

**YAŞAR UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION
MASTER THESIS**

**THE RELATIONSHIP BETWEEN SUPPLY-SIDE RISK SOURCES AND
SUPPLY BASE MANAGEMENT PRACTICES FROM GLOBAL PERSPECTIVE**

Kader TETİK

Thesis Advisor

Assist.Prof.Dr. Ceren Altuntaş VURAL

İzmir, 2016

TEXT OF OATH

I declare and honestly confirm that my study, titled “**The Relationship between Supply-Side Risk Sources and Supply Base Management Practices from Global Perspective**” and presented as a Master’s Thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions, that all sources from which I have benefited are listed in the bibliography, and that I have benefited from these sources by means of making references.

.. / .. / 20...

Kader Tetik

Signature



T.C. YAŞAR ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ TEZLİ YÜKSEK LİSANS TEZ JÜRİ SINAV
TUTANAĞI

ÖĞRENCİNİN		
Adı, Soyadı	:	
Öğrenci No	:	
Anabilim Dalı	:	
Programı	:	
Tez Sınav Tarihi	:/...../20.....	Sınav Saati :
Tezin Başlığı:		
.....		
Adayın kişisel çalışmasına dayanan tezini dakikalık süre içinde savunmasından sonra jüri üyelerince gerek çalışma konusu gerekse tezin dayanağı olan anabilim dallarından sorulan sorulara verdiği cevaplar değerlendirilerek tezin,		
<input type="checkbox"/> BAŞARILI olduğuna (S) <input type="checkbox"/> OY BİRLİĞİ 1 <input type="checkbox"/> EKŞİK sayılması gerektiğine (I) ile karar verilmiştir. <input type="checkbox"/> BAŞARISIZ sayılmasına (F) <input type="checkbox"/> OY ÇOKLUĞU		
2 <input type="checkbox"/> Jüri toplanamadığı için sınav yapılamamıştır. 3 <input type="checkbox"/> Öğrenci sınava gelmemiştir.		
<input type="checkbox"/> Başarılı (S) <input type="checkbox"/> Eksik (I) <input type="checkbox"/> Başarısız (F) Üye : İmza :	<input type="checkbox"/> Başarılı (S) <input type="checkbox"/> Eksik (I) <input type="checkbox"/> Başarısız (F) Üye : İmza :	<input type="checkbox"/> Başarılı (S) <input type="checkbox"/> Eksik (I) <input type="checkbox"/> Başarısız (F) Üye : İmza :

1 Bu halde adaya 3 ay süre verilir.

2 Bu halde sınav için yeni bir tarih belirlenir.

3 Bu halde varsa öğrencinin mazeret belgesi Enstitü Yönetim Kurulunda görüşülür. Öğrencinin geçerli mazeretinin olmaması halinde başarısız sayılır. Mazereti geçerli sayıldığında yeni bir sınav tarihi belirlenir.

ABSTRACT

Master Thesis
The Relationship between Supply-Side Risk Sources and Supply Base
Management Practices from Global Perspective
Kader TETİK

Yaşar University
Institute of Social Sciences
Master of Business Administration

The world is seeing a global marketplace with increased technology, knowledge and experiences in day-to-day business by companies. Global perspective, outsourcing, and the use of global resources have increased so that companies are facing the risks and their expanded influence. From this perspective, it is obvious that companies have become more dependent on their suppliers. The management system, financial condition, quality management systems, human resources, and power to meet with the demand of suppliers, doing business in different geographical regions all vary from each other. These differences have increased supply-side risks which companies face in the global environment. This is a reason that companies should manage their supply-side risk sources with supply base management practices.

This study describes which supply chain management strategy elements have what size effects to supply-side risk sources, and analyzes the relationship between these sources and supply base management practices. In the literature, there are different risk identification and management practices. Although supply-side risk sources which are affected by the supply chain management strategy elements, relationship between supply-side risk sources, and supply base management are issues that need serious attention, work done in this area is insufficient. The questions posed by the research were answered through triangulated research methodology that combines qualitative methods, such as comparative case analysis, quantitative research methods, like factor analysis, and regression and descriptive analysis. The Aegean Free Zone was chosen as a research sample because of having companies which supply raw materials from different parts of the globe, and send to their customers'

outputs in different locations in the world. The supply-side risk sources had been revealed after visiting ten companies in nine different sectors by failure mode and effect analysis method. Likewise, surveys were conducted on the companies operating in the Aegean Free Zone and Atatürk Industrial Zone. The results obtained here were that reduction of supplier base; increased outsourcing and product diversification can cause the supply-side risks sources such as incoming product quality problems, financial instability of a supplier and incorrect interpreting. These risks can be prevented and managed through supply base management practices such as quality assurance program for process and specific program. A collaborative attitude with suppliers, supplier evaluation, identification of the specific supplier deficiencies and development plans are important topics in supply base management.

Keywords: Supply-Side Risks, Supply Base Management, Supply Chain Strategy Elements

ÖZET

Yüksek Lisans Tezi
Küresel Perspektiften Tedarik ile ilgili Risk Kaynakları ve Tedarikçi Havuzu
Yönetim Uygulamaları İlişkisi
Kader TETİK

Yaşar Üniversitesi
Sosyal Bilimler Enstitüsü
İşletme Yüksek Lisans Programı

Teknolojinin geliştiği, bilgi ve tecrübenin günden güne arttığı, ülkeler arasındaki sınırların azaldığı bir düzende işletmeler dünyayı küresel bir pazar olarak görmektedir. Küresel bakış açısı, dış kaynak kullanımı, küresel kaynak kullanımı gibi tedarik zinciri yönetimi strateji öğeleri tedarik zincirlerinin risk ile karşı karşıya oldukları alanları arttırmakta ve etkisini genişletmektedir. Bu açıdan bakıldığında işletmelerin tedarikçilerine daha fazla bağımlı hale geldiği aşikardır. Farklı coğrafi bölgelerde iş yapan her bir tedarikçinin yönetim sistemi, finansal durumu, kalite yönetim sistemleri, insan kaynağı ve talepteki artışları karşılama gücü birbirinden farklılıklar göstermektedir. Bu farklılıklar küresel dünyada işletmelerin karşı karşıya olduğu risk kaynaklarını arttırmaktadır. Bu sebeple şirketler tedarik ile ilgili risklerini tedarikçi havuzu yönetim uygulamaları ile yönetmelidir.

Bu çalışma ile tedarik zinciri strateji öğelerinin tedarik ile ilgili risk kaynaklarını ne boyutta etkilediği açıklanmış, bu risk kaynakları ile tedarikçi havuzu yönetim uygulamaları arasındaki ilişki analiz edilmiştir. Literatürde farklı risk tanımlamaları ve yönetim uygulamaları vardır. Fakat tedarik ile ilgili risk kaynakların hangi stratejilerden etkilendiği, tedarik ile ilgili risk kaynakları ve tedarikçi havuzu yönetim uygulamaları arasındaki ilişki üzerinde önemle durulması gereken konular olmasına rağmen bu alanda yapılmış çalışmalar yetersizdir. Araştırmanın soruları, hem karşılaştırmalı örnek olay analizi gibi nitel yöntemler hem de faktör analizi, regresyon ve betimsel analiz gibi nicel yöntemler kullanılarak araştırma yöntemlerinde çeşitlendirme yaklaşımıyla yanıtlanmıştır. Dünyanın farklı

bölgelerinden hammadde temin eden ve yine üretimlerini farklı lokasyonlarda bulunan müşterilerine gönderen şirketlerin bulunduğu Ege Serbest Bölgesi araştırma sahası olarak seçilmiştir. Burada, dokuz farklı sektörde faaliyet gösteren on firma ziyaret edilmiş, hata türü ve etkileri analizi metodu ile tedarik ile ilgili risk kaynakları sektörel bazda değerlendirilerek üretim sektöründe öncelikli risk grupları ortaya çıkarılmıştır. Aynı şekilde, Ege Serbest Bölgesi ve Atatürk Sanayi Bölgesinde faaliyet gösteren firmalar üzerinde anket çalışması yapılmıştır. Buradan elde edilen sonuçlar, azalan tedarikçi yapısı, artan dış kaynak kullanımı ve ürün çeşitliliği gibi öğelerin girdi üründe kalite problemleri, tedarikçinin finansal değişkenliği ve ihtiyaçları yanlış yorumlaması gibi tedarik risklerine sebep olmaktadır. Bu riskler spesifik ürün kalite programları, süreç kalite programları gibi tedarikçi havuzu yönetim uygulamaları ile önlenabilir ve yönetilebilir. Tedarikçi ile kurulan işbirlikçi tutum, tedarikçi değerlendirme, belirli tedarikçi eksikliklerini tanımlama ve gelişim planları yapma tedarikçi havuzu yönetimi için önemli başlıklardır.

Anahtar Kelimeler: Tedarik ile ilgili risk kaynakları, Tedarikçi havuzu yönetimi, Tedarik Zinciri Strateji Öğeleri

TABLE OF CONTENTS

THE RELATIONSHIP BETWEEN SUPPLY-SIDE RISK SOURCES AND SUPPLY BASE MANAGEMENT PRACTICES FROM GLOBAL PERSPECTIVE

TEXT OF OATH	ii
ABSTRACT	iv
TABLE OF CONTENTS	viii
ABBREVIATIONS	xiii
INTRODUCTION	xiv
FIRST CHAPTER GLOBAL SUPPLY CHAIN MANAGEMENT AND SUPPLY CHAIN STRATEGY ELEMENTS	25
1.1. Management of Global Supply Chains	25
1.2. Literature Review on Global Supply Chain Studies	28
1.3. Supply Base Management in Global Supply Chains	32
1.4. Influencing Factors.....	37
1.4.1. Focus on efficiency	38
1.4.2. Globalization	39
1.4.3. Focus on central distribution	41
1.4.4. Outsourcing	41
1.4.5. Increased product variety	43
1.4.6. Centralized production	43
1.4.7. Reduction of Supplier Base.....	44
SECOND CHAPTER SUPPLY-SIDE RISK MANAGEMENT IN THE GLOBAL SUPPLY CHAIN	46
2.1. Risks in Global Supply Chain	46
2.1.1. Supply Risks.....	48
2.1.2. Operational Risks	50

2.1.3. Demand Risks	51
2.1.4. Security Risks.....	52
2.1.5. Other Risks.....	52
2.2. Supply Chain Risk Management from Global Perspective.....	54
2.3. Managing Supply Side Risks in Supply Chains.....	59
2.3.1. Risk Identification	60
2.3.2. Risk Assessment.....	62
2.3.3. Risk Prioritization	63
2.3.4. Risk Management.....	63
2.4. Supply-Side Risk Management from the Perspective of Supply Base Management.....	64
THIRD CHAPTER: AN EMPIRICAL STUDY ON MANUFACTURING INDUSTRY IN IZMIR.....	68
3.1. Qualitative Stage of Research	70
3.1.1. Failure Mode and Effects Analysis	71
3.1.2. Comparative Case Study	76
3.1.3. Analysis of Comparative Case Studies	77
3.2. Quantitative Stage of Research	88
3.2.1. Questionnaire	89
3.2.2. The Analysis of Survey Research	92
CONCLUSION.....	118
BIBLIOGRAPHY	127
APPENDIX	138

INDEX OF FIGURES

Figure 1. The research process.....	xxiii
Figure 2. The research method.....	xxiv
Figure 2.1. Supply Risk Management Process (Zeng, Berger, and Gerstenfeld, 2005).	60
Figure 3.1. Conceptual Framework.....	69
Figure 3.2. Qualitative Stage of Research.....	74
Figure 3.3. Quantitative Stage of Research.....	91
Figure 3.4. Research Model for Simple Linear Regression Analysis I.....	104
Figure 3.5. Research Model for Simple Linear Regression Analysis II.	107

INDEX OF TABLES

Table 2.1. Classification capability maturity model (PWC and MIT Forum, 2013).	59
Table 3.1. Criteria ranking (Paciarotti, Mazzuto and D’Ettorre, 2014).	75
Table 3.2. Criteria detectability (Paciarotti, Mazzuto and D’Ettorre, 2014).	75
Table 3.3. Criteria severity (Paciarotti, Mazzuto and D’Ettorre, 2014).	75
Table 3.4. The comparison of sectors.	78
Table 3.5. The FMEA for risk items which have high priority.	81
Table 3.6. The FMEA for risk items which have middle priority.	86
Table 3.7. The FMEA for risk items which have low priority.	88
Table 3.8. Demographics Analysis.	93
Table 3.9. Descriptive Statistics for Supply-side Risk Sources.	94
Table 3.10. Descriptive Statistics for Supply Chain Management Strategy Elements.	94
Table 3.11. Descriptive Statistics for Supply Base Management Practices.	96
Table 3.12. KMO and Bartlett's Test.	97
Table 3.13. Factor Analysis for Supply-Side Risk Sources.	98
Table 3.14. Factor Analysis for Supply Chain Strategy Elements.	100
Table 3.15. Factor Analysis for Supply Base Management Practices.	101
Table 3.16. Summary of Factor Analysis.	101
Table 3.17. Correlations and Descriptive Statistics.	102
Table 3.18. Model Summary for Simple Linear Regression Analysis I Dependent Variable: Internal to the firm.	105
Table 3.19. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: Internal to the firm.	105
Table 3.20. Model Summary for Simple Linear Regression Analysis I Dependent Variable: External to the network.	105
Table 3.21. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: External to the network.	106
Table 3.22. Model Summary for Simple Linear Regression Analysis I Dependent Variable: External to the firm but internal to the supply chain network.	106
Table 3.23. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: External to the firm but internal to the supply chain network.	106

Table 3.24. Model Summary for Simple Linear Regression Analysis II Dependent Variable: Supplier Integration.....	108
Table 3.25. Coefficientsa for Simple Linear Regression Analysis II Dependent Variable: Supplier Integration.....	108
Table 3.26. Model Summary for Simple Linear Regression Analysis II Dependent Variable: Supplier Evaluation.....	109
Table 3.27. Coefficientsa for Simple Linear Regression Analysis II Dependent Variable: Supplier Evaluation.....	109
Table 3.28. Summary of Regression Analysis.....	110

ABBREVIATIONS

BCM	Business Continuity Management
CTPAT	Customs Trade Partnership against Terrorism
EC	Efficient Customer Response
ETA	Event Tree Analysis
FMEA	Failure Mode and Effect Analysis
FTA	Fault Tree Analysis
GSCM	Global Supply Chain Management
ISO	International Standards Organization
IT	Information Technology
MRP	Material Requirements Planning
QR	Quick Response
RPN	Risk Priority Number
SBM	Supplier Base Management
SCRM	Supply Chain Risk Management
SRM	Supplier Relationship Management

INTRODUCTION

It is obvious that global supply chain research has not been as much of a focus as local or domestic supply chain studies. The studies of global supply chains only began in the year 2000. Scholars started to take notice of its challenges after September 11th, 2001 when a terrorist attack to the USA handicapped many global supply chains. A supply chain managers' task was viewed as dealing with consequences from events that can't be prevented or are unavoidable. These are things such as terrorist attacks, natural disasters, industrial disagreement, and wars as well as daily risks from usual supply chain failure (Ibrahim, Zailani, and Tan, 2015).

Global supply chain management has been given increased awareness by practitioners and academic researchers due to the growth in globalization. There has also been attention given to investigating the global issues in the literature (Prasad and Babbar, 2000). The specific issues needing focus on a global supply chain are the various factors, such as, customs duties and tariffs, trade barriers, currency ratios, incorporate revenue taxes (Kale, 2007), and also flows of cash and information (Vidal and Goetschalckx, 1997). Global supply chain management is more complicated than domestic supply chain management (MacCarthy and Atthirawong, 2003). A significant geographical space and longer delivery times not only makes transportation costs more difficult, but also inventory costs. Business processes have been affected by different languages, cultures and operations. Likewise, materials planning, inadequate infrastructure, lack of transportation and telecommunications, labor competencies, the suitability of suppliers, demanding forecasting, those challenges above seen like problems of the developing countries. (Meixell ve Gargeya, 2005). Distance and problems in coordinating all parts of the supply chain such as suppliers, forwarders, shippers, customs and networks has resulted in lead time issues. Solving the problems of lead times requires the ability to manage different cultures, legal and regulatory environments (Christopher, Peck, and Towill, 2006).

Firms perceive the whole world as a single market and carry their production facilities all over the world (Kırılmaz, 2014). Companies have a desire to set up their operations in a foreign market in order to compensate for offset requirements compensate offset requirements, take advantage of different sources and compete in a global area (Teng and Jaramillo, 2005). Manufacturers have set up factories in foreign countries in order to benefit from the commercial advantages of the low cost of direct labor, low logistics

costs in the international market and government support. Furthermore, they are open to overseas market due to supply reliability, proximity to their customers and suppliers, and organizational benefits (Meixell ve Gargeya, 2005).

Increased exposure risk in contemporary supply chain strategy elements which are globalization, requirements of being lean and agile, outsourcing, and globally sourcing makes the management of the supply chain harder than ever. Complicated relationships among the supply chain partners are a result of the complexity of the environment. These consequences are exposed to an extended supply chain (Ceryno, Scavarda, and Klingebiel, 2015). There are many studies about minimizing the effects of disruption in the supply chain by ideas and techniques of identifying, analyzing, and accommodating. Nevertheless, implementing strategies is costly and in many cases the market is too competitive to increase prices. Also, in certain situations, implementing measures for mitigating risks makes the system more complex and less feasible. In a complex environment, a company must improve its structure and management process accordingly (Yang and Yang, 2010). Adapting to the supply chain strategies such as outsourcing and sourcing globally makes the companies reduce the areas of risk. Although globalization is thought to result in lowering costs, being in the today's global market and sources is in itself a risk. A company may have low over-all costs but may also face the high probability of risk (Bary, 2004). Product proliferation, outsourcing, globalization, and organizational systems have all been building a more complex business structure. Companies and their supply chains extend globally and their management process have faced problems due to different cultures, technical standards, regulatory requirements and geographic distances (Yang and Yang, 2010). In sum, companies are required to be prepared for risk issues before they experience the negative consequences caused by risk sources.

Negative consequences can occur from suppliers which operate in different geographical places and have various operational structures and management types, limited sources and risks meeting with demand and supply, transportation disruptions and variability of transportation times, and political instability and natural disasters. Realization of how they are essential and what management practices and techniques are needed is an important issue to examine for managing the risk sources in the business environment. With reference to this discussion, the aims, importance and research questions are explained in the following subsection.

The Aims, Importance and the Research Questions:

The consideration of the risk implications of supply chain strategies (e.g. globalization, outsourcing, off shoring etc.) is an important issue for supply chain risk management implementation (Jüttner, 2005). Globalization increases the risk of supply and demand. Outsourcing makes the companies vulnerable due to creating dependency between companies and excess of the interfaces. In addition, off shoring (which is defined as companies investing overseas to gain a price advantage) makes the relationship complicated between companies because of a cross-national link among them (Ceryno, Scavarda, and Klingebiel, 2015). Ibrahim, Zaili; and Tan; (2015) argue the global supply chain literature is limited on leading factors, practices, strategies and also performance research. Due to limited study in the area that is mentioned above, this study is designed to contribute to the global supply chain research by exploring how supply chain strategy elements affect supply side risk sources, and the relationship between supply-side risk sources and supply base management practices.

Thun, Drüke; and Hoenig; (2011) claimed several developments that are different from what is in the past have forced companies to deal with new risk issues such as globalization, focusing on efficiency, centralized distribution and production, increased outsourcing and product variety. Companies are required to change their way of doing business in order to maintain the competitiveness of their supply chain because of these developments (Thun and Hoenig, 2011). Norman and Jansson (2004) also mentioned a number of business trends have affected the vulnerability of supply chains like the reduction of the supplier base, increased outsourcing, globalization, reduced buffers (e.g.inventory and lead time), increased demand and shorter life cycles and capacity limitation of key components. These trends have exacerbated the risk exposure as well as the impact of any supply chain disruption (Jüttner, Peck, and Christopher, 2003). For the supply chain contexts, there is a need for further research about the relationship between corporate strategy, risk and the implications for supply chain management which is poorly understood (Braithwaite and Hall, 1999). Supply chain risk management is an integral part of the supply chain strategy. Any strategic supply chain principle can have certain risk implications. Although in many industries these principles provide the base for enhancing performance or competitive advantage, they are also seen as potentially increasing the supply chains' risk exposure (Jüttner,

2005). From this point forward and in initial literature review in this study globalization, focus on efficiency, outsourcing, global sourcing, centralized production and distribution, reduction of supplier base and increasing product variety will be labeled as supply chain strategy elements.

In the global supply chain management literature, the research generally focuses on a single industry instead of various sectors (Ibrahim, Zaili, and Tan, 2015). That's a reason for first stage of this study that focuses on comparative case studies rather than just a single case study. Ho, Zeng, Yıldız; and Talluri; (2015) also mentioned that there is a gap in research measuring the correlations between risk factors and risk types or the likelihood of occurrence of specific risk types related with their factors. Field and case studies are needed to examine and forecast such correlations to focus on developing methods to examine the likelihoods of occurrence of specific risk types. Thus, every risk can be evaluated with regard to their relative importance and top management can plan and utilize their activities to mitigate the risk (Murugesan et.al. 2013). After recognizing and prioritizing, companies can be prepared for recovery time and the selection of appropriate strategies for different types of risk sources (Zeng, Berger, and Gerstenfeld, 2005). In addition to these, Jüttner (2005) argued that supply chain risk management has increasingly been given attention by practitioners and academics. According to their study 44% of companies have expected to have an increase to their supply chain vulnerability in the next years. That's a reason for the second stage of this study that focuses on how to explain the variance in supply-side risk sources with the help of supply chain strategy elements. Moreover, the relationship between supply side risks sources and different supply base management practices are also investigated. There are many proposed classifications in the literature often labeled as "supply chain risk sources" (Kleindorfer and Saad, 2005; Jüttner, 2005; Wagner and Bode, 2006; Murugesan, Natarajan, and Lakshminarayanan, 2013; Manuj and Menzter, 2008b). For example, Kleindorfer and Saad (2005) named three categories: operational contingencies, natural hazards (earthquakes, hurricanes and storms) and terrorism and political instability. Jüttner (2005) mentioned three categories (supply, demand and operational) and Murugesan, Natarajan; and Lakshminarayanan; (2013) mentioned six categories (supply side risks, manufacturing side risks, demand side risks, logistic side risks, information and environment risks) of supply chain risk sources. Since this study focuses on risks to be

dealt with by supply base management, the risk sources are specifically the result of a disruption emerging from the supply side risks sources (Wagner and Zsidisin, 2010). Focal firm or the supply chains as a whole can emerge by negative consequences from the perspectives of supply-side risk sources (Wagner and Zsidisin, 2010). Thus, supply base management is becoming more critical. Supply base management means how companies benefit their suppliers' processes, technologies, and capabilities to improve the opportunities for competitive advantage and how manufacturing, logistics, materials, distribution and transportation functions are coordinated within an organization (Tan et.al. 1999). From this point forward, nine practices which includes site visits, certification of suppliers' products and processes, and quality issues will be used to explore the relationship between supply side risks sources and supply base management.

Therefore, the main aims of the study are identified as follows:

- Identifying potential failure modes of supply-side risk sources in a supply chain with their causes and results, calculating the risk priority number and comparing different sectors.
- To explain the supply side risk sources with the help of supply chain strategy elements.
- Examining the relationship between supply-side risk sources and supply base management practices.
- Analyzing the managers' opinion about conceptual levels of philosophy, principles and processes in supply chain risk management.

Zsidisin and Wagner (2010) mentioned in their study that different products have different sourcing and market characteristics that affect its risk profile. That's a reason further research should focus on cross-sectorial samples to find out risk from a variety of industries and supply chain disruptions. A purchasing manager's perception of supply-side risks can be changed over time. Their reaction to their accumulated experience with supply disruption will differ depending on whether they have been exposed to the supply disruption from suppliers, supply markets, or the extended supply chain. The investigation of such effects is up to future research. Moving forward from this discussion the first groups of research question is formulated as per the below:

RQ1: What are the perceived importance levels of supply side risk sources in general and in a comparative manner among different industries?

RQ2: What are the main supply side risk source dimensions according to manufacturing industry?

RQ3: What are the main failure modes, their frequencies and effects in different global supply chain members?

A number of factors are thought to increase the risk level in the past century. These factors have led to the many supply chains coping with risks. Product variety that is offered to meet specific needs of the customer can lead to high complexity and vulnerability in the chain. Globalization has also affected how companies are doing business. Companies no longer focus on the local market. They spread globally for potential supplier and customer relationships. Even if spreading globally has given many opportunities in regards to potential relationships, complexity has increased in the global supply network. Because of complexity, supply chains are faced with high levels of risks and have revealed the need to be in close relationships and mutually dependent. Complexity and growing interest in lean manufacturing have been seen as sources of risk. Lean management needs to be efficient in order to create efficient supply networks. However, this process creates a supply chain which is open to risks. Single supplier and outsourcing which are the main strategies to cut costs have also affected the risk to the supply chain (Thun, Drüke, and Hoenig, 2011). The trend towards globalization is one of the strategies which increases the supply chain risk. In addition, companies focus on their core competences and outsource other parts of their work (Thun and Hoenig, 2011). Thus, supply chain risk management has been affected and faced some negative consequences related with these strategies. Due to the variety of supply chain strategy elements leading to supply side risks sources, the second group of research questions is defined as:

RQ4: What are the perceived importance levels of supply chain strategy elements in general?

RQ5: What are the main supply chain strategy elements according to manufacturing industry?

According to organizations in the United States, a global supply base is required for participating in the “world-class” competition (Hanfield and Nichols, 2004). Since

companies have downsized and now focus on their core competencies in order to achieve a competitive advantage (Tan, Handfield, and Krause, 1998), suppliers are responsible for most of the materials used in finished products and many processes and functions that were once controlled by their customers' organizations (Hanfield and Nichols, 2004). As a result of that, superfluous suppliers have been removed and trustworthy and competent suppliers have been consolidated by managers who want to manage their supply base in an effective way (Tan, Handfield, and Krause, 1998). Although a reduced supply base has created an opportunity for companies to manage their relationship with strategic suppliers, some problems in supplier performance such as poor quality levels or missed shipping dates caused by increased reliance on suppliers have occurred. In order to prevent these problems companies can use a variety of approaches such as securing alternative sources of supply, reversing the downsizing and bringing the outsourced products and services back inhouse (Tan. et.al. 1999). As the degree of confidence on the suppliers is increasing, the cost of physical supply can readily count for 30% of the total cost of goods sold. It means higher risk for managers, companies, and extended supply chains. Hereby, the success of an eventual supply chain has been affected by the efficient management of the supply-base (Zeng, Berger, and Gerstenfeld, 2005).

Therefore the third group of research questions is configured as follows:

RQ6: What are the adoption levels of different supply base management practices by different global supply chain members?

RQ7: What are the main dimensions of supply base management according to manufacturing industry?

RQ8: What are the relationships between supply chain strategy elements and supply-side risks, supply-side risk sources and supply-base management practices?

Jüttner (2005) mentioned an integrated supply chain management approach from a practitioner's perspective. The research questions are located at each of the conceptual levels of philosophy, principle and processes as a starting point for further development. Philosophy means changes have been affected by beliefs in a consistent manner from the supply chain context. Risk awareness can be determined by the risk-related beliefs. Their influences have had an affect on how companies manage risks and plan their business continuity. There are two philosophy levels. One is a need for

an openness to share risk-related information, and the other is the willingness to approve supply chain risks as common risks. Exploring motivators to sharing risk-related information is an important issue and also is a research gap. Principles are more open than philosophical issues due to need to establish the parameters. These parameters have been used in the strategic and operational risk management processes. Although companies have defined, optimized and standardized their key processes in the supply chain, they have not taken into consideration the risk implications of these restructured processes. In the last decade, supply chain strategies have been looked at from an efficiency perspective. Even if lean management and just in time approaches seem efficient and indispensable to be competitive in the supply chain, they can increase the risk sources. Trade-off decisions can be lead by the consideration of the risk implications in the supply chain strategies. As a result of that, there is a research gap and a need for further studies about how risk/performance trade-offs can be managed and optimized. Processes are activities, techniques and tools across time and place, from beginning to end, defined inputs and outputs, and a structure for action. For this phase the important part is how to organize the implementation, rather than find the new tools and techniques for risk assessment, management and continuity planning process in the supply chains. Moving forward from this discussion, the research question is an exploratory one:

RQ9: What are the managers' opinions about conceptual levels of philosophy, principles and processes in supply chain risk management?

The Research design of the study:

When the nature of the research questions are examined, it is observed that part of them are exploratory and part of them are explanatory in nature. According to scientific research design, exploratory research questions are attempted to be answered by qualitative research methods and explanatory research questions are attempted to be answered by quantitative research methods (Yıldırım and Şimşek, 2005). Therefore, in order to answer all research questions in an effective way, the triangulation approach to research design was chosen. Triangulation is defined as a combination of methodologies in the study of the same phenomenon. In the social sciences, the use of this technique goes back to Cample and Fiske (1959). They developed an idea named "multiple operationism" and argued more than one method should be used in the validation process (Tick, 1979). There are four main headings to classify the types of

triangulation which are triangulation of data, observers, theory and methods. Triangulation of the method refers to applying qualitative and quantitative data either sequentially or simultaneously. Triangulation is a method to complete missing points that quantitative and qualitative methods can not satisfy (Neuman, 2003).

First part of the study is based on Wagner and Bode (2006) supply-side risks which are considered to be in different sectors and comparing them by the qualitative method which is namely comparative case analysis. According to Sodhi, Son and Tang (2012) conceptual works and case studies should be applied in supply chain risk management research in order to keep close collaboration in the industry. Case studies basically focus on the development of the research questions and sub-problems, determination of the analysis areas, selection of the participating group in the study, data collection, analysis, interpretation and reporting results of the case study (Yıldırım and Şimşek, 2005). The second part of the data collection investigated the relationship between supply-side risk and supply base management practices (Tan et.al. 1999), with regards to strategy elements and the effect to supply-side risks (Thun and Hoenig, 2011) by quantitative method which is survey research. A survey is a research method which of a series of questions that describes the people's behavior, beliefs or attitudes. This method has some advantages such as easier data collection versus other data collection techniques (interviews, observations) and low cost (Thomas, 1998). Lastly managers are asked four questions within the survey which are proposed to be tested through empirical studies by Jüttner (2005). These questions relate to conceptual levels of philosophy, principles and processes of the supply chain management and analysis of the manager's opinion in relation to supply chain risk management. Samples are selected from the production industry through purposive sampling, from the companies located in Turkey. Industrial classification of this study is based on "Statistical Classification of Economic Activities in the European Community (NACE Rev. 2) 2015.

Figure 1. The research process.

