having provided the time and information to enable me to develop this research and, hence, conclude this degree.

All the previously mentioned people has their particular importance in the overall result of my effort; I must confess that if at least one person of the abovementioned were not present in my path, my accomplishments would not have been this fruitful.

To you, my most sincere gratitude! Thank you all!

Index

List of Figures

List of Tables

Glossary

EU – European Union

OEM(s) – Original equipment manufacturer(s)

SC(s) – Supply chain(s)

SCM – Supply chain management

SCRM – Supply chain risk management

Chapter 1: Introduction

It is widely acknowledged that every firm needs interactions to not only survive but also to well succeed in any specific market. However, as time passes these interactions become even more vital to the continuity of firms. In this context the existence of the idea of a SC allows each firm to concentrate its efforts on its main activities, i.e. the ones among their core-competences.

Nowadays, because of globalization, the increase on (global) outsourcing, increased financial and informational flows, social, political and economic instabilities, natural disasters and other hazards, the SC environment has become more complex than ever before. Such obstacles may harm the SC in such a way that production and financial outcomes can seriously collapse. According to Manuj & Mentzer (2008a), global SCs require very well coordinated flow of materials, goods, information and capital under international boundaries perspectives.

> Empirical evidences have shown severe consequences after supply chain disruptions, such as loss of profit, damage of market share, etc. This leads to a general increasing interest in SCRM (Tang & Nurmaya Musa, 2011:31).

The general objective of a global SC is to maximize profit, finding the equilibrium between productivity and profitability, and this means sourcing, manufacturing and assembling from the lowest cost countries, while marketing in big potential demand locations. However, at the same time going global means benefiting from many advantages from low cost supplier countries, it also means being open for a set of disruptive events that may occur. Multi-national operations require attention to differences in infrastructure, which might be an obstacle to the well-functioning of the logistics system, to social, political and economic conjunctures, that can increase costs and uncertainty in such a way the operations in a particular location may become totally unviable. If an odd event hits a SC member in a specific country, where the operations are spread to other parts of the globe, other SC members may have their operations disturbed or even interrupted (Manuj & Mentzer, 2008a).

Hence it is required a strict analysis of the risks in both domestic and global SCs and balance the differences of infrastructures and conjunctures to really verify if it is worth going global, since disruptive events may seriously harm the SC and its outcomes. As per Manuj & Mentzer (2008a:134), "global supply chains have potentially more delay points, greater uncertainties, and hence the need for greater coordination, communication, and monitoring".

1.1. Objectives

Due to the relevance of this broad topic, the general objective of this dissertation is to identify the overall dynamics related to risk, including understanding what is risk, its sources, ways to identify it, manage, assess and mitigate them in global SCs.

There are a large number of work regarding the identification, assessment/measurement, and mitigation strategies for risk. Nevertheless, in the present dissertation it is going to be given focus to risk management on the global SC, more specifically to those risks that can be more easily identified, measured and managed from the firm's perspective, such as demand volatility, supply disruptions, outsourcing issues – micro-risks – and others that affect directly the cost, quality and lead-time in a SC, rather than uncontrollable risks, such as natural disasters, wars, economic cycles etc. – macro-risks – although these are the ones that bring more trauma to SC operations.

The specific objectives of this dissertation are two: to describe what potential threatening risks are more likely to damage global SCs, and how do companies deal with them; the second specific objective is to propose strategies to overcome the SC vulnerability and to build a resilient SC, according to each case study, which appears to be quite relevant since these concepts are highly correlated.

1.2. Methodology

The scarcity of empirical studies in the SCRM field represents a gap and opportunity to be explored and exploited. Therefore, the methodology will consist on the development of multiple case studies, through semi-structured interviews applied to managers and directors responsible for core departments of the studied enterprises; the interviews will have a qualitative nature, since the goal of this study is to understand the dynamics of risk related issues in SCs. Rather than a questionnaire or a set of exhaustive questions, a talk about

specific topics will be proposed, in which it will be possible to obtain more complete answers, and, possibly, additional information from the interviewees.

According to Eisenhardt (1989) and Yin (2009), the case study method is applicable in this dissertation since it aims to understand the contemporary procedures companies use to consider and deal with risk throughout their SCs. Thus, in accordance to the parameters proposed by these authors, three case studies were developed for the purpose of this study.

The use of the combination between theory and case studies will enable the reader to be aware of the concepts and connections between them, as well as he/she will be able to contextualize the issues stated in the case studies and verify if the researched organizations' actions are in line with what the literature propose.

1.3. Research Questions

Companies usually suffer the consequences of the bad management of risk, they are time by time more vulnerable and it becomes increasingly difficult to overcome the bottlenecks brought by their limitations. According to Jüttner *et al.* (2003), managers appear to bold risks directly linked with their business, which sometimes address minimal consequences to the focal firm's operations, such as those risks related to their supplier or direct customer, and neglect the possibility of another source of risk be the obstacle to the firm's well-being.

Taking into account theory, the case studies developed in this dissertation, and that the researched companies are inserted into a globalized scenario, the research questions are:

- Do companies recognize risks inherent to their SC? What risks may threaten their global SC operations? How do they understand and react to them?
- What practices should be taken to overcome companies' vulnerabilities and reduce risk probability and its impacts across the global SCs?

1.4. Dissertation Structure

In Chapter 2, Literature Review, the concepts of risk and uncertainty are going to be explored over different authors' perspectives, as well as the concepts of vulnerability and resilience, which are intrinsically linked to risk and risk management. It is also going to be described

what the main authors about this field defend as strategies to identify, assess and mitigate risk over the SC.

In Chapter 3, three case studies of three companies from different industries are presented along with a brief context about each company, their operations, market scenario, the descriptive data collected on the interviews, and its respective analyzes.

Finally, Chapter 4 presents discussions and conclusions of the whole research. In this Chapter it is explored whether the procedures and strategies proposed by the SCRM field researchers are aligned with what is applied in the researched companies. In addition, it is presented this dissertation's most important contribute, its limitations and suggestions for future researches.

Chapter 2: Literature Review

The SCRM field is relatively nascent and its importance has increased after executives have reported additional concerns on potential threats to their SCs, in addition to the risen of risks. The riskier environment firms have been facing is derived from the enterprises' focus on revenue, cost and asset reduction, which increases complexity in their SCs, as well as from external factors caused or not by humans, such as terrorism, wars, accidents and natural hazards, both revealing the level of exposure and vulnerability of SCs today (Sodhi *et al.*, 2012).

Sodhi *et al.* (2012) additionally contribute to the literature attesting that there is no consensus on a factual definition of SCRM, however, more than 65% of the researchers interviewed on their study defined SCRM as dealing with the unknown, disruptions, disasters, low probability but high impact events or even dealing with risks potentially harmful to SC operations (Sodhi *et al.*, 2012).

Still, there is a vast amount of studies providing models for managing risk in SCs. Understanding first what is risk and then associating it to the SC context is essential for managing global SCs, which is the scope of this dissertation.

Initially, risk is easily misunderstood with uncertainty, but they have quite different meanings. The main difference resides in the knowledge concerning the distribution of related outcomes; while risk, on the one hand, is a term associated to the knowledge about the distribution of potential odd events, even if there is no certainty of exactly what will happen, uncertainty, instead, refers to the completely ignorance about the distribution of such events (Svensson, 2002; Peck, 2006). In more concrete words, uncertainty appears as a prerequisite and a component of risk, shaping the risk perception (McNeill, 2014; Vasvári, 2015).

Vasvári (2015) supports that uncertainty can be decomposed into four strongly correlated components, which are: variability of events, systematic and random measurement errors, indeterminacy, and lack of knowledge. For the purpose of this study, however, since there is a high correlation between its components, uncertainty will be understood as lack of knowledge about possible threatening events, its frequency and negative consequences.

More popularly, risk can be understood as a threat that can harm outcome predictability, and, consequently, the perceived outcome (Jüttner *et al.*, 2003). Therefore, it also hinders the better comprehension of the sources of these threats and, even more, the mitigating strategies' effectiveness.

In the SCM field, as per Christopher & Peck (2004), risk not only exists within the focal firm's boundaries, such as in processes and control, but also externally to the firm, both upstream and downstream the SC, where these risks are the ones that can and must be minimized. Even more, environmental issues are critical sources of risks; natural disasters, wars and terrorism represent this kind of issues which might, most of the times, be unpredictable; industrial competition, economic policies and regulations etc., on the other hand, are environmental issues to which SCs must be able to cope with.

> With the economy globalization, today's supply chains are becoming not only more efficient, but also riskier, due to the tight interconnectedness of numerous chain links that are prone to breakdowns, disruptions, bankruptcies, and disasters. These risks might prevent deliveries, lead to delays, damage goods, or somehow affect smooth operations (Yang *et al.*, 2012:1996).

In this Chapter, the concept of risk is going to be explored according to the perspective of various authors relevant in this field, as well as other concepts related to SC risk, such as vulnerability and resilience, and the applicability of these to the SCRM field. Thereafter, there will be provided a module for managing risk and its considerations to the global SC.

2.1. The concept of risk in the Supply Chain Management field

As per Vasvári (2015), the understanding of risk exists since the born of humanity. Historically the term risk has been used since the Greek empire, where the similar word representing risk was *rhizikon*, which described the necessity to avoid struggles. A similar translation of the aforementioned Greek word to the present meaning of risk is fear or adventure. Roughly, risk to them revealed the level of susceptibility to external or internal disturbances that a particular entity's activities faced, and there it comes the need for strategic decisions concerning the avoidance of difficulties.

More recently in the history, during the beginning of the European maritime trades, risk meant the danger of losing the commercial ships, where ship owners who held only one ship were in a more critical position – more susceptible to the danger of losing nearly the totality of their assets – than those who held two or more (Heckmann *et al*., 2015).

> This risk perception is in accordance with the risk understanding developed over the last four centuries that strongly relates risk to the probability of occurrence of disruptive events (Heckmann *et al.*, 2015:121).

The present concept of risk is approximate to the meanings used in the past; nevertheless, the perception of risk evolves as the complexity in every activity also increases across time. There are two main meanings of risk in the English Dictionary A to Z (1997), which are "possibility, likelihood of danger" and "exposure to danger".

The main authors on the SCRM field have developed the understanding of the concept of risk and put it in a slightly different way. As per Yang *et al*. (2012), risk can be very simply characterized by two factors, which are the probability of a disruptive event happening and the quantitative negative impacts (losses) over the SC when the occurrence of this particular event. Mathematically, risk is quantified as follows:

$$Risk_e = P_e \times I_e \qquad [1]$$

Where P_e represents the probability of the particular event "e" occurring and I_e represents the overall impact of the event "e" over the SC.

Manuj & Mentzer (2008a) define risk the same way Yang *et al*. (2012) did, however they add that the losses resulting from a particular event may present both quantitative and qualitative implications. The quantitative implication refers to losses in sales volume, production capacity, etc., while the qualitative implications may represent a loss of brand value, or the dissolution of partnerships, for example.

Furthermore, the likelihood of occurrence of certain disruptive events depends on how exposed an entity is and on certain triggers that may leverage the probability of a disturbance

occurring. In general, more powerful market leader organizations in their specific industry have the capacity to be the single necessary factor to generate certain disturbances or at least represent a partial power on turning such events on. Instead, less powerful organizations have nothing to do but to cope and react to such disturbances (Manuj & Mentzer, 2008a).

Jüttner *et al*. (2003) contribute to the understanding of risk stating that it is the variation of the expected outcome, its probability of occurrence and its inherent subjective values. Any bottleneck in the material, product and information flow from the very first supplier to the end-customer impacts directly in the SC risk. In summary, risk disables the predictability of variables related to the SC processes, disturbing the final outcome.

Vasvári (2015) describes risk as a measurable and probable uncertainty. The author states that risk exists due to informational limitations, which disables the absolute certainty about future events, yet, being such events at some level expected. Risk presents three descriptive features, according to the author, which are the probability of occurrence, the outcome of the risk, and its aggregate magnitude. Hence, using other words, he agrees with the abovementioned authors, but decomposing what those present as impacts/consequences into two: the outcome of the risk, and its magnitude.

McNeill (2014) does an effort to translate risk to an understanding in the field of the ideas. To this author risk is, definitely, a mental understanding of the possibilities of danger to a specific entity rather than a dangerous event itself, i.e. when a disturbance in fact occurs, running out from the field of possibilities, it is no longer a risk, it is a fact. More concretely, as per the author, it means the uncertainty about the possibility of occurrence and severity of a particular event's negative impacts.

> It is important to note that risk is the exposure to the likelihood of a negative event, but it is not the negative event itself. Risk exists regardless of events (McNeill, 2014:12).

2.2. The links between vulnerability, resilience and risk

2.2.1. Unveiling what is vulnerability

Although it seems intuitive, there is a solid connection between vulnerability, risk and resilience. Peck (2006) defines vulnerability as the level of exposure of a certain entity to the positive or negative adverse outcomes the environment can impose to itself. This way, the level of vulnerability of a firm depends on how environmental changes can affect an entity's outcomes.

Heckman *et al*. (2015:125) sustain the aforementioned definition provided by Peck (2006), stating that vulnerability is "the extent to which a supply chain is susceptible to a specific or unspecific risk event". According to them vulnerability describes the characteristics of an organization that turn them susceptible to disruptions brought by environmental changes.

Jüttner *et al*. (2003) present a slightly different understanding of what is vulnerability, not denying the two definitions presented previously, but complementing them. According to them, vulnerability is the propensity for disturbances to beat risk mitigating strategies and to bring at some level severe impacts to the SC. Vulnerability is connected to risk since the former indicates the level to which an organization is exposed to environmental threats or risk sources.

Thus, from now on in this dissertation, the term vulnerability will be used to describe the degree to which a system is susceptible to disturbances derived from environmental changes, being those disturbances considered as positive or negative deviations from what was previously expected or planned.

2.2.2. The different resilience approaches

The approach to resilience seems to be a consensus between the authors in this field of study. However, there are two specific types of resilience that are relevant for the present study: operational resilience and strategic resilience. When performing studies about resilience and vulnerability, authors typically refer to operational resilience simply as resilience, unless they are comparing different approaches for this term.

Resilience means the ability of an entity to restore its state to the original condition or to another desired state after a disturbance, responding to environmental deviations of what was expected; in other words, it is the ability to cushion and overcome the impacts of disturbances (Peck, 2006; Bhamra *et al*., 2011; Välikangas & Romme, 2013; Heckmann *et al*., 2015).

The definition provided by Heckmann *et al*. (2015:125) of SC resilience is particularly suitable, when considering resilience as a function of vulnerability, such as defended by Bhamra *et al*. (2011). The former authors define SC resilience as "the ability of a supply chain to overcome vulnerability".

The definition of strategic resilience, on the other hand, is the ability to foresee odd events, prevent the possible negative impacts through daily operations, pro-activeness, and innovative-thinking, no longer under a recovery-based strategy, instead, under a renewal-based one. This type of resilience requires learning about emerging changes in the environment, improving visibility, and turning what to other organizations is a threat into a competitive advantage to the firm who performs it (Hamel & Välikangas, 2003; Välikangas & Romme, 2012; Välikangas & Romme, 2013).

> Any company that can make sense of its environment, generate strategic options, and realign its resources faster than its rivals will enjoy a decisive advantage. This is the essence of resilience (Hamel & Välikangas, 2003:63).

In general, the authors defend that visibility, flexibility, adaptive capacity, agility and collaboration are key resources in building resilience into a SC as well as keeping it sustainably resilient.

> Resilience implies flexibility and agility. Its implications extend beyond process redesign to fundamental decisions on sourcing and the establishment of more collaborative supply chain relationships based on far greater transparency of information (Christopher & Peck, 2004:12).

For the purpose of this study, resilience will be understood as the ability of a firm to overcome potential or actual threats, reordering and reorganizing procedures in order to face

them with minimal losses. Throughout this Chapter it will be possible to verify that the whole risk management strategies configure strategies to not only build a resilient SC, but also a strategic resilient one.

Figure 2.1, as follows, illustrates the interactions between the terms risk, vulnerability and resilience presented until then in this Chapter.