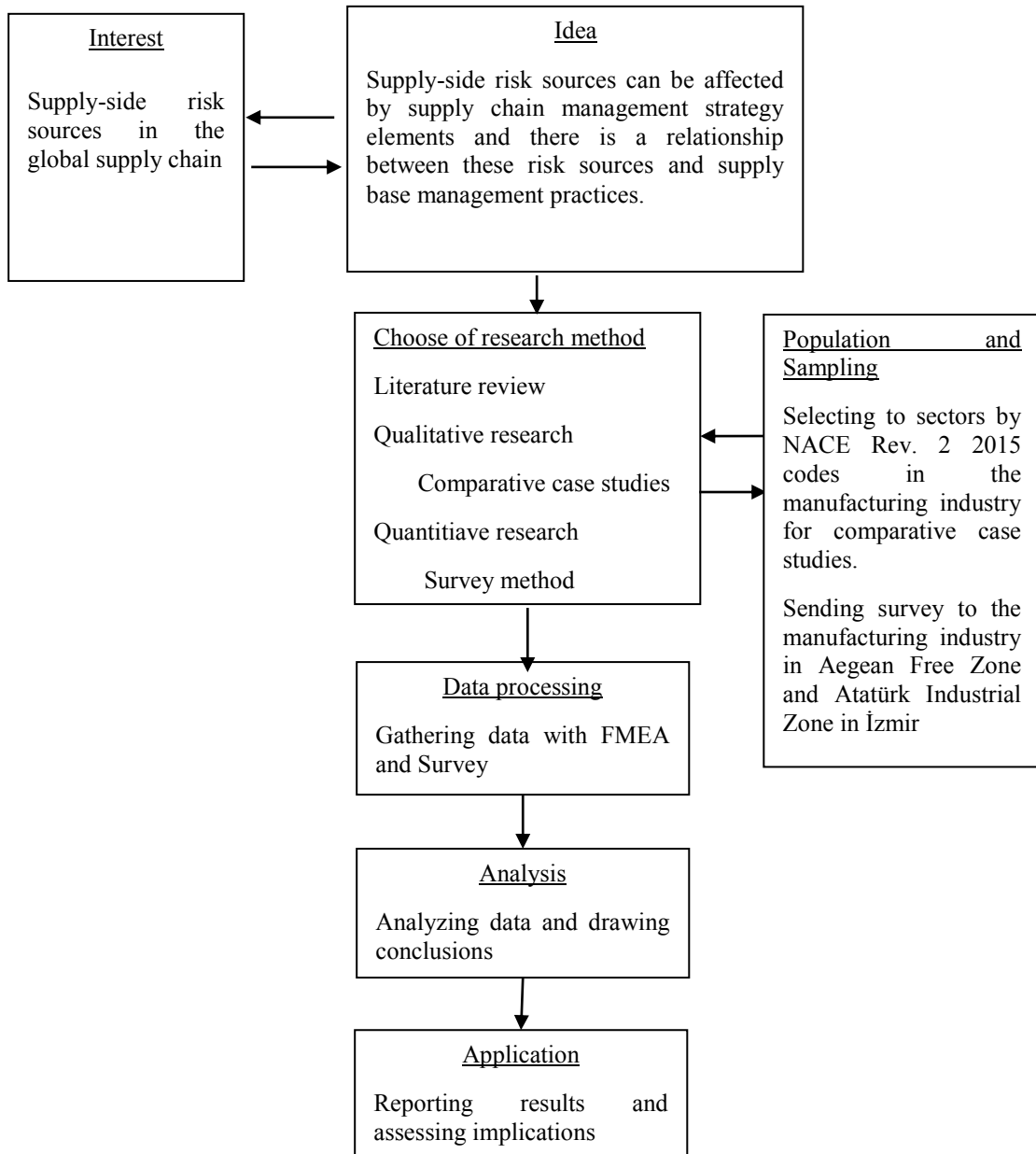
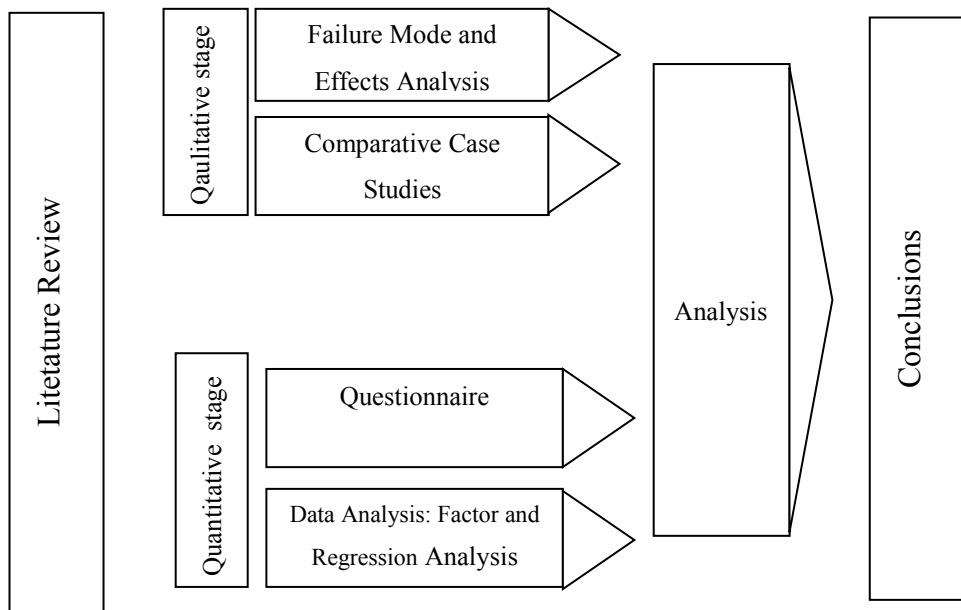


Figure 2. The research method.



The first step was selecting nine companies that operate on different sectors in the Aegean Free Zone in Izmir. These sectors are; processing of vegetables, fruits and storage; manufacturing of wearing apparel; manufacturing of leather and related products; manufacturing of paints, varnishes, similar coatings, printing ink and filler material; manufacturing of plastic products, manufacturing of fabricated metal products (except machinery and equipment); manufacturing of parts and accessories for motor vehicles, manufacturing of spacecraft and aircraft with related machinery and manufacturing of filling and packaging machines.

Plan for the research:

This study focuses on the supply chain strategy elements, supply-side risks, and supply base management practice in a global environment. The thesis consists of four chapters. In chapter one is the search for the current agenda in the field of global supply chain management such as various strategies, definitions, terminology and processes. The questions that are asked are what supply chain strategy elements are an influence to supply side risk sources and review to extend literature. Then explained are risk sources, supply base management and mitigation strategies with a thorough literature review in chapter two. Later, research methodologies, purpose and scope are described in chapter three and finally the research findings were presented.

FIRST CHAPTER GLOBAL SUPPLY CHAIN MANAGEMENT AND SUPPLY CHAIN STRATEGY ELEMENTS

1.1. Management of Global Supply Chains

The history of supply chain management goes back to the 1960s. The first emphasis of physical distribution which is the first stage of supply chain management is made by Bowersox. In addition to observing flows in the physical distribution, as a competitive tool, distribution function outside the company and channel integration with in-house was suggested also by Bowersox. After the introduction of Material Requirements Planning (MRP) in 1970, managers understood that there are important influences on supply delivery time on the internal work processes, production costs, quality and new product development. In the period, the companies formed a physical distribution department which carried out production and financial related distribution activities in their process. The necessity of merging all logistics system is thought instead of the optimization of any logistics activities. Thus, the cost of all logistics services' approach has been developed in order to reduce the whole system cost instead of dealing with each and every activity. As a result of integration, different warehouses, storage, transportation functions and customer service levels passed the physical distribution management. This period is also known as physical and distribution management. In the 1980s with increased global competition, world-class companies were forced to make high quality and reliable products with more design flexibility at a low cost. In this period supply chain management was replaced by the logistics phase. The "supply chain" term was first used by Houlihan in literature. Houlihan had developed an approach to combine the logistics focus and strategic decisions of the company. Then the Quick Response (QR) system was developed and used in the textile industry in 1985. Later Efficient Customer Response (EC) was developed and used in the retail sector in the 1990s. A further development of Efficient Customer Response, Continuous Replenishment Planning had emerged after the mid-1990s. Companies noticed the importance of matching suppliers of goods and services with the needs of customers. Companies also realized that is not enough to produce quality goods. For the new cost-effective method when, where and how they provide the product to the customer had become a priority to becoming successful. With all of these developments companies noticed that managing their own firms was not enough. Thus, involving the network of all

companies which are the upward direction (upstream) and downward direction (downstream) was necessary. This period is named as supply chain management in a literature (Özdemir, 2004).

Today, companies coordinate their suppliers with the perspective offered after 1990 by the supply chain management. Supply chain is a network of manufacturers who supplies the raw material and distributors who turned them into intermediate goods and finished products for customers (Lee and Billington, 1992). Another definition of the supply chain is a set of material, product and information flows between suppliers, logistics service providers, manufacturers, distributors and retailers (Kopczak, 1997). Christopher (1992) identified the supply chain as a network organization through upward and downward links in the all processes and activities of the goods and services. According to the definition by the Supply Chain Management Professional Association, supply chain management is to integrate supply and demand between companies including the processes of source procurement, purchase, conversion and all logistics management, and also coordinating to work together all suppliers, intermediaries, third-party service providers, government and customers (CSCMP, 2011). Davis et.al. (1999) based on the ability to work with suppliers in order to provide high-quality materials and components at a competitive price (Yuksel, 2007). The main objective of supply chain management is to work with the same goals of each organization and select the most efficient (cost, time, benefits, etc.) way. Therefore, companies which are part of the supply chain cannot be considered as independent organizations (Akman and Alkan, 2006).

Supplier locations and supplier selection decisions have been increasingly getting the attention of managers who design supply chains (Meixell ve Gargeya, 2005). Global buyers who produce high quality raw materials and components at the lowest total cost are the mediators between global consumers and local manufacturers. As a result of that, local industries have taken a place in the global supply chains (Kaplinsky and Readman, 2005). Gereffi and Korzeniewicz (1994) built up a model to connect the concept of a value-added chain by a direct route to a company. Their study focuses on integrating across firm limits and increasing the role of buyers (Ibrahim, Zailani, and Tan, 2015). Motwani, Larson; and Ahuja; (1998) mentioned a global supply chain management model which consists of five stages. The first step is to create

awareness and commitment. The top management of a company should understand the meaning of GSCM and how they plan to achieve it after defining the core competencies. The understanding of global supply chain management is to help companies in how they can develop. A document of the characteristics to the marketplace which is evaluated by surveying suppliers, customers, and competitors can be created. The second step is to search and plan to the selected criteria. Later expectations can be set and evaluated to the supply chain partner. A detailed assessment is needed for possible partnership. Some criteria is required to take the partner into the global supply chain like a company profile, the capabilities of personnel and management, financial constancy, strategies for supplier sourcing, and a long-term relationship. The third step is to select effective measures, indicators and operating standards. Competitive benchmarking is performed. The Fourth step is to implement and evaluate the standards and reward system for improvements. The last step is to evaluate program, strategic and operational aspects and if redesign is needed the program should be revised.

Companies have become more networked and dependent organizations with supply chain management principles. Companies have adapted to globalization and outsourcing strategies in order to gain competitive advantages and because of cost pressure. Thus, nodes increasingly go up in the system. Increased network complexity and interaction between different parts of the chain makes the supply chain more vulnerable than in the past. Higher dependency on external retailers and short product life cycles are also important factors that affect the vulnerability of the supply chain. The consequences of these disruptions can have a bad effect on the supply chain ways such as financial losses, a negative corporate image or bad reputation (Murugesan et.al.2013). Managing a company globally also creates concerns in some areas related to economic, politics and logistics. Flows of goods, services and information are required to be managed simultaneously. Cash within and across national boundaries are also important to be well-coordinated in a supply chain which is complex (Manuj ve Mentzer, 2008a). Thus, supply chain management which cannot be well managed may result in supply chain interruption that can be very costly. This situation causes substantial delays affecting stock-outs and lack of the ability to meet customer demand. In conclusion the costs can be very high (Blackhurst et al., 2005). Sourcing, distribution and service networks cannot be

managed without using plans. Locations and corporate resources need proactive management in order to decrease innovational lead time and enhance new product introduction. Sharing of information and plans with the suppliers and customers can increase the efficiency and competitiveness of the chain. In sum, companies should be well-operated in order to take advantage of the long distance property, factor and capital markets in a global basis (Manuj ve Mentzer, 2008a).

1.2. Literature Review on Global Supply Chain Studies

Prasad and Babbar (2000) stressed the increased attention to global supply chain research by significant operations management and logistics journals. Meixell and Gargeya (2005) mentioned supply chain management is not just domestic management philosophy, which exceeds national boundaries to force specific challenges on managers. Supply chain management scope should cover all value-added activities, with the inclusion of subtraction of raw materials, sourcing, transportation, transformation processes, distribution channels, and delivery to the end customers (Tan, 2001). According to Li and Lin (2006) the global supply chain model does not make any distinguishment between sourcing and distribution globally or domestically. However, Vidal and Goetschalckx (1997) stresses domestic supply chains are limited within just one country and at the same time some factors affecting the global supply chain such as international trade rules and tariffs need to addressed. A domestic and international strategic production-distribution center can differentiate for single country or countries in conjunction with selecting suppliers, locating facilities, and warehouses. Sajadieh (2009) mentioned the differences can result from the company's worldwide suppliers. Large geographical distances, increased transportation costs and complicated logistics are the main factors to distinguish domestic and global supply chains. Other factors that also have an effect on the lead time are diversity of culture and language, laws and currency (Ibrahim et.al. 2015). Balan, Vrat, and Kumar (2006) noted different factors such as geographical division, technology and culture have affected the management of supply chains in a world base. For instance, local manufacturers in Japan and New Zealand are affected by the competitive advantage because of their geographical division. Cultural factors that can result in faults are caused by bad communication between various parts in the supply chain. Multinational or domestic supply chains can prefer to use different levels of technology. Technology transfer or knowledge has affected the

management of the global supply chain. Some mechanisms have been used in order to allow the sharing of ideas, drawings, designs and reports among different parts of the chain. If the engineers discover a new way to decrease the variability of the process, that information should be reachable for the engineers who work in different countries despite language barriers. Blos et.al. (2009) mentioned three main practices are important during the phase of supply chain management. These are “*better supply chain communication, supply chain risk management (SCRM) and business continuity management (BCM) training program, and a creation of a chief risk officer (CRO).*” Imperfect communication has resulted in some effects between partners of the supply chain. These effects are problems of controlling key processes, visibility problems, performance of partners, uncertainty and lack of clarity of who is responsible for what, and problems with partner relationships. A supply chain risk management and business continuity program can create a connection among the business processes and critical business activities. Thus, required resources can be analyzed as well as the impact from any damage on resources will have on a business. Creation of a chief risk officer also has a crucial importance to forecasting the possible chain reaction of any event. In this way, the ripple effect can be spreaded from one business unit from the other.

Globalization increased the competitive pressure and multinational corporations have become the main factors for economic growth (Ibrahim, Zaili, and Tan, 2015). Multinational companies have increased their business by expanding global markets in order to use the benefits of global markets, such as cheap raw materials, facilities and cheap labor. They are able to compete on price with local firms by moving far away from where their products are found despite the increasing logistics costs (Kırılmaz, 2014). Besides, entering foreign markets, earning foreign currency, diversifying exports, and acquiring new technologies are also important issues for companies in a global supply chain (Ibrahim, Zaili, and Tan, 2015). Companies have also outsourced some of their functions. Thus, a global supply chain is an essential step for companies to cut costs, get new technology, and extend their market share (Ibrahim, Zaili, and Tan, 2015).

Global supply chain is defined as networking and outsourcing activities on a global basis by Balan et.al. (2006). Integrating across national borders to remove the activities which are non-value adding among the members and processes of global

supply chain is a way to effectively manage the global supply chain. Forecast information must also be shared between the partners for reducing the bullwhip effect. There are good examples that show how effective well-implemented global supply chains are such as Wal-Mart, Toyota, and Dell (Ibrahim, Zaili, and Tan, 2015).

Global Supply Chain Forum identified eight stages of the supply chain management process (Croxtton et.al. 2001). These are;

1. *Customer Relationship Management*
2. *Customer Service Management*
3. *Demand Management*
4. *Order Fulfillment*
5. *Manufacturing Flow Management*
6. *Procurement*
7. *Product Development and Commercialization*
8. *Returns*

These benefits can be obtained to achieve the goal of customer satisfaction, the establishment of communication along the chain through coordination and control activities with the common goal, reducing costs, increased productivity and profitability. Sharing information and coordination among companies in the supply chain decreased uncertainties in demand. In addition, the result of confidence and cooperation among companies to be established, by the way of reducing barriers and increasing flexibility can be taken big advantage of against competitors when offering new products and markets. In this way, the customer satisfaction level increases can be achieved (Özdemir, 2004).

Cagliano et.al. (2008) mentioned even though global supply chain has developed over the last two decades, there is an insufficiency of reliable evidence in the literature. Ibrahim, Zaili; and Tan; (2015) argue the global supply chain literature is limited on leading factors, practices, strategies and also performance research. Although the definitions of global supply chain have surfaced in several reputable international journals, there is a lack of consensus among them. However, the one issue that it refers to is global context. Due to limited study in the area that is mentioned above, this study designed to contribute to the global supply chains (Ibrahim, Zaili, and Tan, 2015).

Systematic Studies in Global Supply Chain

Referring to the global environment the term of global supply chain can be explained as networking among companies anywhere in the world and sourcing of materials on a worldwide basis. Global supply chain studies have been starting to be focused on over the last two decades. Many issues and challenges of the global supply chain have been debated in literature. Ibrahim, Zailani, and Tan; (2015) categorized global supply chain studies in the industry sectors that were issued in the last 15 years. The total number of studies are 165 and can be listed with the inclusion of others 39; not specified 32; electrical/electronic equipment and electronic parts 19; computer electronic equipment 9; product/component/manufacturing industry 8; food/beverage manufacturing 7; metals/ metal refinery and stamping 7; machinery manufacturing 7; telecommunications/communication equipment 6; textiles/fiber/fashion industry 6; transportation and transport equipment manufacturing 6; chemical 5; automotive industry 5; medical/medical equipment 4; rubber and plastic 3; global third party logistics service providers (G3PLs) 3PL (Ibrahim, Zailani, and Tan, 2015). Perspective, conceptual, descriptive, empirical, exploratory cross-sectional and exploratory longitudinal methodologies are major research methodologies (Malhotra and Grover, 1998). Perspective studies reach on the perceptions of the writers. Conceptual studies can be descriptive about the basic and key concepts in the studied area. Research subject is described, formulated and made a model by descriptive studies. Surveys, case studies, review of literature are ways to collect the data for empirical studies with the taxonomy or typology approach. Data is collected for exploratory cross-sectional studies from a single point in time. Data collecting from two or more points over time at the same topic is collected by exploratory longitudinal studies in order to show before and after a test. Global supply chain studies' methodologies can be specified as 25 conceptual, 24 empirical (survey/exploratory cross sectional), 21 exploratory (case study), 11 empirical (modeling), 5 perspective, 5 review, 3 descriptive and 1 exploratory (exploratory longitudinal) (Ibrahim, Zailani, and Tan, 2015). Theory can be defined as an interconnected notion, description and proposals that gives a systematic view of occurrence by determining relationship among variables. The purpose is to explain and predict occurrence (Malhotra and Grover, 1998). Mostly used theories in the global supply chain area can classified as 8 resource-based view, 3 transaction cost

theory, 3 internationalization theory, 2 contingency theory, 2 game theory, and 2 network theory (Ibrahim, Zailani, and Tan, 2015).

Ibrahim, Zailani; and Tan; (2015) claimed their study samples occur from the 211 articles that included global and non-global supply chain research. 93 of them (44 percent) were related with global supply chain issues which show the global supply chain issues are secondary to non-global supply chain. Even though the studies of supply chain have been made in almost every part of the world, they are focus on specifically in advanced countries. Hence, the under-researched countries or regions should be encouraged to do more studies in these areas. The other important point is the research focuses on consumer industries mostly. Some of these are electronics, automotive, and telecommunications. The other sectors are agricultural, construction, marine transport and the retail segment. Lastly, multinational corporations have been mostly applied to global supply chain practices rather than small and medium enterprises. In sum, there has been increased attention to the global supply chain research from all over the world and various perspectives. Countries, companies and managers have to consider how to realize, identify and manage their supply chain in the lights of these developments.

1.3. Supply Base Management in Global Supply Chains

Supply base and supply chain management has been attempting to achieve competitive advantages by downsizing and focusing on core competencies. Many companies have preferred to work with their most competent and trustworthy suppliers instead of redundant suppliers in order to well-manage their supply base. Thereby, companies have begun to establish cooperative and mutually beneficial relationships with their suppliers due to viewing them as virtual extensions. The supplier-manufacturer partnership is an essential philosophy which creates an area for cooperation and innovation. For instance, Procter & Gamble reduced the cost of goods by 4% by its successful supplier-manufacturer partnerships, when the other supply chain increased costs by an estimated 25%. However, companies' dependency on their suppliers is significantly increased by downsizing and outsourcing activities. There are many approaches and tools to address the problems which resulted from supply base performance and capabilities such as reversing the downsizing emphasis, going back to outsourced products and bringing services back-in house, searching for alternative sources of supply, and working with existing

suppliers (Tan, Handfield, and Krause, 1998). A variety of techniques have been used for supplier development by the companies such as supplier evaluation, performance measurement, identification of specific supplier deficiencies, and a development plan to effectively correct these problems. Measurement of the supplier's delivery, quality, and cost performance are also part of the effort to develop the suppliers by companies. Supplier development is more than just supplier evaluation which may include site visits, certification of suppliers' products and processes, and setting performance goals for suppliers. Thereby, buyer-supplier interface has been increased by the willingness of the buying firm. Sharing confidential information with suppliers, negotiating annual contracts, utilizing suppliers' expertise in technical areas have been given more attention through this way (Tan, Handfield, and Krause, 1998). In reviewing the supply base management literature, several central themes have emerged like supply chain management and customer-supplier relationships (Tan, Handfield, and Krause, 1998). Supply base management is defined as a systematic dynamic approach in order to manage the current suppliers, minor suppliers, and also potential suppliers (Melnyk et.al. 2009). Supplier Base Management (SBM) is based on frameworks and insights drawn from the Supplier Relationship Management (SRM) (Moeller, Fassnacht, and Klose, 2007).

Supply base management covers the issues related to the management of major and minor suppliers, scouting, and transition management. A major supplier needs minor suppliers and a proactive scouting strategy. The minor suppliers complete some important tasks; firstly they can develop into future major suppliers, secondly suppliers' capabilities and talents can be evaluated, thirdly these suppliers can be integrated into the major suppliers by transferring knowledge or acquired by them, fourthly inventory of potential capacity can be provided. Scouting system refers to improving the minor suppliers for the future. In addition, the scouting system is required to be proactive and strategic in scope as well as being aligned with the organization's goals and being able to consider the potential young talent. Implementing these systems gives several advantages such as identifying potential suppliers and scouting the opposing teams' actions, processes, and management systems. Transition management provides a defined process for knowledge transfer with minor disruptions (Melnyk et.al. 2009).

Handfield and Nichols (2004) claimed key issues in global supply base management are as follows:

- The importance of trust in buyer-supplier relationships
- Communication is a key
- The personal aspect of supply base management
- Maintaining positive buyer – supplier relationships in difficult economic times
- One size does not fit all
- Supply chain design: We are all in this together
- Measuring supply base performance
- Sharing accurate information: Making sure that everyone is on the same page
- Data represents different things at different times to different people
- Reverse auctions: Can your organization really afford them?
- Do we have the “right” people to do the job?

Trust is important to maintain positive and productive supplier relationships. Handfield and Nichols (2004) noted an example about Chrysler. Thomas Stallkamp built an organization for Chrysler and its suppliers trusted him. When things went wrong, suppliers would help Chrysler with some critical needs. In order to give examples these needs are premium transportation, engineering changes, expediting, solving start-up problems, and others. In normal situations, no suppliers do it for any companies or anyone else because of feeling under pressure or additional costs. In sum, managing supplier relationships positively provides a competitive advantage (Handfield and Nichols, 2002).

Communication is an essential success factor for global supply base management and being good communicators is not as easy as thought. Communication problems do not just refer to differences or misunderstandings in spoken language. There are many differences in language, culture, customs, and business practices in the global environment and to achieve effective communication across the global supply base is immensely connected to these differences. Communication and information sharing are the most important supply manager’s skills which need to improve in the current supply chain management workforce because lacking these skills creates significant shortcomings (Monczka et.al. 2008). Obviously, being effective communicators both

within the organization or with the suppliers and understanding the increased importance of information are crucial topics for supply chain management (Handfield and Nichols, 2004).

The natural aspect of supply base management is the personal relationships and this topic also becomes a precision balancing act in the global environment. Supply base management professionals are in contact with many people from different suppliers' organization. The development of personal relationships helps to maintain understanding and trust among the parts and their organizations. There are four different forms which are transaction cost economics, organizational design, relational theory, and network theory that support the concept of the importance of communication and building trust with suppliers (Handfield and Nichols, 2004).

Building positive buyer-supplier relationships can be immensely hard in difficult economic times. Mutually beneficial business relationships with suppliers and customers have been focused on by supply management professionals. Even though building long-term relationships with select suppliers is preferred most of the time, these relationships should not dissuade from the other suppliers relationships. Again, suppliers require sensing the economic realities the buying firm faces. Thus, communicating the realities of the situation is highly important. There are some recommended guidelines for establishing a positive supplier relationship. Parameters should be established for bidding and rebidding in order to ensure a fair, consistent and unbiased process. Supplier's price, terms and specific information should be confidentially maintained unless it is required by government regulation. Making unreasonable demands should be avoided and problems should be solved by a prompt and fair resolution. Communication should also be open and prompt. Business relationships should be professional, cooperative, and objective (Handfield and Nichols, 2004).

There are different business rules and operating procedures within different organizations. Managing complex systems is important across multiple locations of a global supply base. That's why companies should apply a well-functioning standardized system which requires a wide variety of different implementation approaches across supplier locations. Thus, data definitions and structures should be standardized using a common conceptual schema. Integration of databases should be

harmonious and coherent because lack of data integration can result in the lack of a common, standard language for communication (Handfield and Nichols, 2004).

Supply chain associated functional groups and suppliers are required to be involved in the activities in order to make optimal contribution (Monczka et. al. 1998). Purchasing, logistics, and order fulfillment personnel should be part of the design decisions before the most important decisions are made due to take their valuable contribution. This is also an important issue for companies who are making sourcing decisions in general because sourcing decisions are set by cross-functional commodity teams. In sum, multiple parallel relationships have critical importance and should require developing among the functional groups (Handfield and Nichols, 2004).

Supplier performance must be measured effectively. This is a primary need for effective supply base management. Although the widespread and coherent measures for companies are to focus resources, identify performance glitches, develop strategies, and determine the total cost of ownership for purchased items, suppliers, and the entire supply chain, there are some points to be seen as critical for supplier performance measures such as reducing costs, mitigating risks, and driving continuous improvements (Handfield and Nichols, 2004).

Information sharing is also an important topic for making sure that everyone is on the same page. For example, a typical commercial shipment includes 9 different participants, 20 separate documents, 35 customer-supplier interactions and multiple transport nodes. These issues can take place over many months and cross multiple international borders, creating many possibilities for miscommunication. There are many miscommunication pitfalls such as using a different set of codes, time zone reconciliation from disparate systems, the nonlinear relationships and hierarchy between documents (e.g. purchase orders, purchase order line items etc.), source system data quality, data which does not cover the necessary operational requirements or is not available when it is needed. The solution to these kinds of data problems is meeting face to face in order to attribute meaning. Data definitions should be created from business and technology owners from all source information systems and common definitions agreed upon for all data exchanged. Then, a data dictionary and guidelines can be published and reviewed periodically to ensure they

are correct and up to date. Lastly, information systems and communication is an essential requirement to develop and implement in order to allow a level of automation and effectively link parts of supply chain (Handfield and Nichols, 2004).

1.4. Influencing Factors

Global supply chains have a significant role in organizations achieving a competitive advantage (Motwani, Larson, and Ahuja, 1998). Improvements can affect the business a company is doing. Companies have realized the potential of global markets and customers, and have to satisfy their customers by increasing their range of products in a complex environment. As a result of that, companies are more closely associated and highly linked with each other than past (Zsisidin et al., 2005).

The global environment is shaped by the inclusion of market forces, technological forces, cost forces, political and macroeconomic forces (Fawcett et al., 2008). Motwani, Larson; and Ahuja; (1998) stressed the global supply chain must be managed with the possession of these forces in order to minimize cost or delivery lead time in international trading. Companies are faced with uncertainty of demand and supply. In order to reduce uncertainty demand should be synchronized with supply. Processes should be integrated based on the demand of the customer and strategies used to achieve a high level of productivity and quality (Ibrahim, Zailani, and Tan, 2015). The important issue is the risk handling and sharing throughout the supply chain. Risk drivers have an affect on the likelihood of risk sources. Leaner and more integrated supply chains have been affected by the uncertainties, activities and incidents. Industries are moving in the direction of longer supply chains due to outsourcing. Business trends can trigger risks in supply chain such as globalization, reduction of the supplier base, integrated processes among companies, reduced buffers (e.g. inventory and lead time), shorter lead times, shorter product life cycles (Norman and Jansson, 2004; Jüttner, Peck, and Christopher, 2003; Ceryno, Scavarda, and Klingebiel, 2015), product variants, global sourcing, the focus on efficiency, partnerships and other close relationships, centralized distribution, centralized production, supplier dependence, and customer dependence (Jüttner, Peck, and Christopher, 2003; Ceryno, Scavarda, and Klingebiel, 2015). These certain trends and strategies might change the attributes of supply chain management due to competitive pressures. Globalization and increased product variation are the key elements that have affected the supply chain complexity. Outsourcing, reduction of

suppliers or a focus on efficiency which are the because of maintaining a lean supply chain have affected the supply chain efficiency (Jüttner, Peck, and Christopher, 2003).

Karabulut (2004) noted four factors that lead to a global network of relationships. These are macro-economic, political, technological, and organizational factors. Macro-economic factors can be listed as productivity differences between countries, exchange rate fluctuations, and a gap between developed and developing economies. Political factors include the increase of regional integration to encourage trade, liberalization of input factors which produce, increased attention for the protection of intellectual capital (especially in regional blocs), in emerging markets, the increasing intervention of the higher association of nations to promote global trade. Technological factors include communication and transport costs, lack of information technology in emerging economies, and growth in heavy industry. Organizational factors can be listed as effective management, changes occurring in the economy, and development of a global mind-set management organization.

There are many classifications about strategies that have an affect on the supply chain. This study based on Thun and Hoeing (2011) classification groups seven key strategies that have an affect on supply chain. These can be seen as follows:

- Focus on efficiency instead of security aspects
- Globalization of the supply chain
- Focus on central distribution
- Enforced outsourcing
- Reduction of supplier base
- Increased product variety
- Centralized production

1.4.1. Focus on efficiency

Supply network can be done horizontally or vertically. Changes or relationships in the supply network can up and down. Integrated supply chain has been occurring due to the importance of efficiency instead of effectiveness (Jüttner, Peck, and Christopher, 2003). The need for a lean supply chain is a key development in affecting supply chain risks. Lean management approaches have indicated to be very efficient and unavoidable, specifically in the automotive industry, for achieving

competitive success. With the leaner and more integrated supply chain, uncertainties, dynamics and accidents in one link affect the other links. Companies outsourced their other activities in order to focus on their core competencies. As a result, outsourcing has increased the amount of interfaces and the dependency among parts of the supply chain causes the network to be more open to risks (Thun and Hoenig, 2011). Norrman and Jansson (2004) argue there is no clear interrelation between supply chain risk management and current supply chain management principles. Supply chain risk management should be analyzed from the perspective of efficiency. In the last decade, modern supply chain strategies have mainly been viewed from an efficiency perspective. More research should be conducted on the risk implications of these modern supply chain management principles and their effective usage. For instance, Engardio (2001) stressed that even if lean manufacturing and just-in time supply chains have been boasted, some of risks have come into the open by using these forms. Svensson (2002) argued that although the just-in time issue has been given attention in many various perspectives, vulnerability issues need to be explored. Sheffi (2002) mentioned that the consideration of risk implications has become indispensable and has lead to trade-off decisions by the supply chain strategists (Jüttner, 2005).

1.4.2. Globalization

The origin of the word “global” goes back 400 years, but the concept of “globalization” is a relatively new phenomenon. The concept of globalization appeared in the 1960s, but has been frequently used in the later 1980s (Waters, 1995). In the 1990s, globalization became a key word which scientists recognized the importance of. Today there is a very large amount of literature on globalization. In today’s world a new economic restructuring has emerged by new energy systems, innovations, electronic data communications, and flexibility of borders (Yıldızoğlu, 1996).

Globalization is a process that includes adverse tendencies with the reducing importance of distance in all fields, such as, political, economic, social and cultural. The process of a world’s integration of all these fields represents an emergence of the global economy (Mattsson, 2003). The results of this new economic structure have been seen in the cultural, sociological, economic and technological fields. These developments and changes have revealed new searches, insights and approaches in

parallel to the developments in communication and transportation in the last twenty years. The second half of the twentieth century's emerging economic, social, cultural, ecological and technological developments have caused significant changes and requirements on lifestyles and social habits (Yıldızoğlu, 1996).

Although there are many definitions of globalization, there is a lack of consensus in terms of the construct's meaning and its antecedents. In general, within the concept of interdependency it can be defined as increasing the degree of communication and interaction of its activities and resources between different markets in the global surface (Mattsson, 2003). Fujita and Thisse (2006) noted that there are three major globalization processes. These are transportation, trade costs, and new information and telecommunication technologies. Globalization is a concept including such issues as economic, socio-cultural and political development between countries, technological relations, a better knowledge of different social and cultural beliefs and expectations, and the intensification of international relations. The global age has emerged and requires living in a more complex environment. In other words, people are more connected with each other than in the past. Globalization is a concept that goes further than internationalization and is also complex; in this context it is a phenomenon that increases the flow of goods and services within the borders of countries and regions and the functional integration of the nation (Dicken, 1992). Globalization is a result of developments in communication, transportation, and information technology which makes transportation easier, faster and cheaper. Economic, socio-cultural, technological, and political processes are not able to be separated from each other with precise lines (Coştu, 2005).

Mattsson (2003) stressed that the global market is created in a continuous manner. The nature of the global market is complex. The global market complexity is considered to be exogenous and endogenous. From the perspective of complexity, exogenous means originated externally, which is problems caused outside the company. Endogenous means originated internally, which is problems caused within the company. In addition, the lack of information about some issues (such as concerns about corruption in developing countries) "change" or are "immutable" contribute to the uncertainty faced in the global supply chain (Nelson and Toledano, 1979). Companies must worry about overcoming the immense challenges of the

global environment in a global supply chain in order to achieve a competitive advantage (Ibrahim, Zailani, and Tan, 2015).

1.4.3. Focus on central distribution

There are many benefits to the centralization of distribution models and warehouses. Firstly, efficient warehouse operations have been developed by focusing on increased volume which occurs with centralized locations. Centralized locations refer to having just a few stock points. Secondly, centralized distribution helps to keep less capital binding. Capital binding is required to obtain a certain service level compared with a decentralized distribution model. Material flows will increase because of fewer stock points. Efficient automated technology is needed due to increased flows of goods and that makes the processes faster. Less stock is needed to build up in the centralization of distribution. The bullwhip effect is related to the stock point's number in the supply chain decreasing in the centralization of distribution. The risk for material shortage can be reduced by the minimizing of wrong dimensions. Controlling a centralized warehouse compared with a decentralized one is also easier. In addition, the safety stock and transportation cost can be reduced by this form of distribution (Fröderberg, 2006).

1.4.4. Outsourcing

Outsourcing which can also be labeled as "production sharing," "hollowing out," or "offshore sourcing" in the literature, is important because it is a part of global strategy development (Kotabe and Swan, 1994). Outsourcing is a decision to take certain services which require expertise from another organization (Embleton and Wright, 1998). Companies focus on their core capabilities and outsource other activities from another company. Outsourcing products and services in the global supply chain may be for local or international use (Manuj and Mentzer, 2008b). Outsourcing has had an affect on the relationships between parts of the supply chain and changed the structure and processes of the supply network (Harland, Brenchley, and Walker, 2003). If the company outsources their activities within the country, it engages in standard vertical integration. If the company outsources their activities within the foreign countries, it engages in foreign direct investment (FDI). Outsourcing requires an organizational restructuring of some activities. The definition of off-shoring is often associated with the use of cross-border supply in the global supply chain (Manuj and Mentzer, 2008b). The difference between

outsourcing and off shoring is that off shoring is restructuring the firm along another dimension, specifically geographic (Contractor et.al., 2010).

A strategic planning process which includes decisions of when, where and what to outsource is a really important issue for companies (Gereffi, 1999). Outsourcing and off shoring support the company in three strategic needs. These are efficiency, exploration and exploitation (Dunning, 1993). Most of multinational corporations have outsourced their production functions in order to cut costs even though there are unpleasant inclusions of globalization (Gereffi, 1999). Many factories in the United States of America have replaced their plants to other countries in order to cutdown costs. Their business strategy is redesigned according to their global outsourcing actions (Teng and Jaramillo, 2005). Outsourcing is influenced especially in recently industrialized countries from the use of cheap labor, access to knowledge and talented people and exporting of the finished products to other countries (Kotabe and Swan, 1994; Dunning, 1993). Many factors have affected the source of products in the global environment (Blackhurst et al., 2005). Reduced costs and cost reduction opportunities have become a primary motivator (Blackhurst et al., 2005; Trent and Monczka, 2003). Faster product and process technology have also been important for global sourcing. Furthermore, an extensive and competitive structure makes the businesses interested in global resources and progressing to implement a strategy (Trent and Monczka, 2003). Global sourcing strategy should be designed and developed for major components and finished products. This is important because it brings into the open the cost and quality connection (Kotabe and Murray, 2004).

Although there are many advantages to global sourcing, negative consequences have also occurred (Blackhurst et al., 2005). In 1997 the financial crisis of Asian happened. Afterwards, many other uncertain circumstances have begun to meet with the world economy, such as the 2001 terrorist attack on America and financial crisis of Argentina which got worse in 2001. Global slowdown was the result of these crises. Next came the war between America and Iraq. Afterwards, illnesses with unknown origins came into question, such as the SARS dissemination from China in 2003. Consequences of these economic, political and natural predicaments affected various companies' management strategies (Kotabe and Murray, 2004). Frequency and the negative impacts of an interruption have increased due to the nature of the global environment. Higher levels of agility and lower inventory levels have been

affected due to the movement towards global sourcing. These areas are related with each other, making disruptions in supply chains more apparent. That is a reason companies need to handle with the probability and frequency of occurrence of events causing disruptions. More agility and lower inventory levels have been influenced by the trend of customer response time, in principle, giving a rise to the potential negative impact. Hence, generally, likelihood and timing of disruptions have a negative impact on the supply chains. There is an interaction between these areas and supply chain disruption issues have become a key topic. The other important subject is capacity issues which are related to international regions and product flow in international regions. Additionally, there is concern about the lack of ability to measure capacity at different nodes. For this reason companies must deal with interruptions more often than ever in order to be prepared for the potential situations (Blackhurst et al., 2005).

1.4.5. Increased product variety

Companies would not exist without their consumers who are buying their products or services. For this reason all activities within the chain should be required to be strategized in order to satisfy the consumer's needs. With globalization, communication is improved. Therefore companies need to compete so as not to lose their consumers in a global environment. As a result of those new products, better quality is expected by today's consumers in a short time and good price (Griffiths, James, and Kempson, 2000).

Customer expectations have caused new markets to open on a global basis. Rising demand and its result have caused globalization. Offering world class products at competitive prices and after sales services has become greatly important in today's competitive global environment. For this reason companies are required to take advantage of serving maximum markets in variable places around the world (Prakash et al. 2015).

1.4.6. Centralized production

Centralized production refers to having one main facility. All the company's products are transported and distributed from this facility. Due to only validating one process, the ensuring of quality becomes easier. APQC (formerly the American Productivity & Quality Council) (2000) argue the benefits of centralization in manufacturing. Manufacturing controllable cost, scrap and rework costs, assets turn,

annual raw material inventory turn rate, average production schedule attainment during a planning period for primary products are the areas which show the benefits of centralized production.

1.4.7. Reduction of Supplier Base

Companies have established a long-term collaboration with their suppliers. This collaboration is based on trust and cooperation by relying on single or a small number of preferred suppliers for sourcing a product. Having a small number of suppliers is a prior condition in order to maintain a strong relationship with the suppliers. Even if the number of registered suppliers is large in the many traditional organizations, just a small part of such suppliers actually gets the business year after year (Kauffman and Leszczyc, 2005). Supply base reduction strategy and long-term supplier relationship development have been adopted by companies because of the growing importance of purchasing. Many researchers have highlighted the requirement of reducing the supply base (Dowlatshahi, 2000; Parker and Hartley, 1997; Swift, 1995). The necessity of supply base reduction has been explained by three reasons by Dowlatshahi (2000). First of all, to reduce supplier development costs by a small supply base. Second is to establish a close and workable relationship with suppliers. Third is the reward to substantial businesses. Effective and efficient supplier relationship management considerably contributes to maintaining a competitive advantage for a company. Kraljic (1983) grouped the purchases based on profit impact and supply risk as routine, bottleneck, leverage and strategic purchases. The characteristics of routine items' purchasing are more number of suppliers available, very short term supplier relationships, supplier monitoring, simplification and automation of purchasing procedure and delegation of decision making power to lower levels of management. The characteristics of bottleneck items' purchasing are a monopolistic supplier market, longterm supplier relationship, security of inventories, internally developed alternatives, contingency planning, and delegation of decision making power to higher levels of management. The characteristics of leverage items' purchasing are more numbers of suppliers available, a short term supplier relationship, exploitation of full purchasing power, and delegation of decision making power to medium levels of management. The characteristics of strategic items' purchasing are few suppliers, a medium/ long term supplier relationship, and detailed evaluation of suppliers, supplier development efforts, and delegation of decision making power to

top levels of management. Nature of the purchase affects to decisions associated with purchasing such as the size of supply base, the extent of resources to commit supplier development, and other long-term involvement with suppliers.

Summarizing Chapter One

As it mentions above, supply chain management is a global management philosophy (Meixell ve Gargeya, 2005). The business world has been restructured by globalization and brought the view of a global supply chain. Therefore, the world is seen as a single market by companies which take a place in this global environment and they get their raw materials anywhere in the world and make their production to final consumers from different locations. In other words, companies take place in a living system which refers to the supply chain. The purpose of supply chain management is to meet consumer demand at the right place, time and at an effective cost in order to gain a significant competitive advantage. However, it is hard to develop effective business relationships with suppliers, especially when suppliers are located across various parts of the globe. Making improvements in supplier selection and relationship management provides some advantages such as better products, reduced costs, stronger supplier collaboration and more effective business processes. The supplier base can be managed with supplier base management. This can create a systematic and strategic approach to plan, develop and manage the supplier base. Supply base management is essential in order to improve the liquidity of the global supply chain, preserve a record, identify new suppliers, and evaluate existing suppliers. Thus, risks can be reduced with this approach. As a result of that, companies should understand the relationships between the supply chain strategy elements and supply-side risk sources, supply-side risk sources and supply base management practices in order to be successful. Hence, companies can mitigate the risks, increase profitability, reduce costs, and create a high level of customer satisfaction by leaving their competitors behind them in the global market. In the next chapter supply-side risk management will be examined.

SECOND CHAPTER SUPPLY-SIDE RISK MANAGEMENT IN THE GLOBAL SUPPLY CHAIN

2.1. Risks in Global Supply Chain

Rao and Goldsby (2009) stress that there are many debated identifications of the origin of the word “risk” in supply chain management literature. Some researchers mentioned its origin comes from the Italian word *risicare* that means to dare. Some others suggest it comes from the Arabic word *risq* that means gift from God. According to mathematicians such as Pascal and Fermat, the word risk has reference to approaches of psychology and human behavior to understand risk and reply to risk. A risk in any supply chain is a vital truth. Risk is a term related with unexpected events (Dittmann, 2014), and a chance of danger, damage, loss, injury or any other undesired consequences (Harland, Brenchley, and Walker, 2003). Risk can be defined as the possibility of loss, greater the probability of loss and adverse effects and negative consequences in a business event or activity. Within the supply chain management area the meaning of risk is defined as a disadvantage that in an accurate manner shows the image of business reality (Rao and Goldsby, 2009). There are two components of risks which are potential losses and probability of those losses (Manuj and Mentzer, 2008a).

According to Norrman and Jansson (2004) that business trends have come about due to risks in supply chains.

- *“Increased use of outsourcing of manufacturing and R&D to suppliers;*
- *Globalization of supply chains;*
- *Reduction of supplier base;*
- *More intertwined and integrated processes between companies;*
- *Reduced buffers, e.g. inventory and lead time;*
- *Increased demand for on-time deliveries in shorter time windows, and shorter lead times;*
- *Shorter product life cycles and compressed time-to-market;*
- *Fast and heavy ramp-up of demand early in product life cycles; and capacity limitation of key components.”*

Jüttner, Peck; and Christopher; (2003) noted environmental, organizational and network risks. Environmental risks are fires, explosions, terrorist attacks or natural

disasters (earthquakes, tsunamis and other extreme weather events). Organizational risks are worker strikes, production uncertainties (quality and machine breakdown) and uncertainty related to computing technologies. A network risk arises from the interaction between the companies in the supply chain. Uncertainty in the supply network may occur because of ownership, chaos and inertia. Chaos is the insecurity in the supply chain because of misinformation. Inertia is the risk which is associated with lack of response and consists of environmental factors and market conditions. The lack of ownership is the limit which is caused by uncertainty among companies in the supply chain. Tang (2006) mentioned that risks can occur from an outcome of uncertainties or an outcome of man-made events. Chopra and Sodhi (2004) focused on disruptions, delays, systems, forecast, intellectual property, procurement, receivables, inventory and capacity. In addition, global supply chains have carried different risks affecting performance, volatility, economic and political riskiness, and alterations in the regulatory circumstances with buying and selling rates (Meixell and Gargeya, 2005). At the same time, natural disasters have negative impacts on the supply chain from production facilities to transportation especially in today's global environment and the operations of supply chains continuously integrated in a global base. Natural hazards such as tsunamis, earthquakes, hurricanes (Kleindorfer and Saad, 2005; Wagner and Bode, 2006), economic disruptions (Kleindorfer and Saad, 2005; Wagner and Bode, 2006) can be listed in catastrophic risk sources. Transportation operations and the distribution network are also particular issues towards end-customer. Logistics side risks cover potential disturbances to the flow of goods, information and money (Ellegaard, 2008). Logistic side risks are inadequate operational/ financial strength of the carrier, storage issues, poor design of transportation network, wrong choice of transportation mode, improper packaging and marking details, damages due to accident /improper stacking, or delays in delivery time (Murugesan, Natarajan, and Lakshminarayanan, 2013). Ritchie and Marshall (1993) stated risk sources which are environmental, industrial, organizational, problem-specific and decision-maker related factors (Rao and Goldsby, 2009). Another classification of risk sources are disruptions, delays, system, forecast, intellectual property, procurement, receivables, inventory, capacity (Chopra and Sodhi, 2004).

The typology selected in this study is based upon Manuj and Menzter (2008b). Risk sources can be grouped into qualitative and quantitative risks in order to better understand supply chains as supply, operational, demand, security, macro, policy, competitive and resource risks. However, supply, operational, demand and security risks are directly associated with supply chain risks which disrupt the operations of matching demand and supply. The other risks of macro, policy, competitive and resource show themselves in the form of combination to supply, demand, operational and security risks. Therefore, this study focuses on supply, demand, operational and security risks and gives the other risks as a one heading.

2.1.1. Supply Risks

Supply risk is the possible deflection in an inbound supply. Any difficulty of time, quality, and quantity can result in unaccomplished orders (Chen, Sohal, and Prajogo, 2013). Zsidisin and Wagner (2010) classified the supply-side risk in three categories: supplier, supply market and extended supply chain. Wagner and Bode (2006) mentioned detailed work on supply-side risks sources. Supplier related risks can be sorted as ineffective management in the supplier firm, labor/management problems at suppliers, problems in electronically sharing information (e.g., through EDI, ERP) with suppliers (Zsidisin and Wagner, 2010), or inflexibility of supplier (Chopra and Sodhi, 2004).

Information risks are delay or unavailability of the information and communication infrastructure (Guo et al., 2006; Murugesan et al., 2013), either within or outside the company, breakdown of external/internal IT infrastructure (Chopra and Sodhi, 2004; Blackhurst et al., 2008; Murugesan et al., 2013), inadequate security of information system (Blackhurst et al., 2008; Murugesan et al., 2013), wrong choice of communication / information sharing medium (Murugesan et al., 2013), and information delay (Cucchiella and Gastaldi, 2006). Information flow between the parts of the supply chain provides effective coordination and smooths functioning. Asymmetry of the information is a primary area of the systems. As a facilitator, information flow maintains synchronization and coordination between parts of the supply chain and causes better decision-making and decreases uncertainty due to lack of information. What information is shared, when and how it is shared, and with whom, has a great importance on the supply chain performance (Murugesan et al., 2013). Otherwise, the use of data and required parameters will be impossible to

follow on the system. From this point, a decision support system should be regarded and closely integrated with the IT infrastructure. For example, according to Spekman and Davis (2004) Cisco Systems Inc. is exposed to \$ 2.5 billion in the inventory in 2001 because of a lack of communication between its supply chain partners.

On the other hand, quality problems are important supply side risks sources (Zsidisin and Wagner, 2010; Manuj and Mentzer, 2008b). The supplier's capability for ensuring supply is crucial for the buyer companies that have fear about quality problems of the supplied units. For instance, Robert Bosch, the German company, is faced with major loss that is caused by quality problems of their pumps. Lead-time variability makes the process unforeseen, so forecast errors increase. Buyer companies rely on its supplier to preserve a proficient production processes. Any problem that occurs in delivery of the required material, components or products will have destructive effects on the performance of the supply chain to serve its customers (Chen, Sohal, and Prajogo, 2013).

The supplier's financial situation and sudden default of the supplier are also a critical issue. Financial instability, default, insolvency or bankruptcy of suppliers can cause serious trouble for the firms and its consequences have given rise to severe supply chain disruption. Supplier business risks are affecting the continuity of the supplier, which results in the confusion of the temporary or permanent processes and annulment of the relationship between of the buyer-supplier. Purchasing, activities and relationship of the supplier are exposed to many risks associated with their suppliers and supply network (Zsidisin and Wagner, 2010). Sheffi and Rice (2005) stressed on an example that is about the automobile manufacturer Land Rover. The firm faced a serious problem after its only supplier which produced chassis frames, UPF-Thomson, folded in 2001. Dependence on a single supplier is a danger due to limited space for maneuvering. Integrating to the direct competitor of the customer's firm as a vertical is another type of disruption by virtue of termination of the buyer-supplier relationship. Production and operations management of the supplier has a critical importance on capacity constraints or logistics performance. Insufficient production capacity, being without quality control systems, or blockages in the production are the factors that affect the performance of suppliers. These factors intervene in lead time, quantity and quality. According to AMR Research (2007) supplier failure is the No.1 risk factor. Quality of the purchased products and services

can carry significant risk with effects through the chain. This is called the bullwhip effect (Wagner and Bode, 2006). The other important topic is the technological adaptability of the supplier (Zsidisin and Ellram, 2001), and non-availability of technical know-how. These are things such as method of production, required special testing facilities, tooling packing etc. (Murugesan, Natarajan, and Lakshminarayanan, 2013) in order to adapt to changes in the customer's costs and competitiveness. Technology incompatibility comprises of skills, quality and intellectual property (Zeng, Berger, and Gerstenfeld, 2005).

Supply market problems and issues are generally related with the single supplier and supplier-buyer relationship. Supply market related risks can be sorted as lack of alternative suppliers (Wagner and Bode, 2006; Sodhi and Lee, 2007; Murugesan, Natarajan, and Lakshminarayanan, 2013), inability to influence suppliers, and inability of suppliers to meet increases in required volumes (Zsidisin and Wagner, 2010).

In the global environment, product and services are obtained from different locations. Therefore, supply-side risk sources from the extended supply chain have become important when sourcing from suppliers that their location far away from the buyer firm (Zsidisin and Wagner, 2010). Extended supply chain risks are transportation disruptions with inbound supply channels, variability in transportation times with inbound supply channels, political instability / war affecting suppliers' operations, natural disasters or "acts of God" affecting suppliers' operations, and long physical distances between the supplier and buyer (Zsidisin and Wagner, 2010).

2.1.2. Operational Risks

Operational risk is a likelihood of an occurrence related with the main firm that may affect the firm's interior capability to produce goods and services, quality and timeliness of production and the profitability of the company (Manuj and Mentzer, 2008b). Operation risk is the probability of a decline in manufacturing the required quality and quantity in the right amount of time.

Operational risk sources can be sorted into disruptions in operation, insufficient production and process capacity, high levels of process variations, changes in technology, and exposure to changes in operations. (Manuj and Mentzer, 2008a). These risks may lead to loss of core competency, improper handling/ maintenance of

strategic warehouses/inventory, or organization issues (Murugesan, Natarajan, and Lakshminarayanan, 2013).

All manufacturing systems have different types of variations in their process. Two of them, which are process and flow variability, affect the productivity and efficacy of the production system by the product quality, efficiency of process, and throughput time (Chen, Sohal, and Prajogo, 2013). Process variability occurs with machine breakdown, structures or inaccessibility of the operator. Flow variability is caused by the method of which the business is contained to the system and the motion among stations (Chen, Sohal, and Prajogo, 2013).

2.1.3. Demand Risks

Demand uncertainty is the underlying risk in a supply chain. Customer expectations have changed in the global environment and competition between firms has increased. Also, supply chains have become more complex and product variety has increased with shorter product life cycles (Sheffi and Rice, 2005). Jüttner (2005) mentioned disruptions that emerge from downstream operations of a supply chain are called demand side risks. Furthermore, unanticipated or very volatile customer demands (Manuj and Mentzer, 2008b; Murugesan et al., 2013; Lee et al., 1997; Spekman and Davis, 2004) and change in customer preference (Murugesan, Natarajan, and Lakshminarayanan, 2013) are also demand side risks.

Demand risk is the probability of decline between forecasted demand and materialized demand. Manufacturers have difficulties to forecasting large variations in orders which results in high demand risks (Chen, Sohal, and Prajogo, 2013). Sources of demand risks are new product introductions, changes in demand (fashion season, new product introductions by competitors), and chaos in the system (or the bullwhip effect on demand as the deviation increases) (Manuj and Menzter, 2008a). At the same time, delays in delivery (Chopra and Sodhi, 2004), receivables risks (Chopra and Sodhi, 2004; Murugesan, Natarajan, and Lakshminarayanan, 2013), and reputation risk (Sodhi and Lee, 2007; Murugesan, Natarajan, and Lakshminarayanan, 2013) can be sorted as demand risks. Volume changes, insertion or expediting can be consequences of shorter product life cycles or new products being introduced into the market. Demand fluctuations can be caused by customers' activities like sales promotions and order matching. In some situations although demand of the market is consistent and the demand sample is smooth, the bullwhip effect will intensify the

demand motion and raise order variability (Chen, Sohal, and Prajogo, 2013). The bullwhip effect is identified by an enlargement of demand volatility through the upstream direction in the chain. In this context it concerns forecast quality disruptions that occurred demand side and firms being affected by costly shortages and inefficient capacity usage. Delayed or incorrect information, promotions, arranging orders, price alteration and conversing or deficiency gaming can be explained by the bullwhip effect (Lee, Padmanabhan, and Whang, 1997). Overreactions, unnecessary interventions, second guessing, and mistrust are also factors that identify the bullwhip effect (Christopher and Lee, 2004).

The basic principle of a supply chain is to equal supply and demand. Nevertheless, achieving this goal is difficult because of unexpected changes. The inconsistency among materialized orders and forecasts damages the supply chain efficiency and effectiveness. Forecast errors (Manuj and Mentzer, 2008b; Murugesan, Natarajan, and Lakshminarayanan, 2013) can result in an overage in inventory, obsolescence, and unproductive capacity usage when the forecast is more than the materialized demand. On the other hand, it can result in shortages when the forecast is less than the materialized demand. As a result, consequences of these circumstances have caused the ineffectiveness of the supply chain (Chen, Sohal, and Prajogo, 2013).

2.1.4. Security Risks

Security risks can be listed as information systems security, infrastructure security, terrorism, vandalism, crime and sabotage (Manuj and Mentzer, 2008b). Socio-technical is an unfortunate incident that happens unexpectedly resulting in damage or injury such as machine breakdown, equipment failure or electricity and water problems, failures and malfunctions of IT. Vandalism, sabotage, labor strikes, and industrial accidents are also included as human-centered issues (Chopra and Sodhi, 2004).

2.1.5. Other Risks

Macro risks

Economic shifts in wage rates, interest rates, exchange rates, and prices are macroeconomic risks (Manuj and Mentzer, 2008b). Price fluctuations take place in different forms such as general price changes and movements in the relative prices (Rao and Goldsby, 2009). Currency exchange rates have an affect on the goods'

price, timing and volume of purchases which affect the supply chain performance (Meixell and Gargeya, 2005). According to Kogut (1985) global supply chains can be advantageous when they are designed to keep operational flexibility. This flexibility would let it trade on cost benefits and advantage of differing prices for the same asset. In like manner, Gurmani and Tang (1999) build up a model which trades on currency exchange rates in global supply chains. It also been realized that some relationship which had begun on the commitment of cost savings are not alive in the global supply chain. An example is that many firms have outsourced low-end jobs to low wage countries. But the overall wage rates are not as low as they are mentioned. That's a purposeful example to companies so they might rethink their outsourcing decisions. In sum, the firms need to realize the macroeconomic uncertainties within their risk assessment (Rao and Goldsby, 2009).

Policy Risks

Economic, political, and social growth makes the supply chain more complex and longer with interactions among the network and environment of supply chains. Networks can be exposed directly or indirectly by restrictions of business, administration, legislation, institutional, and regulatory issues (Murugesan, Natarajan, and Lakshminarayanan, 2013). Supply chain-relevant laws and policies such as trade and transportation laws legally enforceable for these type of risks (Wagner and Bode, 2006).

Policy risks can be listed as policy uncertainty (Murugesan, Natarajan, and Lakshminarayanan, 2013; Manuj and Mentzer, 2008b; Rao and Goldsby, 2009), macroeconomic uncertainty (Murugesan, Natarajan, and Lakshminarayanan, 2013; Rao and Goldsby, 2009; Cheng and Kam, 2008), uncertainty due to government laws/regulation (Murugesan, Natarajan, and Lakshminarayanan, 2013; Cheng and Kam, 2008), social uncertainty (Tang and Tomlin, 2008; Murugesan, Natarajan, and Lakshminarayanan, 2013) and safety regulations by government agencies (Oke and Gopalakrishnan, 2009; Bovet and Sheffi, 1998). These are important factors of uncertainty in the global base due to the setting up and operation of global supply chains.

Competitive Risks

Competitive risks have to do with the lack of history about competitor activities, moves and foreign markets (Manuj and Mentzer, 2008b). These risks are the uncertainties related with competition between existing and potential firms. Innovations in the product market have had the effect of staying competitive in the extended supply chain by product or production process (Rao and Goldsby, 2009).

Companies do not look to integrate vertically due to being under conditions of competitive and input unpredictability. The most important understanding is instinctive; companies are concerned with hardly staying afloat under conditions of uncertainty. Even if companies have the necessary resources, they do not integrate due to competitive pressure. Besides, merger and acquisition activity would have been obtained in the level of speculation in relation to the focal firm. Nevertheless, some authors have mentioned that achieving supply chain efficiencies does required close working relationships among manufacturers and suppliers. In sum, the development of a supply chain risk management plan needs to consider overall industry uncertainty (Rao and Goldsby, 2009).

Resource Risks

Resources risks are related with unanticipated resource requirements (Manuj and Mentzer, 2008a). Nembhard et.al. (2005) to maintain a supply chain model. According to this model manufacturing companies can have the flexibility to choose from different suppliers, facility locations, and market regions. They forecast the value of flexibility and determine the optimum strategy to manage the flexibility under currency exchange rates by using a real options approach. It means that when the time delay among the decision and option application is not contemplated, operational flexibility value can be notably overrated. More flexible companies have more strategic risk management options existing. Thus, companies allocate resources quickly and readily in response to change (Manuj and Mentzer, 2008a).

2.2. Supply Chain Risk Management from Global Perspective

“The point is simple: risk is broader than ever before. A risk and uncertainty lens is the newest and perhaps one of the most important capabilities and contributions that can be made to a firm’s competitiveness and viability” (Bary, 2004, 697).

Supply chain risk management is defined as follows by Norman and Jansson (2004): collaborating with partners and applying risk management tools in order to handle risks and uncertainties. A single company can deal with its risks in all operations but the definition which is mentioned is needed to analyze the relationship of buyer-seller. A company which wants to reduce the impact of unpredictable events should manage its risk management process (Dittmann, 2014) for business performance improvement (Ritchie and Brindley, 2007) and also efficiency, which cannot be achieved with high levels of risk (Christopher and Lee, 2004; Christopher and Peck, 2004). Manuj and Mentzer (2008a) defined global supply chain risk management as follows:

- Identification, evaluation of risks and conclusion of losses,
- Implementation of suitable strategies with a coordinated approach between parts of supply chain (aiming to decrease losses or losses etc.)
- Matching of actual cost savings and profitability.

The International Organization for Standardization (ISO) has lately made accessible a new set of standards. That supply chain management standard is called the ISO 28000-2007. The purpose of this certification program is a project to evaluate and control organizational activities that have an influence on the security of the supply chain. This type of certification is anticipated to be very popular by common popularity due to companies want to see their supply chains undergo larger risks in the future. Academics and companies have thought that risk management is the essential part of holistic supply chain management principles. Challenging environments, supply and demand uncertainties, globalization, shorter product life cycles and technology are required when speaking about managing risks (Rao and Goldsby, 2009). To give an example from the world of giants: American Airlines recalled products such as drugs, meat and animal feed against deterioration due to the risk of delays in the air. US toy giant Mattel recalled 20 million toys because it contained excessive lead. Japan's giant Toyota recalled 7.4 million vehicles due to failure in the power window control issues from all over the world. Boeing has been dissatisfied their customers by saying they would be 15 months late due to the production schedule. In these examples even the largest firms can find it difficult to control things such as production, sales and distribution (Moses, 2012).

According to experimental research supply chains are mainly vulnerable. This is because of a lack of using risk management tools which are mentioned in the literature (Ceryno, Scavarda, and Klingebiel, 2015). Growing uncertainties and short product life cycles have been an effect of the globalized market. Due to this issues risk management has become unavoidable and is an integral part of a holistic supply chain framework (Christopher and Lee, 2004; Jüttner, 2005). However, well-managed supply chain management is a dynamically integrated model with components such as suppliers, manufacturers, retailers, distributors in order to monitor and control internal and external uncertainty. The system should be created taking into consideration risk size, scope and sources with the dispersion and results of them (Salkin, 2014).