Figure 2.1: The Link Between Risk, Vulnerability and Resiliency

Figure 2.1 summarizes the relation between the three concepts previously exposed. It is possible to conclude, then, that the risk exposure reveals the degree of vulnerability of a system, or a SC, in this case. A SC may be more vulnerable depending on each risk-related event, on the severity of its impacts, and on how likely it is of risk impacts harming a SC. The connection between vulnerability and resilience is reciprocal; on the one hand, vulnerability determines how resilient a system is, while on the other hand, building resilience into a system will decrease its vulnerability, as well as rebuild downwards the perception of risk exposure.

2.3. Risk Analysis and Management Procedures in Global Supply Chains

The global operations face many uncertainties when it comes to deciding where to source from, policies of each potential sourcing country, economic conjunctures, wars, catastrophes, competitive environment, infrastructure, raw materials prices, oil prices, supplier reliability, security issues, and others. Therefore, it is needed a strict and cohesive SCRM culture within the whole SC for an assured continuity of operations (Manuj & Mentzer, 2008a).

> Supply chain risks hence comprise ‘‘any risks for the information, material and product flows from original supplier to the delivery of the final product for the end user’’ (Jüttner *et al.*, 2003:200).

The literature in the SCM field refers to two different terms when it comes to dealing with risk as if they were synonyms: risk management and risk mitigation. Nonetheless, these terms have related but different understandings. While the mitigation of risks is deeply linked to the ability of being resilient and means acting to reduce the impacts of unexpected events onto the SC, frequently backed by robust contingency plans, the management of risks is linked to the ability of being strategically resilient, and refers to a more mature and strategic action, comprising the avoidance of risks through frequent restructuring and even cushioning the impacts of a SC disturbance. This way, the mitigation of risks may be included in the risk management strategies.

SCRM is, according to Tang & Nurmaya Musa (2011), the management of risk in the SC through the collaboration between the SC members in order to ensure profitability and continuity of operations. Besides, SCRM aims to identify potential sources of risk and adopt the most suitable strategy for each type of risk sources in order to overcome SC vulnerability (Jüttner *et al*., 2003).

Some of the main authors on the SCRM field point to steps to manage risk in the SC. Jüttner *et al*. (2003) defend that four steps must be followed, which are: assessing the risk sources, defining the most relevant risk consequences, tracking the risk drivers by the SC strategy, and mitigating the risks. Manuj & Mentzer (2008a), on the other hand, identify five steps, which are: risk identification, risk assessment, selection of appropriate risk management strategies, implementation of risk management strategies, and mitigation of SC risk.

Other authors, such as Tang (2006) and Ho *et al*. (2015), identify the estimation of the likelihood of occurrence of disruptive events and the evaluation of its impacts as separate and different steps to be addressed in SCRM, however, these already seem to be embedded to the 'risk assessment' step proposed by Manuj & Mentzer (2008a).

Between the authors studied in this dissertation who propose steps to manage risk in the SC, Ho *et al*. (2015) recommend a step that was not even cited in none of the other papers: the step of continuous improvement; according to them, risk must not be left aside, and must always be tracked, studied and struggled. Additionally, Ho *et al*. (2015) defend that although

risk identification and risk assessment are two different steps, they are complementary and must be held together in order to achieve enhanced results for risk mitigation.

2.3.1. Global Supply Chain Specificities

Before highlighting what differentiates a domestic SC from a global SC it is needed first to define what is a SC. According to Christopher (2011), the understanding of a generic SC is that it is the network of entities involved in the production of a good, including the relationship among them, both upstream and downstream the value chain, since the first suppliers of raw materials until the very end-customers.

Under the aforementioned perspective, a SC in which its value adding activities and operations – such as sourcing, manufacturing, retailing and customer service, for example – are spread over different regions of the globe can be defined as a global SC (Manuj & Mentzer, 2008ab; Yang *et al.*, 2012; Lapide, 2014).

Manuj & Mentzer (2008a) and Stank *et al.* (2015) attest that the main objective of operating globally is to profit from regional conditions, i.e. from economic incentives, relatively lower costs, laws, regulations, geographical location etc., while marketing in big potential demand regions. Within the scope of global SCM, Stank *et al.* (2015) provide an overall analysis of viability for operating in different countries, in which they grade the economic, politics, infrastructure and competence aspects of those – the EPIC assessment – according to their conditions and readiness for having an internal company as a global SC member.

2.3.2. Global Supply Chain Risks

The rise of the globalization phenomenon has made purely domestic SCs examples time by time more difficult to find. The reason for this, according to Manuj & Mentzer (2008b), is that global operations represent a source of competitive advantage due to financing conditions, labor costs, exposure to large markets etc.; however global SCs are exposed to higher levels of uncertainties, and, therefore risk. The unpredictability of threats and odd events coexist in both domestic and global SCs, however, the more global a SC is, the more unpredictable are instabilities since business between and across countries is subject to differences in mindset, culture, laws and regulations, and economic and infrastructural conditions (Manuj & Mentzer, 2008b).

Intuitively, the risks inherent to domestic SCs are also natural to global SCs, yet more critical and powerful; even more, global SCs face specific risks related to the nature of a global business, being dependent and exposed to foreign markets, international financial markets, political conjunctures etc., therefore the need of a deep analysis on the potential threats and risks on sourcing, manufacturing, assembling and distributing across and beyond the boundaries of the country where the head office is located (Manuj & Mentzer, 2008a). According to Manuj & Mentzer (2008b), the increase of complexity when a SC goes global is the reason why companies must place bigger efforts on managing risk, since it represents barriers to the well implementation of business strategies and lessens the predictability of outcomes.

Under this perspective, Tang & Nurmaya Musa (2011) and Ho *et al.* (2015) assume that SC risks arise from issues related to supply, manufacturing, demand, infrastructure, information restrictions, political-economic conjunctures, accidents, natural disasters, wars and terrorism, which can affect the material, financial and informational flow and may represent reputational, financial, cultural, and transportation risks, all of them critically impacting the financial performance of SC members. These are detailed as follows.

2.3.2.1. Reputational risks

The SC focal firm must be aware that it is responsible for every decision and act taken by it and its upstream and downstream partners across the whole global SC. Actions taken by any of these firms are under constant tracking by authorities in a way that any activity that runs out the ethical and corporate social responsibility code, such as the use of child labor, slavery, and environmental pollution, for example, will bring severe consequences to the focal firm, in form of penalties and reputation damage (Tsikoudakis, 2013).

In such cases, the brand image – reliability of its practices – will be subject to market judgment, being the focal firm the one who will be publicly charged for such occurrences and the most damaged firm from the whole SC in terms of reputation. Partner selection, consequently, must consider not only their reliability, but partners' partners reliability, as well as partnerships must be settled using strict contracts with specific clauses related to the provision of information about the very first tiers of SC suppliers (Tang & Nurmaya Musa, 2011; Tsikoudakis, 2013). As per Tsikoudakis (2013), risk for the reputation of a firm

represents a critical one, since once a bad opinion is formed about a firm it is especially difficult to turn it around.

2.3.2.2. Cultural Risks

As per Revilla & Sáenz (2014), national culture frames how an individual understands and deals with an issue of any sort, according to its values and beliefs, being extended to their attitudes inside the work environment. Cultural differences and barriers are present in every single SC considered global, even when partners reside in neighbor countries. Such gaps can take place as risk aversion and risk priority assessment, models of hierarchy, behavior when facing a problem, language barriers, time zone differences, beliefs, religion, work-days, holidays etc. (Cross & Bonin, 2010).

Cross & Bonin (2010) classify this risk as critical for the successful SC strategy implementation. Cultural differences often represent misalignment of strategies and goals between SC partners in different countries; such aspects determine the level of quality a particular partner is devoting into an activity, which may not be what is required by the focal firm, and, finally, it determines how dedicated are the employees in pursuing and achieving the main goals of that SC.

Differences in language and time zones may represent a barrier to communication and problem solving in urgent situations. Other issues such as work-days, holidays, religious practices and habits (Ramadan for the Muslims and Shabbat for the Jewish, are examples), may represent barriers to reaching milestones and deadlines since these issues may lead to problems in communicating, manufacturing, and transporting, possibly leading to an increased total lead-time (Whitman & Panetto, 2006; Cross & Bonin, 2010).

> Language barriers inhibited effective communication, especially recognition of urgency, and the multiple time zones obstructed efficient trouble-shooting and follow up from remote locations […] And finally, there was the issue culture – How was our supplier motivated? Did they share our long-term vision? Did we understand the challenges they face and did they need (or want) our support in developing internal capabilities? (Cross & Bonin, 2010:3).

2.3.2.3. Transportation Risks

Risks to transportation appear as barriers to the well flow of goods and personnel in charge for the delivery of those. According to McGreevy & Harrop (2015), such transportation disruptions are critical for the SC and can be classified as unintentional – in case of natural disasters and accidents, for example, even derived from human failures – and intentional – piracy, theft, sabotage, counterfeiting, terrorism, wars etc. are examples.

Unintentional disruptions, as in the case of natural disasters, may damage logistic facilities – warehouses, transportation vehicles –, infrastructures – such as routes, ports and airports –, and may close airspace, highways, disable ports etc. On the other hand, in cases of human failures or accidents, cargoes may be lost due to *en route* accidents or due to contamination (especially of food products), losses when loading or unloading trucks etc. (World Economic Forum, 2012; McGreevy & Harrop, 2015).

Intentional disruptions can have various motivations behind it and its effects can impair the global SC through several aspects. International piracy and thefts put in danger both the transportation of goods and the security of those who carry them. Terrorist incidents, in its turn, may damage infrastructures needed for transporting goods, may represent a menace for cargoes and people, and are evermore followed by an increase on the level of security on borders, ports and airports temporarily or in a longer term perspective, impacting on the inbound, outbound and total lead-time of products (World Economic Forum, 2012; McGreevy and Harrop, 2015).

Peck (2006) and Tang (2006) affirm that after 9/11 terrorist attacks there has been installed a strict program in the USA in monitoring containers arriving and leaving the country, since in its inside can exist weapons, explosives and even terrorists. Although such procedures are welcome, they slow down the flow of goods, because of increased bureaucracy and inspection on clearing goods in general. In regions of wars of any kind, cargoes, people and infrastructures are in danger, then the quality of transportation is also a concern, being the SC subject to delays, and in the worst case loss of cargo and of personnel (World Economic Forum, 2012; McGreevy and Harrop, 2015).

Finally, the World Economic Forum (2012) finds that one of the major vulnerabilities for global SCs is the reliance on oil as the main fuel for transporting goods around the globe. Under this perspective civil unrest, wars, terrorism and economic embargoes from countries who produce oil to the rest of the countries represent a serious risk for SC continuity.

2.3.2.4. Financial Risks

Global operations increase financial risks to the SC, when comparing to purely domestic SCs. Such risks are related to the capacity of settling accorded payments between SC members, issues related to international trades and financial markets, and finally to damage to shareholder value and brand equity (Hartley-Urquhart, 2006; Tang & Nurmaya Musa, 2011).

According to Hartley-Urquhart (2006), global operations lead to increased complexity on the financial flow and cash management. This complexity appears as: 1) capital, products and parts being subject to duties, taxes, commodities' prices and exchange rate fluctuations, 2) as low visibility into the payments timing across countries, and 3) as loss of stock price, brand equity, stakeholder and shareholder value due to reputation damage (Hartley-Urquhart, 2006; Tang & Nurmaya Musa, 2011).

Hartley-Urquhart (2006) attest that exchange rate fluctuations not only affect the focal firm, but it can affect sometimes exclusively suppliers, depending on the currency used in the location where these are established. Since the raw materials' prices are usually set by the international market and in US dollars, the supplier may be unable to purchase raw materials if the US dollar strengthen relatively to the suppliers' currency or if the raw materials' prices raise in US dollars in such a way it will be not possible to buy it, what may stop the material flow and represents, therefore, an aspect of vulnerability to the financial flow (Hartley-Urquhart, 2006).

2.3.3. Risk Management Model

Manuj & Mentzer (2008a) provide a compact but effective model for implementing risk management strategies. In order to identify risk, they suggest that a brief description of each possible risk should be prepared to each broad category of risk, adding whether the risk is

categorized as atomistic or holistic, if the effects are qualitative or quantitative and if it affects domestic or global operations.

In assessing risk, Manuj & Mentzer (2008a) provide a deep analysis of each risk factor. In their proposed canvas, presented as Appendix number 1, they suggest the listing of the potential losses of each risk, its probability of occurrence, its impacts, the worst possible scenario, whether if it is acceptable or not, the impacts of this specific risk on the company's competitors, and the final evaluation of that risk.

The previously mentioned step is key when selecting strategies for dealing with risks. It may make no economic sense to invest, for instance, in a particular strategy for managing a specific risk with high probability of occurrence but weak impacts on the SC operations; in this case the best strategy is to accept the risk and its consequences and do nothing. Otherwise, risks with high probability of occurrence and severe impacts must be dealt with using strategies to plan and act urgently (Kumar *et al*., 2014; Aqlan & Lam, 2015).

When it comes to managing risk, a critical obstacle for global SCs is its complexity, usually leading to suboptimal interactions between its members. As per Manuj & Mentzer (2008a:147), "managing complexity is critical to successful implementation of risk management strategies". Therefore, they suggest 7 generic risk management actions for dealing with SC complexity, which are: avoidance of risks, postponement, speculation, hedging, control, transferring/sharing risk, and security. In summary, these strategies reduce the likelihood of an odd event hitting the chain, simultaneously improving the control over the SC. Additionally, in parts, they help to build contingency plans, through the hedging strategy, spreading operations or contracting manufacturers in different parts of the globe.

Manuj & Mentzer (2008a) suggest two approaches, a more general and a more applied one, to be used in more specific risk cases. The general canvas is as shown in Table 2.1.

Despite the important contribution of Manuj & Mentzer (2008a), it is just a summary of the work presented by Lee (2002). This author synthetizes the type and characteristics of different SCs according to the level of uncertainty in supply and demand inherent to those, which

finally relates to the degree of stability of the supply process and the nature of the products involved in each case, respectively.

As per Lee (2002), the demand uncertainty in a SC varies proportionally according to the level of innovativeness of the core product being commercialized. Still, regarding the supply process, it is more uncertain as much evolving this is[1].

Table 2.1: Supply Chain Types and General Risk Management Strategies

		Demand Uncertainty	
		Low	High
Supply Uncertainty	Low	**Efficient Supply Chain** *Focus on Cost-Efficiency* Postponement Single Sourcing	**Responsive Supply Chain** *Focus on Responsiveness and Flexibility* Postponement
	High	**Risk Hedging Supply Chain** *Focus on Pooling and Sharing Risks* Multiple Sourcing Transferring/Sharing Risk Hedging	**Agile Supply Chain** *Focus on Responsiveness and Hedging Risks* Hedging

Source: Manuj & Mentzer (2008a:146)

In Table 2.1 it is represented the different types of SCs – expressed in bold – according to the level of demand and supply uncertainty inherent to each one of those. In italics it is highlighted the main characteristic for each type of SC when it comes to overcoming supply and demand risk. The rest presented in the body of the Table 2.1 represent more specific strategies for managing risk according to the authors.

Going deeper into every risk, Manuj & Mentzer (2008a) provide an approach for selecting, separately, strategies for both major and minor risks, according to each type of SC. For major risks, the model highlights the usual risk management strategies used by companies of a specific industry and requires the selection of a most wanted risk management strategy. According to Manuj & Mentzer (2008a), sometimes strategies focused on solving the major risks may end up solving the minor risks, if not, they suggest operational measures to fix these issues.

[1] For more detail, see Lee, H. L. 2002. Aligning Supply Chain Strategies with Product Uncertainties.

2.3.4. Considerations on Global Supply Chain Risk Management

Manuj & Mentzer (2008a) reaffirm the need for continuous improvement also defended by Ho *et al*. (2015). According to Manuj & Mentzer (2008a), the continuous feedback is needed by the risk management and mitigation step from the risk identification one in order to guarantee business continuity. Furthermore, risk management and mitigating strategies, for both major and minor risks, must be in line with the general global SC strategies; otherwise, with no cohesion between them, they will not work properly.