Tummala and Schoenherr (2011) developed a framework to manage the risks in the supply chain. The stages for managing risks are identification, measurement and assessment, evaluation and mitigation strategies in conjunction with contingency plans, control and monitoring. Supply chain operations and risk management processes are ongoing processes together and complement each other. PWC and MIT Forum (2013) stress on “*Classification Capability Maturity Model*” to show the processes among supply chain management and risk management in Table (2.1).

Level 1: Supply chain has a low integration level as a functional one. Overall activity is characterized by high copy. There are unconnected processes between internal and external activities and no coordinated work between the supply chain partners with suppliers. There is no balance between “inventory and capacity levels” and “poor customer service and highest total costs”. There is no risk management structure. The supply chain has a weak assessment of the risk sources. Risks are managed temporarily. There is no preliminary work for managing risk and response mechanism or positioning (PWC and MIT Forum, 2013).

Level 2: Supply chains have been organized in a cross-functional way. Internal processes are integrated. There is information sharing. They are structured in a way that visibility functions. Resources are managed jointly between high levels of compliance and performance goals. Integrated strategic planning for a single company takes place in the tactical and operational levels. There are documents related to risk management and they are integrated into internal processes. Basic and simple vulnerability threats are analyzed. Scenarios are prepared in order to create a buffer for inventory, capacity and delay problems. Postponement and postponement

differentiation strategies are improved in order to respond to changing demand. There is minimal visibility (PWC and MIT Forum, 2013).

Level 3: They focus on the external supply chain collaboration and proactive risk responses. This is a general characteristic of the supply chain that has extended the cooperative business. Information sharing is comprehensive and has high visibility. Product design or key operations such as supply chain inventory management are integrated between partners. External data entry is included in the internal planning activities. Interfaces are standardized to reduce complexity of the product and process. The company set up information sharing and visibility sensors and establishes mechanisms to respond proactively to anticipate changes outside the company. Formal risk management methodologies are quantitative and perform sensitivity analysis. Flexibility and business continuity plans are created (PWC and MIT Forum, 2013).

Level 4: There is dynamic adaptation. Flexible response is given to risk and there is adaptability to complex environments. Companies are required to stand at exactly the same point about key values with their supply chain partners through their collective goals and programs. These integration marks are obtained by developing the value chain that is identified and investigating to find a higher point value chain. Risk sensors and estimators are used to forecast risks (PWC and MIT Forum, 2013).

Table 2.1. Classification capability maturity model (PWC and MIT Forum, 2013).

	Supply Chain Management	Risk Management	
1 1 e v e 1	<p><u>Functional</u></p> <p>Limited coordination among internal functions</p> <p>Locally owned and managed resources</p> <p>Performance is evaluated as a separate measure from functional key performance indicators (KPI)</p> <p>The lack of integrated planning</p>	<p><u>Temporary</u></p> <p>Provisional risk management processes</p> <p>The lack of visibility changes in areas other than the functional area</p> <p>The lack of reinforcement planning against potential disruptions</p> <p>A structure can only limited changes to the framework of standard functional input parameters</p>	Low level
2 1 e v e 1	<p><u>Integrated</u></p> <p>Information sharing and joint planning activities between the internal functions</p> <p>Jointly managed substantial resources and performance targets</p>	<p><u>Bumper planning</u></p> <p>Which is based on the reinforcement of cross-functional planning, positioning planning</p> <p>Basic risk management processes</p> <p>The lack of visibility changes and samples outside of the company</p>	
3 1 e v e 1	<p><u>Collaborator</u></p> <p>Supply chain visibility for important activities among the partners, information sharing and integration</p> <p>Merger in internal and external processes</p> <p>Supply chain rationalization</p>	<p><u>Proactive</u></p> <p>Using sensors and predictive roll response mechanisms to proactively position</p> <p>Business continuity plans</p> <p>Joint monitoring flexibility</p> <p>Quantitative risk management</p>	High Level
4 1 e v e 1	<p><u>Dynamic</u></p> <p>Compliance with key dimensions of customer value throughout the enterprise</p> <p>Pairing the supply chain segmentation for multiple customer value proposition</p> <p>Defining the value chain pattern occurs in complex, dynamic environments</p> <p>Abilities to adapt changes</p>	<p><u>Flexibility</u></p> <p>Investment to flexibility (processes, products, facilities, capacity)</p> <p>Remote pressure management to weak partner in the value chain</p> <p>Risk segmentation strategy</p>	

2.3. Managing Supply Side Risks in Supply Chains

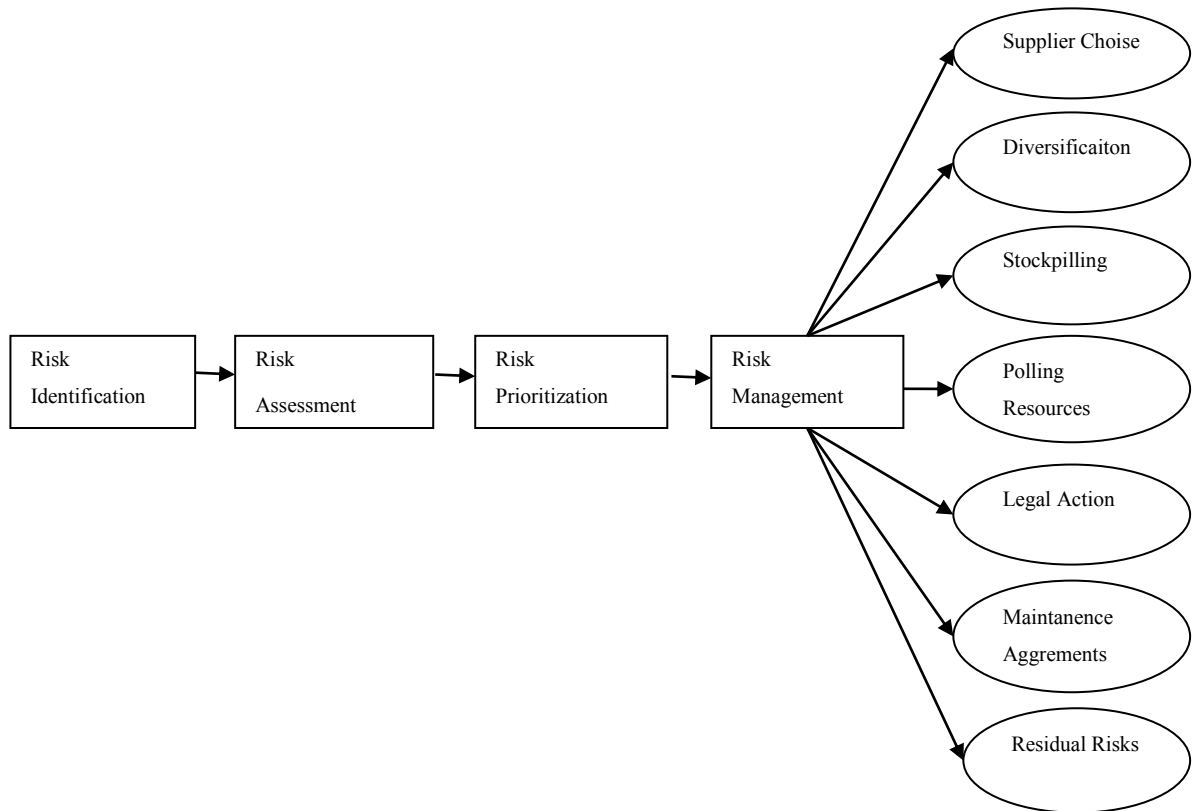
Risk management is a decision-making process which includes identifying of the risks, assessment and mitigation in order to understand and try to reduce their impact. Focusing on probability and direct effects are important. The steps and names of the risk management process can be different depending on the literature. Preventing the consequences of an accident or risk issues and risk management processes are parallel. Furthermore, business continuity management also has same purpose as the management processes, techniques, strategies. These are tools in order to control, continue and recover from unexpected situations (Norman and Jansson, 2004).

Jüttner et.al. (2003) claims there are four important management stages. These are to assess the risk sources, define the supply chain adverse consequences, identify the risk drivers, and mitigate risk in the supply chain. Understanding and identifying risks, minimizing their influence, making decisions and evaluation of consequences are needed to focus on the risk management process by considering probability and direct impact. Mitigation strategies require being prepared in a necessary situation for business continuity and cost reduction purposes (Norrman and Jansson, 2004; Tang, 2006). This normally refers to business continuity management (BCM). BCM refers to management disciplines, processes and techniques to plan stages and steps when an accident happens and a firm must continue its important operations. (Norrman and Jansson, 2004).

Supply chain strategy debates have been taking place in the lean and agile philosophies. Lean thinking focuses on the reduction and elimination of waste. A lean concept is proposed to be used where demand is stable and presumable, and where variety is low. The agility concept is proposed to be used where demand is volatile and variety is high. It is a concept used to match supply and demand in unpredictable markets. In addition, agility refers to being demand-driven instead of forecast-driven. In sum, these two approaches can complement each other (Christopher, Peck, and Towill, 2006).

According to Zeng, Berger, and Gerstenfeld (2005) the supply chain risk management process occurs in four stages for managing the supply risks (Figure 2.1.). These are risk identification, risk assessment, risk prioritization and risk management. Risk management includes supplier choice, diversification, stockpiling, pooling resources, legal action, maintenance agreements and residual risks.

Figure 2.1. Supply Risk Management Process (Zeng, Berger, and Gerstenfeld, 2005).



To deal with supplier risks each step in the process is required to be analyzed by quantitative and qualitative techniques (Zeng, Berger, and Gerstenfeld, 2005). Without risk assessment processes such as contingency planning, insurance, and paranoia which have a very thin difference between them, companies can face the highest risk issues by uncertainty. For effective management of risks it is required to identify, monetize, and measure the possibility of occurrence (Bary, 2004).

2.3.1. Risk Identification

Risk identification is an important step in risk management. Effects of those risks can be seen after identification. Companies should analyze both direct and indirect risk in order to evaluate their situation and find their consequences between every link in the supply chain. Thus, a risk analysis can be done to define the uncertainties. Risks should firstly be identified to manage them. These risks are environmental, associated with supplier, manufacturers and customers (Büyüközkan, 2008). Many organizations have faced threats or had risk management processes initiated without realizing that they are exposed to disruption. As a result, they face serious threats due to taking wrong action or not take any action against something that is seen as a

minor threat (Supply Chain Risk Leadership Council, 2011). To start the process of risk management requires selecting the supply chain to be analyzed. There are two dimensions to be considered. These are its strategic importance and sensitivity of the supply chain. It is a priority to examine when many uncertainties or interruptions have been experienced in the past, or it provides a high profit in the supply chain. . Having small uncertainty but being a critical part of the supply chain for the company also makes it useful priority for investigation. For example, political instability or the financial condition of the suppliers has a critical role in the country where the supplier may require an examination of the supply chain. The evaluation criterias are cost / price, quantity, supply time, one or the monopoly of being the supplier, including information on topics such as critical customers (Kırılmaz, 2014). The priority of supply chain risk management is to understand supply chain risks. Thus, tools are required to help in maintaining a regular system of predictability. Blackhurst et.al. (2005) focuses on the dynamic risk index at every node in the supply chain. For example, transportation event management systems which are effective in identifying potential problems by calculating predicted lead times for various global channels are preferred by some companies. Even though these systems show the failure mode, they cannot forecast the priorities of problems. People should follow by monitoring the main spot. However, there is a great amount of information in today's world and people are restricted in their capabilities. Thus, an automated system which allows some criteria to control when people should intervene is required (Blachurst et.al., 2005). There are many ways to identify and analyze risks (Norman and Jansson 2004). Identification techniques include scenario analysis, process mapping and-cost-benefit analysis (Zeng, Berger, and Gerstenfeld, 2005), obtaining of historical data, brainstorming sessions, cause-and-effect analysis, probability-impact matrix, pareto analysis, group meetings, interviews, Delphi method, the creation and control of supply chain map, and determining the critical path (Zeng, Berger, and Gerstenfeld, 2005). (Kırılmaz, 2014). Another method for identifying risks is called fault tree analyses (FTA) and event tree analysis (ETA). FTA is graphical diagram and explores the potential situation that led to critical events. ETA is focused on several occasions and used after an event occurs (Norman and Jansson, 2004). Yazar (2009) also noted Occupational Health and Safety Risk Analysis, Environmental Impact Analysis, Information Security Risk and Vulnerability Analysis, Corporate Risk and Opportunity Management, Project and

Process (FMEA) Risk Analysis, SOA Financial Reporting Controls (risk-based), Internal Control System (risk-based).

2.3.2. Risk Assessment

The second stage of the risk management is to assess risks. This is an important stage for selecting appropriate management activity. Risk map / matrix are a method to compare events by their probabilities and consequences. The supply risk assessment process is summarized by Zsidisin and Ellram (1999). This process occurs from a ten-step risk assessment.

1. Identify material or services
2. Appoint the manager to own process
3. Initiate risk assesment score card
4. Review criteria for each risk factor (8 risk factors: design, cost, legal, availability, manufacturability, quality, supply base, and environmental, health and safety impact
5. Collect data for each risk factor
6. Assigned risk scores
7. Conduct impact analysis
8. Document analysis and actions
9. Monitoring
10. Determine cease assessment

These risk assessments are in relation to material –related risks which could influence well-timed and cost effective delivery (Norman and Jansson, 2004).

Companies can use the likelihood ratio before and after the results against the risks. Thus creating the risk tolerance may find acceptable risk levels. If it is found to be higher than the probability of risks and results, it is needed to take more action in order to reduce their business risks. These commodities over time may vary by product or service. Different risk tolerance levels may be set for different levels of the business. Often risks are better understood and comparable using financial assets even if they are due to be considered with other values, such as reputation. For example, the leader of a company raising the stock price may be affected by potential risks results (SCRLC, 2011).

2.3.3. Risk Prioritization

Prioritizing risks is the key success factor for supply chain risk management. There are various risks in the supply chain. When the need is to manage the supply chain in an effective way, these risks need to be prioritizing after their identification in order to determine where action is required to be taken (Murugesan et.al., 2013). Risk prioritization techniques are the probability of occurrence and severity of impact (Zeng, Berger, and Gerstenfeld, 2005). A two-by-two matrix can be used for these dimensions and each quadrant considered in order to decide which direction to take the company. Regularly monitoring risks helps to lower the severity and likelihood of occurrence. Dispensing operational changes and controls are diminishes the frequency of occurrence for risks with high likelihood but low severity. Great attention should be paid to risks which are high severity of impact and contingency plans should be made for business (Zeng, Berger, and Gerstenfeld, 2005). Realizing the priorities helps companies give attention and establish appropriate risk mitigation strategies. Thus, every risk can be evaluated with regard to their relative importance and top management can plan and utilize their activities to mitigate the risk (Murugesan et.al., 2013). After recognizing and making prioritizations, companies can be prepared for recovery time and selecting appropriate strategies for different types of risk sources (Zeng, Berger, and Gerstenfeld, 2005).

2.3.4. Risk Management

Risk management techniques are supplier choice, diversification, stockpiling, pooling resources, legal action, maintenance agreements and residual risks (Zeng, Berger, and Gerstenfeld, 2005).

Supplier choice is to center suppliers' business continuity planning and financial condition, executive health and vulnerability, management stability, and infrastructure integrity (Zeng, Berger, and Gerstenfeld, 2005). Diversification refers to avoiding dependence on a single supplier and arranging for backup suppliers of key products and services and selecting suppliers from different geographical areas (Zeng, Berger, and Gerstenfeld, 2005). Stockpiling refers to keeping inventories of parts and equipment (Zeng, Berger, and Gerstenfeld, 2005). Pooling resources means pooling resources with competitors so that if disaster strikes one, others will lend a hand. The network helps companies get equipment at a moment's notice from a supplier, minimizing the effect of any break in the supply chain (Zeng, Berger, and

Gerstenfeld, 2005). Legal action is an agreement established between suppliers and buyers to address continuity issues, which allows the buyers to switch to other suppliers and the supplier to forewarn the buyer of any anticipated disruptions (Zeng, Berger, and Gerstenfeld, 2005). Maintenance agreements are agreements to help ensure that critical equipment is kept in good working order during the normal course of operations (Zeng, Berger, and Gerstenfeld, 2005). Residual risks refer to addressing and assessing the risk that result from the contingency plan itself (Zeng, Berger, and Gerstenfeld, 2005).

2.4. Supply-Side Risk Management from the Perspective of Supply Base Management

Risks which can be minor or major should be evaluated in order to ensure continuity of supply. The Food and Drug Administration (FDA) has discussed a regulatory change which is related with purchasing controls and making risk management mandatory. FDA's concern is based on failures that have caused public harm. For example, a heparin issue resulted in about 80 deaths and a drug recall in 2007. The Global Harmonization Task Force (GHTF) Study Group Three released a report named "Guidance on the Control of Products and Services Obtained from Suppliers" in 2009 (GHTF SG3 N17). Supply base management can be used to identify and mitigate risk by focusing on specific tools such as supplier risk mapping, supplier assessments for evaluation and selection, and supplier ratings for reevaluation of suppliers. An extensive up-front supplier qualification process of manufacturers is able to avoid, or at least minimize potential supply-base failures. Risk mapping should be highlighted in areas in which loss of control and resulting product quality, and line-down instances is likelihood because it is time-consuming and expensive to evaluate every potential supplier. Risk mapping refers to developing a standard list of risk elements and characteristics, along with appropriate mitigation strategies. Thus, each of the risk elements can be identified and minimized. Once this form is developed, it is beneficial to revise it annually to include or remove items. In addition, the risk map may help the original equipment manufacturer (OEM) choose a supplier that indicates the required goods in its catalog and fulfills a self-audit of the major and important components or materials. A list of qualification activities for each sourced material and component can be made by risk mapping. It is important to document the extent of controls in order to lead technical, business,

and quality concerns. These are all essential assessments in the selection and qualification of new suppliers. Mostly, the assessment requires visiting the supplier's facility. Technical evaluation is important to choose a supplier. Risk assessment team focuses on the supplier's capability to meet specifications. There are several key points to understand and follow in this process. For instance, the supplier's processes and process controls should be understood, equipment should be reviewed and maintained, the facility should be toured in order to evaluate cleanliness, order, and the condition of both the facility and equipment. In addition, the attitude and knowledge of the workers should be assessed, how the supplier accepts and traces product and keeps records should be understood, capacity of key equipment should be verified contingency plans for loss of critical equipment should be discussed in order to address the critical characteristics of the parts and materials to be purchased. Suppliers should also understand why these crucial characteristics are truly crucial. On the other hand, business evaluation is also important in order to bring what fits with the supplier's existing business. For example, learning about available capacity, business reporting structure and workforce provide to business vitality. In addition, suppliers' employee number, their shifts and regular hours, and critical skills are also issues that need to be known by the risk assessment team. Thus, baseline information can be created for future evaluations. There is other important issue related to the bank and business references. When financial information is not shared by supplier, probably a meeting should be set up its financial management about the supplier's commitment. This is a really important point between parts when a failure happens. Evaluating the supplier's quality management system is also an essential topic. For example, if the potential supplier has an ISO (13485 or 9001) certificate, it means a third-party auditor has better access and spends more time auditing than the company does. So the company should copy the certificate and verify it. If the supplier has no ISO certificate, the company should be ensured about the quality management processes of supplier. ISO certificates and supplier assessment processes are both important and complete each other in order to mitigate both the technical risks, business risks, and the quality management system risks (GHTF SG4 N28). In addition, the suppliers' quality plans, process flow diagrams, risk assessments and control plans are important aspects to know. How a supplier controls its supply chain is the other important aspect. When any problems occur, it is important to notify and address it with the reaction plan and the corrective action which is taken (GHTF SG4

N28). In summary, managing risk in the supply chain is not just in one situation. It is an ongoing discipline. The reason is that supply base management can help to identify and mitigate supply-side risk sources by focusing on supplier evaluation and integration. It also provides objective evidence for confident supply-chain decisions.

Summarizing Chapter Two

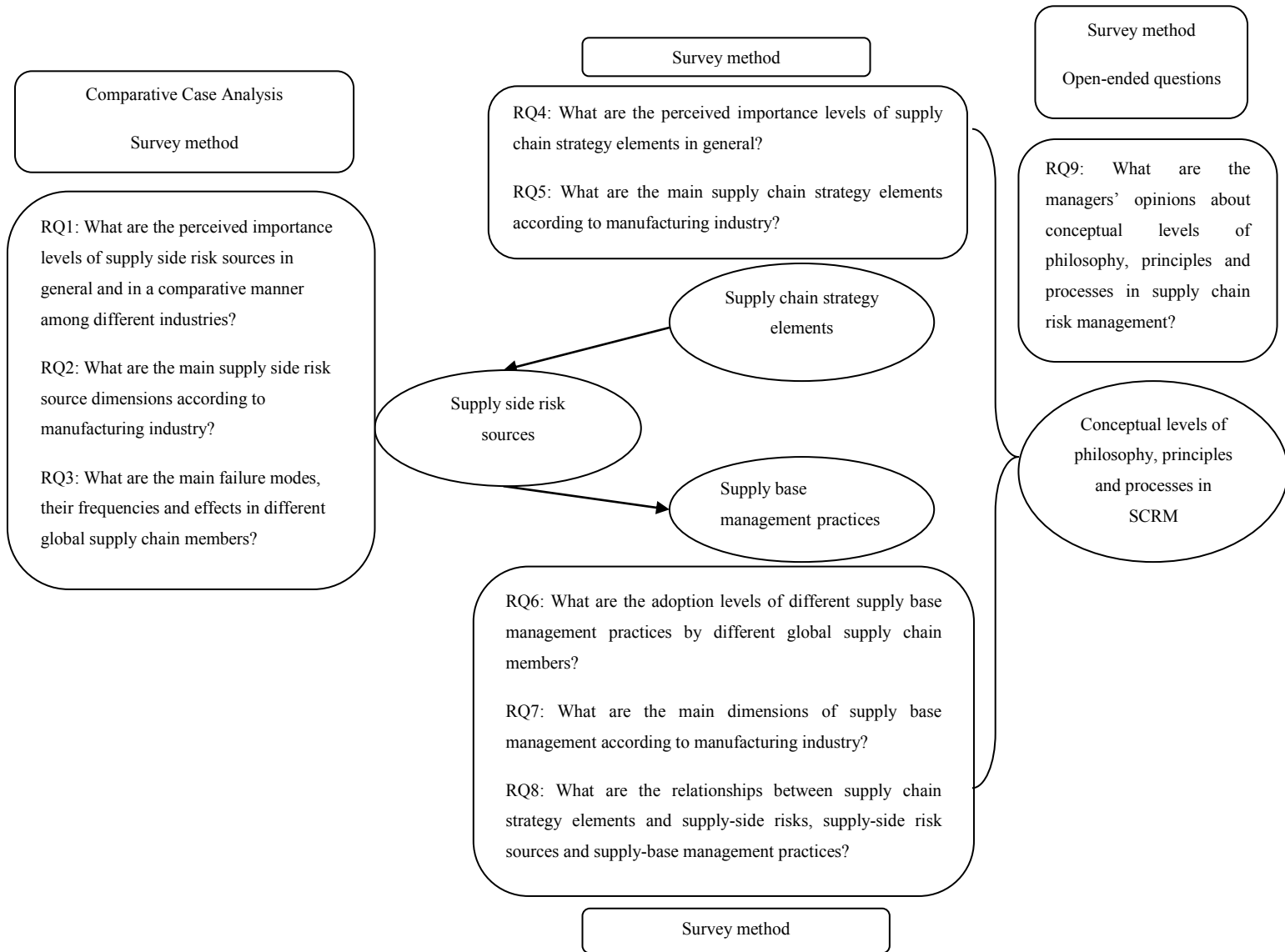
Geographical dispersion, outsourcing and sourcing globally in the supply chain has resulted in a focus on risks from disruptions of the supply chain. Although cheap labor, raw materials and markets in emerging economies seem to have business opportunities, companies can face some disadvantages such as risks of supply continuity, longer and variable lead times, and delivery uncertainty (Yang and Yang, 2010). Risks in the global supply chain used to be defined as simple. That no longer applies. Global economies have all been emboldened to the open overseas markets. There are several examples that make clear the situation such as China and Russia introducing new market drivers, and the development of economic communities which are in Europe, South East Asia, Africa, and the USA (Yang and Yang, 2010). A fault of any one component causes failures among all partners in the supply chain from upstream to downstream. Efficiency and robustness of the supply chain have great importance and a trade-off must be made among them. The consequences of these dimensions ends in an additional consideration of product design, strategies of production, distribution, and maintaining of partnership relations between buyer and supplier (Yang and Yang, 2010). As previously mentioned, there are four major elements in order to manage the life cycle of a supplier and a relationship by supplier in a structured and systematic manner. Firstly, current major and important suppliers are required to be managed. Most of the research about suppliers' management has practically focused on these suppliers from a static perspective. Secondly, minor suppliers are needed to manage. These are important issues for evaluating suppliers, supplier development, supplier improvement, supplier education, and supplier integration. Suppliers are required to be ready to work with, willing to change their practices and systems with the aim of improving and integrating themselves in the buying companies' systems. In addition, supply base management is important for buying companies because of several key grounds. For example, a pool can be created for replacing suppliers due to potential capacity expansion can be seen easily. A source of competitive pressure can be composed readily in order to keep suppliers'

prices competitive and to see new capabilities for replacing with the others. And lastly risks can be reduced with the supply base management. Supply base management is also important for the suppliers in order to create a commitment between the parts of chains and a start of a long-term relationship. Thirdly, scouting is a proactive approach that searches to detect and gather the best suppliers for the firm. The purpose of scouting is to assign the potential trends, developments or changes in order to take a place in the competitive environment. Fourth, transition management focuses on moving suppliers in and out of the major system. The purpose of transition is to reduce problems created by the transition. For example, the buying company can face challenges about intellectual property or any critical knowledge when a major supplier goes out of the system. Supply chains should be designed to deliver a wide range of solutions such as cost, delivery and quality, responsiveness, etc. (Melnyk et.al., 2010). The impact of globalization to competitive pressure on manufacturers and service providers has increased over the last few decades. A firm's supply chain is composed of various business partners through many countries. In sum, managers should understand the specific requirements of each relationship and the effective management of various relationships at one time (Griffith and Myers, 2005).

THIRD CHAPTER: AN EMPIRICAL STUDY ON MANUFACTURING INDUSTRY IN IZMIR

As already mentioned in the introduction section, the methodology adopted in this study is a triangulation effort that combines qualitative and quantitative research methods in order to answer the research questions. The qualitative research process includes a comparative case analysis study that aims to prioritize the supply-side risk sources in manufacturing industry. The quantitative research process includes a factor; regression and descriptive analysis that aim to explore the supply-side risk sources that have been affected by supply chain strategy elements and the relationship between supply-side risk sources and supply base management practices. In addition, the macro view of supply chain risk management has been analyzed by open-ended questions in the manufacturing industry. The overall research process, which is a two-step or sequential triangulation (Creswell, 2003) is briefly represented Figure 3.1.

Figure 3.1. Conceptual Framework.



3.1. Qualitative Stage of Research

Part of this research was carried out using the qualitative research model. Qualitative research method is defined as using data collection methods such as interviews, observation, document analysis, and perception (Yıldırım ve Şimşek, 2008).

The implementation of FMEA method can be separated into three parts. These are qualitative, quantitative and corrective analyses. Qualitative analysis is to identify the potential failure modes, causes and effects. Quantitative analysis is to calculate the Risk Priority Number. Corrective analysis is to apply strategies in order to decrease the risk level (Paciarotti, Mazzuto and D'Ettorre, 2014).

Data in the qualitative stage were collected through the FMEA form. This part of the study examined potential failure modes, possible effects and causes for each item. Supply chain, Trading, Purchasing, Quality, Production etc. departments of the firms are targeted for this stage. At least five people (directors, managers, specialist etc.) from each department in a single firm are targeted. Thus, by evaluating the multiple perspectives of the different departments of the company, valuable data have been targeted to collect. Primarily companies were called by telephone and informed about the purpose of this study. A meeting was requested from the production, purchasing and logistics etc. departments. After contacting a supervisor FMEA forms were sent in order to be clear about the general framework. Interviews were conducted face to face. However, because purchasing, production, supply chain, and logistics departments were too busy, reluctant and had problems with finding time, from the six firm's just one manager was interviewed. Two departments from one, three departments from another and four departments from the last company were interviewed. Failure modes, potential causes and reasons for each item were focused on for details. During the interview, interviewer was requested to go on each risk group and evaluated failure modes, possible of causes and effects. In the first interview an empty FMEA form was presented and had almost no information about the points. This is because the interviewer saw the interview as a time consuming event, did not know about the used methods and did not bother with this kind of information in short time. Therefore, for each item and points extended literature were scanned and written in terms of causes and effects to give an idea to the interviewer. During the meeting the reason of this is explained to the interviewer and is asked whether they want to add or change any point of the information. This way the interviewers showed a more active participation. Then for each item they were

asked about the probability of occurrence, detectability and severity. In this section, a rating scale of 1 to 10 points (Paciarot, Mazzuto, and D'Ettorr, 2014) was used. After the interview, probability of occurrence, detectability and severity are calculated and risk priority numbers are given for each firm and they are arranged accordingly. Then comparative sector analysis is made with respect to three main supply-side risk sources (Wagner and Bode, 2006). The risks that belong to each main group are compared on a sectoral basis. The qualitative stage of the research can be seen in Figure 3.2.

3.1.1. Failure Mode and Effects Analysis

FMEA is a systematic method. The first purpose of FMEA is to analyze and rank failure modes that exist and state the potential of the risks related with different products (or process). The second is to prioritize risks according to highest ranked matters for regenerative action in order to provide quality and reliability of a product or process (Paciarotti, Mazzuto and D'Ettorre, 2014). Risk Priority Number (RPN) is formed by calculating possibility of occurrence, detectability and severity in order to show the risk level priority (Franceschini and Galetto, 2001). FMEA is an analysis and assessment method that can be applied to a product or process in order to avoid errors. FMEA is applied to determine the types of possible errors and their impacts in order to see the causes of problems and effects to customer in each product, part and process. FMEA firstly aims to identify and solve the potential errors in a product or process before its completion (Ahsen, 2008). After this, a short brief is useful to define the basic concepts;

Failure: The inability to fulfill the function of a system.

Failure Effect: Shows the change in the system function caused by a fault.

Failure Cause: Influential factors which is important to emergence of the failure type. A failure mode can have multiple reasons.

Detectability: Existence of the implementation that prevents the failure before achieving customers.

Occurrence: Displays the occurrence of the failure.

Severity: The level of the potential failures which is reflected to customers.

Risk Priority Number (RPN): Detectability x Severity x Occurrence

The first widespread usage of FMEA in risk management process was started as a life insurance policy by British Government in the 17th century (Ahsen, 2008). Application dates for FMEA goes back to 1949. US Army started to use it in the aeronautic sector. “Failure Modes, Effects, and Critical Analysis procedures” was documented in 1949 in order to determine the effects of the fault by a reliability analysis technique. MIL-STD-1629 and numbered 9/49 dated Failure Modes, Effects and Critical Analysis Procedure has been used as a reliable evaluation technique in the US Army. The reason for using it solves and prevents any problems about reliability and safety (Paciarotti, Mazzuto and D’Ettorre, 2014). Ford Motor Company declared the standards of FMEA for publicity and implementation in 1977. Other motor companies adopted it one after the other and furthermore separated into Design and Process FMEA. Besides, suppliers were asked to design and process FMEA for parts which they produce (Yang et al., 2006). Over the years, FMEA has become a standard practice which ensures qualitative and quantitative information in various sectors and countries (Paciarotti, Mazzuto and D’Ettorre, 2014). In 1988, the International Standards Organization (ISO) has published standards for the management system series of ISO 9000 standards. Series of ISO 9000 standards has enabled institutions to focus on improving their quality management and meet to needs of customer demand and expectations. ISO 9000 standard is similar QS 9000 which is applied in the automotive industry. Chrysler, Ford and General Motors have made intensive works in the supplier quality management system of its suppliers (Ahsen, 2008).

Success of FMEA is related with the determination in the causes and effects of each failure, identification potential failures, revealing the risk prioritization and enabling to monitor problems and corrective action (Franceschini and Galetto, 2001). The risk assessments in these sectors are alike with the insurance sector which is based on identifying and preventing possible failure and risks. Today, the risk management approach is widely used to ensure the long-term success and protection of important assets (Ahsen, 2008). The FMEA requires team work where the team is composed of personnel from different departments (production, purchasing, logistics, etc.) and includes a team leader. The first stage is to collect product-process data and its arrangement. It should be based on the experts ‘opinion and/or on historical data. The second stage is to identify the related potential failure modes, and specify

detectability which is the ability to find and spot the failure itself. The third stage is to determine the severity which shows possible fault functionality and/or production losses conclusions after the reviewing of performance and customer satisfaction. The final parameter is to evaluate occurrence of failure mode which is probability of failure occurrence. These parameters are ranked on a predefined scale. 1 to 10 scales for each parameter are the most common rating scale which can be seen Table 3.1, 3.2., and 3.3. (Paciarotti, Mazzuto and D'Ettoire, 2014).

Figure 3.2. Qualitative Stage of Research.

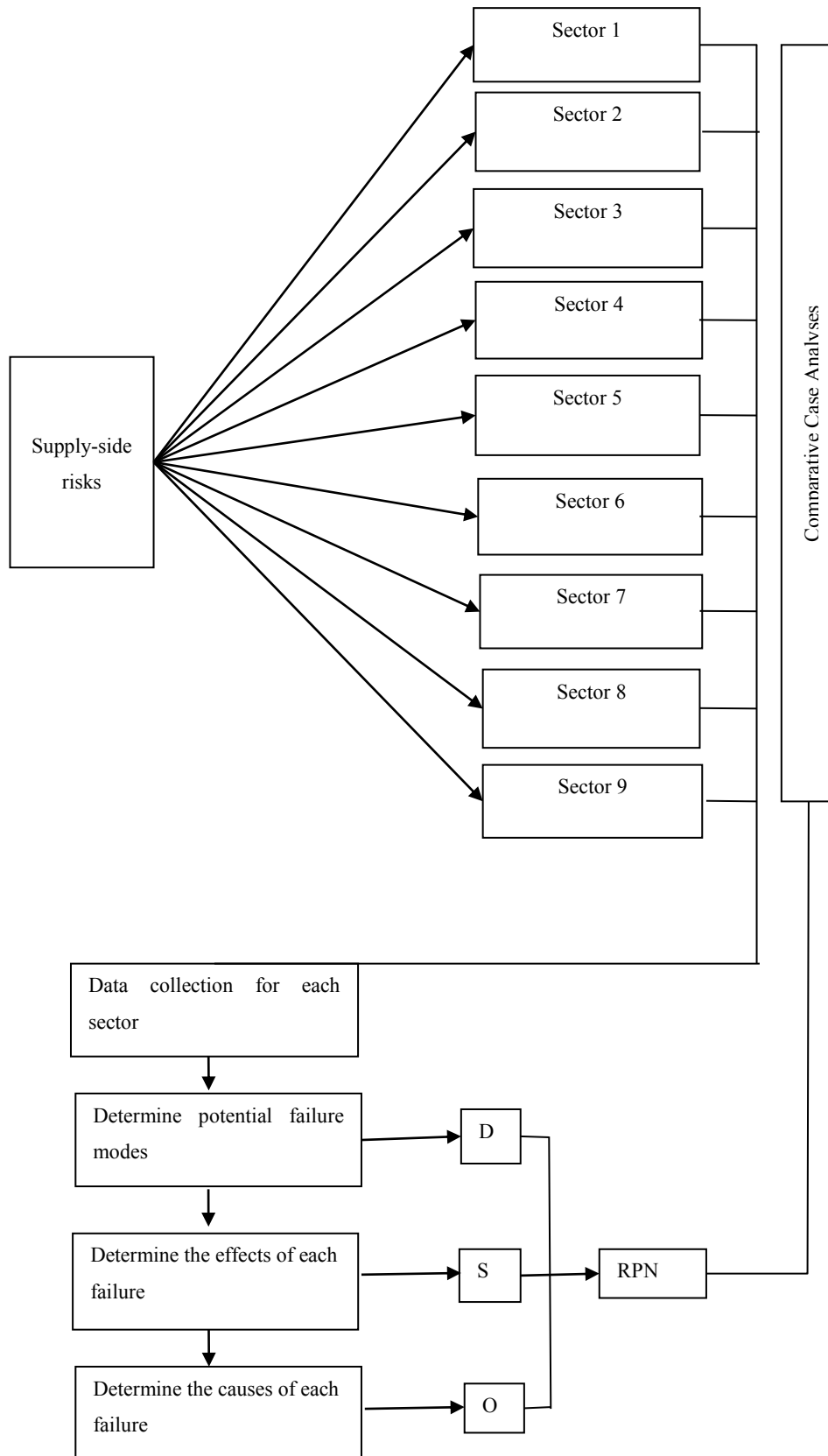


Table 3.1. Criteria ranking (Paciarotti, Mazzuto and D’Ettorre, 2014).

Occurrence ranking criteria			
Occurrence	Description	Frequency	Ranking
Very high	Failure is almost inevitable	1 in 2	1
		1 in 3	0
		1 in 8	9
High	Repeated failure	1 in 20	8
		1 in 80	7
Moderate	Occasional failure	1 in 400	6
		1 in 2,000	5
Low	Relatively few failures	1 in 15,000	4
		1 in 150,000	3
Remote	Failure is unlikely	1 in 1,500,000	2
			1

Table 3.2. Criteria detectability (Paciarotti, Mazzuto and D’Ettorre, 2014).

Detectability ranking criteria		
Detectability	Description	Ranking
Absolute uncertainty	Impossible to detect the failure	10
Very remote	Very difficult to detect the failure	9
Remote	Difficult to detect the failure	8
Very low	Very low chance to detect failure	7
Low	Low chance to detect failure	6
Moderate	Moderate chance to detect failure	5
Moderately high	Moderately high chance to detect failure	4
High	Probably the current control will detect the failure	3
Very high	High probably the current control will detect the failure	2
Almost certain	Surely the current control will detect the failure	1

Table 3.3. Criteria severity (Paciarotti, Mazzuto and D’Ettorre, 2014).

Severity ranking criteria		
Severity	Description	Ranking
Dangerously high	The failure effect is hazardous for customer/user safety	10
Extremely high	The same as above only with warning	9
Very high	The product is not operative	8
High	High degradation of product and customer dissatisfaction	7
Moderate	Partial malfunction of the product and customer dissatisfaction	6
Low	The product could be reworked and some customer dissatisfaction	5
Very low	The failure could be noticed by many customers	4
Minor	The failure could be noticed by few customers	3
Very minor	The failure is not apparent to the customer	2
None	No effect	1

3.1.2. Comparative Case Study

Selecting the method is an important topic for the research subject. Different methods (survey, archival analysis, experiment, history and case study) can be used in different research contexts. The methods of research should be selected in terms of research questions. The research questions signify the appropriate research method. When one uses basic “what” questions, this type of research may be exploratory and can use any of the methods. When one uses mainly “how” and “why” questions, this type of research may be explanatory and can be used for case studies, histories and experiments (Yin, 2009). “How” and “why” questions are the convenient research questions for case study research (Kaarbo and Beasley, 1999).

Case study as a research method is used in many studies. Some of them are political science and government studies, social psychology and sociology, organizational and administrative studies, city-area planning research and scientific research and thesis in the social sciences (Yin, 2009). George and McKeown (1985) stressed on claims which is examined within-case analysis. Yin (1994) defined a case study as investigation of a fact within its real-life situation and specification if the limits and status are not obvious (Kaarbo and Beasley, 1999). There is a confusing terminology concerning “case studies”. In social science the word ‘case’ and different terms related with the idea of case analysis are not well identified even if they are broadly used. The term case can have different meanings such as “study,” analysis,” or “method,” the meaning becomes more complex. Different definitions about terms of case and case studies have made the meaning and intention of this technique hard to understand and unclear (Kaarbo and Beasley, 1999). Orum et al. (1991) mentioned about case study saying that it should be in depth by having many facets and using qualitative research methods for a singular social fact.

The systematic comparison of two or more cases is the purpose of the comparative case study. The comparison has to be focused and structured (Kaarbo and Beasley, 1999). Even though case study research is a qualitative approach, it includes quantitative data, qualitative data, or both of them (Eisenhardt, 1989). There are three important ideas of data collection that also maintains set up validity and reliability in case study approach. First one is to use multiple sources of data. Second is to build a case study database. Third and last one is; all data and notes are to be documented

and organized in order to set up a chain of evidence and make the process clear (Yin, 2009).

3.1.3. Analysis of Comparative Case Studies

Number of the Multiple cases should be at least four and the most ten in order to ensure better results about interactivity among conditions and singleness of interactivity. Selection of the case is very important in multiple-case designs in qualitative research (Stake, 2006). For this study, nine companies were selected from the manufacturing sector. Even though five different department's manager were targeted to interview in order to collect multiple perspectives, one manager was interviewed from all six companies, two managers were interviewed from one company, three managers were interviewed from two companies, four managers were interviewed from one company. Using failure mode and effect analysis technique, supply side risk sources are focused on potential failure mode, effects and causes by managers. Then, every risk items' risk priority number is calculated. For multiple perspectives, averages are calculated after giving every department's results. Risk items are grouped by their priority which is namely high, middle, and low. "Labor management problems at suppliers" and "Transportation disruptions with inbound supply channels" have high priority in six sectors. Natural disasters or "acts of God" affecting supplier's operations have also high priority in five sectors. "Ineffective management in the supplier firm", "Suppliers incorrectly interpreting our requirements", "Inability of suppliers to meet significant (<20%) increases in required volumes", "Variability in transportation times with inbound supply chains" and "Political instability / war affecting suppliers' operations" have middle priority in four sectors. "Financial instability or financial failure of a supplier", "Incoming product quality problems", "Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers", and "Lack of alternative suppliers" also have middle priority in three sectors. Lastly, "Inability to influence suppliers" has low priority in two sectors, and "Long physical distances between you and your suppliers" has low priority in just one sector. As a result of that, sectors are compared according to their risk priority number and priority levels and which risk items are prioritized in how many sectors. The figure 3.4. shows the comparison of sectors.

Table 3.4. The comparison of sectors.

No	Item	Sectors	RPN	Total sector no
1	Labor/management problems at suppliers	Dried food	274	6
		Automotive	245	
		Paint	225	
		Leather	200	
		Textile	200	
		Aviation	104	
2	Transportation disruptions with inbound supply channels	Plastic	338	6
		Dried food	280	
		Paint	243	
		Textile	218	
		Automotive	200	
		Machine	100	
3	Natural disasters or “Acts of God” affecting supplier’ operations	Automotive	500	5
		Dried food	158	
		Textile	133	
		Plastic	105	
		Leather	100	
4	Inability of suppliers to meet significant (>20%) increases in required volumes	Dried food	504	4
		Paint	210	
		Plastic	150	
		Leather	112	
5	Variability in transportation times with inbound supply channels	Dried food	444	4
		Plastic	357	
		Paint	243	
		Automotive	200	
6	Ineffective management of supplier	Textile	547	4
		Leather	300	
		Automotive	245	
		Dried food	176	
7	Suppliers incorrectly interpreting our requirements	Textile	152	4
		Plastic	110	
		Machine	100	
		Paint	100	
8	Political instability / war affecting supplier’s operations	Textile	212	4
		Plastic	106	
		Dried food	103	
		Paint	100	
9	Financial instability or financial failure of a supplier	Automotive	245	3
		Dried food	163	
		Plastic	114	
10	Incoming product quality problems	Leather	490	3
		Plastic	273	
		Dried food	152	
11	Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers	Paint	252	3
		Automotive	192	
		Textile	154	
12	Lack of alternative suppliers	Leather	600	3
		Dried food	265	
		Textile	117	
13	Inability to influence suppliers	Dried food	324	2
		Textile	112	
14	Long physical distances between you and your suppliers	Plastic	157	1

The risk items which have high priority

In this section, there are three risk items that are examined which are high priority in most sectors. These risk items are labor/management problems at suppliers, transportation disruptions with inbound supply channels, and natural disasters or “acts of God” affecting suppliers’ operations. Every risk item is evaluated according to which sector has priority and which one is not in conjunction with the multiple perspectives from departments. Potential failure mode for these items can be generalized as delays in delivery times, incomplete shipments, never delivered shipments and stoppage in production and assembly. At the end of this section, the potential failure mode as well as effects and causes can be seen which are related with the items in Table 3.5.

Labor/management problems at suppliers

Labor/management problems at suppliers have high priority numbers in the paint, automotive, dried food, aviation, textile and leather sectors, while having low priority numbers in the machine, metal, and plastic sectors. For sectors which have high priority, RPN is 274 for dried food, 245 for automotive, 225 for paint sector, 200 for leather, 200 for textile sector, and 104 for aviation. RPN is 324 in the purchasing department. RPN is 224 for logistics department for dried food sectors. RPN is 245 for automobile and 200 for leather sector. In addition, there are big differences between the department’s opinions in two sectors which are aviation and textile. For example in the aviation sector, RPN is 128 for supply chain, 150 for production and planning department, and 35 for purchasing department. In the textile sector, the result taken from foreign trade department is 24 and that is considered low; a few other results from the purchasing departments are 294 and 280 and they are considered high.

Transportation disruptions with inbound supply channels

Transportation disruptions with inbound supply channels has high priority number in the plastic, dried food, paint, textile, automotive, machine sector while low priority in the metal, aviation, and leather sector. For sectors which have high priority, RPN is 338 for plastic, 280 for dried food, and 243 for paint, 218 for textile, 200 for automotive, and 100 for machine. For sectors which have low priority results are as follows; RPN is 36 for metal, 14 for aviation, and 12 for leather sector. In addition, there are differences between the manager’s opinions in the plastic, dried food,

textile and aviation sectors. For example, RPN is 378 for foreign trade department, 315 for production department, and 280 for top management in the plastic sector. In the textile sector, the RPN calculated based on a manager's feedback working in the foreign trade department is 40 which are considered low; another result from purchasing is 280 and 336 which is considered high priority. In the dried food sector, there is a big difference between managers' opinions; RPN is 72 for purchasing and 504 for logistics department. For the sectors that has low priority; RPN is 6 in the supply chain and purchasing department, 30 for planning department in the aviation sector.

Natural disasters or "acts of God" affecting suppliers' operations

Natural disasters or "acts of God" affecting suppliers' operations has high priority in the automotive, dried food, textile, plastic, and leather sectors while low priority in the machine, aviation, metal and paint sectors. For sectors which have high priority the results are as follows, RPN is 500 for automotive, 158 for dried food, 133 for textile, 105 for plastic sector, and 100 for leather. For sectors which have low priority; RPN is 90 for machine, 39 for aviation, 30 for metal and 16 for paint sector. There is a difference between department's opinions in some sectors. For example, RPN is 216 for purchasing, 100 for logistics department in the dried food sector. RPN is 315 for purchasing, 54 for other purchasing, and 30 for foreign trade department in the textile sector. RPN is 98 for foreign trade, 112 for top management and production department in the plastic sector. RPN is 6 for purchasing, 20 for planning and 100 for supply chain department in the aviation sector.

Table 3.5. The FMEA for risk items which have high priority.

Item function	Potential failure mode	Potential effects	Potential causes
Labor/management problems at suppliers	<ul style="list-style-type: none"> * Incomplete and incorrect shipments * Delays in delivery times * Stoppage in Production / Assembly 	<ul style="list-style-type: none"> *Reliability *Costs incurred due to failure to Production/Assembly 	<ul style="list-style-type: none"> * Unions (entering the union of the supplier) * Labour rights (has been worked to child labor, payment of wages to each of the individual worker, uncle per system, price issues) * The lack of certification systems (BSCI certification for agricultural) * The lack of supplier specifications * Mistreating workers by management * The lack of appropriate work environment (unpaid Social Security employees)
Transportation disruptions with inbound supply channels	<ul style="list-style-type: none"> * Incomplete and incorrect shipments * Delays in delivery times * Stoppage in Production / Assembly 	<ul style="list-style-type: none"> * Personnel overtime * Transportation costs * Costs incurred due to failure to Production/Assembly 	<ul style="list-style-type: none"> * Weather conditions * Accidents * Volcanic eruption (due to volcano eruption in Iceland, materials comes from instead of the US Northern Hemisphere enter Turkey via the South Hemisphere) * The strike carried out in ports
Natural disasters or "acts of God" affecting suppliers' operations	<ul style="list-style-type: none"> *Incomplete shipments * Delays in delivery times * Stoppage in Production / Assembly * Never delivered shipments due to the interruptions of the production in the suppliers 	<ul style="list-style-type: none"> * Loss of personnel * Loss of money, materials and facilities 	<ul style="list-style-type: none"> * Natural disasters (earthquake, flood, hurricane, storm, etc.) (for example, flooding and delays of shipments due to Tsunami) * Severe weather events (closing roads due to snow, flooding due to rain, extremely hot or cold weather, etc.) *Diseases

The risk items which have middle priority

In this section, there are three risk items that are examined which are the middle priority items in most sectors. These risk items are ineffective management of supplier, suppliers incorrectly interpreting our requirements, inability of suppliers meeting the significant (>20%) increases in required volumes, variability in transportation times with inbound supply channels, and political instability / war affecting supplier's operations. These have priority in four sectors. The other risk items are financial instability or financial failure of a supplier, incoming product quality problems, problems in electronically sharing information (e.g., through EDI, ERP) with suppliers and lack of alternative suppliers. These have priority in three

sectors. Every risk item is evaluated according to which sector has priority and which one is not in conjunction with the multiple perspectives from departments. Potential failure mode for these items can be generalized as single supplier dependency, orders not taken or never on time, repeated production due to getting wrong mails, importing problems of the product to the facility due to quality documents, transit damage, capacity failure, fluctuation in delivery times, delays in delivery times, incomplete shipments, never delivered shipments and stoppage in production and assembly. At the end of this section, potential failure mode, effects and causes can be seen which are related with the items in Table 3.6.

Ineffective management of supplier

Ineffective management has a high priority in the leather, textile, dried food and automotive sectors while having a low priority in the paint, machine, metal, aviation and plastic sectors. RPN is 300 for leather, 547 for textile, 245 for automotive, and 176 for dried food. There are little differences between the results of departments in textile and dried food sector. RPN is 540 for purchasing and foreign trade department. RPN is 560 in the textile sector. RPN is 192 for purchasing and 160 for logistic department in the dried food sector. For sectors which have low priority the results are as follows; RPN is 72 for paint sector, 30 for metal, and 15 for machine sector. RPN is 64 for top management and foreign trade department, 81 for production department in the plastic sector. RPN is 75 for supply chain and purchasing, 50 for production and planning departments in the aviation sector.

Suppliers incorrectly interpreting our requirements

Suppliers incorrectly interpreting our requirements have high a priority number in the paint, machine, textile and plastic sectors, while having low priority in the metal, aviation, automotive, leather and dried food sectors. For sectors which have high priority the results are as follows; RPN is 152 for textile, 110 for plastic, 100 for both paint and machine sector. For sectors which have low priority the results are as follows; RPN is 1 for leather, 18 for aviation, 39 for dried food and 40 for metal and automotive sectors. In addition, there are some differences between department's opinion in three sectors which are plastic, aviation, and textile. For example in the plastic sector, RPN is 63 and 54 for foreign trade, 72 for production department and 252 for top management. In the textile sector, the result taken from one manager from the purchasing department is 96, another's result from purchasing is 168 and

foreign trade is 168. Purchasing department RPN is 63 and logistics department RPN is 15 in the dried food sector. The supply chain department RPN is 16, purchasing department is 16 and production and planning department RPN is 20 in the aviation sector.

Inability of suppliers to meet significant (>20%) increases in required volumes

Inability of suppliers to meet significant (>20%) increases in required volumes has high priority number in the dried food, plastic, paint, and leather sector while low priority number in the textile, automotive, aviation, metal and machine sectors. For sectors which have high priority the results are as follows; RPN is 504 for dried food, 210 for paint, 150 for plastic, and 112 for leather. For sectors which have low priority the results are as follows; RPN is 77 for textile, 50 for automobile, 40 for aviation, 24 for metal, and 15 for machine. In addition, there are differences between the manager's opinions in the dried food, plastic, textile and aviation sector. RPN is 432 for the purchasing department and RPN is 576 for the logistics department for dried food. For plastic sector, RPN is 100 and 200 for foreign trade, 128 for production and 175 for top management departments. RPN is 12 for purchasing, 45 for production and planning, and 64 for supply chain in the aviation sector. In the textile sector, the RPN calculated from one manager from purchasing department is 63 which is considered low; another result from purchasing is 245 and foreign trade departments is 168 which is considered high priority.

Variability in transportation times with inbound supply channels

Variability in transportation times with inbound supply channels has high priority in the dried food, plastic, paint, and automotive sector while low priority in the textile, machine, aviation, metal, leather, sector. RPN is 444 for dried food, 357 for plastic, 243 for paint, and 200 for automotive sector. RPN is 75 for textile, 16 for machine, 14 for aviation, 12 for leather, and 10 for metal sector. For sectors which have high priority the results are as follows; RPN is 384 for purchasing department and 504 for logistics department in the dried food sector. RPN is 378 for foreign trade department, 336 for production and top management in the plastic sector. For sectors which have low priority the results are as follows; RPN is 80 and 84 for purchasing department and 63 for foreign trade department in the textile sector. RPN is calculated as 5 for supply chain, 8 for purchasing, and 30 for planning department in the aviation sector,

Political instability / war affecting supplier's operations

Political instability / war affecting supplier's operations has high priority in the textile, plastic, dried food, and paint sector, while having low priority in the aviation, metal, automotive, machine, and leather sector. For sectors which have high priority the results are as follows; RPN is 212 for textile, 106 for plastic, 103 for dried food, and 100 for paint sector. For sectors which have low priority the results are as follows; RPN is 38 for aviation sector, 36 for metal and automotive, 16 for machine, and 1 for leather sector. In addition, there are differences between the manager's opinions in the plastic, dried food, textile and aviation sector. RPN is the 70 for top management, 98 for production, and 128 for foreign trade departments in the plastic sector. RPN is 105 for purchasing and 100 for logistics department in the dried food sector. RPN is 20 according to one purchasing manager and 280 for the other purchasing managers, 336 for foreign trade department in the textile sector. RPN is 100 for supply chain, 10 for planning and 2 for purchasing department in the aviation sector.

Financial instability or financial failure of a supplier

Financial instability and financial failure of suppliers has a high priority number in the automobile, dried food and plastic sectors, while having a low priority in the leather, aviation, paint, machine, metal, textile sectors. The calculated RPN is 245 for automobile, 163 for dried food, and 114 for plastic sector. RPN is 108 and 147 for foreign trade, 108 for production, and 90 for top management in the plastic sector. There is a huge difference between the departments of the dried food sector. RPN is 324 for purchasing and 2 for logistics department. For sectors which have low priority the results are as follows; RPN is 1 for leather, 10 for machine, 14 for paint, 30 for metal, 47 for aviation and 80 for textile sector. In the aviation sector, purchasing department RPN is 35, production and planning department RPN is 50, supply chain department RPN is 56. In the textile sector, RPN is 120 for purchasing, 60 for another purchasing and foreign trade department.

Incoming product quality problems

Incoming product quality problems have high priority number in the leather, plastic and dried food sectors, while having low priority in the paint, textile, machine, aviation, automobile, and metal sectors. For sectors which have high priority the

results are as follows; RPN is 490 for leather, 273 for plastic, 152 for dried food sector. For sectors which have low priority the results are as follows; RPN is 23 for aviation, 30 for paint, 40 for automobile, 60 for metal, 88 for textile, and 90 for machine. In addition, there are some differences between department's opinions in some sectors. RPN are 210 and 294 for foreign trade department, 294 for production department, and 252 for top management in the plastic sector. For dried food sector the results are as follows; RPN is 192 for purchasing department and 112 for logistics department. RPN is 140 and 72 for purchasing department and 54 for foreign trade department in the textile sector. Lastly, in the aviation sector, RPN is 40 for supply chain, 20 for production and planning and 8 for purchasing department.

Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers

Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers have high priority number in the paint, automotive, and textile sector, while having low priority in the dried food, aviation, metal, leather, plastic, and machine sector. RPN is 252 for paint, 192 for automobile, and 154 for textile sector. RPN is 97 for dried food, 54 for aviation, 12 for metal and leather, 9 for plastic, 1 for machine sector. In addition, there are big differences between department's opinions in two sectors which are dried food and textile. For example in the dried food sector, RPN is high in the purchasing department; RPN is 35 for logistic department. In the textile sector, the result taken from one manager from purchasing department is 8; another result from purchasing is 175 and foreign trade departments are 280.

Lack of alternative suppliers

Lack of alternative suppliers has high priority number in the leather, dried food, and textile sector, while having low priority in the paint, plastic, aviation, automotive, metal, and machine sector. RPN is 600 for leather sector, 265 for dried food, and 117 for textile sector. For sectors which have low priority the results are as follows; RPN is 90 for paint, 63 for plastic, 51 for aviation, 50 for automotive, 36 for metal, 27 for machine sector. In addition, there are big differences between the manager's opinions in the textile and dried food sector. The results taken from purchasing is 189 and 108 while foreign trade departments are 54 in the textile sector. In the dried food sector, RPN is 98 that considered is low, and is 432 that considered is high. In the aviation

sector, RPN is 100 for supply chain, 24 for production and planning, and 30 for purchasing department. Finally, in the plastic sector, RPN is 63 in all departments.

Table 3.6. The FMEA for risk items which have middle priority.

Item function	Potential failure mode	Potential effects	Potential causes
Ineffective management of supplier	* Incomplete shipments* Delays in delivery times* Stoppage in Production / Assembly * Never delivered shipments	* Costs incurred due to failure to Production/Assembly * Have been searched for new suppliers* Impact on quality, logistics and performance indicators	* Mistreating workers by management* Changing of Production / Purchase / Logistics manager (not to be dominated by issues, adaptation process, and no common spoken language)
Suppliers incorrectly interpreting our requirements	* Incorrect shipments * Delays in delivery times * Stoppage in Production / Assembly	* Cost of reprocessing (transportation, repackaging, re-labelling and including labor cost for incorrect shipments) * Fire (due to realize the error immediately in the production) * Costs incurred due to failure to Production/Assembly * Passing time to be corrected the failure	* Lack of skilled labor * Telephone orders, foreign language problems, incorrect interpretations of the production personnel * Lack of necessary quality documents (like PPI) and systems * Lack of control plans and lack of feedback after taken specifications * Not to be customer-oriented * Not have clear and obvious design or documents
Inability of suppliers to meet significant (>20%) increases in required volumes	* Failure to meet the increased demand * Capacity failure * Delays * Slowing or stopping in production	* Have been searched for new suppliers * Costs incurred due to failure to Production/Assembly	* Lack of personnel and raw material to continue to meet increased demand * Lack of raw materials from the suppliers of suppliers
Variability in transportation times with inbound supply channels	* Fluctuation in delivery times * Noncompliance conditions of production planning	* Communication problems * Shipping costs * Standby time	* Transportation costs * Improper transport mode selection * Changes in the supplier delivery time (for example, delivery times can extend from 8 week to the 10 week because of the supplier) * Not measure the performance of forwarders and problems caused by inefficient forwarders
Political instability / war affecting supplier's operations	* Incomplete and incorrect shipments* Can not be made delivery on time* Stoppage in Production / Assembly	* Loss of personnel * Loss of money, materials and facilities * Confidence problems towards country	* Political instability created by wars* The collapse of local suppliers, the loss of their production centers, reduction of personnel or not to work* Cross-country issues* Limited resources* In-country issues (for example, closure of customs system in the December 25 and remain the containers in port)* Selections* Euro / dollar parity* Instability and insecurity caused by government * Social explosions (large-scale riot, general strike, etc.)* The ban imposed by legislation
Financial instability or financial failure of a supplier	* Delays in delivery times * Stoppage in Production / Assembly	* Have been searched for new suppliers * Costs incurred due to failure to Production/Assembly	* Have been hidden the information about the financial condition of suppliers * Not have been prepared to agreements by lawyers * Lack of collateral agreements * Financial errors caused by the human in the firms * Bankruptcy / deteriorating financial situation of suppliers * Financial problems of supplier

Incoming product quality problems	<ul style="list-style-type: none"> * Delays in delivery times * Never delivered shipments * Importing problems of the product to the facility due to quality documents * Transit damage 	<ul style="list-style-type: none"> * Costs incurred due to failure to Production/Assembly * Cost of reprocessing (transportation, customs, repackaging, re-labelling and including labor cost for incorrect shipments) * Fire (due to realize the error immediately in the production) 	<ul style="list-style-type: none"> * Installed and / or have not been well managed to the ISO 9001 * Lack of skilled labor * Technical infrastructure deficit * Machine / equipment maintenance deficiency * Lack of approved supplier lists * Failure to quality controls * Lack of control to suppliers * Lack of capacity
Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers	<ul style="list-style-type: none"> * Not taken to the orders never or on time * Made twice or more production due to getting wrong mails 	<ul style="list-style-type: none"> * Integration and communication impairment * To be processed the same data again * Do not keep information from different departments each other * Inconsistent reporting * Hourly / daily problems in the mails, systems or internet 	<ul style="list-style-type: none"> * Lack of technology * Lack of general terminology * Lack of cooperation * E-mail issues (not to go, go now, posting piece installed files)
Lack of alternative suppliers	<ul style="list-style-type: none"> * Single supplier dependency * Failure to meet the increase in demand * Delays in delivery time 	<ul style="list-style-type: none"> * The lack of price competition * Inventory holding costs 	<ul style="list-style-type: none"> * The lack of alternative suppliers * The risk of short-term or long-term contracts * Limited resources * Monopoly * Swelling of capacity due to the being single supplier

The risk items which have low priority

In this section, there are three risk items that are examined which are low priority in most sectors. These risk items are inability to influence suppliers which has priority for two sectors and long physical distances between you and your suppliers which has priority for one sector. Every risk item is evaluated according to which sector has priority and which one is not in conjunction with the multiple perspectives from departments. Potential failure mode for these items can be generalized as delays in delivery times, problems of the order to pull ahead, and longer time to tolerate faulty or incomplete deliveries. At the end of this section, the potential failure mode, effects and causes can be seen which are related with the items in Table 3.7.

Inability to influence suppliers

Inability to influence suppliers has high priority number in the dried food and textile while having low priority in the paint, machine, metal, automotive, leather, aviation and plastic. RPN is 324 for dried food and 112 for textile sector. RPN is 90 for paint, 60 for leather, 54 for aviation, 50 for automotive, 36 for machine and metal, 1 for plastic sector. In addition, there are differences between the manager's opinions in the textile, dried food and aviation sector. RPN is 504 for purchasing and 144 for logistics department is the dried food sector. In the textile sector, the result taken

from one manager from purchasing department is 192; another result from purchasing is 90 and foreign trade departments are 56. For aviation sector, RPN is 100 in the supply chain that considered is high, and is 24 and 40 that considered is low in the planning and purchasing departments.