Christopher & Peck (2004) emphasize that acting and reacting against risk must be an effort of all SC members. Collaborative working and exchange of information enable the creation of a SC intelligence and improve the visibility of both upstream and downstream risk profiles, finally reducing overall uncertainty and building a resilient SC.

In concordance, Ho *et al*. (2015) find that visibility together with flexibility, collaborative relationships between the SC members, adopting co-opetition, a certain level of control over the suppliers, agility and responsiveness, understanding diverse organization cultures, and developing a continuous improving pull-system reduce substantially uncertainty in a SC.

Finally, as per Ho *et al*. (2015), there are evidences showing that to build a robust SC, the attention of the companies in case must be focused not only in the risk management itself, but also before and after the risk management process. SC continuity requires continuous monitoring and improvement.

> Supply chains are more than cost-reducing, value-adding mechanisms in support of a business model and long-term commercial competitive advantage. They link industries and economies (Peck, 2006:140).

Chapter 3: Global Supply Chain Risk Management Case Studies: An analysis of how global companies operating in Portugal manage risks throughout their Supply Chain

When studying the different barriers and embarrassments that may impact global SC activities, the need to go beyond the academic studies arise in order to enrich the understanding of all aspects of risk-related events. This way, it is possible to check if the researchers' and professionals' methods and models are in line with each other's.

In this section, three case studies are presented for three different companies that operate in different sectors of activities. Therefore, the aim of this section is not to establish an appraisal of which methods of dealing with risk is the best, yet, it is assumed that companies from different sectors may face different risks, due to the raw materials used, their suppliers' and clients' geographical location, between other reasons, thus it is assumed that such specificities may require different strategies and actions to mitigate risk in such global SCs.

3.1. Company 1 – Unilever Jerónimo Martins

Unilever Jerónimo Martins was founded as it is known today in 2007, employs around 800 people, and it is owner of important brands in four major retail product industries in Portugal: the homecare (home cleaning and clothing detergents), personal care (shower gels, soaps, deodorants and deodorizers), food (margarines, savory bouillons and sauces, and desserts) and refreshment industry (ice creams, soft drinks and hot teas).

At Unilever Jerónimo Martins the interviewee was the Director of the Department of Procurement and Planning. In the case of this Unilever's department, the "planning" heading refers to Marketing Sales Unit, responsible for the demand planning and forecast as well as its connection to the factories, and Manufacturing planning, responsible for the planning of materials to be used in their manufacturing site in Santa Iria da Azóia, Portugal.

The interview was held in Unilever's main manufacturing site, in Santa Iria da Azóia, and took approximately one and a half hour, where all the questions from the interview guide were followed and answered in detail.

In the aforementioned manufacturing site, it is produced goods for the Portuguese market as well as for other European and non-European markets. These production facilities in Santa Iria da Azóia are in charge for producing ice creams, margarines (spread and cooking), savory bouillons, and is also in charge for refining the oil used in the production of the margarines and savory bouillons. Apart from the exportation segments, its average annual revenue is around €320 million, considering exclusively the Portuguese market.

Until 2013, this manufacturing site used to produce washing powder detergents for the Portuguese market, but such segment of products is now part of the rest of the portfolio of products present in Portugal owned by Unilever but imported from its sibling companies spread across the globe.

3.1.1. Description of Unilever Jerónimo Martins' Supply Chain

Given the big variety of products commercialized in Portugal under the Unilever label, there is a huge number of raw materials required for its continuity, in which the main are carton and plastic container and lids (for all types of packaging), dairy products, fruits, flavoring and emulsifiers (for the ice cream), oils (for margarine and savory bouillons), yeast and meet extracts paste, flavoring and herbs (for savory bouillons).

To fulfill Unilever's plants' needs, its upstream partners are spread all around Europe; Portuguese partners are responsible for supplying packaging materials, sugar, flour and dairy products, while other partners spread along a big variety of European countries such as Spain, France, Belgium, Holland, Germany and Italy supply these and other raw materials to Unilever.

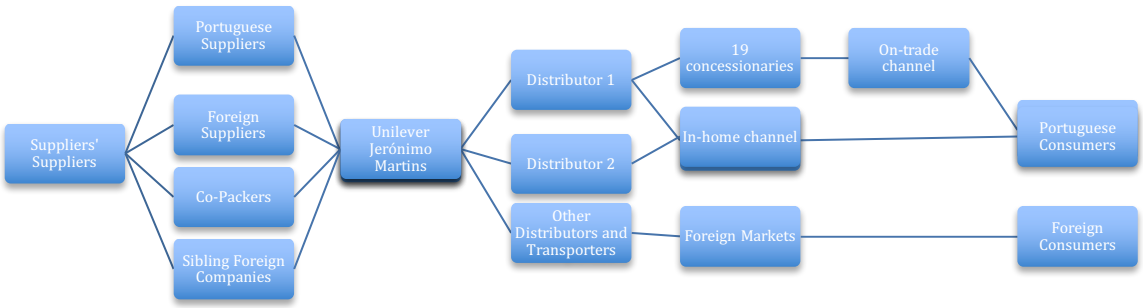
Additionally, Unilever acquires finished products from its sibling companies around Europe as well as from other partner companies (co-packers) products under the label Unilever to be commercialized in Portugal.

Downstream the SC, Unilever's partners are those responsible for storing and distributing finished goods; and the very end clients of this SC can be divided in two categories, the in-

home[2] channel, which are grocery stores, markets, super and hyper markets, and the on-trade channel, representing hotels, bars and restaurants. In terms of sales volume, Unilever's most important end clients are two super and hyper market chains present in Portugal.

Unilever Jerónimo Martins has two major warehousing and distribution partners for the domestic market. One of them, Frisul, stores and distributes frozen and cool products, for both the in-home and the on-trade channels. This partner is responsible for supplying the in-home channel and the 19 other concessionary partners, in its turn responsible for supplying impulse consuming goods – such as ice-creams, soft drinks etc. – to around 60 thousand end clients in the on-trade channel in Portugal. The other distribution center, Luís Simões, is in charge for supplying the in-home channel. On the other hand, products to be exported are stored either at Frisul's or Luís Simões' facilities, but other distributors and transporters are those responsible for exporting them to other markets. Figure 3.1, presented below, expresses a resume of Unilever's SC.

Figure 3.1: Unilever's Supply Chain Organization Chart by Role



[2] The in-home channel refers to the network of retail stores and markets where the brand's customer purchases products to be consumed at home. The idea behind the on-trade channel is the opposite from this channel; this way, the in-home can be also called as off-trade channel.

3.1.2. The interviewee's perception of risk

According to the Director, risk is related to events that may harm a company's financial flow and reputation. Stock-outs and failures in following the CSR code are examples of such risks, respectively. Ahead, it is exposed, according to the Director, the main risks faced by Unilever's SC under the literature's 4 major categories of SC risk: Reputational, Cultural, Transportation, and Financial risks.

3.1.2.1. Reputational risks faced by Unilever Jerónimo Martins

Reputational risks can be translated to events that may change negatively the perception of the society regarding the company itself. Not following the CSR code, polluting excessively the environment, the use of child labor and slavery, and health damaging products are examples of such events that may deteriorate Unilever's reputation. In the case of this firm, even manufacturing worldwide known and trusted quality brands, reputation damage certainly would represent a critical constraint and a difficult barrier to overcome, echoing seriously in the company's financial results.

3.1.2.2. Cultural risks faced by Unilever Jerónimo Martins

Different countries and regions mean different cultures, and therefore different preferences. Global companies, such as Unilever, must focus its efforts on understanding the cultural preferences differences across different countries and regions of the globe and adapt its products to what is desired and needed by each location's consumers, otherwise the cultural risks could be substantially augmented.

3.1.2.3. Transportation risks faced by Unilever Jerónimo Martins

Transportation risks are represented basically by every events that may threaten the quality of the transportation, i.e. inbound and outbound transit time, how the transporters handle the products, and the hygiene conditions throughout the whole outbound way until it gets to the retailers. Such issues are considered risks since they may bring impacts to the total product lead-time and/or quality of the finished product.

3.1.2.4. Financial risks faced by Unilever Jerónimo Martins

The financial risks are those that may represent money constraint or losses to the company as a whole, even further, that may turn the business in a no longer sustainable one. All the

previous mentioned events and risks might have impacts over Unilever's finances; quality issues, long-lasting or not, inbound or outbound transportation constraints, production constraints, stock-outs are such examples.

Unilever's business is to produce goods for people's consumption; for this purpose, the company's biggest concern is the people, consumers and staff directly or not directly linked to the firm. Issues related to the company's people may harm at first the reputation and consequently company's finances. Accordingly, although downstream there is a huge and important demand volatility to the goods produced by Unilever, the Director stresses that the most threatening risk to the company's global SC continuity is the health danger, since its products are mostly food or food components and drinks.

3.1.3. How does Unilever Jerónimo Martins deal with risk?

Risks that impact Unilever's global SC arise both from upstream and downstream, being equally alarming. The company's business is always running under specific principles of respecting people and the environment, so managing risk must also be running in parallel with those principles. Basically, the company's general risk management strategies care about guaranteeing the quality of finished products and inputs upstream, and about lead-time and emissions of pollutants downstream.

3.1.3.1. Risk Assessment

The SC risk assessment performed by Unilever is maiden *ex-post*; the company performs frequent and constant analyses of its partners' performance and if they delivered the desired and require service/product. Such analyses regard the quality of the general partnership, more specifically, at what level did the partners deliver the right quantity of materials/service, if this delivery was on time and what was the quality of the delivered service/materials; every time there is a critical issue, the partner is required to correct the nonconformities.

Additionally, on a yearly basis, Unilever performs a Vendor Rating analysis, where they assess the suppliers' commitments with the focal firm mainly in terms of general quality of the delivered service. In this analysis the company prepare reports classifying the annual performance of each supplier, ranging from "unacceptable supplier" to "excellent supplier".

"Excellent suppliers" will be congratulated, instead, "unacceptable suppliers" must either present a robust plan for fixing the nonconformities or the partnerships will be broken.

3.1.3.2. Risk Management

The SCRM strategy applied at Unilever Jerónimo Martins consists in identifying and mitigating the risk. The overall strategy is translated in reducing the probability of occurrence of odd events, i.e. reducing the uncertainty and exposure to risk, and consequently reducing the firm's vulnerability.

To that purpose Unilever invests a lot upstream, collaborating with its partners and requiring the highest levels of quality and social responsibility, in order to mitigate the risks[3]. The company believes that its constant investment and concern upstream will naturally mitigate the risks along the SC over the years. Table 3.1 exposes the general strategies applied upstream, as part of the Positive Assurance thinking, and downstream, to correct possible constraints that, eventually, could not be mitigated by the upstream massive investments.

Table 3.1: Unilever Jerónimo Martins' General Procedures for Reducing SC Risk

Upstream	Downstream
Shared principles with partners	
Information sharing	
Collaborative Planning and Acting	
Sales and Operational Planning (S&OP)	
Requirement of strict technical specifications for suppliers' raw materials and inputs	Strict specifications for storing and transporting
Constant supplier quality auditing	$^2/_3$ Rule
Packaging suppliers' geographical location	Safety Stocks
Close relationship with critical inputs suppliers	

The above mentioned procedures are seen as complimentary by Unilever. Both upstream and downstream measures take into account the complexity and relatively low agility and flexibility inherent to global SCs as well as the company's principles and CSR code. The

[3] Strategy named as "Positive Assurance".

company believes that not only them itself, but also their whole SC partners must share and strictly respect the same principles, respecting its people and the environment, in such a way that if any of the partners disrespect such principles, it can no longer be a partner.

In order to settle and continue the partnerships, Unilever requires that upstream and downstream partners follow very strict technical specifications for quality of inputs, storing and transporting. Upstream such specifications are set according to the risk classification of the inputs or raw materials used, i.e. according to the danger a certain input can bring to consumers' health, mainly taking into account the probability of this input contaminating the final product; this way, an input that is more likely to damage consumers' health present a higher risk classification, thus stricter technical specifications.

Established upstream partners pass through constant rigorous auditing for attesting the quality of the inputs supplied to Unilever. If the auditing indicates that there is something irregular to the quality required and agreed, the supplier must present a plan to fix the quality specifications; if approved by the company's Crisis Committee, the supplier must act immediately, otherwise the partnership will have an end.

The choice of some of Unilever's suppliers, as in the case of the packaging, is based under a mix of respecting the company's principles and increasing flexibility and agility due to the uncertainty of the consumer market. Sourcing packaging and other inputs from Portuguese suppliers represents an important effort in reducing the environment pollution and diminish the overall inbound lead-time for this input.

More specifically in the case of the packaging finished inputs, sourcing from Portuguese suppliers can leverage the production and delivery of Unilever's finished products, since it brings flexibility and agility to its SC[4], and represents a cost reduction on the inbound transport, first due to the relatively lower distance to its manufacturing site in comparison to foreign suppliers, and second because the nature of packaging materials is to take up space rather than weight, i.e. such products are not heavy, nevertheless they occupy space on

[4] Packaging finished inputs are not stored by Unilever, and, when a client sets a last minute order, packaging materials are immediately required to complete the production process.

storage and transporting, what would represent more trucks with idle capacity to carry out, comparatively, to the same amount of any other raw materials, e.g. flour.

The establishment of specifications as a means of protecting the consumer is key to its business, however, not only requirements are important for Unilever's well-being; an important company's effort is to build solid and close relationships with its critical partners – for example, those supplying quality and shortened-supply inputs – so there will be no future need to increase risk while building new relationships with potential partners.

If upstream Unilever's SC the main concern is about the suppliers' inputs quality, downstream the firm's major issue is the demand volatility and how to fulfill the consumer market needs. The Director of Unilever interviewed for this study points that the demand of products may be forecasted through statistical data, nevertheless, it cannot be perfectly anticipated, thus, for Unilever, demand volatility is an important concern, especially in the in-home channel.

The company's struggles are to reduce the gap between what is forecasted and what is really ordered and consumed. For that purpose, Unilever applies a multidisciplinary and cross partners share of information in order to reduce misunderstandings and capture the very little details from the end of the chain up, providing a clearer and time to time more accurate data. Given such information constraints, the company settles monthly meetings attended by professionals from different departments of the company with the aim to better understand the market needs and coordinate the information backwards along the chain, what is called the Sales and Operational Planning (S&OP).

The S&OP is an important procedure to forecast and coordinate the information along the chain, yet, upstream the SC there is no enough agility to cope with the fast yaws in demand, even if they have been forecasted as much precisely as possible; therefore, Unilever Jerónimo Martins uses safety stocks to guarantee market fulfillment.

Beside the concern on making more accurate forecasts, downstream, Unilever also cares about quality and preventing losses. There are two major approaches to deal with such concerns; at first, the company also requires specifications for settling and keeping

partnerships and those depend on the product to be stored and transported. For ice creams, for example, it is specified that the distributor must store the goods in such a negative temperature safe enough for preserving the final products' original characteristics. Secondly, Unilever applies the $^2/_3$ rule, which states that food products must be sold to its in-home channel clients with at least $^2/_3$ of its shelf life; this consists on a strategy to prevent losses arising from out of date products and to reduce the risk of consumption of such products, which could damage the company's reputation.

3.1.4. Unilever Jerónimo Martins' Opportunities and Challenges

It has been evident that Unilever keeps its SC constantly being rigorously tracked and closely assessed; besides all that previously expressed, the company supports a continuous improvement thinking throughout itself and its SC. For that reason, according to the Director, all the aforementioned risks are controlled at a very high level by the company.

One of the company's milestones for 2016 and for the next years is the simplification, both in processes and across the SC. Unilever Jerónimo Martins believes that simplifying the safety stocks, i.e. reducing SKUs, will considerably reduce the company's risk exposure, since it will require less effort on sourcing inputs and verifying the quality level, there will be less products to store, and finally there will be less finished products to take care of, in the limit less finished products prone to get out of date.