Long physical distances between you and your suppliers

Long physical distances between you and your suppliers has high priority in the plastic sector while having low priority in the dried food, leather, paint, aviation, automotive, metal, textile, and machine. RPN is 157 in the plastic sector which is considered high. For sectors which have low priority the results are as follows; RPN is 90 for dried food, 84 for leather, 50 for paint, 43 for aviation, 25 for automotive, 24 for metal, 20 for textile and 8 for machine sector.

Table 3.7. The FMEA for risk items which have low priority.

Item function	Potential failure mode	Potential effects	Potential causes
Inability to influence suppliers	<ul style="list-style-type: none"> * Delays in delivery time * Problems of the order to pull ahead 	<ul style="list-style-type: none"> * The lack of price competition * Inventory holding costs 	<ul style="list-style-type: none"> * The lack of alternative suppliers * The risk of short-term or long-term contracts * Limited resources * Monopoly * Swelling of capacity due to the being single supplier * Submission to supplier and be obligated
Long physical distances between you and your suppliers	<ul style="list-style-type: none"> * The longer time to tolerate faulty or incomplete deliveries 	<ul style="list-style-type: none"> * High transport costs 	<ul style="list-style-type: none"> * Bureaucratic obstacles * Inefficient operation of customs and border crossings and the complexity of customs legislation * Transition document * Quota issue

3.2. Quantitative Stage of Research

Quantitative research is used especially when there is a hypothesis or a theory to be tested for confirmation or disconfirmation, and the relationships among the variables are being examined (Newman, 1998; Creswell, 2009). Quantitative research methods collect numerically representable data in a systematic manner (Kirk and Miller, 1986), and are mostly derived from standardized questionnaires based on scales. Thus, quantitative data is systematic and standard, which is easier and more concise to interpret.

3.2.1. Questionnaire

In preparation of the questionnaire, a great effort has been made and worked with diligence to keep the accuracy of the results and to reach the highest level of research and validation. The scales suggested by the literature have concluded that it would be appropriate to use in this regard. The questionnaire consists of 5 sections. In the first section the gender, position level, working department, working time in a current business, total work experience, and company's age are asked.

Number of workers in their business department, position level and outsourcing rate questions are taken from Kroesa and Ghosh (2010). In the second section supply-side risks sources scale is used (Zsidisin and Wagner, 2010). With this section how these risk items affects to risk of the supply chain by using 1-5 Likert Scale is asked. In the third section scale of developments contribute to an increase risk within supply chain are taken (Thun and Hoenig, 2011) by using the 1-5 Likert Scale. In the fourth chapter firm's practice of supply base management is used (Tan et.al. 1999) by using the 1-7 Likert Scale. Finally, in the last chapter four open-ended questions about conceptual levels of philosophy, principles and processes in the supply chain management are used (Jüttner, 2005). References belong to questionnaire can be seen in Appendix 5. The questionnaire was translated into Turkish which can be seen in Appendix 3, English version can also be seen in Appendix 4. Turkish and English versions of the questionnaire were examined by the thesis advisor and one native speaker and translated items were corrected with respect to their suggestions. Questionnaire was pre-tested by 5 managers from the purchasing, production, supply chain and general management departments. These managers were selected based on their different working areas and experiences. All survey items were asked to them face to face. In this process the item "low volume, low cost materials are handled by individual plant staff based on local needs" is needed to remove due to being unrelavant by these managers. After these pre-testing processes, the questionnaire items were replaced into their final version. First, determination of the people who answer the survey is examined. It searched similar studies on the literature at this stage and determined to send the survey to the middle-level (supply chain, purchasing, production specialists, managers, directors or executives) and high-level managers. Company's websites are visited and the e-mail addresses are gathered. Questionnaires were sent via e-mail which has a disclosure to companies which

operate in Aegean Free Zone and Atatürk Industrial Zone in İzmir. Besides sending e-mails, some of them have participated face to face and some others have taken the questionnaire from Google drive. 40% of the total data was collected by face to face methods, 10% of data was collected by internet and 50% were collected by drop by method. 80% of the data were gathered in the first two weeks, 20% of them gathered in the second two weeks. The quantitative stage of the research can be seen in Figure 3.3.

3.2.1.1. Sampling Process and Survey Method

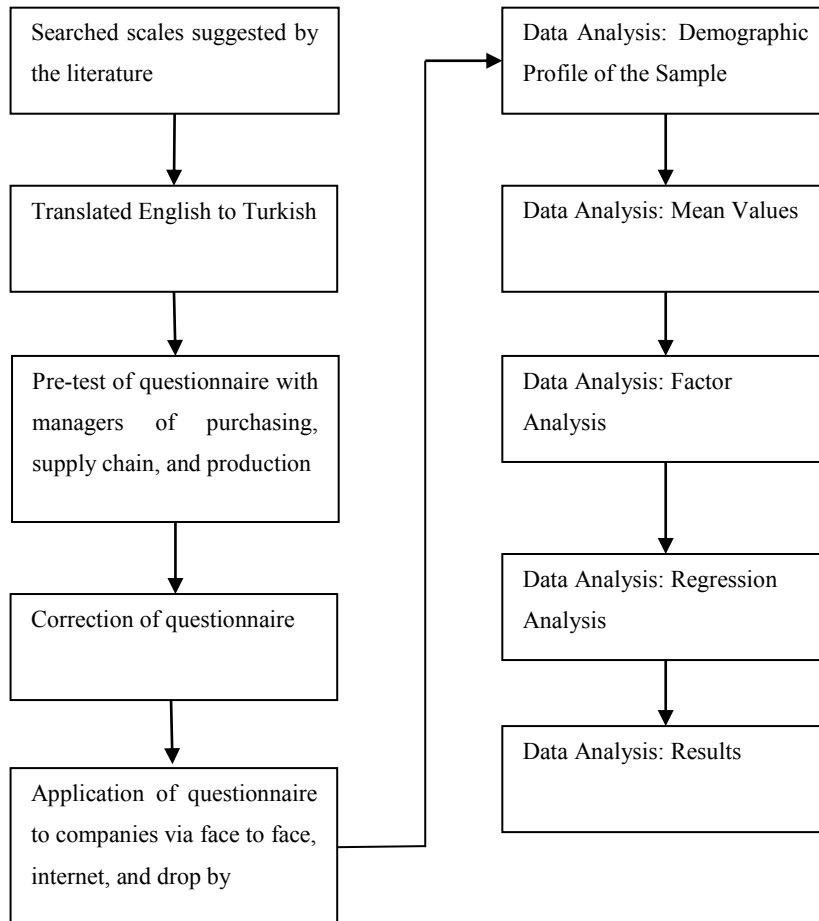
First determination of the people who answer the survey is examined. It searched similar studies on the literature at this stage and determined to send the survey to the middle-level (supply chain, purchasing, production specialists, managers, directors or executives) and high-level managers. Thus, nonrandom and judgmental sampling methods were used. Selection method is subjective in the nonrandom sampling methods and researcher determines the samples from universe according to his/her judgment (Gegez, 2005). Industrial classification of this study is based on “Statistical Classification of Economic Activities in the European Community (NACE Rev. 2) 2015” which can be seen in Appendix 1. Samples are selected from production industry through purposive sampling, from the companies located in İzmir. Company’s websites are visited and e-mail addresses are gathered. Questionnaire was sent via e-mail which has a disclosure to companies which operate in Aegean Free Zone and Atatürk Industrial Zone in İzmir. Besides sending e-mails, some of them have participated face to face and some others have taken the questionnaire from Google drive. A reminder e-mail sent to all companies after two weeks which was firstly sent to survey. Disclosure belonging to questionnaire can be seen in Appendix (2). Started to send questionnaire on November 11, 2015 and data collection finalized on December 15, 2015. A total of 95 people replied to the questionnaire. SPSS 20 version has been conducted to analyze all statistical analyses.

3.2.1.2. Nonresponse Bias

In order to test if there are differences between responses depending on the data collection method, t-tests were run between mail responses and face-to-face responses (Armstrong and Overton 1977). The results indicated that there were no significant differences between these groups. In addition, due to test if there are differences between responses depending on the data collection process, t-tests were

run between the first two weeks and second two weeks. The groups represented the first 70 and last 25 responses of the total 95 responses received. The results indicated that there were no significant differences between these groups.

Figure 3.3. Quantitative Stage of Research.



3.2.2. The Analysis of Survey Research

In this stage, the analysis of the survey research was held in accordance with the intended up purposes. Therefore, the analysis which can be seen below is divided into four subgroups with explanation of research aims.

3.2.2.1. Demographic Profile of the Sample

The first section in the questionnaire involved questions regarding the demographic profile of respondents. Table 3.8. shows the profile of the respondents in the survey. 57, 9 % of the respondents are male and 42, 1% of the respondents are female. The majority of participants' ages are 30-39 (48, 4%). The current experiences of the participants are mostly between the years 1-5 (38, 9%) and 6-10 (33, 7%). In terms of the total professional experience level, the respondents have between 11-20 years (49, 5%). Respondents mostly had an age range of of the respondents are mostly over 30 (35, 8%) and than 11-20 (31, 6%). The respondents' departments are Logistics and Supply Chain Management Department (53, 7%), Marketing Department (23, 2%), Production Department (15, 8%), and General Management (7, 4%). The employee population of the companies is less than 200 (41, 1 %), and 201-500 (30, 5 %). The outsourcing level of the companies is mostly 1-25% (55, 8 %). In order to test if there are differences between responses depending on the outsourcing rates, t-tests were run between outsourcing rates (Armstrong and Overton 1977). The results indicated that there were no significant differences between outsourcing rates. In addition, to test if there are differences between responses depending on the data collection process, t-tests were run between middle size companies (fewer than 200 employees) and big size companies (greater than 200 employees). The results indicated that there were significant differences between those internal to the firm (0, 16), external risks to the firm but internal to the supply chain (0, 37), and supplier integration (0,03).

Table 3.8. Demographics Analysis.

Valid		Frequency	Percent
Demographics		Participants	Percent (%)
Gender	Female	40	42,1
	Male	55	57,9
Age	20-29	21	22,1
	30-39	46	48,4
	40-49	21	22,1
	50-59	4	4,2
	60 and over	3	3,2
Current experience	1-5	37	38,9
	6-10	32	33,7
	11-20	25	26,3
	21-30	1	1,1
Professional experience	1-5	16	16,8
	6-10	22	23,2
	11-20	47	49,5
	21-30	8	8,4
	30 and over	2	2,1
Company Age	1-5	8	8,4
	6-10	5	5,3
	11-20	30	31,6
	21-30	18	18,9
	Over 30	34	35,8
Departments	Production	15	15,8
	Log&SC	51	53,7
	Marketing	22	23,2
	General Management	7	7,4
Employees	Less200	39	41,1
	201-500	29	30,5
	501-1000	16	16,8
	1001-1500	2	2,1
	Over 2500	9	9,5
Outsourcing rate	0%	13	13,7
	1-25%	53	55,8
	26-50%	13	13,7
	51-75%	11	11,6
	Over 75%	5	5,3

3.2.2.2. Mean Values

The general questions part of the question form contained items measuring the perceptions of the respondents regarding the supply-side risk sources, supply chain management strategy elements, and supply base management practices. The mean values of this section were used in order to analyze these perceptions and the results are shown on Table 3.9. The results were explored to specify the high importance items and compare them with low importance items.

Table 3.9. Descriptive Statistics for Supply-side Risk Sources.

	N	Mean	Std. Deviation
Incoming product quality problems	95	4,1684	,96373
Financial instability or financial failure of a supplier	95	3,9368	,99798
Suppliers incorrectly interpreting our requirements	95	3,9368	1,04993
Inability of suppliers to meet significant (>20%) increases in required volumes	95	3,7053	1,11921
Ineffective management in the supplier firm	95	3,6737	1,14336
Transportation disruptions with inbound supply channels	95	3,6632	,95216
Variability in transportation times with inbound supply channels	95	3,5053	,99866
Political instability / war affecting supplier's operations	95	3,5053	1,18388
Inability to influence suppliers	95	3,3789	,99123
Natural disasters or "acts of God" affecting suppliers' operations	95	3,3579	1,22835
Labor/management problems at suppliers	95	3,3158	1,10380
Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers	95	3,1789	1,01036
Long physical distances between you and your supplier	95	3,1368	1,05800
Valid N (listwise)	95		

When Table 3.8. is analyzed, the mean values do not have a high leniency. The highest means belong to the items related with the quality problems. The sample is from manufacturing industry. Product quality problems are highly considered in the supply-side risk sources for all companies in the manufacturing industry. Mismanaged quality control, lack of skilled labor, technical infrastructure deficit, machine and equipment maintenance deficiencies, lack of control suppliers are the reasons for risk item. Quality control management system have not been well manage, lack of skilled labor, tecninal infrastucture deficit, machine and equipment maintenance deficiencies, lack of control suppliers are the reasons for risk item. The second-highest means item is financial instability or financial failure of a supplier.

The information which is related to financial condition have generally been hidden by (the?) supplier. Due to the supplier bankruptcy or deteriorating financial situation, orders can not be delivered or delays can happen during delivery times. When this situation happens, because of lack of well prepared collateral agreements with suppliers, the situation get worse. Human errors can also cause financial errors in the supplier. The third-highest means item is suppliers incorrectly interpreting our requirements. These items also can cause cost of reprocessing, fire or failure to the production. Standby time is also caused by this item. Lack of quality documents, skilled labor, or feedback mechanism are the reasons for this risk item. Lastly, the lowest means item is long physical distances between you and your supplier. It is considered irrelevant with the supply-side risk sources than other items. The risk can cause longer delivery times and the physical distances are known before so the delivery times are planned according to it. So the mean is very low for the risk item.

Table 3.10. Descriptive Statistics for Supply Chain Management Strategy Elements.

	N	Mean	Std. Deviation
Reduction of suppliers	95	3,9053	1,05259
Enforced outsourcing	95	3,5053	1,10004
Increased product variety	95	3,4632	1,10906
Focus on efficiency instead of security aspects	95	3,2737	1,06633
Globalization of the supply chain	95	3,1895	1,10410
Centralized production	95	3,1895	1,15127
Focus on central distribution	95	3,1263	1,03392
In general, do you consider your supply chain as vulnerable to incidences?	95	3,0105	1,23336
Valid N (listwise)	95		

When Table 3.10. is analyzed, the highest means of affecting supply chain management strategy to supply chain risk belongs to the reduction of suppliers. Supply base reduction is a strategy. Companies have adopted to these strategies to establish long-term supplier relationship development. By reducing the number of suppliers, companies have maintained collaboration which is based on trust and cooperation. However, this analysis shows reduction of suppliers is a supply chain management strategy to affect the supply chain risk. The second-highest mean belongs to the enforced outsourcing. Although companies focus on their core

competences by using this strategy, this study shows it has affected the supply chain risk. The third-highest mean belongs to the increased product variety. As a result of globalization, companies have to offer new products at a better quality and price in order to satisfy their consumers. Lastly, the lowest mean addresses the question of their supply chain's vulnerability. So the managers do not think their supply chain is vulnerable.

Table 3.11. Descriptive Statistics for Supply Base Management Practices.

	N	Mean	Std. Deviation
Our company has a quality assurance (certified) program for our supplier's specific product	95	5,9579	1,34414
Suppliers receive changes to our specifications after we develop a new product design	95	5,5579	1,72415
We undertake annual negotiations to establish the price for key-input items from our suppliers	95	5,4842	1,57685
Our company has a quality-assurance program for our supplier's manufacturing process	95	5,4105	1,64054
Our company takes advantages of supplier-provided technical support and test capabilities	95	5,2526	1,54347
Local plant managers are given authority to execute purchase orders and daily supply flows	95	5,1158	1,71268
Commodity management teams set the levels of cost, quality and lead time for supplier performance	95	4,9684	1,62725
We share a great deal of sensitive information with our suppliers	95	4,8000	1,84275
Our manufacturing personnel regularly visit our supplier's facility	95	4,4105	1,80127
Valid N (listwise)	95		

When Table 3.11. is analyzed, the highest means of supply base management practices belong to the quality assurance program for supplier's specific product. Product certification is the process of certifying that a certain product has passed quality assurance tests and meets qualification criteria. The product certification is an important component of a total quality management system. Most of the respondent indicated their company has a certification program for their supplier's specific product in terms of supply base management practices. The second highest mean belongs to supplier receive changes of specifications after had been developed a new product design.

3.2.2.3. Factor Analysis

The collected survey data were analyzed using SPSS 20.0. The factor analysis was used to specify underlying factors examining for each of the item scales (Hair et al. 2006). Firstly, correlation matrix was held in order to assure the factorability of the variables. Correlation matrix should be controlled because the items that have no correlations with other factors may not be part of any factor. Furthermore, high correlations between variables may show that the item is a part of more than one factor. Hence, non-correlated or highly correlated items were investigated and extracted if is required. Principal component factor analysis is employed to extract the factors (Eigen values > 1). The factor matrices were rotated using the orthogonal Varimax rotation Kaiser Normalization to enhance interpretation. The solutions were obtained by rotating all factors with eigenvalues greater than one. Before applying factor analysis, the correlation matrix for the 31 items in this sub-scale was analyzed. Out of the 5 unavailable correlations, 26 of them were significant at 0, 87 level. This result provides an adequate level for conducting factor analysis to the available data. Then, highly intercorrelated items have been sorted out by analysing the correlation table. These were used to detect the double loadings during the factor analysis process. The highly correlated items were found to be loaded on two or three factors. Then, they were selected and removed from the item list (Hair et al. 2006). The sample size should be adequate and the factor loadings should be high to get reliable factor solutions in the factor analysis (Field, 2000). Hence, Kaiser-Meyer-Olkin test was applied and the KMO ratio was 68%. The results of KMO can be seen in Table 3.12. Values above 50% are considered to be appropriate for factor analysis (Hair et al. 2006). Furthermore, reliability tests were performed for each factor using Cronbach's alfa for the internal consistency of the scale items (Cronbach, 1951).

Table 3.12. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,689
Bartlett's Test of Sphericity	Approx. Chi-Square	1484,121
	df	465
	Sig.	,000

Supply-side risks sources. The first factor analysis was applied to the supply-side risk sources part which is represented by Section I in the questionnaire. The questions here

were derived from the supply-side risk sources scale (Wagner and Zsidisin, 2010). There were 14 items examined for supply-side risk sources, based on the perceptions of supply management professionals in evaluating concerns associated with their respective purchases. The item of “lack of alternative suppliers” was laid because of correlation table. From the factor analysis, three factors emerged; internal to the firm (processes and control), external to the network (environmental), and external to the firm but internal to the supply chain network (demand and supply). These factors were labeled with classification of risks (Christopher and Peck, 2004). The internal risks to the firm consist of potential problems associated with a specific supplier in accordance with its management and quality systems. These include issues with the financial stability of the supplier, labor / management problems, and problems which occurred because of suppliers incorrectly interpreting requirements. The results of the factor matrix for supply-side risk sources are summarized in Table 3.13. The Cronbach alpha reliability estimates for the factors internal to the firm, external to the network and external to the firm but internal to the supply chain network were 0.450, 0.779, and 0.824 respectively. These results demonstrate sufficiently high reliability of the supply-side risk source scale except internal risk to the firm factor. Cronbach's alpha is the measure of the reliability and consistency of the sampling instrument and examine whether all the data were measuring the same underlying construct. If alpha results are 0.5, it is acceptable but weak and in this study the internal risk sources to the firm is low result than this level. However, it is used for being considered because of sample size and is clean out after distribution of the factors (Hair et.al. 2006).

Table 3.13. Factor Analysis for Supply-Side Risk Sources.

ITEMS	Internal to the firm	External to the network	External to the firm but internal to the supply chain network
Incoming product quality problems	,830		
Financial instability or financial failure of a supplier	,797		
Suppliers incorrectly interpreting our requirements	,795		

Ineffective management in the supplier firm	,642		
Labor/management problems at suppliers	,458		
Political instability /war affecting suppliers' operations		,800	
Natural disasters or "acts of God" affecting suppliers' operations		,658	
Variability in transportation times with inbound supply channels		,588	
Problems in electronically sharing information (e.g. through EDI, ERP) with suppliers		,587	
Long physical distances between you and your suppliers			,775
Inability to influence suppliers			,769
Transportation disruptions with inbound supply channels			,690
Inability of suppliers to meet significant (>20%) increases in required volumes			,559
Cronbach a	0.450	0.779	0.824

Response cue: The next set of the questions relates of your perception of supply risk for the purchased item you just described. When making sourcing or supply management for a product, to what extent are you concerned about each of the following factors which may contribute to supply risk? (5-point scale 1=not at all, 2=slightly, 3=moderately, 4=very, 5=extremely)

Supply Chain Strategy Elements. A second factor analysis was performed on eight items of supply chain strategy elements. From the factor analysis, two factors emerged. The factors were labeled as of complexity and efficiency (Thun and Hoening, 2011). Complexity refers to globalization of the supply chain, outsourcing activities, and increased product variation. Efficiency includes centralization of distribution and production activities, reduction of supplier base, and focusing on efficiency. The results of the factor matrix for supply chain strategy elements are summarized in Table 3.14 The Cronbach alpha reliability estimates for the factors complexity and efficiency were 0,623, 0,675 respectively. These results demonstrate sufficiently high reliability of the supply chain strategy elements scale (Hair et.al. 2006). The items of "In general, do you consider your supply chain as vulnerable to incidences?" were removed because of correlation table.

Table 3.14. Factor Analysis for Supply Chain Strategy Elements.

ITEMS	Complexity	Efficiency
Globalization of the supply chain	,811	
Enforced outsourcing	,642	
Increased product variety	,523	
Focus on central distribution		,411
Centralized production		,764
Reduction of suppliers		,719
Focus on efficiency instead of security aspects		,694
Cronbach a	0,623	0,675

Response cue: In your opinion, to which extent do the following developments contribute to an increase of risk within your supply chain? (1=do not agree 5= do agree absolutely).

Supply Base Management Practices. A second factor analysis was performed on eight items of supply chain strategy elements. From the factor analysis, two factors emerged. The factors were labeled to address supplier integration and supplier evaluation (Melnik et.al. 2010). The purpose of supplier integration is to work on integrating the supplier and their systems into the buying companies' system which includes quality assurance for products and processes, technical support and test capabilities, and also sharing critical information. The purpose of supplier evaluation is to identify process capabilities, strengths and weaknesses, which also includes visiting the supplier's facility and determining the supplier's cost, quality and lead time. The results of the factor matrix for supply base management practices are summarized in Table 3.15. The Cronbach alpha reliability estimates for the factors supplier integration and supplier evaluation were 0,754, 0,586 respectively. These results demonstrate sufficiently high reliability of the supply base management practices scale (Hair et.al. 2006). There are three items were laid due to the correlation table. These items are "Local plant managers are given authority to execute purchase orders and daily supply flows", "Suppliers receive changes to our specifications after we develop a new product design", and "We undertake annual negotiations to establish the price for key-input items from our suppliers".

Table 3.15. Factor Analysis for Supply Base Management Practices.

ITEMS	Supplier Integration	Supplier Evaluation
Our company has a quality-assurance (certified) program for our supplier's specific product.	,848	
Our company takes advantage of supplier-provided technical support and test capabilities.	,801	
Our company has a quality-assurance program for our supplier's manufacturing process.	,747	
We share a great deal of sensitive information with our suppliers.	,526	
Commodity management teams set the levels of cost, quality and lead time for supplier performance.		,747
Our manufacturing personnel regularly visit our supplier's facility.		,702
Cronbach a	0.754	0.586

Response cue: Indicate the most appropriate response regarding your firm's practice of the following areas of supply base management: (On a scale of 1 = strongly disagree to 7 = strongly agree).

The summary of all factors derived from the factor analysis, their explanation powers and reliability degrees are listed on Table 3.16.

Table 3.16. Summary of Factor Analysis.

Survey Sections	Factor Names	Cronbach's Alpha	% of Variance Explained
Supply-side risk sources	Internal to the firm	0,450	76,3
	External to the network	0,779	10,7
	External to the firm but internal to the supply chain network	0,824	12,8
Supply Chain Management Strategy Elements	Complexity	0,623	36,4
	Efficiency	0,675	63,5
Supply Base Management	Supplier Integration	0,754	43,5
	Supplier Evaluation	0,586	51,6

Correlation analysis analyses the relationships between dependent and independent variables. If there is one independent variable in the analysis, it is called simple correlation analysis. If there are multiple independent variables in the analysis, it is called multiple correlation analysis. Simple correlation analysis is the preferred analysis in scientific research. Correlation analysis defines the tests that determined the relationship based on the level of deviations from the mean. The correlation coefficient and direction of variables gives information about how the interaction between variables. The correlation coefficient takes values ranging from -1 to +1. If there is no interaction, it takes the value 0. If there is full and strong interaction, it takes the value 1. If there is reverse and full interaction, it takes the value -1. The correlation coefficient is usually represented by the letter “r”. According to this; inequality of the correlation coefficient can be shown as “ $-1 \leq r \leq +1$ ” (Türkbal, 1981). Summated factor scores were calculated as the means of each item. Descriptive statistics for all summated variables, including means, standard deviations, and correlations, can be seen below.

Table 3.17. Correlations and Descriptive Statistics.

		Internal to the firm mean	External to the firm but internal to the supply chain network mean	External to the network mean	Efficiency mean	Complexity mean	Supplier Integration mean	Supplier Evaluation mean
Internal to the firm mean	Pearson Correlation Sig. (2-tailed)	1	,584**	,516**	,256*	,104	,528**	,182
	N	95	95	95	95	95	95	95
External to the firm but internal to the supply chain network mean	Pearson Correlation Sig. (2-tailed)	,584**	1	,526**	,508**	,189	,345**	,174
	N	95	95	95	95	95	95	95
External to the network mean	Pearson Correlation Sig. (2-tailed)	,516**	,526**	1	,293**	,242*	,224*	,201
	N	95	95	95	95	95	95	95
Efficiency mean	Pearson Correlation Sig. (2-tailed)	,256*	,508**	,293**	1	,328**	,219*	,319**
	N	95	95	95	95	95	95	95
Complexity mean	Pearson Correlation Sig. (2-tailed)	,104	,189	,242*	,328**	1	,065	,121
	N	95	95	95	95	95	95	95
Supplier Integration mean	Pearson Correlation Sig. (2-tailed)	,528**	,345**	,224*	,219*	,065	1	,388**
	N	95	95	95	95	95	95	95
Supplier Evaluation mean	Pearson Correlation Sig. (2-tailed)	,182	,174	,201	,319**	,121	,388**	1
	N	95	95	95	95	95	95	95
Mean	95	19,0316	13,8842	13,5474	13,4947	10,1579	21,4211	9,3789
Standard Deviation	95	4,03562	3,20194	3,49702	3,06620	2,49389	4,86319	2,79886

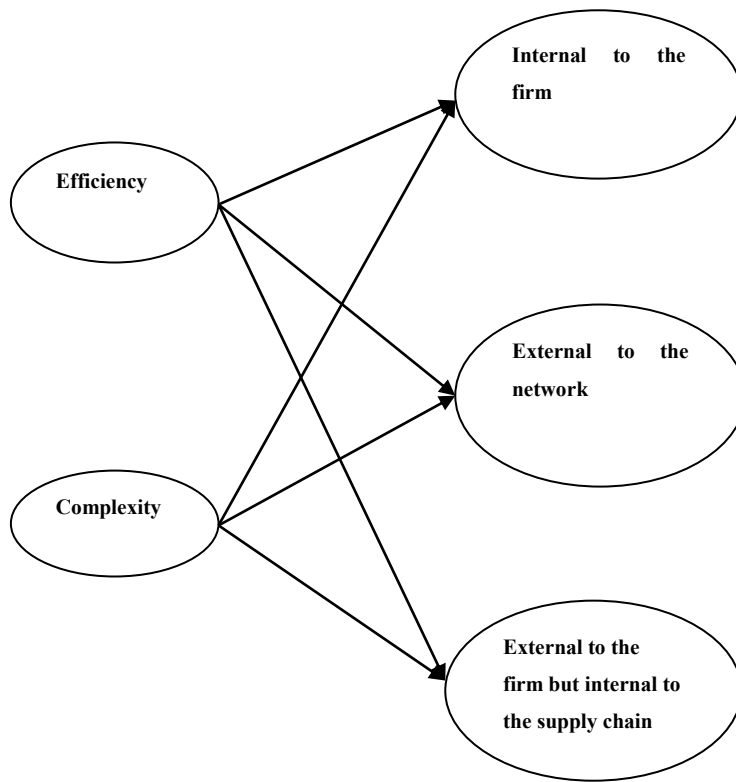
** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

3.2.2.4. Regression Analysis

At this part of the survey research, one aim was to explain the variance in the supply-side risk sources of manufacturing industry regarding the supply chain management strategy elements and the supply-side risk sources regarding the supply base management practices. There were different independent variables hypothesized to explain these variances at different sections of the question form. The first group of independent variables were derived from the section that measured the supply-side risk sources from supply chain management strategy elements. As already explored and deduced in the factor analysis part, the supply chain management strategies were grouped under two main factors. These were named efficiency and complexity. The first factor, efficiency, had four items. When the items were explored, it was revealed that all of them emphasized efficiency of operations, and therefore the factor is labeled efficiency. The second factor, complexity, had three items. When the items were explored it was shown that all of them emphasized the complexity of operations, and therefore it is labeled complexity. As a result of this factor analysis, it was concluded that the supply chain management strategy elements of manufacturing industry were affecting supply-side risk sources. Following these factors, it was questioned whether these influencing factors facilitated the supply-side risk sources at all. The sample group was asked questions about supply-side risk sources in the first section and supply chain strategy elements were questioned in the second section of the questionnaire. These questions were grouped under one variable named supply-side risk sources, and the survey questioned the relationship between the two independent variables derived supply chain management strategy elements. The research model for this analysis is given on Figure 3.4.

Figure 3.4. Research Model for Simple Linear Regression Analysis I.



As these supply chain management strategy element are believed to affect the supply-side risk sources, the hypotheses for this analysis are listed as per below:

H1: There is a statistically significant relationship between supply chain management strategy elements and supply-side risk sources.

H1a: There is a statistically significant relationship between supply chain management strategy elements and internal risks to the firm.

H1b: There is a statistically significant relationship between supply chain management strategy elements and external risks to the network.

H1c: There is a statistically significant relationship between supply chain management strategy elements and external risks to the firm but internal to the supply chain.

Table 3.18. Model Summary for Simple Linear Regression Analysis I Dependent Variable: Internal to the firm.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,061a	,004	-,018	1,01441955

a. Predictors: (Constant), Complexity, Efficiency

The two independent variables were analyzed with a simple linear regression analysis in order to measure their predictive power on the dependent variable. The model summary on Table 3.18. shows that model were used by simple linear regression analysis and this model containing two independent variables, indicated the predictive power with its adjusted R square score of -0, 18 %.

Table 3.19. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: Internal to the firm.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,000	,105		-,004	,997
	Efficiency	,043	,105	,043	,409	,683
	Complexity	-,044	,105	-,044	-,421	,675

a. Dependent Variable: Internal to the firm

The coefficients on Table 3.19. state that this model is insignificant. The model is statistically insignificant and therefore H1a is not supported.