Instead, Unilever has important challenges to meet for the next years. The most audacious is to double production in a global basis while reducing the emission of pollutants to the environment. The other challenge refers to a cross-company challenge, improving the collaborative planning between Unilever and big in-home channel clients when those execute promotional events. The company's Director stresses that promotional events require intense collaboration between all the parts involved so that the focal firm can deliver the request on time, with no losses and no extra costs to any of the parts.

3.1.5. Are the practices taken by Unilever Jerónimo Martins aligned with the literature?

The literature presents objective however generic concepts of risk as well as generic best practices and models for reducing SC vulnerability, risks and building a resilient SC.

Businesses face different barriers and risks, therefore each of them must be aware of those and resilient enough to minimize its impacts over the business continuity.

When it comes to the understanding of risk, Unilever's director affirms that risk in the SC context is every barrier to the well-being of the business, leading to financial losses, which is perfectly in line to what the literature states. The director, however, identifies not four, as the literature indicates, but only two major SC risks: reputational and financial risks. Such risks seem to be the most critical ones to this company, moreover, the four risks stated by the literature are all intrinsically connected among themselves since reputational, transportation and cultural issues may bring impacts over a company's finances.

Even though the transportation and cultural risks were not immediately mentioned in the interview, the director expressed certain concerns regarding the quality of the storage and transportation as well as regarding the adaptation to certain regions' particular cultural preferences and habits. A possible disadvantage of such approach is that possibly separating the SC risks in four instead of two may favor the whole risk management process.

Regarding the risk management process, Unilever Jerónimo Martins uses its positive assurance policy in lowering the probability of an odd event occurring. Permanently ensuring partners reliability, multidisciplinary and cross-partner share of information and collaboration are always present in the company's SCRM agenda.

To cope with unforeseen risks, Unilever does not follow any rigid path or recipe, as the literature suggests. Furthermore, when questioned about any threatening event the company had ever faced, the director could not mention any, suggesting that the company could possibly face serious constraints if any severe odd event hit its SC. According to the literature, following a well-designed risk management model, taking into account possible odd events, its consequent financial impact on the focal firm's SC, and eligible strategies to manage or overcome such constraints, allows the firm to be prepared for any nature of risks that may harm its SC.

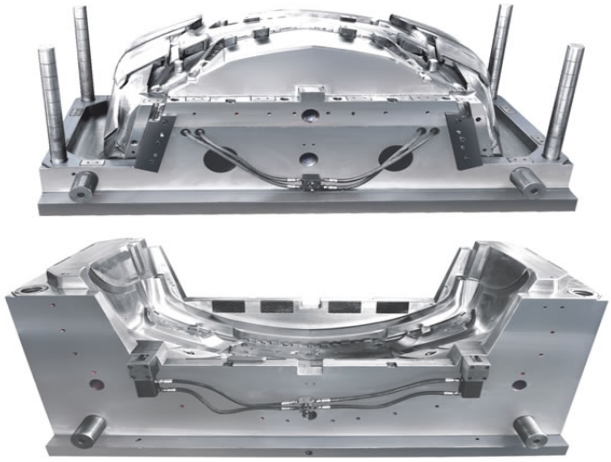
3.2. Company 2 - DRT Moldes

DRT Moldes is a Portuguese company headquartered in Leiria, Portugal, whose business is the manufacture of steel molds for plastic materials mainly for the automotive industry, but also, in a reduced scale, for the big home appliances industry. DRT was founded in 1994 and has currently approximately 150 employees. The company's office and manufacturing site are both placed at the same location, where they are able to develop the projects, manage its business and control the manufacturing process accordingly.

The interview was held at DRT Moldes' headquarters and took approximately one hour. Mrs. Marília Lopes, the company's Project Manager, was the interviewee, who generously performed a tour around the headquarter and factory, and carefully answered the questions from the interview guide.

During the tour Mrs. Lopes showed the different steps on manufacturing a mold, since the beginning of the steel treatment, to the final testing of the final product – i.e. the finished mold itself. It was possible to see molds for car bumpers, engine protectors, rear-view mirrors, as well as for many other automotive parts. Such industry may awaken one's curiosity about how such mold looks like, as in the case of the author of this dissertation; therefore, Figure 3.2 shows a real car bumper finished mold.

Figure 3.2: Car Bumper Mold



Source: www.qimingmould.com

The automobile and big home appliance molds industry has two major characteristics that, together, differentiate this industry from others, even from industries of smaller molds. Mrs. Lopes stresses that DRT Moldes requires a large amount of investment to complete the manufacturing process, and that the whole process takes between 24 and 30 weeks to be completed, given the number of manufacturing processes each mold has to pass through and that the machinery works on a constant speed.

3.2.1. Introducing DRT Moldes' Supply Chain

Every SC has differences; there are no equal SCs, although there might be similarities. In the case of DRT Moldes, they are not producing the good which is going to be directly used by the consumer. In comparison to Unilever, DRT is elsewhere upstream the SC, however, they still have suppliers and suppliers' suppliers. These are the ones who provide the raw materials and inputs for the production of DRT's most used input: the steel, basically composed by iron ore and carbon.

Besides steel, its inputs also include screws and springs, since some molds can be not as static as one might think – some molds can be manufactured to function as a mold for more than one part, as in the case of right and left symmetrical but mirrored parts.

Those raw materials are transformed into hard steel and sent to DRT into blocks. European partners from Germany, Spain and France account for the biggest part in the provision of steel for that purpose, while the USA accounts for a minor stake of such supply.

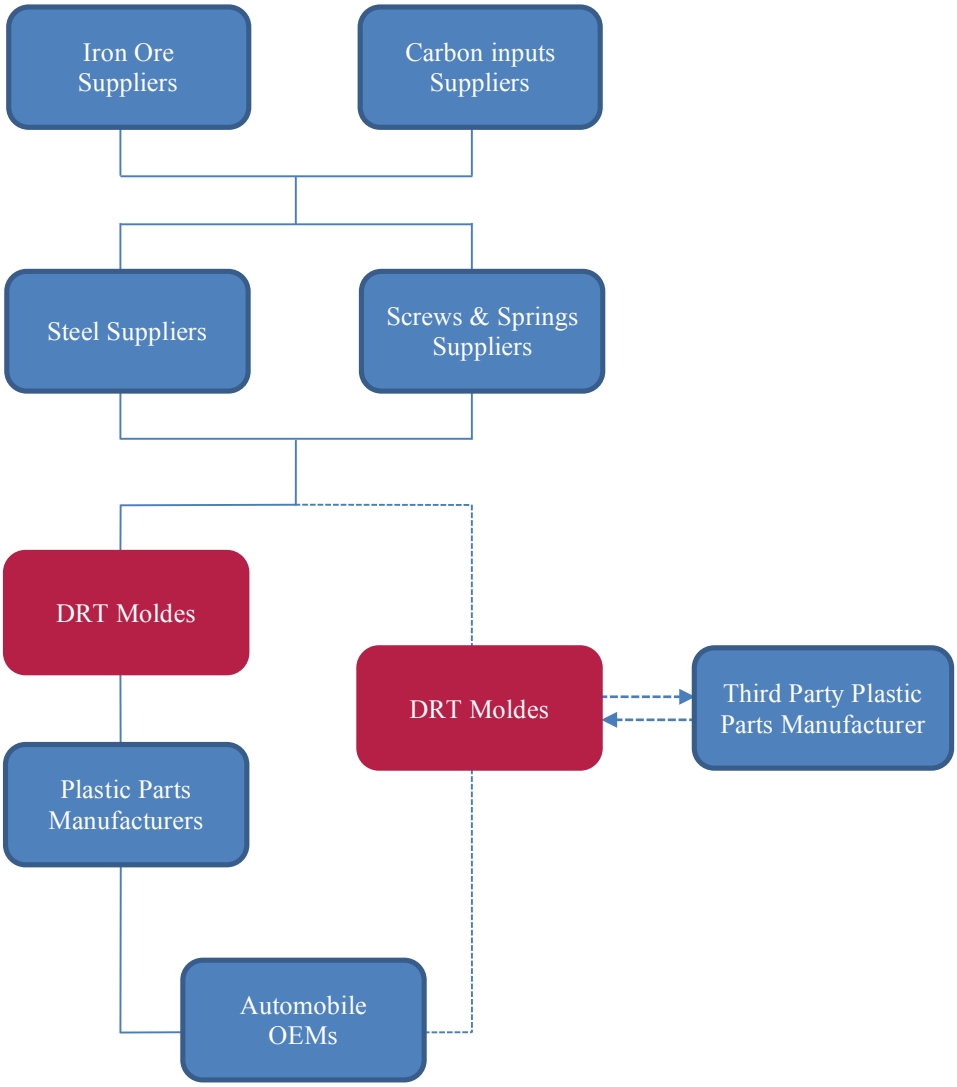
Internally, then, DRT develops projects and manufacture the molds according to requirements set by OEMs regarding the dimension of the part, quality of materials and timing. All this set, the steel is processed, thoroughly molded, using the highest technology available in the market. In the internal process the company makes sure their mold will comply with the established requirements as well as it will facilitate the next step of the SC of manufacturing the finished plastic part, namely on cooling the plastic material after being molded.

DRT itself can either appear in its SC as a first-tier or a second-tier supplier to its partner automobile OEMs, still, acting as a second-tier supplier is the most common, according to the Project Manager. Being a second-tier supplier, the company's role is to merely design,

manufacture the molds, strictly according to the end clients' requirements and send them to the SC first-tier supplier, who is going to manufacture the plastic parts and send it to the next step of the value chain: the assembling. On the other hand, acting as a first-tier supplier, DRT receives the orders, manufacture the molds under the agreed requirements, outsource the manufacture of the plastic parts, and deliver the OEMs the finished parts, this way being directly linked to the end client.

Downstream, the partners and clients are spread around Europe and eventually even in North America. First-tier suppliers and outsourced partner companies reside in countries such as Poland, Czech Republic, Austria and Mexico. Finally, in the end of the value chain are the major German automobile OEMs – Volkswagen, Audi and BMW –, all three headquartered in Germany. Figure 3.3, below, resumes the interactions of DRT Moldes' SC.

Figure 3.3: DRT Moldes' Supply Chain Organization Chart by role



3.2.2. What is risk to DRT Moldes?

In the interview, Mrs. Lopes explains that, generally speaking, risk is every event that may damage the financial health of the company involved. However, differently from what the studied literature stresses, DRT Moldes is exposed to some risks which are particular either to the molds industry or to the role they play in the automobile SC. Such characteristics, in this case, arise from the firm's nature of being a supplier, under the perspective of an OEM.

Besides the reputational, cultural, transportation and financial risks studied in this dissertation, the Project Manager mention another particular risk to its industry: the manufacturer responsibility risk. This risk relates to the propensity of the supplier company to be blamed and charged for any issue downstream the value chain that is directly linked to any possible failure upstream.

3.2.2.1. Reputational risks

The risk to the firm's reputation are critical, according to Mrs. Lopes. DRT is inserted in a complex, demanding and challenging SC, where quality, safety and deadlines must walk strictly in parallel and be fulfilled. This way DRT's products are also critical to its OEMs clients' products, i.e. its vehicles.

According to Mrs. Lopes, the critical points to the company's reputation rely on fulfilling the clients' requirements on both quality and time. Any failure in fulfilling the quality requirements may either result on the rejection of a finished mold by the partners or, in the limit, onto possible disastrous outcomes when it gets to the consumer market. Instead, delays in manufacturing the mold slow down the total SC lead-time.

3.2.2.2. Cultural risks

As per Mrs. Lopes, there are no critical cultural risks to which DRT is exposed. There are no major issues of time zones since the largest part of its partners are established in Europe. Regarding possible language constraints, the Project Manager stresses that the company's office staff speak other European languages, and, besides that, English is the most commonly used language in its business. Moreover, according to the Manager, there is a big effort both by DRT and by its partners on conditioning their working hours and working style to each other's.

The only minor cultural barrier to be mentioned is the different units of weights and measures used in Portugal and in the USA. While in Portugal meter is the unit of measure, in the USA it is the inch; furthermore, since the meter and the inch are not easily convertible[5], doing business using both units may lead to tiny unconformities or incongruities into the expected raw material or input but that may cause severe problems ahead in the SC.

3.2.2.3. Transportation risks

According to Mrs. Lopes, there are several risks to which both inbound and outbound transportation are exposed. Any kind of delays in transportation, such as accidents, natural disasters and strikes are likely to disturb the well flow of goods.

More particularly to DRT case, as it deals with partner companies spread around Europe and in North America, the transportation risks are critical not because of lack of infrastructure, but mostly because of the distance between such parties, likely to be translated into delays. When it comes to doing business with Mexico, however, another issue arises: the bureaucracy prevailing in the national customs, which, besides the geographical distance, still intensify the delays in transporting the finished molds.

3.2.2.4. Financial risks

Most of the financial risks faced by DRT Moldes are the same faced by other industries. All the aforementioned risks impact over DRT's financial health, representing, as well, financial risks.

As per Mrs. Lopes, economic cycles represent a risk to every company in every industry, however, according to her, in the steel, molds and automobile industry, it is more critical, since these three industries are hit initially by economic boom or recession.

Even more, the Project Manager points two other issues that may aggravate the financial risks to which DRT Moldes is exposed. First, the company uses external funding to build the mold; in such case, the funding is just paid back to the lender institution after the mold have been approved and delivered to the first-tier supplier or end client. If there is any market trouble even by the OEM, by the first-tier supplier, partner company or by the economy itself, there

[5] 1 millimeter = 0.039370079 inch; 1 inch = 25.400 millimeters

will be an interruption in the company's cash flow, and therefore trouble on paying off duties. Second, the Manager states that it is required a large amount of investment to build a mold to the industries they supply. This way, a non-paid back funding represents to DRT Moldes an important financial liability to cope with.

3.2.3. How does DRT Moldes deal with risk?

Being a second-tier or a first-tier supplier in any SC require special attention to managing the quality of the inputs supplied to the next steps of the value chain; this includes guaranteeing the procurement of reliable suppliers upstream, both in terms of time and quality of the goods supplied.

To DRT's business, such issues are even more important, since they are integrated in a high-end value chain. In the automobile value chain high quality standards are required to guarantee the consumers' safety; if a bumper or a steering wheel support, for example, don't comply with the established requirements, the consumers' lives may be in danger.

Additionally, Mrs. Lopes states that the most threatening risks arise more from upstream and internally than downstream. The Manager points that quality issues are the ones in which DRT most focuses on; on the other hand, the demand volatility, that represents huge concerns to some industries, is considered a minor threat to DRT's business due to the mold's life time and to the collaborative planning between DRT and the OEMs, both to be discussed in the next sections.

3.2.3.1. DRT Moldes' Supply Chain Risk Management Structure

Basically, the SCRM structure adopted by DRT Moldes consist on identifying, managing and mitigating the risks. The company seems to be deeply aware of the issues present in their industry. It appears that their experience in such industry allows them to understand and classify what is the propensity of an odd event disturbing their activities and how severe it would be. However, the company does not follow any structured risk assessment program, except for an *ex-post* general assessment of their business and SC performance, which is part of their risk management program, through which they are able to identify and assess threats and problems recently verified in its SC.

In sum, through the company's SCRM strategies they aim to reduce the probability of occurrence of an odd event. To deal with upstream, downstream and internal uncertainties DRT strategies aim to assure, at least in thesis, that the finished mold will be manufactured and delivered to the partner or client on time and under the agreed specifications.

3.2.3.1.1. Risk Management Practices

DRT Moldes risk management practices are strict in protecting the SC from disruptions. Such practices aim to assure that their product will be manufactured with the best conditions since the very first supplier to the OEMs. Therefore, a number of strategies are defined, put into action onto the company's daily operations, and thoroughly monitored to its purpose. Table 3.2 highlights the major practices adopted by DRT in order to control the risks in its SC.

Table 3.2: DRT Moldes' General Risk Management Practices

<table>
<tr><th>Upstream</th><th>Internal Processes</th><th>Downstream</th></tr>
<tr><td colspan="3">Collaborative Planning & Communication</td></tr>
<tr><td colspan="3">Reverse Manufacture Planning Structure</td></tr>
<tr><td colspan="3">Factoring & Insurance</td></tr>
<tr><td>Hedging</td><td rowspan="4">Quality Management & Monitoring of the whole manufacturing process</td><td rowspan="4"></td></tr>
<tr><td>Requirement of quality certificates and technical specifications</td></tr>
<tr><td>Onsite control of inputs quality</td></tr>
<tr><td>Dual Sourcing</td></tr>
</table>

As expressed in Table 3.2, there are several practices that can be seen as common to the three SC subdivisions expressed in the Table. According to Mrs. Lopes, in its SC there must be an intense collaboration, communication and information sharing between the SC actors not to risk each process timing and deadlines, in the limit not disturbing to total SC lead-time.

The necessity of having a strong collaboration and communication among SC partners emerge from DRT's manufacture planning structure. The company plans its manufacturing process after receiving the orders, and adapts its working hours so as to deliver the order on

time. The Project Manager says that the manufacturing planning starts from the last week of the manufacturing process and goes backwards until the first to reach that goal, therefore the collaboration and communication in its SC also allow the upstream partners to be ready to supply each actor's next step in the SC.

Two other complimentary practices used by DRT which are also common to the three SC subdivisions are the factoring and the use of insurance in the manufacturing process. The factoring, in its turn, allows DRT Moldes to start the investment on manufacturing the mold itself through loans, which certainly must be paid back in the future. In the case an odd event occurs and DRT's investment does not pay back – e.g. because of a specification failure in the mold – the insurance contract covers nearly the total amount of the financial losses.

If on the one hand, the insurance works as a financial risk mitigation tool, on the other hand, the factoring works both as a financial risk management feature and as an investment and business booster. In addition, the strategy of hedging completes the financial risk management tools, preventing financial losses due to variations in the price of commodities or in the exchange rates.

Seen as a key issue to its SC and to DRT Moldes continuity, the control of the specifications and quality of raw materials and inputs upstream is a constant concern to the company. In order to assure the quality of the finished mold, and that no plastic parts manufactured using their molds becomes defective neither at its manufacturing process nor after being assembled and put into the consumer market, DRT Moldes promotes a robust quality control program upstream and internally.

Upstream partners are required to own steel quality certificates as well as to match other requirements relating to dimensions and lead-time. Fulfilled such requirements, when the inputs arrive at DRT, the company carefully inspects each input, looking for any requirements mismatch, before setting them to the mold manufacturing process. If DRT finds any requirement mismatch, such issue is reported to the supplier. Depending on how urgent is that order and how fast that supplier can deliver them a new block of steel, DRT either replace the order for that same supplier, or place it to a secondary supplier of steel. Otherwise, the input is sent to the manufacturing process.

Internally, DRT Moldes organizes each step of the manufacturing process electronically. Several screens spread in the factory displays what is the manufacturing plan for the following weeks, what are the molds being currently processed, at what stage is each mold, and the current progress of each step.

During the mold manufacturing process, each step is closely monitored by a supervisor, and, at the end of each step, the material is examined before being directed to the next ones. Finally, at the very end of the manufacturing process, the finished molds pass through a rigorous inspection before being sent to the first-tier supplier or plastic parts manufacturer.

Following down the value chain, Mrs. Lopes states that there are no major issues downstream. Nevertheless, the literature refers to a specific transportation risk common DRT Moldes' SC: dealing with countries where the customs bureaucracy may lead to lead-time issues, as it is the case of dealing with partners settled in Mexico. When asked about a possible transportation constraint arising from such situation, the Manager answered that DRT is always subject to this constraint, but in such case the Mexican party has interlocutors to clear customs and speed up the transportation across borders.

Another issue frequently mentioned in the literature is the risks resulting from demand volatility. To DRT Moldes, however, it does not represent a major threat since the lifetime of a mold is on average seven years. Although the company supplies several big European OEMs, new molds are only requested either when a previous mold had presented specification failures or when there is a project of launching a new vehicle model.

Yet, to reduce any probability of planning failures, as well as to comply with timing requirements, when OEMs request a new mold, DRT Moldes promotes a reverse plan for manufacturing the molds, given the relatively long time necessary to complete the whole process. The Project Manager refers that her company's manufacturing process is flexible to the OEMs request, being organized from the client request backwards. To this end, DRT establishes flexible working hours so that they can match the clients' time requests and mitigate any risk possible to arise from the manufacturing process timings.

For assuring that every step in the SC is perfectly coordinated and that every process is performed at its optimal conditions, a huge effort on collaborative work and communication among all the SC partners is required. According to Mrs. Lopes, such efforts must start on the very end of the SC in order to assure that every specification and requirement is met since the very first supplier; this enables the agility in developing and manufacturing the molds and naturally minimizes the probability of occurrence of an odd event.

3.2.3.2. Threats to DRT continuity

DRT's concern about quality, general processes and timings seems an important weapon on mitigating the risk until its point in the company's SC. However, DRT Moldes is always susceptible to disruptions and failures internally and externally. When asked about the most threatening event the company had ever faced, Mrs. Lopes mentioned irregularities in the finished mold that were only recognized when the mold had already reached the tier-1 supplier and used in manufacturing the plastic parts.

In such situation, DRT and its suppliers build a crisis committee composed by the most qualified staff suitable to contribute to an optimal solution for that issue, first to ascertain the roots of the problem and fix it, and then investigate at what level each upstream partner is responsible for that failure. This strategy puts the focus on the client and its problem, to then define whose will be the financial liabilities.

3.2.4. Appraisal of DRT Moldes' Supply Chain Risk Management Strategies

According to Mrs. Lopes, the learning process must be a constant, permanent and embedded feature in DRT Moldes. Under this scope, the company performs a constant operations learning program, wherein, periodically, its staff does the evaluation of the business strategies and performance, including a periodical assessment of the satisfaction level of its downstream partners and clients. The Project Manager states that this feature enables the company to learn from its failures and become even more resilient.

Mrs. Lopes says that not all the aforementioned risks and threats are controllable by DRT, however some of them can be managed somehow. The controllable ones are those possible to born in the manufacturing process, while the manageable ones refer to every risk possible to derive from processes external to the company. The requirement of quality certificates, the

use of multiple sourcing, and strict control of the manufacturing process in site are such risk management examples.

It appears that DRT Moldes' activity in its SC is somehow passive, framed by the active role played by the automobile OEMs, in its turn the actor that establishes the requirements and represent the major focus of each and every SC partner. This seems to be the root of DRT's inability to have a more powerful hand onto other risks external to the company.

Regarding the risk management practices, all DRT's SCRM strategies are in line with what is disseminated in the literature, especially concerning the nature of its SC – with low supply and demand uncertainties. Nonetheless, as the literature highlights, in such SC the strategy of postponement would be important in improving the cost-efficiency and reducing the total SC lead-time.

Despite the discipline in conducting their proposed risk management strategies, such practices seem somehow messy and not efficient in reducing the vulnerability to never observed risks. In addition, the company lacks an *ex-ante* risk identification and assessment structured program. Instead, DRT performs *ex-post* periodical analyses of their business performance, allowing them to identify, assess and manage threats and problems once they have already been verified. Such lack of a structured risk management program reduces the company's ability to be strategic resilient, turning them more vulnerable to more tragic events and disruptions never faced before.

3.3. Company 3 – V

The third company studied in this dissertation, henceforth called V, was founded in 1995 and is the number one automobile manufacturer/assembler in Portugal in terms of sales, producing vehicles for two different brands of the group. Worldwide, V is the sole manufacturer of the only 3 models of vehicles the company assemble, of which approximately just 0,8% is driven to the Portuguese market. The biggest slice of the production is exported to other European countries, the Americas and Asia.

V, nonetheless, not only produces cars. The company's secondary business, the production of molds and car parts, represents approximately 10% of its business. Table 3.3 highlights V's basic business data for the year 2015.

Table 3.3: V's basic business data – 2015

Units of Cars Produced	Sales Volume (million euros)	Impact over Portuguese Exports (%)	Production for Internal Market (%)	Production for Foreign Markets (%)	Impact over GDP (%)	Number of employees
102.158	2000	4	0,8	99,2	1	3580

Source: Company's Official Website

The data presented previously expresses the importance of this company to the Portuguese economy, both internally and externally, as well as it partially explains the reason why V was chosen to be studied in the present dissertation. Besides the significance of such company to the Portuguese economy, the complexity inherent to automobile SCs awakens one's interest in exploring every risk and threat to one of the world's most demanding automobile brands in the world. Due to expressive importance of the automotive business to this company, this case study will focus on V's most significant of the two businesses.

The interview was answered by the Supply Chain and Transports Manager at V's manufacturing site in Portugal. During the nearly one and a half hour interview the Manager carefully answered each question frequently using charts and tables to illustrate the topics discussed.

3.3.1. The Complexity of V's Global Supply Chain

The automobile OEMs face important and critical uncertainties in their day-to-day SC activities. Such issues arise from the fact that automotive OEMs most of the time act exclusively as car assemblers, what leads them to procure and purchase a large number of all sort of car parts – going from tissues, plastic parts, screws, glass, paints, rubber, cables, to electric and electronic systems – from different regions of the globe. In the case of V, it might be even more critical, given the relevance of the company in Europe, the brands to whom they produce, and their high quality requirement standards.

Upstream, the chain begins with the extraction or production of raw materials that are occasionally distant from the final product itself, both in terms of geographical location and in terms of production processes similitudes. The Manager highlights that the majority of the parts used in the production of a car are purchased from EU SC partners – some of those are Portuguese. However, suppliers are also spread over the Americas – Brazil, Mexico and the United States – and Asia – China, Japan and Turkey[6].

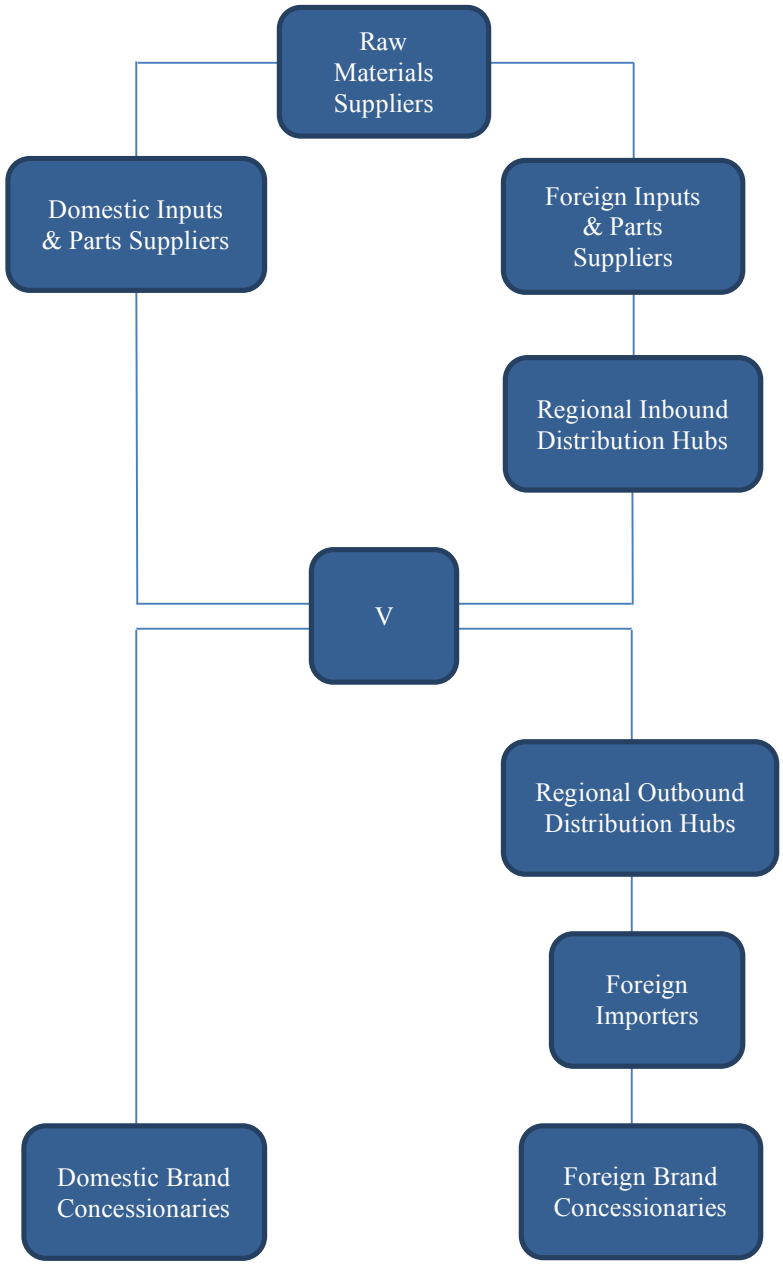
In order to well perform the transit of inputs, final products and goods in general, V works along around 30 transport partners both upstream and downstream. Upstream, the inputs and goods head to regional hubs where they will be redirected to V. Downstream, the final products are also directed to regional hubs to further redistribution. Inputs and final products coming and going to Portugal are an exception to this distribution system.

Following down the SC, the interviewee split the company's partners into two groups: the internal partner and the external partners. The Manager classifies the manufacturing department as the only internal partner, while external partners are local private concessionaries, foreign importers, and finally foreign concessionaries. Such importers set the orders to V and manage the sales together with the concessionaries of the country where they operate.

Figure 3.4, ahead, illustrates the pipeline throughout V's SC, emphasizing the links between V and its direct partners, both upstream and downstream. A rough examination over this brief sketch of V's global SC may lead to one's underestimation of the complexity of such SC, more specifically to the domestic dynamics in V's pipeline. The complexity of both domestic and global pipelines are, instead, critical, due to the level of rigorousness of the industry requirements and some other factors to be explored ahead in this Chapter.

[6] Approximately 99% of the total number of suppliers are European. Around 7% of those are Portuguese, of which nearly 3% reside in V's manufacturing site. Data sourced from V's official website.

Figure 3.4: V's SC Organizational Chart



3.3.2. The Risks to V's Supply Chain Continuity

Complex as it is, dealing with such a large number of partners, especially upstream, and having branches in almost every corner of the globe, a SC as V's, in thesis, present an increased probability of a disruptive event affecting them, being, therefore, particularly exposed and susceptible to every kind of controllable and uncontrollable odd events.

To better assess, manage and build contingency plans to possible SC disruptive events, the Manager stresses that the company divides the risks into two segments, that can deeply interfere into the company's operations and results: the financial risks and social risks.

The financial risks derive from the possibility of occurrence of any event that may harm the financial health of V, disturbing the capabilities of settling accorded payments, of performing investments, and damaging the creation of stakeholder and shareholder values. The social risks, on the other hand, are those that exist due to the possibility of occurrence of events related to environmental pollution, to law violation, and to any other kind of issue that may change how the society see the brands to whom V produce, e.g. a specific mechanical problem in a batch of car models that may cause hundreds or thousands of accidents.

Notwithstanding the above mentioned risks, the interviewed Manager was asked to identify whether V is exposed to reputational risks, cultural risks, transportation risks and to describe them.

3.3.2.1. Reputational Risks

Such risks can be, in parts, compared to what the Manager defined as social risks. However, the interviewee adds that besides the previously mentioned issues, the name of the company is always in vogue, especially in Portugal, given the relevance of the company in the Portuguese economy and the status of the brands to whom V produces. If any positive accomplishment is well recognized by the media and society, any misstep is usually severely condemned.

3.3.2.2. Cultural Risks

A company as global as V, certainly faces the usual issues arising from cultural differences. As per the Manager, however, there is no issue that may not be managed. Different holidays period, festive occasions, working-hours, time-zones and languages represent everyday issues to which both V and its partners have to adapt. The establishment of flexible working hours and the use of English, German and/or French as the standard communication languages by both sides are important features to overcome such barriers.

3.3.2.3. Transportation Risks

The inputs and parts used in V's manufacturing process and its final products travel by land – roads and railways –, air and sea. Under this perspective, the Manager highlights the climate conditions and natural disasters as the most critical barriers to the flow of goods for the company, such as excessive rains, snow storms, earthquakes, volcano activities, that can block or event destroy transport facilities and infrastructures.