Table 3.20. Model Summary for Simple Linear Regression Analysis I Dependent Variable: External to the network.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,534a	,285	,269	,85761762

a. Predictors: (Constant), Complexity, Efficiency

The model summary on Table 3.20. shows that model were used by simple linear regression analysis and this model containing two independent variables, indicated the predictive power with its adjusted R square score of 26, 9 %.

Table 3.21. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: External to the network.

		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-,003	,102		-,034	,973
	Efficiency	,071	,102	,071	,693	,490
	Complexity	,228	,102	,227	2,227	,028

a. Dependent Variable: External to the network

The coefficients on Table 3.21. state that efficiency is not able to explain the variance in risk sources external to supply network. However the variance in the risk sources is partly explained by complexity dimension. The standardized beta value of 22% is statistically significant and indicates a positive relationship between the predicted variables. Therefore H1b is partly supported.

Table 3.22. Model Summary for Simple Linear Regression Analysis I Dependent Variable: External to the firm but internal to the supply chain network.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,534a	,285	,269	,85761762

a. Predictors: (Constant), Complexity, Efficiency

The model summary on Table 3.22. shows that model indicated the predictive power with its adjusted R square score of 26.9 %.

Table 3.23. Coefficientsa for Simple Linear Regression Analysis I Dependent Variable: External to the firm but internal to the supply chain network.

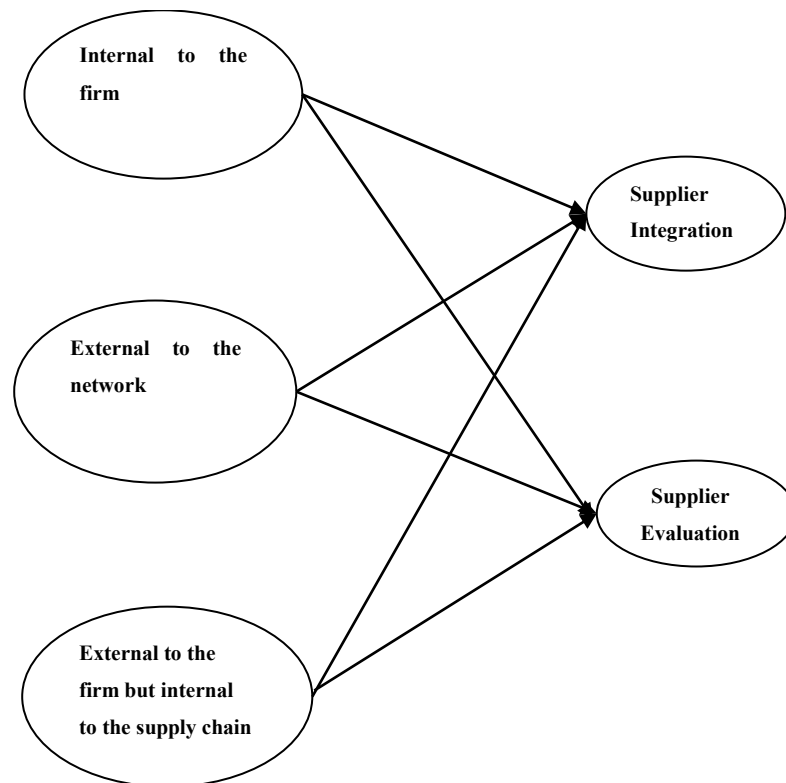
		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	,007	,088		,079	,937
	Efficiency	,505	,089	,504	5,681	,000
	Complexity	,177	,089	,176	1,986	,050

a. Dependent Variable: External to the firm but internal to the supply chain network

The coefficients on Table 3.23. state that model is significant. The sign of these coefficients are positive so the relationship between the independent variables and the dependent variable is positive as already hypothesized. 50% of the variance is explained by efficiency and 17% of the variance is explained by complexity. So H1c was supported.

One of the three hypotheses (H1c) was supported at the end of the analysis and one of the hypotheses was partly supported (H1b), one hypotheses were rejected (H1a). There weren't any relationships between supply chain management strategy elements which are efficiency and complexity and internal risk sources to the firm. There is a relationship between complexity and external risks to the network but there is no relationship between efficiency and external risks to the network. In the other hand, supply chain strategy elements have affected to the external risk to the firm but internal to the supply chain network (H1c). Hereafter, it was questioned if supply base management practices had relationship with the supply-side risk sources. This can be seen in Figure 3.5.

Figure 3.5. Research Model for Simple Linear Regression Analysis II.



H2: There is a statistically significant relationship between supply side risk sources and supply base management practices.

H2a: There is a statistically significant relationship between supply side risk sources and supplier integration.

H2b: There is a statistically significant relationship between supply side risk sources and supplier evaluation.

Table 3.24. Model Summary for Simple Linear Regression Analysis II Dependent Variable: Supplier Integration.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,477a	,228	,203	,89301819

a. Predictors: (Constant), External to the firm but internal to the supply chain, External to the network, Internal to the firm

Table 3.25. Coefficientsa for Simple Linear Regression Analysis II Dependent Variable: Supplier Integration.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7,904E-17	,092		,000	1,000
	Internal risks to the firm	,454	,092	,454	4,924	,000
	External risks to the firm but internal to the supply chain network	,148	,092	,148	1,611	,111
	External risks to the network	,016	,092	,016	,173	,863

a. Dependent Variable: Supplier Integration

The model summary and the coefficients table on Table 3.24. and Table 3.25. show that H2a was partly supported by the analysis. This model has been containing three independent variables, indicated the predictive power with its adjusted R square score of 20.3 %. However when the model variables are examined, it is observed that only the relationship between internal risks to the firm and supplier integration is statistically significant. 45% of the variance in the dependent variable is explained by these internal risks. The other two risk sources lack statistical explanatory power.

Table 3.26. Model Summary for Simple Linear Regression Analysis II Dependent Variable: Supplier Evaluation.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,211a	,044	,013	,99354415

a. Predictors: (Constant), External to the firm but internal to the supply chain, External to the network, Internal to the firm

When Table 3.26. and Table 3.27. below are analyzed, it can be seen that the variance in supplier evaluation is explained by independent variables which are internal to the firm, external to the network, external to the firm but internal to the supply chain. The model has a weak explanatory power with 01% adjusted R square. Also the model variables indicate that there are no statistically significant relationships between independent and dependent variables. Therefore H2b was not supported.

Table 3.27. Coefficients^a for Simple Linear Regression Analysis II Dependent Variable: Supplier Evaluation.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2,485E-16	,102		,000	1,000
	Internal risks to the firm	,031	,102	,031	,303	,763
	External risks to the firm but internal to the supply chain network	,156	,102	,156	1,524	,131
	External risks to the network	,138	,102	,138	1,346	,182

a. Dependent Variable: Supplier Evaluation

The summary of all hypothesis derived from the regression analysis are listed on Table 3.28.

Table 3.28. Summary of Regression Analysis.

Regression Analysis	Hypotheses	Support or Reject	Sig.
Simple Linear Regression Analysis 1 Dependent variable: Internal risks to the firm	H1a	Reject	0.842
Simple Linear Regression Analysis 1 Dependent variable: External risks to the network	H1b	Partly Supported	0.071
Simple Linear Regression Analysis 1 Dependent variable: External risks to the firm but internal to the supply chain network	H1c	Support	0.000
Simple Linear Regression Analysis 2 Dependent variable: Supplier Integration	H2a	Partly Supported	0.000
Simple Linear Regression Analysis 2 Dependent variable: Supplier Evaluation	H2b	Reject	0.245

3.2.2.4. Open-ended questions

In this section, the managers were asked four open-ended questions in order to learn their perspective and ideas about supply chain risk management issues.

The first question was concerned about what motivators or inhibitors affect information related to a company's share risk. Motivation for sharing risk related information is mostly concerned with customer satisfaction, top management decisions, reducing cost, and making a difference and creating confidence in order to gain competitive advantage. Inhibitors of sharing risk related information can be divided under four sub-headings: method, approach, and regulation issues; communication; sharing information; and risk management. The question and answers can be seen as follows:

“What are the motivators or inhibitors for companies to share risk related information?”

Motivators

- The satisfaction of the end consumer
- Global/managerial decisions
- Product Safety
- Competition

- Making a difference
- Sharing information in order to avoid delay cost
- Not losing confidence and cooperation

Inhibitors

Method, Approach and Regulation issues

- The absence of quality control systems
- The absence of company policy
- The absence of top management decisions overall
- Short-term planning instead of making and sharing the annual or five-year budget and strategic plan
- Not being institutional
- Lack of management approach, purchasing approach, and supplier approach

Communication

- Communication failures or difficulties (lack of initiative and responsibilities, being in different locations, time zone, different languages)
- Inability to reach the right people
- Not establishing appropriate channels for communication
- Non-authorized personnel on both sides or a lack of a final decision authority
- Not enough knowledge (lack of foresight)

Sharing information

- To create a barrier to marketing activities
- To prevent the loss of confidence in the company
- Not being willing to share information about financial risks
- Not being transparent and on time in information sharing
- Lack of information sharing or transferring available information to the suppliers during the technical meeting
- Threat of copying product
- Threat of directly relationship of supplier and customers
- Threat of information sharing with suppliers about specifications such as technical drawings (because their competitors can take over them)

- The fear of losing power about price negotiation between supply chain stakeholders
- Uncertainty

Risk Management

- The absence of identifying and forecasting risks due to ensure for continuity of quality and services
- The absence of demand forecast
- Monopoly or limited number of suppliers
- Directives from marketing
- Lack of production planning
- Variability of raw materials prices
- Problems in the capacity and over-stock
- Reducing costs

The second question was related with risks that are accepted as shared supply chain risks by companies. As it is done at the factor analysis, the answers gathered from the open-ended questionnaire under the sub-headings internal risks to the firm, external risks to the network, and external risks to the firm but internal to the supply chain. Internal risks are generally related with the processes and control mechanism. External risks to the network are generally related with the environmental issues. Lastly, external risks to the firm but internal to the supply chain are mostly related with the supply and demand issues. The question and answers can be seen as follows:

“Which risks are accepted by companies as shared supply chain risks?”

Internal risks to the firm

- Problems in the internal processes of suppliers
- Financial situation of the supply chain parts and financial risk
- Quality problems
- Work with the suppliers which have financial difficulties
- Technical equipment failures
- Failure to perform because of over-capacity
- Strike in the supplier
- Problems of payment term

- Delivery problems

External risks to the network

- Political instability (political situation, local and global purchasing fluctuation)
- Volatility in the parity, fluctuations in metal exchange, decline of oil prices
- General economic conditions (foreign exchange risk, economic stability, global stability)
- National security (territorial decisions)
- Customs regulations and testing factors (TSE, ISO, etc.)
- Product safety
- Oil and raw material prices and their availability
- Natural disasters and force majeure war or state of emergency,
- Natural disasters or “acts of God”
- Customs issues

External risks to the firm but internal to the supply chain network (supply and demand)

- Risks of logistics (logistics disruptions, logistics costs, property damage and delay of delivery)
- Unexpected changes in demand
- Forecasting errors and fluctuations in demand
- Single supplier risk

Third question was related with analysis and minimize of risk and performance trade-off. It is divided to three sub-heading to analyze the answers of this question. These are supplier evaluation, supplier integration, and supply chain risk management. The question and answers can be seen as follows;

“How can the risk performance trade-offs in supply chain strategies be analyzed and minimized?”

Supplier Evaluation

- Effective risk analysis and supplier evaluation system that is established according to the company structure can help to minimize risks.

- KPI (Key Performance Indicator) can be identified. Performance indicators of suppliers are monitored (does not work with suppliers that have low performance).
- Alternative suppliers will be created by increasing the number of suppliers. It enhances product suppliers in different geographical regions. It may also increase the number of the alternative raw material suppliers.
- Performance criteria should be clear, understandable, and measurable (to be closed for comments, statistical evaluation). A separate area should be given for comments.
- Stock order quantities should be given according to supplier's production-delivery performance. Thus, risks can be reduced.

Supplier Integration

- The establishment of effective communication channels and the provision of bilateral information flow are the important issues.
- High and healthy internal and external information sharing is a necessary.
- Information flow should be through between departments and companies.
- All coming input-output of supply chain should be control and made permanently positive or negative feedback.
- Training.
- Agility.

Supply Chain Risk Management

- Risks should be identified and definitions should be accurate.
- Preventive actions should be determined.
- Failure mode and effect analysis (FMEA) should be done. Thus, risk priority number can be calculated in conjunction with the severity, detectability, and probability of occurrence in order to be prioritize the risks.
- Supply chain consists of many different stages, and thus in every stage can be faced with risks. The important part is to focus on risks with the largest affect on processes.
- Safety stock requirement should be adjusted according to demand forecasting.

- Risks can be analyzed by periodic evaluations with the targets. Hence, the negative situations can be foreseen and minimized.

The fourth question concerned the implementation of supply chain management processes within a company or across companies. According to answers to this questions, the answers is given in three sub-heading which are top management, organizational structure, and risk management. The question and answers can be seen as follows:

“How can the implementation of SCRM processes be organized within and across companies?”

Top management

- Organization chart should be prepared. Responsibilities and task should be clear. Supply chain policy should be correctly identified; data can be entered and evaluated on the intranet system; authorities and responsibilities should be determined by management based on purchasing volume.
- All departments are responsible and management should support the strategies. Periodic assessments should be made and areas for improvement should be identified and action plans should be prepared.

Organizational structure

- The information flow should be required between departments of planning, purchasing, trade, quality, R&D, and sales.
- The quality control systems, information flow systems, feedback after each action, and approval stage is required between companies. Then, companies can evaluate each other performance and results can be analyzed together.
- Supply chain risks should be managed in coordination with logistics and production departments. However, it differs depending on the size of the company’s business volume. Supply chain function can be organized under the logistics or purchasing departments, grouped as a separate supply chain function.
- Assessment of responding quickly to urgent customer demand conditions (agility) should be evaluated and taken necessary actions for improving.

- The company evaluates the performance of each organization between the companies and results achieved by analyzing together.
- Clear and simple communication should be provided within the organizational structure.
- The process should be analyzed step by step; job description should be clear for each step and explain an understandable way. The appropriate person should be determined for each task; task descriptions and instructions must be written. There are different method to manage risks in a company such as teamwork, top management decisions, supply chain, operations, product development, and R&D department's manager's decisions.

Risk Management

- Risk management must be effectively implemented as part of the company's established system.
- The correct point of contact should be identified between companies.
- Communication must occur in a common language
- Management system applications must be done by an authorized person.
- Information should be collected in a single point, coordination should be ensured.
- Senior management should be informed.
- Risk management should be regarded as a separate management in conjunction with internal audit function. It should proceed in parallel with a management level.
- Risk management should be evaluated by different departments and must be checked by different perspectives. Thus, monitoring mechanisms can reduce blindness.
- Terms and standards related to the goods or services received should be defined very clearly.
- Identification which is different from the standard should be shared on time.
- Strong communication is required based on trust.
- Make supplier think and feel like the Buyer Company.
- Risk management should be controlled by a separate audit function.
- Action plans must be implemented in parallel with the operations people.

- Necessary measures should be taken. Corporate culture must be developed accordingly.
- Failure mode and effect analysis should be done.
- Gradual control mechanisms should be used in the selection of supplier in order to minimizing risks. There should be identified processes to follow by purchasing, planning, and quality departments together. Holistic targets are essential for joint decision-making in the company.
- Planning departments should share their sales forecasts.

CONCLUSION

Nine sectors have been analyzed with failure mode and effects analysis by asking fourteen different risk sources to the managers of purchasing, supply chain, and production. These sectors are dried food, automotive, paint, leather, textile, aviation, plastic, machine, and metal. After calculating their priorities in these sectors, two items appear to have high priority in six sectors. First one is labor/management problems at suppliers which have high priority in dried food, automotive, paint, leather, textile, and aviation sector. Second one is transportation disruptions with inbound supply channels which have high priority in plastic, dried food, paint, textile, automotive, and machine. In addition to these two risk items, natural disasters or “Acts of God” affecting supplier’ operations have high priority in five sectors. These sectors are automotive, dried food, textile, plastic, and leather. On the other hand, labor/management problems at supplier are loaded in the factor analysis as internal risk to the firm. Transportation disruptions with inbound supply channels are loaded as external risk to the firm but internal to the supply chain network. Natural disasters or “Acts of God” affecting supplier’s operations are loaded as external risk to the network. It shows the supply chain managers are considered three risk items which caused from the internal firm to natural disasters. Dried food industry has a high priority of labor management problems at supplier. When it is compared with the other manufacturing industry, labor/management problems have been faced more than other industries. Agricultural labor works in the most primitive conditions in this industry from the early morning to late evening in a less amount of fee. Their problems are generally related with the low wages, housing, nutrition, health problems and difficult working conditions. Because of that many problems have been faced in this industry. The other sector which has high priority for labor management problems at supplier is the automotive industry. As in the entire world, automotive industry is one of the leading sectors in Turkey's economy. This industry has major buyers in key industries such as iron and steel, petrochemicals, and tires. Automotive is a leading sectors in the manufacturing industry when compare its share in the production and evaluation of the economic contribution rate in Turkey. However, as same as food industry automotive industry’s risk sources which has a high priority labor/management problems. For example, Bursa is the center of the automotive center with annual \$22 billion in exports which is the largest part of

exports. Last year, total of 15 thousand 600 automotive workers from four companies had joined the strike and stoppage the work because of wage policy. Workers blamed to companies and unions about implementing different wage policy for equal work. Because of these labor management problems, the loss of one day of production in the sector caused to the economy of \$ 175 million. The other industry is painting industry. Turkish painting industry is in Europe's 6th largest paint manufacturer. The total production capacity of the sector is annually about 800,000 tons / year. The paint production has increased 200% in the last decade in Turkey. The share of the world market in the Turkish paint industry of this scale takes about 1.5-2 percent. However, Turkish paint industry in terms of production have dependent on external conditions. Due to the need for the raw materials and intermediate goods are based on substantially on imports. Painting industry has a high priority of labor management problems at supplier. In this industry informal working is extremely intense and hazardous chemicals have been generally used for human health that can be serious problems in terms of occupational health and safety. The other industry is leather industry which has high priority for this risk item. Leather industry supplies a large of the raw materials from abroad for all inputs that use in the industry. These products have become high quality products after processing. Leather and leather products have a very wide range of applications and enter the overall luxury goods group. While the production of leather and leather labor was born in Europe, the first development of this sector has increasingly shifted to Asia and Latin America, and especially directed to areas where livestock have improved. Turkey comes after Italy in Europe in leather production in the world. This is the industry of working and production conditions are very difficult for leather labor. Many health problems caused dirty environment, long working hours, heavy labor, mandatory overtime, and low wages. Textile and apparel is one of the labor-intensive sectors, too. Today, Turkey is the third-largest textile exporter of Europe's and the world's sixth largest apparel exporter. However, labor management problems have high priority in this industry. The result of problems generally occur from low wages, not writing of hours, mandatory overtime, unregistered workers, the minimum wage for the payment of the social security contributions, not processing of seniority, and heavy working conditions.

As discussed before labor management problems, transportation disruption and with inbound supply channels and natural disasters or “Acts of God” have affected to the supplier operations. These effects can appear as the main failure modes. There are three failure modes for six sector which have high priority; incomplete and incorrect shipments, delays in delivery times, stoppage in production or assembly. In addition to these failure modes never delivered shipments due to the interruptions of the production in the suppliers is the another failure modes for natural disasters which has high priority in five sectors. These failure modes have affected to the reliability of the supplier and costs which are incurred due to the failure of production or assembly. The other effects can be listed as personnel overtime, transportation costs, loss of personnel, and loss of money, materials and facilities. There are many causes of these failure modes. Unions, labour rights, low wages, or unregistred labor can create labor/management problems at supplier. For example, workers can be fired due to become a member of unions. Child labor can be worked for low wages. Low wages are common occasion for manufacturing industry. The lackness of certification systems of supplier make harder to control their processes and application for buyer companies. Unregistered labor (unpaid Social Security employees), the lack of appropriate work environment and working hours can create serious health problems. Weather conditions, accidents, volcanic eruption, and strike carried our in ports can create transportation disruptions with inbound supply channels. For example, transporters can remain stuck on the road or in the parking area for days because of heavy rainfall and snowfall. Although the rules are obeyed and all necessary cautions are taken, accidents can happen on a sudden. Or volcanic eruption can change all the plans and transportation nodes. This is a good example that volcanic eruption that occurred in Iceland. The aerospace company which is analyzied mentioned that their specific raw materials which normally come from US Northern Hemisphere, had to be entered from South Hemisphere by changing all the its way. Lastly, the employees who work heavy and exhausting business at the port can go on striks for their right. This occasion can cause long waitings on the ports for the transporters or conteyners. Natural disasters, severe weather events and diseases can affect to the supplier’s operations. Because of earthquake, flood, hurricane, storm, etc. supplier’s facility, raw materials or operation machines may be become unavailable. Further, employees may be damaged. Or, closing roads due to snow, flooding due to rain, extremely hot or cold weather can affect to the delivery times.

Today, dangerous and deadly diseases can rapidly conquer the world. For example, the world famous SARS virus has spread to only 1.5 months. Over 8,000 people were infected with the virus and 755 of them died. Because of them supply chain operations have been affected in USA.

When results of the questionnaire are analyzed by descriptive statistics, two risk items have emerged as the main supply side risk source dimensions. These are respectively incoming product quality problems and financial instability or financial failure of a supplier. Although the user-based definitions of quality incorporate subjective elements from the perspective of consumer preferences, manufacturing industry generally focuses on the supply side of equation and is primarily concerned with engineering and manufacturing practice about quality issues. Once a design or a specification has been established, any deviation implies a reduction in quality. Excellence is equated with meeting specifications, and with “making it right the first time.” A product that deviates from specifications is probably to be poorly made and unreliable. So it provides less satisfaction than one that is properly constructed. Quality is defined in a manner that simplifies engineering and production control. Statistical quality control and reliability engineering has been led to an emphasis. Both techniques are designed to select deviations early by analyzing a product’s basic components, identifying possible failure modes, and then proposing alternative designs to enhance reliability and employing statistical techniques to find if a production process is doing apart from acceptable limits. Second important risk in the manufacturing industry is financial instability or financial failure of a supplier. Suppliers are the lifeblood of many organizations. Dependencies between supply chain parts have increased and all partnerships present risk. However, some suppliers may be sensitive to buyer-company operations, while others are not interested so much and not feel any fear to business continuity. Financial risk and instability of supplier decrease of business confidence. For example, a company invest a project, but a project – and the project’s funding – can be settled with if even one essential supplier fails to deliver on a predetermined contract. Thus, being proactive and assessing the financial stability of suppliers are the crucial for companies in order to minimize financial risk and increase business confidence. Relying on any one supplier for a critical product makes company open to forces outside companies’ control. Identifying which supplier are needed to diversify is important for mitigating

risk. A disruption in any link can affect to other links in a supply chain. So any disruptions caused the suppliers financial stability present time and delays problems. Furthermore, if a major supplier suddenly goes under, its partners can be faced serious problems such as delaying projects, being have to find new suppliers, being unable meet deadlines, credit issues and bad reputational impact.

When results of the questionnaire are analyzed by descriptive statistics, one element has emerged as the main supply chain strategy element which is reduction of supplier base. Reduction of supplier base and enforced outsourcing, increased product variety and focusing on efficiency are essential supply chain strategy elements in general. Many companies are aware that there may be need to reduce the number of suppliers due to be difficult to deal with them. However, in this study reduction of supplier base is to contribute to an increase of risk within their supply chain. In this study it is also searched the perceived importance levels of supply chain strategy elements in general. Enforced outsourcing has led to considerable benefits such as cost reduction and affecting product quality in a good way. But from the other side is considered to lead to supply chain risk. Increasing demand for product variety creates more complex product process technologies and affects to risk. Globalization of the supply chain, centralized production and distribution are not as essential as other strategy elements that mentioned above.

The main dimension of supply base management practice is the quality assurance program for supplier's specific product according to manufacturing industry. The second important practice is to take changes of specifications after to be developed a new product design. These two practices have highly interaction between each other. Identifying the applicable technical requirements as specified within engineering drawings, material and processing specification have contained a number of additional quality requirements such as critical part/material traceability and review of products/processes/systems. Supplier quality assurance process includes several steps from definition of the product's quality requirements to selection the most appropriate supplier. On the other side, suppliers may be offered the opportunity to improve or develop their systems. Sharing sensitive information is not preferred supply base management practices. Visiting supplier's facility is also not preferred supply base management practices in general.

Before the looking the relationship between supply chain strategy elements and supply-side risks, supply-side risk sources and supply-base management practices, factor analysis is made. Supply chain strategy elements are loaded in two factors. Focusing on efficiency, central distribution and production, and reduction of supplier base are loaded as efficiency. Globalization, outsourcing, and product varieties are loaded as complexity. Supply-side risk sources are loaded in three factors. Labor/management problems, financial instability of supplier, incorrect interpreting to the requirements or quality problems, and ineffective management are loaded internal risks to the firm. Political instability, natural disasters, variability in transportation time, problems, sharing information is loaded external risk to the firm. Long physical distances, inability to influence suppliers, transportation disruption, and inability to meet with demand are loaded as external risks to the firm but internal to the supply chain network. Supply-base management practices are loaded in two factors. Our company has a quality-assurance (certified) program for our supplier's specific product; our company takes advantage of supplier-provided technical support and test capabilities; our company has a quality-assurance program for our supplier's manufacturing process; we share a great deal of sensitive information with our suppliers are loaded as supplier integration. Commodity management teams set the levels of cost, quality and lead time for supplier performance and our manufacturing personnel regularly visit our supplier's facility are loaded as supplier evaluation. Then, the relationship between supply chain strategy elements and supply-side risk sources are analyzed by regression analysis. According to results, there is no relationship between supply chain management strategy elements and internal risks to the firm. There is relationship between complexity and external risks to the network, but no relationship between efficiency and external risks to the network. However, there is significant relationship between supply chain management strategies and external risks to the firm but internal to the supply chain network. Lastly, the relationship between supply-side risk sources and supply base management practices are analyzed. There is no relationship between supply side risk sources and supplier evaluation. Although, there is only the relationship between internal risks to the firm and supplier integration is statistically significant, there is no relationship between the other two risk sources and supplier integration. Thus, it is obvious that manufacturing industry in Turkey have been faced with risks which caused from external to the firm but internal to the network due to efficiency and complexity of

supply chains. Because of focusing on efficiency, central distribution and production and reduction of supplier base, companies have been influenced the negative consequences like long physical distances, transportation disruptions, inability of influence supplier and inability to meet with demand. Globalization, outsourcing and product variety as complexity dimension have also affected to the risks which caused from the external to the network (such as political instability, natural disasters and variability in transportation times). On the other side, labor management problems, financial instability, incorrect interpreting, quality problems and ineffective management problems at the supplier have been managed by the practices of supplier integration like quality assurance for specific program and systems and sharing information.

In the last section of questionnaire four open-ended questions are asked to the managers in order to learn their perspective and ideas about supply chain risk management issues. First question was concerned about what motivators or inhibitors have affected to share risk related information for companies. Motivators of sharing risk related information are mostly concerned about customer satisfaction, top management decisions, reducing cost, and making a difference and creating confidence in order to gain competitive advantage. Inhibitors of sharing risk related information can be divided under four sub-heading. These are method, approach, and regulation issues, communication, sharing information, and risk management. Second question was related with risks which are accepted as shared supply chain risks by companies. The gathered answers from the open-ended question for this question, sub-headings are given as internal risks to the firm, external risks to the network, and external risks to the firm but internal to the supply chain. Internal risks are generally related with the processes and control mechanism such as problems in the internal processes, financial instability, and quality problems. External risks to the network are generally related natural disasters, political instability, and general economic conditions. Lastly, external risks to the firm but internal to the supply chain are mostly related with the supply and demand issues such as logistic risks, unexpected changes in demand and forecasting errors. Third question was related with analysis and minimize of risk and performance trade-off. It is divided to three sub-heading to analyze the answers of this question. These are supplier evaluation, supplier integration and supply chain risk management. Effective risk analysis and supplier evaluation system should be established and alternative supplier should be created. Effective communication channels and information flow is important for

supplier integration due to high and healthy internal and external information sharing. Risk should be analyzed, identified and preventive actions should be determined. Fourth question was related with implementation of supply chain management processes within a company or across companies. The answers are given in three sub-heading which are top management, organizational structure, and risk management. Top management decisions about implementation supply chain management processes are to prepare organization chart, prepare to policies, and make clear about responsibilities. Then organizational systems should be maintained in terms of information flow and given responsibilities between departments of company and quality control systems. Effective implementation of the establish system is crucial in order to manage and mitigate risks.

Implications for practitioners

This study has some implications for both practitioners and scholars. Practitioners can use the findings while managing their supply-side risk sources and improve their risk management system.

For the already established manager's production, logistics & supply chain, and marketing, it is essential to be sure about their supply-side risk sources which have high priorities. If these sources are not prioritized, it will be difficult to manage and mitigate these risk sources. For implementation of risk management practices, as already mentioned in the open-ended questions part, the decisions of top management have high importance. If the top management is considered about this issues, the organizational structure can be revised in terms of responsibilities of managers and departments or can be created a risk management team includes all related managers in order to create an effective risk management system. Method, approach, and regulation issues (such as company policy, short and long term planning) can be evaluated in conjunction with risk items. Information flow and communication between departments of planning, purchasing, trade, quality, R&D, and sales can be powerful. All coming input-output of supply chain should be control and made feedback to improve the system. In sum, especially in manufacturing industry (which has high importance of being the materials on time with high quality and a good price) supply-side risk sources should be prioritized and managed. Failure mode and effect analysis is a way to calculate the risk priority number in conjunction

with the severity, detectability, and probability of occurrence in order to be prioritizing the risks.

Limitations and Scholarly Implications:

In this research, firstly the main supply-side risks sources are analyzed in the manufacturing industry by using failure mode and effects analysis in order to prioritize them. For this part of the research it is used data from ten companies in nine different sectors. Even though five different department's managers were targeted to interview in order to collect multiple perspectives, it was not achieved. There were some reasons like seen the interview as a time consuming and did not bother with this kind of information in short time. This is the first limitation of this study. Further research, it should be interviewed to managers from different departments and if it is possible, it should be composed a team in order to evaluate the risk sources together for common judgment. Thus, managers can be more attractive and come open to ideas related with topic. All companies which interviewed from only Aegean Free Zone. This is the second limitation of this study. Then, it is analyzed the relationship between supply chain strategy elements and supply-side risk sources, supply-side risk sources and supply base management practices. For this part of the research it is used data from 95 managers of production, logistics & supply chain and marketing departments. Samples are selected from production industry, from the companies located in İzmir, especially in the Aegean Free Zone and Atatürk Industrial Zone. This is the third limitation. For further research, survey can be applied for other regions in İzmir and Turkey, and different countries in the world due to see different perceptions and practices of companies. Moreover, survey can be applied for other industries by improving with additional variables. Thus, different supply-side risk sources, supply chain strategy elements and supply base management practices and the relationship between them can be figured out in different industries in Turkey and in the world. Furthermore, in this study, it is made a general framework about supply chain risk management implications from the opinions of supply chain managers. Hence, scholars can study on this issue as well.

BIBLIOGRAPHY

BOOKS

Buzan, B. (2004). *From international to world society? English school theory and the social structure of globalisation*. Cambridge Cambridge University Press.

Christopher, M. (1992). *Logistics and supply chain management : strategies for reducing costs and improving services*. Logistics & Distribution Management Series, London : Financial Times : Pitman Pub.