Still, the SC Manager adds that wars, strikes, accidents and infrastructure conditions are critical issues to the flow of goods. Recently V has been dealing with the wars in Ukraine, all sorts of strikes across Europe, and with the bad condition of the French railway infrastructures, that can be translated into poorer transport quality conditions in general, and in equally inbound and outbound lead-time delays.

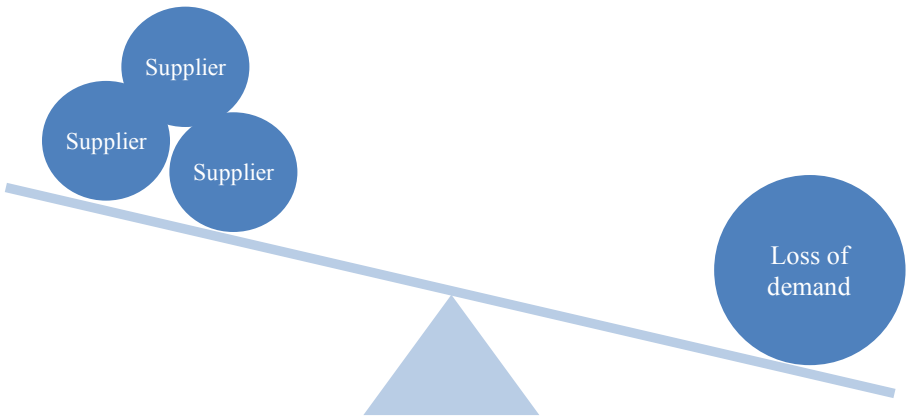
3.3.3. The Three Pillars to Overcome Supply Chain Barriers

Risks and barriers exist in no matter how global a SC is, plus, it is not fact that the more global a SC is, the more hindrances it will face, but it is that the more globalized a SC is, it will be exposed to additional risks depending basically on what goods are being traded, the number of partners the focal firm transact with, and the geographical locations where the SC operates.

V's Manager explains that going global has two major benefits for a SC. First, establishing partnerships worldwide enables the company to benefit from technology specialization and manufacturing expertise in different regions of the globe. Secondly, if sourcing locally in Portugal may represent gains in safety stock reduction and inbound lead-time, on the other hand sourcing exclusively from local partners increases the SC vulnerability, given that there will not be an alternative supplier in the case of a shortage or any other obstacle hits the local scenario.

Nevertheless, the impact a disruptive event associated to global operations may be truly deep and costlier to overcome. Accordingly, the company's SC Manager classify that the majority of the risks V faces arise from the company's suppliers; instead, the most threatening risk to the company would be a severe loss of demand in the consumer market, as expressed in Figure 3.5.

Figure 3.5: Risk Weight Balance – Supplier Related Risks vs. Loss of Demand

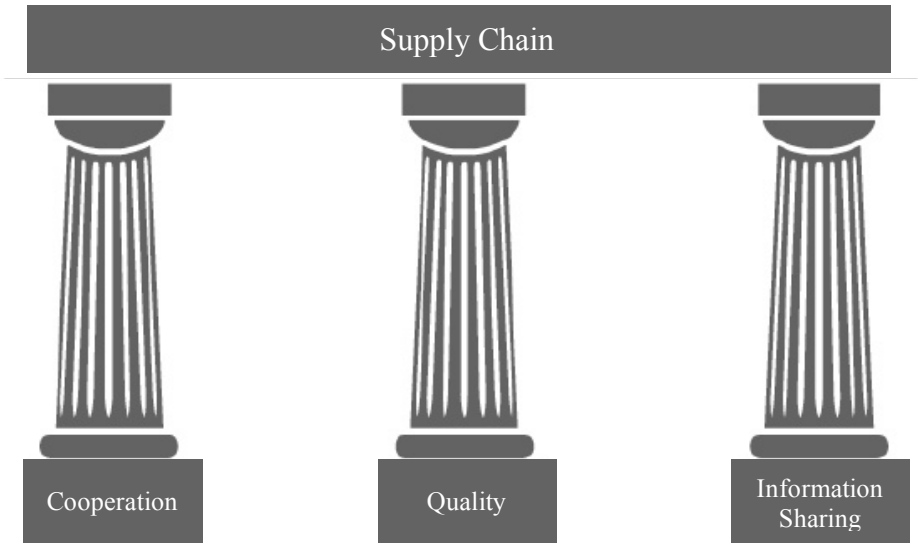


As it can be seen in Figure 3.5, supplier related risks weight less than the risk of losing considerably the demand on the consumer market. However, the formers are still risks to care about; those relate especially to the capacity of the suppliers handing in the right products at the right time. Infrastructural and other transportation issues are inserted in the supplier related risks, even these been extraneous to the supplier partners.

The loss of demand is not recognized by V as a probable event, instead its consequences would be catastrophic to the company. The demand variability, which represents one of the most critical risks to various industries and companies is not recognized by V's Manager as an important threat to its SC operations continuity. The demand variability, as per the interviewee, exists in the automobile industry, but it is soft enough to keep the production level nearly stable. In the case of V, what suffers some level of variability is the demand between different models of cars, therefore V's effort is to manage the production volume of the models demanded in different periods.

In order to handle and overcome the risks coming from the complexity of its global operations, V believes that three elements work as pillar to compose the basis of its SC, presented in Figure 3.6: cooperation, information sharing and quality. These elements besides building the basis for V's SC continuity, also support the company's risk management strategies, i.e. without those it would be impossible to improve a longer-term resilience of V's SC and reduce its vulnerability.

Figure 3.6: V's Three Pillars to Overcome Barriers



V believes that these three elements are complimentary and promote a special organization in its SC in a way that there will be a significantly lower probability of errors, mistakes and misunderstandings, optimizing the operations potential, both for internal and external partners.

Quality and, consequently, safety represent a crucial pillar for the SC base, given the demanding aspect of the automotive industry. Either the former or the ladder elements are needed throughout the whole SC and must cover all the processes and aspects of manufacturing a car. The Manager believes that using good quality inputs is one of the steps to build quality and safe cars.

The cooperation and information sharing/communication are particularly complimentary since the share of information is part of a cooperative thinking. According to V's Manager, the cooperative thinking and information sharing builds a sense of mutual respect and understanding between every SC partner, and also let them to be aware of each other's individual troubles, needs and goals, this way leading to the ideal match of the SC common goals.

3.3.3.1. Managing Risks: Avoid Impacts Over the Clients

In V, their concern is that the possible failures along the SC do not hit the clients, neither in quality nor in quantity. For that there is a tough effort between the SC department, the internal and external clients, and the suppliers, to plan the car production process and track every risk in the very short and longer terms.

The planning begins from the end of the chain backwards. In the beginning of each year, the company establishes the expected production level for that year. Every month, in addition, the manufacturing department plans the volume of each input required to match the external clients' needs for the next six months, so V's procurement department is able to set the orders of inputs to its suppliers. According to the company's Supply Chain and Transports Manager, a monthly production planning allows the inputs orders to be corrected periodically, avoiding an excess of stock of inputs, and consequently financial losses.

Upstream the SC, V's suppliers are strictly chosen; they must own updated quality certificates to be part of V's SC. Even more, before providing the inputs to V, the company's suppliers are required to execute dry-run tests in a unit of its products to reduce at some level the probability of occurrence of any misfortunate event during the SC final product usage.

In parallel, to ensure that both upstream and downstream flow of goods are safe for the SC operations, V perform strict short-run risk analyses throughout the whole SC. These analyses and possible future actions aim to mitigate the impacts of possible SC constraints to internal and external clients, and, in the very end, avoid financial losses.

The risk analyses are done every day, in which is given a report for the risks for the next two days. Even more, in order to guarantee an optimal examination of the risk possibilities and correct the risk perception by the company due to possible variations to what was previously expected for the SC operations, such daily analyses are executed twice a day. If the risk analyses reports indicate any unaccepted disruption – given its probability and/or impact over the SC – the company proceeds to alternatives to manage those risks, such as sourcing from an alternative supplier, or altering means of transportation of goods, for example.

Supplier quality unconformities, however, don't represent necessarily contract break-ups between V and its suppliers. Although in such case V will either source the input from another supplier – if the unconformity was noticed prior to the car manufacture – or charge this supplier for the unconformities – if the batches of cars are already assembled –, the company will cooperate with this supplier in order to fix that problem and continue the partnership.

3.3.4. Recent Threats to V's Supply Chain

Despite the expertise that leads V to use the strategies mentioned until now, the company's Manager states that some disruptions are impossible to forecast and still difficult to overcome due to the specialization of some countries into specific inputs, as it is the case of Japan and its specialization in electronic parts. Even more, the interviewee defends that every disruptive event is an opportunity for the company to learn from and to develop other responsive alternatives.

Between the large amount of risks the company has faced in the recent years, three situations were the most critical: the 2011 earthquake in Japan, the recent wars in Ukraine, and the 2015 fires in V's supplier plants in Portugal and Germany.

After the earthquake and tsunami hit Japan in 2011, the supplier manufacture plant as well as the regional infrastructures were seriously damaged, and V was caught on a shortage of electronic parts to build its cars. A group of representatives was sent from Portugal to Japan to analyze the situation and, in cooperation with the supplier partner, find a way out of this shortage. Thanks to the readiness of the national authorities to crisis situations such as this, and to the cooperative job between V's representatives and its Japanese partners, the national infrastructures and the supplier's production plant were rebuilt relatively quick, and the shortage has come to an end.

In 2015 another shortage hit V. Supplier manufacturing plants in Portugal and Germany, who supplies V with different types of inputs, caught on fire on the same period. These situations were overcome through the use of the multiple-sourcing strategy until such plants were totally rebuilt and ready to resume the supply of inputs to V. At first, however, V had to overload the

alternative suppliers, what represented higher costs; on the other hand, V accomplished its main goal during a disruption: the impacts to the clients were the lowest possible.

The last risk to V's SC, which is a situation that is still on course since 2014, is the war and instability in Ukraine. The region of Crimea housed supplier partners and paths through which parts and components passed to reach V's manufacturing facilities in Portugal. The instability not only in Crimea, but in the whole Ukraine, represented a risk of blockage, damage or destruction to the cargo passing through that region, what led V to find other routes through which the goods going and coming from Portugal could be safely transported.

3.3.5. Are V's actions aligned with the literature?

Uncertainties and risks in V's SC promote a scenario in which good planning and objective actions are especially required for successful results. V, nonetheless, is aware of the complexity of its SC, and, in general, the company performs careful planning, with and without its SC partners, over the possibilities of disruptions, ways to cushion its impacts to the SC, or even reduce the probability of occurrence of such disruption. The actions V takes, in its turn, are direct to the point, and follow a protocol of collaborative job along with the SC partners involved into the issue in order to solve it.

As part of the collaborative mindset present in V, the company's Manager believes that the cooperation and information sharing are the key to responsiveness and to reduce the impact of a disruption into their SC.

The three pillars that support the SC seem powerful on sustaining the chain operations by enabling the effectiveness of the strategies taken by V together with its partners. The strategies, in its turn, aim both to improve the resilience of the SC, i.e. preventing disruptions from hitting the chain, and to act through contingencies, therefore mitigating its effects to the various actors of the SC.

According to what the Supply Chain and Transports Manager declared throughout the interview, it was possible to conclude that V's SC is somehow a low demand uncertainty but high supply uncertainty chain. This way, the strategies used by V are thoroughly in line with what this field's researchers defend.

The requirement of strict technical specifications to the suppliers, i.e. the focus on quality and safety, and multiple sourcing refer to strategies to hedge risk. On the other hand, charging a partner for failures is a transference of risk and hedging. Finally, cooperation, collaborative planning and information sharing are tools to improve the visibility and responsiveness in the whole SC.

Because of the dimension and expertise of the company, as well as the agreements they might have signed with the other partners, and especially with the other companies of the same group, there may be a requirement of a frequent and constant update to the entire company regarding their risk management/mitigating procedures and understandings. This makes from V the most up-to-date company studied in this dissertation in terms of accordance to the literature and readiness to SC disturbances.

Chapter 4: Discussion and Conclusion

4.1. Discussion

Several reasons awaken in the author of this dissertation the taste for such a broad and complex topic as the global SC risk management. The author of this thesis was born and raised during the time when the theme globalization was in vogue; just like globalization, the improvement of the communication and interactions were also being so-called, what seeded in the author the curiosity about the steps products pass through, as well as where do such steps take place until they get to the shelves.

While studying for the subject Logistics and Supply Chain Management, during his Masters, the author discovered a wide gap in the SCRM field, especially in researches combining the literature and the practical scenario. The decision on writing about global SCs was made due to the simple facts that: 1) it is particularly difficult to find SCs that are not global due to the reasons already addressed in this dissertation, and 2) global SCs are subject to a larger variety of more critical disturbances and constraints. Therefore, a global SCRM study combining both theoretical and practical perspectives will certainly enrich the SCRM literature, despite the gaps that were not approached in this study.

Although all the companies studied in this thesis are global, they present different levels of SC globalization. DRT Moldes' direct upstream and downstream partners are mainly concentrated in Europe; Unilever Jerónimo Martins' main direct upstream partners are European, however, this company's downstream partners and clients are spread around Europe, Africa and America. V, instead, is the company with the most globalized SC; they source from at least four continents and they supply the three models of cars they produce to the whole Europe, Americas and Asia.

Besides the aforementioned personal and academic relevance of the theme, there is a shortage of empirical studies on the field of SCRM, both under qualitative and quantitative approaches, revealing the opportunity of developing such work as the one presented in this dissertation, i.e. a link between theory and practical observations (Sodhi *et al.*, 2012).

4.1.1. The Awareness of the Firms' Supply Chain Risks

The concept of risk, detailed in Chapter 2, was one of the first items supposed to be discussed during the interviews. The intention was to introduce the topic "risk" and evaluate the interviewees' perception of the risks their SC faced taking into account their understanding of the conceptual risk.

Notwithstanding, all the three companies' representatives were unable to clarify the concept of risk. Instead, when questioned about their understanding of risk, they pointed to practical and objective risks inherent to their SC, in which the financial risk was unanimously mentioned by the three companies.

Cultural and reputational risks were not immediately mentioned, but when questioned about these, the respondents were able to identify such risks faced by their SC. Notwithstanding, those were pointed as totally controllable by the company along with its partners, i.e. such risks may have a certain probability of occurrence, however, their impacts over the SC are minimal or none due to risk management strategies.

Transportation risks, instead, were cited as critical by the three companies due to the lack of predictability and lack of control over some events by the member companies of a SC. Such risks may present a low probability of occurrence but high degree of impacts over the SC, since these may lead to cargo damage, disturbances in the transit time, extending inclusively the total SC lead-time.

In addition, Unilever Jerónimo Martins provides an unprecedented view of cultural and transportations risks, not mentioned by the authors studied for this thesis. As its core business is the manufacturing of food products, so, caring a lot about consumers' preferences and health, the cultural risks faced by this company are translated into the development and manufacturing of a product that does not match the consumers' cultural tastes. Moreover, an important additional unprecedented transportation risk is the hygiene and temperature conditions of the warehouse and transportation vehicles, that if not in accordance with the requirement, it may damage consumers' health, and, consequently, echo onto the company's reputation.

Finally, the four categories of risks defended separately by Hartley-Urquhart (2006), Cross & Bonin (2010), Tsikoudakis (2013), Revilla & Sáenz (2014), and McGreevy & Harrop (2015) and detailed in Chapter 2, were observed as issues that companies care about, as those could harm, in higher or lower levels, the firms' SCs.

4.1.2. Literature vs. Observed Strategies

Researchers are almost unanimous about the optimal strategies companies should take to manage and mitigate risks in SCs. These strategies are resumed into reducing the SC vulnerability and avoiding the risk exposure; if not possible, SC members must put into operation actions to overcome the disruption, or at least to lessen its impacts over the chain, always backed by flexibility, agility, collaboration and information sharing (Hamel & Välikangas, 2003; Christopher & Peck, 2004; Manuj & Mentzer, 2008ab; Ho *et al*., 2015).

In order to evaluate the strategies employed by the companies and gently exposed by its interlocutors during the interviews, it is important to identify what is the type of these companies' SC according to the level of demand and supply uncertainty inherent to those, as proposed by Lee (2002), and displayed in Manuj & Mentzer (2008a). Table 4.1, below, illustrates such observations.

Table 4.1: Researched Companies According to Supply and Demand Uncertainty of their Supply Chains

		Demand Uncertainty	
		Low	High
Supply Uncertainty	Low	-	-
	High	**DRT Moldes** **V**	**Unilever Jerónimo Martins**

In the interviews it was possible to verify that none of the companies studied for this dissertation is member of a low supply uncertainty SC. All the three companies rated issues related to suppliers as critical to the SC, such as safety and quality requirements, inbound lead-time, and macro incidents related to the suppliers' country of origin. Still, DRT Moldes

and V, both being member companies of automotive SCs, rated as low the demand uncertainty to their chains; Unilever, on the other hand, rated their demand uncertainty as high especially because of the demand variability of the in-home market segment.

After categorizing these companies' SCs, an important question emerges: are their risk management strategies aligned to the strategies proposed by Lee (2002)? That is, is DRT Moldes and V focusing on polling and sharing risks and Unilever focusing on responsiveness and hedging risks?

First, in order to verify whether the companies are aligned to the proposition of Lee (2002), it is important to apply a scheme of the seven generic strategies proposed by Manuj & Mentzer (2008a) to bridge the authors and simplify the analyses of the strategies. Table 4.2, presented below, points out what strategies are used by each company to, therefore, investigate if these three companies are coherent and cohesive according to Lee (2002) and Manuj & Mentzer (2008a)[7].

Table 4.2: Generic Strategies Proposed by Manuj & Mentzer (2008a) Employed by Unilever Jerónimo Martins, DRT Moldes and V

	Unilever Jerónimo Martins	**DRT Moldes**	**V**
Avoidance of risks	■	■	■
Security	■	■	■
Control	■	■	■
Postponement			
Speculation	■		
Hedging		■	
Transferring/Sharing Risk	■	■	■

In Chapter 3, it became clear that Unilever, DRT Moldes and V make an effort on minimizing uncertainties and avoiding disruptions in their SC by ensuring safety, security and control in and over their chains. These companies' constant concern about their forward and backward

[7] Blank spaces don't mean the companies don't apply such strategies, instead, it only means that such tools may not represent an important feature for managing risk and were not mentioned in the interviews.

direct partners' quality and reliability, besides their also continuous concern about the effectiveness of their production processes to keep up with the quality standards are examples of their risk avoidance strategy.

However, these companies seemed to have a critical lack of knowledge about their suppliers' suppliers as well as about their reliability. Despite de relentless concern and effort on avoiding risks, the relative ignorance about at least their tier-2 suppliers represents a potential failure in avoiding risks, assuring quality materials and controlling risks in the SC.

The role of collaboration, cooperation and information sharing, in addition, are resumed into the maintenance of control over the SC operations, supporting the main risk avoidance strategy, and is also crucial for creating a problem-solving synergy.

Speculation and hedging are strategies for the companies to manage risks arising from the demand side and supply side, respectively. As for Unilever there is a high demand uncertainty and its upstream SC is not agile enough to match sudden demand variations, the company bets on safety stocks to cope with such uncertainty. As DRT Moldes, on the other side, deals more directly with commodities, the hedging strategy is used basically to protect the company from fluctuations in the prices of commodities used as inputs, as well as to protect it from variations in the exchange rates.

Finally, the transference of risks or risk sharing are strategies that can be achieved through several actions, among these are the outsourcing and agreements. Unilever, DRT Moldes and V use different tools to transfer or share risk between their SC partners. Unilever outsources the manufacture of certain products, this way transferring part of the risk associated to the production process. DRT and V, instead, share risk through contract clauses agreed between them and their partners. Notwithstanding the good relationship between those two companies and their partners, contract clauses declare that the partner(s) responsible for a specific disruption or failure will be charged for the damages brought to the other SC members.

4.1.2.1. The Matching Between Uncertainties in Demand and Supply and the 7 Generic Strategies

As per Lee (2002), a SC with high level of supply uncertainty but low level of demand uncertainty must hedge risks, focus on risk pooling and risk sharing. This is somewhat what DRT Moldes and V do. Both companies have no need of retaining safety stocks neither of inputs nor of finished products since the demand variability is considered low, and because the backward risks associated are properly pooled through multiple sourcing strategies, transference of risks, or even hedging, as in the case of DRT Moldes.

A high level of uncertainty on both demand and supply sides, where Unilever Jerónimo Martins is located, on the other hand, requires an agile SC for guaranteeing the disturbances will bring minimal impacts to the chain operations (Lee, 2002). Besides relying only on planning and expectations, the speculation and control strategies employed by Unilever allow its SC to be responsive enough to the demand fluctuations through the development of safety stocks. Upstream, Unilever does not hedge risks, as proposed by Lee (2002), instead, it transfers/shares risks and apply the control strategy to cope with the risks associated to the high supply uncertainty.

In sum, each of the three companies miss at least one of the strategies proposed by Manuj & Mentzer (2008a) and Lee (2002). Therefore, the analysis points to a partial alignment between the observed strategies and the ones proposed by the researchers. Unilever Jerónimo Martins, DRT Moldes and V, however, are able to manage the risks arising from both forward and backward sides, leading to minimal losses in their SC.

4.1.2.2. Resilience in Firms' Supply Chains

The global business environment in which such companies are inserted may evoke a question about the vulnerability of their SCs and how resilient to disruptions they are. The literature suggests that the practice of non-resilience building strategies create systems prone to break-downs. Even more, the researchers point to the importance of being strategically resilient and the competitive advantage this attribute can get to the systems that use it.

The case studies and the present Chapter exhibit strategies that, overall, are resilience building ones. Not coincidentally, collaboration and communication were the most mentioned general

risk management tools in the three interviews; the literature defends that those represent the most important combination for improving resilience in a SC. Another unanimous tool mentioned by the companies' representatives, but mentioned by few authors, was the requirement of strict technical specifications by the focal firms to its suppliers and other partners, which avoid present and future losses through the decrease in the SC vulnerability.

Besides these two tools, simplification and continuous assessment and improvement of operations and methods are the heart of Unilever's effort on reducing the SC vulnerability. On the one hand, simplification decreases the level of complexity of a SC, decreases total lead-time and, therefore, the system's vulnerability; in contrast, the continuous assessment and improvement develop the adaptive capacity the company owns, through the development of the SC's visibility and flexibility.

In addition to Unilever, DRT Moldes also applies a continuous learning and improvement plan to guarantee the decrease of the vulnerability inherent to its SC. This tool works to prevent that a failure already observed in the past do not hit once more the company's SC, and if it does, that works to minimize its impacts.

Given the relative rigidity of the forward side of V's SC, the company bets on continuous improvement in communication between the company departments and between these and the SC partners. The SC communication not only improves the SC responsiveness, either minimizing the impacts of an odd event or preventing its occurrence, but also includes brainstorming, improves visibility and enables the SC partners to foresee potential competitive advantages to, then, invest into it. Communication, in such case, leads to a vulnerability shrink and extend the SC continuity.

In resume, collaboration, simplification, continuous improvement, and communication are the tools Unilever and V use to visualize their business environment and to act not only to prepare their SC for disruptions, but also to foresee disruptive changes or gaps in the industry from which they could profit from if they adapt their SC in advance. DRT Moldes, in contrast, despite requiring quality certifications from its steel suppliers, does not present the strategical aspect of resilience. It seems like their level of recoverability is higher than that of adaptability.

4.1.3. Most Suitable Practices to Manage Risks in Global Supply Chains

The complexity of global SCs require rigorous practices and steps to manage risks more accurately and avoid misunderstandings, excessive financial expenditure and failed strategies. Under this perspective, Unilever was the only company who declared having steps composing their SCRM structure, and these are two: risk identification and risk mitigation.

These two steps, however, represent a small piece of what researchers such as Jüttner *et al*. (2003) and Ho *et al*. (2015) suggest. These authors defend that the more steps the SCRM structure has, the easier will be to complete efficiently each one of those. Moreover, the lack of a structure may lead to confusion about the ongoing events and to overlapping strategies.

Therefore, the suggested optimal SCRM structure for such companies is the proposed by Manuj & Mentzer (2008a), which comprises the one suggested by Jüttner *et al*. (2003), plus the contribution of Ho *et al.* (2015). The steps are: risk identification, risk assessment, selection of appropriate risk management strategies, implementation of risk management strategies, mitigation of SC risks and continuous improvement.

The risk identification is performed naturally in a daily basis, or through periodical meetings between the companies' departments or even between SC partners, in which this step is boosted by cooperation and communication.

Manuj & Mentzer (2008a) propose a model for pursuing the risk assessment, already discussed in Chapter 2, and displayed in Appendix number 1. With this model it is possible to qualify and quantify the risks, as well as to create a priority assessment of which risks are the most critical. After completed the risk assessment, the next step is to choose the most suitable strategy for managing the listed risks, in which some of them are exemplified in the case studies.

The implementation of the risk management strategies and mitigation of risks are steps subject to each company's financial, time and effort availability, which is, however, out of the scope of this dissertation. The mitigation of the risks, in addition, depends on the enforcement and constant evaluation of the companies' strategies.

Moreover, it is mandatory that these companies keep improving continuously their operations and SCRM strategies. Although it requires visibility and a certain level of flexibility, it can sustainably extend the SC continuity. This step, as proposed by Ho *et al*. (2015) walks in parallel with the strategic aspect of resilience, and enables its user to reposition in the case of environmental changes and even profit from it.

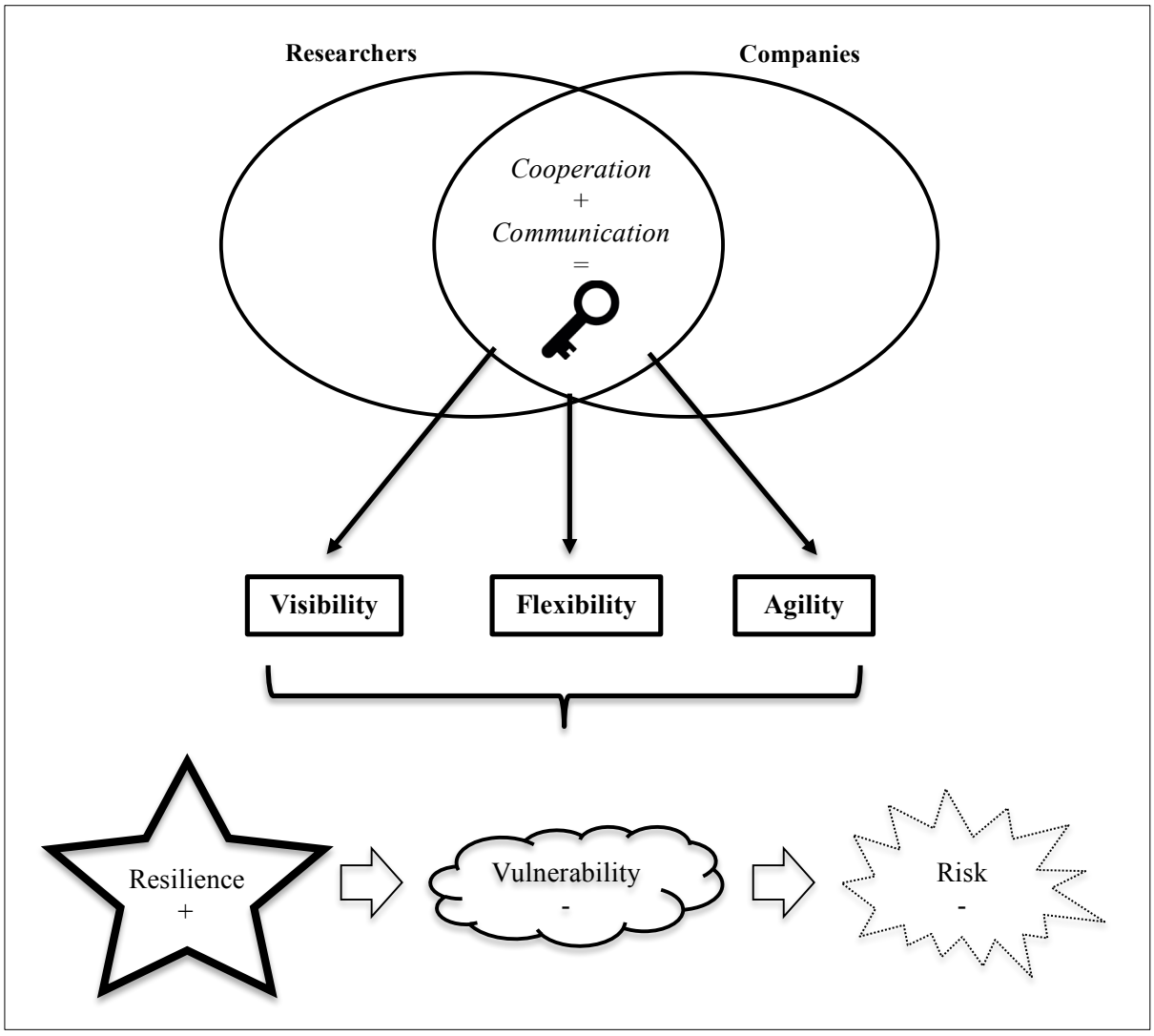
Finally, as these companies seem not to know enough their indirect suppliers, it is strongly recommended that those place bigger efforts on getting to know better, cooperate and communicate with at least their tier-2 suppliers in order to reduce disruption possibilities and probabilities. This issue certainly represents a cost increase for the company to apply it, however, the benefits in terms of risk reduction seem considerable since this recommendation will mitigate possible cost increase impacts arising from supply-related odd events, such as quality and inbound lead-time.

4.1.4. The Contribution

This dissertation takes advantage of the shortage of studies combining theoretical and empirical approaches to global SC risk-related issues and, therefore, provides important findings about what do researchers' conclusions and companies' strategies and actions have in common.

Figure 4.1, on the next page, summarizes, then, the most important contribution of this dissertation. Differently from Figure 2.1, that expresses a reciprocal relationship between Risk, Vulnerability and Resilience, this image displays one-way relationships between these concepts. The intersection represents two of the most important tools a firm can use to deal with risk in its SC, agreed both by the researchers and the companies. Such tools improve the visibility, flexibility and agility of a SC, which, finally, improve the SC strategic and operational resilience, reduce vulnerability, and therefore the risk exposure.

Figure 4.1: How do Cooperation and Communication Act on Lessening Risk in a Supply Chain



Despite this finding, one must not ignore what was exposed in Figure 2.1, i.e. the risk perception still frames the degree of vulnerability of a SC, which, in its turn, determines how resilient a SC is. However, these tools build resilience in such a way that the risk exposure decreases substantially.

4.2. Conclusion

After having studied a vast literature on the SCRM field and having interviewed three companies' representatives about their awareness on the risks inherent to their SCs and how

did they deal with such risks, it was possible to reach some conclusions concerning the literature and the case studies.

First of all, the literature provides a robust conceptualization of SC risks, its triggers and factors, as well as risk related concepts, such as uncertainty, resilience and vulnerability, which are crucial for exploring why and how do companies react to odd events. Nevertheless, the proposed strategies by the researchers to overcome risk, although strong and well structured, in general seem to be too generic, not exploring each SC or industry specificities more deeply.

On the other hand, the recognition of risks and its triggers seem to be somehow natural and embedded to a SC or company's DNA. When asked about several academic concepts and steps to recognize, measure or mitigate risk, the interviewees did not answer as the literature propose, however, this does not mean they are ignorant about risk-related issues, are unable to recognize or to mitigate their SC risks; this may just mean they are probably outdated, since this is a new and evolving field.

Moreover, despite the generic aspect of the strategies the researchers defend to manage specific risks, there is a kind of unanimity between the authors and the companies about what strategies should be implemented to manage and mitigate certain risks. Regarding the steps to promote a sustainable SCRM mechanism there is a convergence between the researchers, still it is something that the companies must apply thoroughly and in detail, as recommended by Manuj & Mentzer (2008a) and addressed earlier in this Chapter, in order to facilitate the recognition, assessment and mitigation of the risks.

4.3. Limitations and Future Research

The scope of the present dissertation involves the qualitative analysis of global SC risk-related features, aiming to identify the risks companies from different industries classify as the most critical ones to the operations of their SCs, as well as how and why do they manage them.

This research takes advantages of the lack of actual researches in the SCRM field addressing categorized risks inherent to most of the global SCs, especially when it comes to linking the

theory and actual observations. Most of the studies developed until now report to very specific disruptions, such as transport ones, or the sole conceptualization of risks in SCs, not to a general analysis of disruptions and strategies to manage these. Despite the effort of the present dissertation on filling this gap, there are still limitations on this research, which introduce fruitful paths for future studies.

Throughout this research it was not possible to investigate more deeply how effective are the SCRM strategies applied by the researched companies. Secondly, the case studies developed in this dissertation lack a better comprehension about the risks arising from the researched companies' internal processes. Although the focus of this study was to investigate the role of the interactions between SC members into managing risks, these two issues represent an important gap between the current researches.

A probable reason for the aforementioned constraints was that the development of three case studies did not allow a deeper analysis of each enterprise and its SC, given the time constraints both of the author of the present dissertation and the companies object of studies.

Therefore, it is suggested that future research should focus on one specific industry, SC, or even a single company and perform quantitative analyses to enable a total dedication by the author to the studied entity, as well as to evaluate more precisely and deeper the effectiveness of the applied SCRM steps and strategies. Among this dedicated analysis, an important contribution would be to address the barriers and risk sources arising from the focal firm internal processes.

This research plays an important role on developing a more mature understanding of the risk dynamics in global SCs, however, this field is rapidly evolving and the studies about it can be considered yet embryonic. Future studies on SCRM will certainly support other researchers, students and even the firms to improve their SC processes, communication and collaboration between SC partners.

Bibliographic References

Aqlan, F. & Lam, S. S. 2015. Supply chain risk modelling and mitigation. ***International Journal of Production Research,*** vol. 53, no. 18, pp. 5640.

Bhamra, R., Dani, S., & Burnard, K. 2011. Resilience: the concept, a literature review and future directions. ***International Journal Of Production Research***, 49, 18, pp. 5375-5393, Business Source Complete, EBSCO*host*, viewed 29 October 2015.

Blos, M., Quaddus, M., Wee, H., & Watanabe, K. 2009. Supply chain risk management (SCRM): a case study on the automotive and electronic industries in Brazil. ***Supply Chain Management - An International Journal***, 14, 4, pp. 247-252, Social Sciences Citation Index, EBSCO*host*, viewed 28 November 2015.

Christopher, M. 2011. ***Logistics and supply chain management: creating value-adding*** networks. Great Britain: Pearson Education.

Christopher, M., & Peck, H. 2004. Building the Resilient Supply Chain. ***International Journal Of Logistics Management***, 15, 2, pp. 1-13, Business Source Complete, EBSCO*host*, viewed 28 October 2015.

Cross, B., & Bonin, J. 2010. How to Manage Risk in a Global Supply Chain. ***Ivey Business Journal***, 74, 6, p. 1, Regional Business News, EBSCO*host*, viewed 14 December 2015.

Cruz, J. M. 2013. Mitigating global supply chain risks through corporate social responsibility. ***International Journal Of Production Research***, 51, 13, pp. 3995-4010, Business Source Complete, EBSCO*host*, viewed 14 December 2015.

DK Publishing Book. 1997. English Dictionary A to Z. New York: DK Publishing Book.

Eisenhardt, K. M. 1989. Building Theories from Case Study Research. ***Academy Of Management Review***, 14, 4, pp. 532-550, Health Business Elite, EBSCO*host*, viewed 6 November 2015.

Fu, Y., & Piplani, R. 2004. Production, Manufacturing and Logistics: Supply-side collaboration and its value in supply chains. ***European Journal Of Operational Research***, 152, pp. 281-288, ScienceDirect, EBSCOhost, viewed 21 September 2016.

Growth Strategies. 2006. 2 – Resiliency: business' foremost strategic goal. No. 985, pp. 3-4.

Hackert, A., Krumwiede, D., Tokle, J., & Vokurka, R. 2012. Global Corporate Social Responsibility Practices and Cultural Dimensions. ***SAM Advanced Management Journal***, 77, 4, pp. 33-41, Health Business Elite, EBSCO*host*, viewed 14 December 2015.

Hallinan, E. R. 2007. Resilience: Tough times call for a flexible business plan, ***Reeves Journal,*** vol. 87, no. 9, pp. 14-15.

Hartley-Urquhart, R. 2006. Managing the Financial Supply Chain. ***Supply Chain Management Review***, vol. 10, no. 6, pp. 18.

Heckmann, I., Comes, T., & Nickel, S. 2015. A critical review on Supply chain risk – Definition, measure and modeling, ***Omega***, 52, pp. 119-132, Business Source Complete, EBSCO*host*, viewed 28 October 2015.

Ho, W., Zheng, T., Yildiz, H., & Talluri, S. 2015. Supply chain risk management: a literature review. ***International Journal Of Production Research***, 53, 16, pp. 5031-5069, Business Source Complete, EBSCO*host*, viewed 29 October 2015.

Humphrey, J., & Schmitz, H. 2001. Governance in global value chains. ***Ids Bulletin - Institute Of Development Studies***, 32, 3, pp. 19-+, Social Sciences Citation Index, EBSCO*host*, viewed 7 December 2015.

Jüttner, U., Peck, H., & Christopher, M. 2003. Supply chain risk management: outlining an agenda for future research. ***International Journal Of Logistics: Research & Applications***, 6, 4, pp. 197-210, Business Source Complete, EBSCO*host*, viewed 29 October 2015.

Kieser, A. 1994. Cultures and Organizations. Software of the Mind (Book). ***Organization Studies (Walter De Gruyter Gmbh & Co. KG.)***, 15, 3, p. 457, Business Source Complete, EBSCO*host*, viewed 14 December 2015.

Kleindorfer, P., & Saad, G. 2005. Managing Disruption Risks in Supply Chains. ***Production & Operations Management***, 14, 1, pp. 53-68, Business Source Complete, EBSCO*host*, viewed 27 November 2015.

Kumar, S., Himes, K., & Kritzer, C. 2014. Risk assessment and operational approaches to managing risk in global supply chains. ***Journal Of Manufacturing Technology Management***, 25, 6, pp. 873-890, Business Source Complete, EBSCO*host*, viewed 21 November 2015.

Lapide, L. 2014. Global supply chains: when uncertainty is a certain factor. ***Supply Chain Management Review***, 2, p. 41, General OneFile, EBSCO*host*, viewed 20 November 2015.

Lee, H. L. 2002. Aligning Supply Chain Strategies with Product Uncertainties. ***California Management Review***, 44, 3, pp. 105-119, Health Business Elite, EBSCO*host*, viewed 4 november 2015.

Manuj, I., Esper, T., & Stank, T. 2014. Supply Chain Risk Management Approaches Under Different Conditions of Risk. ***Journal Of Business Logistics***, 35, 3, pp. 241-258, Health Business Elite, EBSCO*host*, viewed 2 November 2015.

Manuj, I., & Mentzer, J. 2008. Global supply chain risk management. ***Journal Of Business Logistics***, 29, 1, pp. 133-155, Health Business Elite, EBSCO*host*, viewed 24 October 2015.

Manuj, I., & Mentzer, J. 2008. Global supply chain risk management strategies. ***International Journal Of Physical Distribution & Logistics Management***, 38, 3-4, pp. 192-223, Social Sciences Citation Index, EBSCO*host*, viewed 2 November 2015.

McCrea, B. 2012. Best practices in global transportation and logistics: top analysts gather to help logistics and supply chain professionals better understand and overcome the mounting challenges of global transportation and logistics management. ***Supply Chain Management Review***, 7, p. 8, General OneFile, EBSCO*host*, viewed 15 December 2015.

McGreevy, C., & Harrop, W. 2015. Intentional cargo disruption by nefarious means: Examining threats, systemic vulnerabilities and securitisation measures in complex global supply chains. ***Journal Of Business Continuity & Emergency Planning***, 8, 4, p. 326-345, Scopus®, EBSCO*host*, viewed 11 December 2015.

McNeill, C. 2014. Risk: A Multidisciplinary Concept Analysis. ***Nursing Forum***, 49, 1, pp. 11-17 7p, CINAHL Plus with Full Text, EBSCO*host*, viewed 29 October 2015.

Olson, D., & Swenseth, S. 2014. Trade-offs in Supply Chain System Risk Mitigation. ***Systems Research And Behavioral Science***, 31, 4, p. 565-579, Scopus®, EBSCO*host*, viewed 11 December 2015.

Peck, H. 2006. Reconciling supply chain vulnerability, risk and supply chain management. ***International Journal Of Logistics: Research & Applications***, 9, 2, pp. 127-142, Business Source Complete, EBSCO*host*, viewed 29 October 2015.

Pettit, T., Fiksel, J., & Croxton, K. 2010. Ensuring supply chain resilience: development of a conceptual framework. ***Journal Of Business Logistics***, 31, 1, pp. 1-21, Health Business Elite, EBSCO*host*, viewed 29 October 2015.

Revilla, E., & Sáenz, M. 2014. Supply Chain disruption management: Global convergence vs national specificity. ***Journal Of Business Research***, 67, pp. 1123-1135, ScienceDirect, EBSCO*host*, viewed 20 November 2015.

Sheffi, Y., & Rice Jr, J. 2005. A Supply Chain View of the Resilient Enterprise. ***MIT Sloan Management Review,*** vol. 47, 1, pp. 41-48, viewed 24 November 2015.

Singh, A., Mishra, P., Jain, R., & Khurana, M. 2012. Design of global supply chain network with operational risks. ***The International Journal Of Advanced Manufacturing Technology***, 1-4, p. 273, Academic OneFile, EBSCO*host*, viewed 11 December 2015.

Skjøtt-Larsen, T., Hsuan, J., Kinra, A., & Kotzab, H. 2015. ***Managing the Global Supply Chain*** (4th Ed.). Copenhagen: CBS Press.

Sodhi, M., Son, B., & Tang, C. 2012. Researchers' Perspectives on Supply Chain Risk Management. ***Production & Operations Management***, 21, 1, pp. 1-13, Business Source Complete, EBSCO*host*, viewed 26 November 2015.

Stank, T., Dornier, P., Petersen, K., & Srinivasan, M. M. 2015. Global supply chain operations: a region-by-region. ***Supply Chain Management Review***, 1, p. 10, General OneFile, EBSCO*host*, viewed 24 November 2015.

Svensson, G. 2002. A conceptual framework of vulnerability in firms' inbound and outbound logistics flows. ***International Journal of Physical Distribution & Logistics Management***, vol. 32, no. 1, pp. 110-134.

Tang, C. 2006. Robust strategies for mitigating supply chain disruptions. ***International Journal Of Logistics: Research & Applications***, 9, 1, p.33, Publisher Provided Full Text Searching File, EBSCO*host*, viewed 29 October 2015.

Tang, O., & Nurmaya Musa, S. 2011. Identifying risk issues and research advancements in supply chain risk management. ***International Journal Of Production Economics***, 133, Leading Edge of Inventory Research, pp. 25-34, ScienceDirect, EBSCO*host*, viewed 23 October 2015.

Triandis, H. C. 1993. Cultures and Organizations: Software of the Mind. ***Administrative Science Quarterly***, 38, 1, pp. 132-134, Business Source Complete, EBSCO*host*, viewed 14 December 2015.

Tsikoudakis, M. 2013. Reputations jeopardized by supply chain disruptions. ***Business Insurance***, 47, 1, p. 1, *Health Business Elite*, EBSCO*host*, viewed 11 December 2015.

Tyndall, G. 1997. Managing your global supply chains. ***Chain Store Age***, 73, 12, p. 24, Business Source Complete, EBSCO*host*, viewed 24 November 2015.

Välikangas, L. & Romme, A. 2012. Building resilience capabilities at "Big Brown Box, Inc.". ***Strategy & Leadership,*** vol. 40, no. 4, pp. 43-45.

Välikangas, L. & Romme, A. 2013. How to design for strategic resilience: a case study in retailing. ***Journal Of Organization Design***, 2, 2, pp. 44-53.

Vasvári, T. 2015. Risk, Risk Perception, Risk Management – a Review of the Literature. ***Public Finance Quarterly***, 60, 1, pp. 29-48, Business Source Complete, EBSCO*host*, viewed 29 October 2015.

Vyas, N. 2015. Four compass points for global supply chain management. ***Supply Chain Management Review***, 5, p. 54, General OneFile, EBSCO*host*, viewed 24 November 2015.

Whitman, L., & Panetto, H. 2006. The missing link: Culture and language barriers to interoperability. ***Annual Reviews In Control***, 30, pp. 233-241, ScienceDirect, EBSCO*host*, viewed 14 December 2015.

World Economic Forum. 2012. New models for addressing supply chain and transport risk. Available at http://www3.weforum.org/docs/WEF_SCT_RRN_NewModelsAddressingSupplyChainTransportRisk_IndustryAgenda_2012.pdf, viewed 14 December 2015.

Yang, P., Tang, J., & Yan, C. 2012. A Case Study of Global Supply Chain Risk Management. ***2012 24th Chinese Control & Decision Conference (CCDC)***, p. 1996, Publisher Provided Full Text Searching File, EBSCO*host*, viewed 28 October 2015.

Zaidah, Z. 2007. Case study as a research method. ***Jurnal Kemanusiaan***, p. 1, Directory of Open Access Journals, EBSCOhost, viewed 21 September 2016.

Appendix

Appendix 1: Risk Assessment and Evaluation Table

List of risks	Potential losses		Probability		Impact/ Consequences		Worst possible scenario	Is the worst possible scenario acceptable	Other considerations	Final evaluation of risk
	Quant. ($)	Qual.	Quant. (p)	Qual.	Quant.	Qual.		Yes/No		
Example: Reliability of suppliers										
Disruption of supply	$10000/day		0,25		$2500/day		Loss of 10% of customers if supply disruption lasts over 3 weeks	No	Many competitors with no quality differences who can supply to our customers	Serious
Macro										
Policy										
Competitive										
Resource										

Source: Manuj & Mentzer (2008a:145)

Appendix 2: Interview Guide

Interview guide

1. Describe your company's main activities.
2. Describe your supply chain (including upstream and downstream partners, their role and geographical location).
3. Who are your suppliers and your suppliers' suppliers?
4. Who are your clients and your clients' clients?
5. Describe the relationship with your SC partners.
6. Do you all perform collaborative planning and management? What kind of activities?
7. What is your perception and understanding of risk?
8. What is your understanding of SCRM?
9. Do you manage your risks together with your SC partners (collaborative work)?
10. How do you manage the quality of your suppliers' materials?
11. How do you manage your clients' quality?
12. What is the intensity of the variation on the demand of your products? How do you manage the risks arising from demand volatility?
13. From which side do you think most of the risks come from (Upstream or downstream)? At what level are they threatening?
14. Compare risks inherent to domestic SCs and global SCs.
15. Do you face any barriers for the well flow of information (information leakage, information delays, misunderstandings, information control by state organisms)?
16. How do you prevent, control and respond to risk related events and disruptions? Describe your strategies.
17. Describe the reputational risks your SC face.
18. Describe the cultural risks your SC face.
19. Describe the transportation risks your SC face.
20. Describe the financial risks your SC face.
21. What do you consider the most threatening risks your SC face? How do they impact into the operations continuity?
22. How do you assess and manage the aforementioned risks?
23. What was the most tragic threat you have ever faced? How did you overcome it?
24. What do you think can be improved in your SCRM strategies? (Do you have any ongoing plans for that purpose?)
25. At what level do you find the aforementioned risks both up and downstream the value chain controllable to your company?