Cresswell, J.W. (2003). *Research Design: Qualitative, Quantitative and Mixed Method Approaches*, 2n edition, Sage, Thousand Oaks, CA

Dicken, P. (1992). *Global Shift: The Internationalization of Economic Activity*. Newyork: Guilford Press.

Field, A.P. (2000). *Discovering statistics using SPSS for Windows advanced techniques for the beginner*. London Thousand Oaks : Sage Publications.

Gegez, E. (2005). *Pazarlama Araştırmaları*. İstanbul:Beta

Gereffi, G., Korzeniewicz, M. (1994). *Commodity Chains and Global Capitalism*. Westport, CT: Praeger.

Hair, J., Black, W., Babin, B. & Anderson, R. (2010), *Multivariate Data Analysis (7thed.)*. England: Pearson Prentice Hall.

Monczka, R.M, Handfield, R.B.,Giunipero, L.C., & Patterson, J.L. (2008). *Purchasing and Supply Chain Management Fourth (4th) Edition*.

Neuman, W.L. (2003). *Social Research Methods: Qualitative and Quantitative Approaches*. London: Allyn and Bacon.

Sajadieh, M.S. (2009). *Global supply chain management*, in Farahani, R., Asgari, N. and Davarzani, H. (Eds). *Supply Chain and Logistics in National, International and Governmental Environment: Concepts and Models*, Springer Verlag, Heidelberg, 43-56.

Stake, R.E. (2006). *Multiple Case Study Analysis*.

Waters, M. (1995). *Globalization*. Routledge.

Yıldırım, A., Şimşek, H. (2005). Sosyal bilimlerde nitel araştırma yöntemleri. 5. Baskı. Ankara: Seçkin Yayıncılık.

Yıldızoğlu, E. (1996). Globalleşme ve Kriz. İstanbul: Alan Yayıncılık.

Yin, R. (1994). Case study research: Design and methods (2nd ed.). Thousand Oaks, CA: Sage Publishing.

Yin, R. K. (2009). Case study research: Design and methods (4th Ed.). Thousand Oaks, CA: Sage.

ARTICLES

Ahsen, A.V. (2008). Cost-oriented failure mode and effects analysis. *International Journal of Quality & Reliability Management*, 25(5), 466 – 476.

Akman, G., & Alkan, A. (2006). Tedarik Zincir Yönetiminde Bulanık AHP Yöntem Kullanılarak Tedarikçilerin Performansının Ölçülmesi: Otomotiv Yan Sanayinde bir uygulama. *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi* 5(9), 23-46.

APQC (American Productivity & Quality Council). (2010). Manufacturing: Centralization versus Decentralization Which is better?, Target Third Issue 55.

Armstrong, J.S., & Overton, T.S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14(3), 396–402.

Balan, S., Vrat, P., & Kumar, P. (2006). Assessing the challenges and opportunities of global supply chain management. *Int.J. Value Chain Management*, 1(2).

Blackhurst, J., Craighead, C.W., Elkins, D., & Handfield, R.B. (2005). An empirically derived agenda of critical research issues for managing supply-chain disruptions. *International Journal of Production Research*, 43(19), 4067-4081.

Blos, M.F., Quaddus, M., Wee, H.M., & 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), 247–252.

Braithwaite, A., & Hall, D. (1999). Risky Business? Critical decisions in supply chain management. *Supply Chain Practise*, 1(2) 40-57.

Büyüközkan, G. (2008). Tedarik Zincirinde Risk Yönetimi. *Lojistik Dergisi*. 8(21), <http://www.gulcinbuyukozkan.net/kose8.pdf> (25.05.2015).

- Cample, D.T, & Fiske, D.W. (1959). Convergent and discriminant validation by the multitreat-multimethod matrix. *Psychological Bulletin*, 56, 81-105.
- Ceryno, P.S., Scavarda, L.F., & Klingebiel, K. (2015). Supply chain risk: empirical research in the automotive industry. *Journal of Risk Research*, 18(9), 1145-1164.
- Chen, J., Sohal, A., & Prajogo, D.L. (2013). Supply chain operational risk mitigation: a collaborative approach. *International Journal of Production Research*, 51(7), 2186-2199.
- Chen, J., Sohal, A.S., & Prajogo, D.I. (2013). Supply chain operational risk mitigation: a collaborative approach. *International Journal of Production Research*, 51(7), 2186-2199.
- Cheng, S.K., & Kam, B.H. (2008). A conceptual framework for analysing risk in supply networks. *Journal of Enterprise Information Management*, 21(4), 345–360.
- Chopra, S., & Sodhi, M.S. (2004). Managing risk to avoid supply-chain breakdown. *MIT Sloan Management Review*, 46(1), 53-62.
- Christopher, M., & Lee, H. (2004). Mitigating Supply Chain Risk Through Improved Confidence. *International Journal of Physical Distribution & Logistics Management*, 34(5), 388-396.
- Christopher, M., and Peck, H. (2004). Building the Resilient Supply Chain. *The International Journal of Logistics Management*, 15, 1–14.
- Christopher, M., Peck, H., & Towill, D. (2006). A taxonomy for selecting global supply chain strategies. *The International Journal of Logistics Management*, 17(2), 277 – 287.
- Contractor, F.C., Kumar, V., Kundu, S.K., & Pedersen, T. (2010). Reconceptualizing the Firm in a World of Outsourcing and Offshoring: The Organizational and Geographical Relocation of High-Value Company Functions. *Journal of Management Studies*, 47(8).
- Coştu, Y. (2005). Küreselleşme Üzerine Bazı Düşünceler, *Gazi Üniversitesi Çorum İlahiyat Fakültesi Dergisi*, IV (7-8), 90-105.
- Council of Supply Chain Management Professionals (CSCMP) <http://cscmp.org/>, (25.11.2015).

- Cronbach, L.J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16(3), 297-334.
- Croxton, K., García-Dastugue, S., Lambert, D. & Rogers, D. (2001). The Supply Chain Management Process. *International Journal of Logistics Management*, 12(2), 13-36.
- Cucchiella, F. & Gastaldi, M. (2006). Risk management in supplychain: a realoption approach. *Journal of ManufacturingTechnology Management*, 17(6), 700-720.
- Davis, R. E., Knappenberger, P.C., Michaels, P.J., & Novicoff, W.M. (2003). Changing Heat-Related Mortality in the United States. *Environmental Health Perspectives*, 14(111).
- Dittmann, J.P. (2014). Managing Risk in the Global Supply Chain. Supply Chain Management Faculty at the University of Tennessee.
- Dowlatshahi, S. (2000). Designer-buyer-supplier interface: theory versus practice. *International journal of production economics*, 63(2), 111 -130.
- Dunning, J. H. (1993). Commentary: How Should National Governments Respond to Globalization?. *The International Executive*, 35(3), 187-198.
- Eisenhardt, K.M. (1989). Building theories from case study research. *The Academy of Management Journal*, 14(4), 532-550.
- Ellegaard, C. (2008). Supply risk management in a small company Perspective. *Supply Chain Management: An International Journal*, 13(6), 425–434.
- Embleton, P.R., & Wright, P.C. (1998). A practical guide to successful outsourcing. *Empowerment in Organizations*, 6(3), 94-106.
- Fawcett, S.E., Magnan, G.M., McCarter, M., & Matthew, W. (2008). A three-stage implementation model for supply chain collaboration. *Journal of Business Logistics*, 29(1), 93.
- Franceschini, F., & Galetto, M. (2001). A new approach for evaluation of risk priorities of failure modes in FMEA. *International Journal of Production Research*, 39(13), 2991-3002.

- Fujita M., & Thisse, J.F. (2006). Globalization and the Evolution of the Supply Chain: Who Gains and Who Loses?. *International Economic Review*, 47(3), 811-836.
- George, A., Mckeown, Tim. (1985). Case studies and theories of organizational decision-making. In R.Coulam & R. Smith (Eds.). *Advance in information processing in organizations*, 2, 43-68. Greenwich, CT:JAI press.
- Georgiadis, P., & Michaloudis, C. (2012). Real-time production planning and control system for job-shop manufacturing: A system dynamics analysis. *European Journal of Operational Research*. 216, 94–104.
- Gereffi, G. (1999). International trade and industrial up-grading in the apparel commodity in chain. *Journal of International Economics*, 48(1), 37-70.
- GHTF SG3 N17 (Quality Management System—Medical Devices—Guidance on the Control of Products and Services Obtained from Suppliers).
- GHTF SG4 N28 (Guidelines for Regulatory Auditing of Quality Management Systems of Medical Device Manufacturers Part 1: General Requirements).
- Giunipero, L., & Handfield, R. (in press). Purchasing education and training requirements for the future. Tempe, AZ: Center for Advanced Purchasing Studies.
- Griffiths, J., James, R., & Kempson, J. (2000). Focusing customer demand through manufacturing supply chains by the use of customer focused cells: an appraisal. *Int. J. Production Economics*, 65(1), 111 – 120.
- Guo, B., Fujimura, R., Zhang, D., & Imai, M. (2012). Design-in-play: Improving the variability of indoor pervasive games. *Multimedia Tools and Applications*, 59(1), 259-277.
- Handfield, R., & Nichols, E. (2002). *Supply chain redesign*. Upper Saddle River, NJ: Prentice-Hall.
- Hanfield, R.B., & Nichols, E.L. (2004). Key issues in global supply base management. *Industrial Marketing Management*, 33, 29–35.
- Harland, C., Brenchley, R., & Walker, H. (2003). Risk in Supply Networks. *Journal of Purchasing & Supply Management*, 9, 51–62.

- Ho, W., Zheng, T., Yildiz, H., & Talluri, S. (2015). Supply chain risk management: a literature review. *International Journal of Production Research*, 53(16), 5031-5069.
- Ibrahim, H.W., Zailani, S., & Tan, K.C. (2015). A content analysis of global supply chain research. *Benchmarking: An International Journal*, 22(7), 1429 – 1462.
- Jüttner, U. (2005). Supply Chain Risk Management – Understanding the Business Requirements from a Practitioner Perspective. *International Journal of Logistics Management*, 16(1), 120–141.
- Jüttner, U., Peck, H., & Christopher, M. (2003). Supply Chain Risk Management: Outlining an Agenda for Future Research. *International Journal of Logistics: Research and Applications*, 6(4), 197–210.
- Kaarbo, J., and Beasley, R.K. (1999). A Practical Guide to the Comparative Case Study Method in Political Psychology. *Political Psychology*, 20(2), 369-391.
- Kale, S.U. (2007). Global competitiveness: role of supply chain management. Paper presented at the Conference on Global Competition & Competitiveness of Indian Corporate.
- Kaplinsky, R. & Readman, J. (2005). Globalisation and Upgrading: What can (and Cannot) be Learnt from International Trade Statistics in the Wood Furniture Sector? *Industrial and Corporate Change*, 14(4), 679-703.
- Karabulut, A.N. (2004). Küreselleşmenin Ticari Hayat Üzerindeki Etkileri. *Mevzuat Dergisi*, 7(76), 1306-0767.
- Kauffman, R.G., & Leszczycb, P. (2005). An optimization approach to business buyer choice sets: How many suppliers should be included? *Industrial Marketing Management* 34, 3 – 12.
- Kleindorfer, P.R., & Saad, G.H. (2005). Managing disruption risks in supply chains. *Production and Operations Management*, 14(1), 53–68.
- Kleindorfer, P.R., Saad, G.H. (2005). Managing disruption risks in supply chains. *Production and Operations Management*, 14(1), 53–68.
- Kogut, B. (1985). Designing global strategies: Comparative and competitive value-added chains. *Sloan Management Review*, 26(4): 15.

- Kopczak, L.R. (1997). Logistics partnership and supply chain restructuring. survey results from the US computer industry. *Production and Operations Management*, 6(3), 226-247.
- Kotabe, M., & Murray, J.Y. (2004). Global sourcing strategy and sustainable competitive advantage. *Industrial Marketing Management*, 33, 7–14.
- Kotabe, M., & Swan, K.S. (1994). Offshore Sourcing: Reaction, Maturation, and Consolidation of U.S. Multinationals. *Journal of International Business Studies*, 25(1), 115-140.
- Kraljic, P., (1983). Purchasing must become supply management. *Harvard Business Review*, 61(5), 109–117.
- Lee, H. L., Padmanabhan, V., & Whang, S. (1997). Information Distortion in a Supply Chain: The Bullwhip Effect. *Management Science*, 43(4), 546-558.
- Lee, H.L. and Billington, C. (1992). Managing supply chain inventory: pitfalls and opportunities. *Sloan eManagement Review*, 33(3), 65-73.
- Li, S., & Lin, B. (2006). Accessing information sharing and information quality in supply chain management. *Decision Support Systems*, 42(3), 1641-1656.
- MacCarthy, B.L., & Atthirawong, W. (2003). Factors affecting location decisions in international operations—a Delphi study. *International Journal of Operations & Production Management*, 23, 794–818.
- Malhotra, M.K. & Grover, V. (1998). An assessment of survey research in POM: from constructs to theory. *Journal of Operations Management*, 16(4), 407-425.
- Manuj, I., & Mentzer, J.T. (2008a). Global Supply Chain Risk Management. *Journal of Business Logistics*, 29(1), 133.
- Manuj, I., Mentzer, J.T. (2008b). Global Supply Chain Risk Management. *International Journal of Physical Distribution & Logistics Management*, 38(3), 192-223.
- Mattsson, L.G. (2003). Reorganization of distribution in globalization of markets: the dynamic context of supply chain management. *Supply Chain Management: An International Journal*, 8(5), 416 – 426.

- Meixell, M.J., & Gargeya, V.B. (2005). Global supply chain design: A literature review and critique. *Transportation Research Part, E* 41, 531–550.
- Melnyk, S.A., Davis, E.A., Spekman, R.E., and Sandor, J. (2010). Outcome-Driven Supply Chains, *Sloan Management Review*, 33-38.
- Miller, K.D. (1992). A Framework for Integrated Risk Management in International Business. *Journal of International Business Studies*, 23(2), 311-331.
- Moeller, S., Fassnacht, M., and Klose, S. (2006). A Framework for Supplier Relationship Management (SRM). *Journal of Business-to-Business Marketing*, 13(4), 69-94.
- Monczka, R., Peterson, K., Handfield, R., & Ragatz, G. (1998). Determinants of successful vs. non-strategic supplier alliances [special issue]. *Supply Chain Linkages. Decision Science Journal*, 29, 553– 577.
- Motwani, J., Larson, L., & Ahuja, S. (1998). Managing a global supply chain partnership. *Logistics Information Management*, 11(6), 349 – 354.
- Murugesan, P., Natarajan, T., & Lakshminarayanan, M. (2013). Assessment Scale Development and Validation. *Benchmarking: An International Journal*, 20(1).
- Nelson, P., & Toledano, G. (1979). Challenges for International Logistics Management. *Journal of Business Logistics*, 1(2), 1-21.
- Norrman, A., & Jansson, U. (2004). Ericson's Proactive Supply Chain Risk Management Approach after a Serious Sub-Supplier Accident. *International Journal of Physical Distribution and Logistic Management*, 34(5), 434-456.
- Orum, T.V., Alcorn, S.M., Steigerwalt, A.G., Foster, J.L.M., Fogleman, J.C., & Brenner, D.J. (1991). Taxonomy and Pathogenicity of *Erwinia cacticida* sp. nov. *International Journal of Systematic Bacteriology*, 197-212.
- Özdemir, A.İ. (2004). Tedarik Zinciri Yönetiminin Gelişimi, Süreçleri ve Yararları. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 23, 87-96.
- Paciarotti, C., Mazzuto, G., D'Ettorre, D. (2014). A revised FMEA application to the quality control management. *International Journal of Quality & Reliability Management*, 31(7), 788 – 810.

- Prakash, S., Soni, G., Pal, A., & Rathore, S. (2015). A grey based approach for assessment of risk associated with facility location in global supply chain. *Grey Systems: Theory and Application*, 5, 3.
- Prasad, S., & Babbar, S. (2000). International operations management research. *Journal of Operations Management*, 18, 209–247.
- PwC/MIT Forum for Supply Chain Innovation Making the right risk decisions to strengthen operations performance http://www.pwc.com/gx/en/operations-consulting-services/pdf/pwc-and-the-mit-forum-for-supply-chain-innovation_making-the-right-risk-decisions-to-strengthen-operations-performance_st-13-0060.pdf (24.05.2015).
- Rao, S., & Goldsby, T.J. (2009). Supply chain risks: a review and topology. *The International Journal of Logistics Management*, 20(1), 97-123.
- Sheffi, Y., & Rice, J. B. (2005). A Supply Chain View of the Resilient Enterprise. *MIT Sloan Management Review*, 47(1), 41-48.
- Sodhi M. S., Sodhi, N. S., & Tang, C. S. (2014). An EOQ model for MRO customers under stochastic price to quantify bullwhip effect for the manufacturer. *International Journal of Production Economics*, 155, 132-142.
- Sodhi, M. S., & Lee, S. (2007). An analysis of sources of risk in the consumer electronic industry. *Journal of the Operational Research Society*, 58(11), 1430-1439.
- Spekman, R.E., & Davis, E.W. (2004). Risky business: expanding the discussion on risk and the extended enterprise. *International Journal of Physical Distribution and Logistics Management*. 34(5), 414-433.
- Supply Chain Risk Leadership Council (SCRLC). (2011). *Supply Chain Risk Management: A Compilation of Best Practices*. (<http://www.scrhc.com>).
- Tan, K.C. (2001). A framework of supply chain management literature. *European Journal of Purchasing & Supply Management*, 7, 39-48.
- Tang, C., & Tomlin, B. (2008). The power of flexibility for mitigating supply chain risks. *Int. Journal of Production Economics*, 116(1), 12–27.
- Tang, C.S. (2006). Perspectives in Supply Chain Risk Management. *International Journal of Production Economics*, 103(2), 451–488.

- Teng, S.G., & Jaramillo, H. (2005). A model for evaluation and selection of suppliers in global textile and apparel supply chains. *International Journal of Physical Distribution & Logistics Management*, 35(7), 503 – 523.
- Thomas, R. M. (1998). *Conducting educational research: A comparative view*. West Port, Conn: Bergin & Garvey
- Thun, J. H., Hoenig, D. (2011). An empirical analysis of supply chain risk management in the German automotive industry. *International Journal Production Economics*, 131, 242–249.
- Tick, T.D. (1979). Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, 24(4), 602-611.
- Trent, R.J., & Monczka, R.M. (2003). Understanding integrated global sourcing. *International Journal of Physical Distribution & Logistics Management*, 33(7), 607-629.
- Tummala, R., and Schoenherr, T. (2011). Assessing and Managing Risks Using the Supply Chain Risk Management Process (SCRMP). *Supply Chain Management: An International Journal*, 16, 474–483.
- Vidal, C.J., & Goetschalckx, M. (1997). Strategic production-distribution models: a critical review with emphasis on global supply chain models. *European Journal of Operational Research*. 98(1), 1-18.
- Wagner, S.M., & Bode, C. (2006). Dominant Risks and Risk Management Practices in Supply Chains. *International Series in Operations Research & Management Science*, 17(124), 271-290.
- Yang, B., and Yang, Y. (2010). Postponement in supply chain risk management: a complexity perspective. *International Journal of Production Research*, 48(7), 1901-1912.
- Yazar, Z. (2009). Risk Yönetiminde Başarı Faktörü İş Sürekliliği Yönetimi ve İş Etki Analizi için Bir Uygulama Örneği.
- Zeng, A. Z., Berger, P., & Gerstenfeld, A. (2005). Managing the Supply-side Risks in Supply Chains: Taxonomies, Processes and Examples of Decision-making

Modeling. Applications of Supply Chain Management and E-Commerce Research, 92(1), 14–160.

Zinn, V., & Bowersox, D.J. (1988). Planning Physical Distribution with the Principle of Postponement. *Journal of Business Logistics*, 9(2), 117-136.

Zsidisin, G.A. & Ellram, L.M. (2001). Activities related to purchasing and supply management involvement in supplier alliances. *International Journal of Physical Distribution & Logistics Management*, 31(9), 629-46.

Zsidisin, G.A. & Wagner, S.M. (2010). Do perceptions become reality? the moderating role of supply chain resiliency on disruption occurrence. *Journal of Business Logistics*, 31(2), 1-20.

Zsisidin, G.A., Ragatz, G.L., Melnyk, S.A. (2005). The dark side of supply chain management. *Supply Chain Management Review*, 9(2), 46–52.

THESIS

Fröderberg, A. (2006). Cutting Logistics Costs with a Centralized Distribution Model for ABB's Distribution of LV Products in Asia Pasific. Master's Thesis.

Kırılmaz, O. (2014). *Tedarik Zinciri Şebekesinde Risk Yönetimi: Otomotiv Endüstrisinde Bir Uygulama*. Yayınlanmış doktora tezi, Gazi Üniversitesi Endüstri Mühendisliği Anabilim Dalı.

Salkın S.C. (2004). Geleneksel ve E-Ticaret Tedarik Zinciri Risk Yönetiminin Sistem Dinamiği Yaklaşımıyla Modellenmesi. *Yayınlanmış yüksek lisans tezi*, İstanbul Teknik Üniversitesi. .

APPENDIX

APPENDIX 1 Classification of Sectors

SELECTED SECTORS TO THE STATISTICAL CLASSIFICATION OF ECONOMIC ACTIVITIES IN THE EUROPEAN COMMUNITY (NACE REV.2 2015)				
NO	KOD	DEFINITION	COMPANY NAME	PRODUCT
1	NACE Rev.2 (10.39.05)	Production of frozen or dried fruits and vegetables	SYSTEM MULTIFOOD GIDA TEKSTİL MAK. SANAYİ VE DIŞ TİC. LTD.ŞTİ.	Dried food production
2	NACE Rev.2 (14.13.04)	Manufacturing of apparel	HUGO BOSS TEKSTİL SANAYİ LTD. ŞTİ.	Apparel
3	NACE Rev.2 (15.12.07)	Manufacturing of leather and related products (luggage, handbags, etc for the manufacture of products)	SF LEATHER DERİ TEKSTİL KONFEKSİYON SANAYİ VE TİCARET LTD. ŞTİ.	Bags and Accessories
4	NACE Rev.2 (20.30.11)	Production of the paints, varnishes and acrylic and vinyl polymer	AKZO NOBEL BOYA SANAYİ VE TİCARET A.Ş.	Powder paint
5	NACE Rev.2 (22.22.43)	Manufacturing plastic bags, garbage bags, packaging material	FİLE SAN PLASTİK SAN. VE TİC. LTD. ŞTİ.	Plastic net
6	NACE Rev.2 (28.29.05)	Manufacturing of filling and packaging machines	FİLE MAKİNA AMBALAJ SAN. TİC. LTD. ŞTİ.	Packaging Machinery
7	NACE Rev.2 (25.29.02)	Production of metal reservoirs and tanks	HMT KAZAN DEPOLAMA SİSTEMLERİ OTOMASYON SAN. VE TİC. LTD. ŞTİ.	Liquid Storage Systems
8	NACE Rev.2 (29.32.20)	Manufacturing of parts and accessories for motor vehicles	MAHLE MOTOR PARÇALARI SAN. VE TİC. A.Ş.	automotive supply
9	NACE Rev.2 (30.30.02)	Manufacturing of aircraft parts	*KALE PRATT & WHITNEY UÇAK MOTOR SANAYİ A.Ş. *LISI AEROSPACE	Aircraft engine parts

APPENDIX 2 Disclosure of Survey

Bu anket Kader Tetik'in Tedarik ile ilgili Risk Kaynakları ve Tedarik Temelli Yönetim başlıklı yüksek lisans tezi için hazırlanmıştır. Ankette tedarik risk algısı, tedarik zincirindeki riskin artmasına neden olan gelişmeler ve tedarik bazlı yönetim alanında firmanızın uygulamalarına ilişkin sorular bulunmaktadır. Bu çalışmada farklı sektörlerde yer alan firmaların tedarik risk kaynakları ve yönetim uygulamaları arasındaki ilişki analiz edilecektir. Sonuçlar bilimsel araştırma için kullanılacak ve bu amaçların dışında üçüncü taraflar ile paylaşılmayacaktır. Bu çalışmanın bundan sonraki tedarik zinciri risk yönetimi çalışmalarında yol gösterici olması açısından aşağıda yer alan soruların sizler tarafından yanıtlanması büyük önem taşımaktadır. Bu konuda göstermiş olduğunuz ilgi ve yardımlarınızdan dolayı şimdiden teşekkür ederiz.

Anketi ekteki form üzerinde ya da aşağıdaki link tıklanarak doldurulabilir. Sizi, *Tedarik ile ilgili Risk Kaynakları ve Tedarik Temelli Yönetim Anket *formunu doldurmaya davet ediyorum. Formu doldurmak için şurayı ziyaret edin: https://docs.google.com/forms/d/1Bqb3UqNzw34BkOdrTDZ-D7X59ki74Q_on1ZZ0ieYjG4/viewform?c=0&w=1&usp=mail_form_link

Kader Tetik

APPENDIX 3 Turkish of Survey

TEDARİK İLE İLGİLİ RİSK KAYNAKLARI VE TEDARİK TEMELLİ YÖNETİM ANKETİ

PROFİL SORULARI:

1. Yaşınız : 20-29 30-39 40-49 50-59 60 ve üstü
2. Cinsiyetiniz : Kadın Erkek
3. Mevcut işyerinizde çalışma süreniz? : ____ Yıl / ____Ay
4. Profesyonel çalışma süreniz? ____ Yıl / ____Ay
6. İşletmenizin yaşı? : 1-5 6-10 11-20 21-30 30'dan fazla
7. Hangi departmanda görev yapmaktasınız? _____
- 8.Çalıştığınız işletmede kaç kişi istihdam edilmektedir?
- 200'den az 201-500 501-1000 1001-1500 1501-2500 2500'den fazla
9. Çalıştığınız kurumda pozisyon seviyenizi belirtiniz:
- Tedarik Zinciri Uzmanı Tedarik Zinciri Takım Lideri Tedarik Zinciri Müdürü
Tedarik Zinciri Direktörü
- Tedarik Zinciri Yöneticisi / Başkan Yardımcısı Diğer _____
10. Tedarik zinciri süreçleriniz için dış kaynak kullanımı (fason/taşeron) faaliyetlerinin yüzdesi (%) belirtiniz.
- 0% 1-25% 26-50% 51-75% 75 ve üstü %

Bu bölümdeki sorular satın aldığınız ürünlerle ilgili tedarik riski algınızı ölçmektedir.

Bir ürün için kaynak ya da tedarik zinciri yönetimi esnasında aşağıdaki faktörlerin tedarik zinciri riskini ne boyutta etkilediğini düşünüyorsunuz?

1=Çok düşük 2=Ortanın biraz altında 3=Orta 4=Ortanın biraz üstünde 5=Çok yüksek	1	2	3	4	5
Tedarikçi firmadaki etkisiz yönetim şekli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finansal istikrarsızlık veya tedarikçinin mali başarısızlığı	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tedarikçilerin gereksinimlerimizi hatalı yorumlaması	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Girdi üründe kalite sorunları	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tedarikçideki işçi/yönetim sorunları	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tedarikçiler ile elektronik bilgi paylaşımı (örneğin EDI, ERP aracılığı ile)sorunları	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternatif tedarikçilerin eksikliği	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tedarikçileri etkileme yetersizliği	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tedarikçinin talepteki önemli artışları (%20'den fazla) karşılamadaki	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

yetersizliği	
Girdi tedarik kanallarındaki ulaşım aksamaları	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Gelen tedarik kanallarındaki ulaştırma sürelerinde değişkenlik	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Siyasi istikrarsızlık / savaşın tedarikçi operasyonlarını etkilemesi	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Doğal afetlerden veya mücbir sebeplerden etkilenen tedarikçi operasyonları	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Tedarikçilerinizle aranızdaki uzak mesafeler	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Bu bölümdeki sorular tedarik zincirindeki riskin artmasına neden olan gelişmelerle ilgili algınızı ölçmektedir.

Sizce aşağıdaki gelişmeler tedarik zincirindeki riskin artmasına ne ölçüde neden olur?

1=hiç etkilemez 5= çok etkiler	1 2 3 4 5
Güvenlik boyutları yerine verimliliğe odaklanma	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Tedarik zincirinin küreselleşmesi	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Merkezi dağıtıma odaklanma	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Zorunlu dış kaynak kullanımı	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Tedarikçilerin azalması	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Artan ürün çeşitliliği	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Merkezi üretim	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Genel olarak tedarik zincirinizin çevresel olumsuzluklara karşı kırılgan olduğunu düşünüyor musunuz?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Bu bölümdeki sorular tedarik bazlı yönetim alanlarında firmanızın uygulamalarına ilişkin algınızı ölçmektedir.

Tedarik temelli yönetim alanlarında firmanızın uygulamalarına ilişkin en uygun cevapları belirtiniz: (en sık çalıştığınız tedarikçi/tedarikçileri düşünerek yanıtlayabilirsiniz.)

1 = kesinlikle katılmıyorum 7 = kesinlikle katılıyorum	1 2 3 4 5 6 7
Ürün yönetim ekipleri tedarikçi performansı için maliyet, kalite ve teslim süresi seviyelerini ayarlar.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Yerel fabrika yöneticilerine satınalma siparişleri ve günlük tedarik akışlarını yürütme yetkisi verilmiştir.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Firmamızın tedarikçilerin belirli ürünleri için onaylı kalite güvence programı vardır.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Firmamızın tedarikçilerin üretim süreci için bir kalite güvence programı vardır.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Firmamız tedarikçileri tarafından sağlanan teknik destek ve test olanaklarından yararlanır.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Üretim personelimiz düzenli olarak tedarikçilerin tesislerini ziyaret eder.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Tedarikçiler biz yeni bir ürün tasarımı geliştirdikten sonra spesifikasyona ilişkin güncellemeleri alır.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Biz tedarikçilerimizle hassas bilgilerin büyük bir kısmını paylaşırız.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Biz anahtar girdi kalemlerinde fiyat sabitlemek için tedarikçilerimizle yıllık anlaşmalar yaparız.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Şirketlerin risk ile ilgili bilgileri tedarik zinciri üyeleri ile paylaşmaları için ihtiyaç duyulan itici güçler veya bunun önündeki engeller nelerdir?

Hangi riskler şirketler tarafından ortak tedarik zinciri riskleri olarak kabul edilmektedir?

Tedarik zinciri stratejilerinde risk-performans ilişkisi nasıl analiz ve minimize edilebilir?

Tedarik zinciri risk yönetimi süreçlerinin uygulanması şirketler içinde ve şirketler arasında nasıl organize edilebilir? Yetki ve sorumluluklar nasıl dağıtılmalı, hangi fonksiyonlar tarafından yönetilmelidir?

APPENDIX 4 English of Survey

SUPPLY - SIDE RISK SOURCES AND SUPPLY BASE RISK MANAGEMENT QUESTIONNAIRE

PROFILE QUESTIONS:

1. What is your ages? : 20-29 30-39 40-49 50-59 60 and over
2. What is your gender? : Female Male
3. How long are you working current workplace? : ____ year / ____ month
4. How long are your professional working time? ____year / ____ month
6. What is company's age? : 1-5 6-10 11-20 21-30 Over 30
7. Which department you have been working? _____
8. How many people are employed in your business unit?
Less than 200 201–500 501–1000 1001–1500 1501–2500 Over 2500
9. Please indicate the level of your position within your organization:
Supply chain specialist Supply chain team leader Supply chain manager Supply chain director
Supply chain executive/VP Other
10. Please indicate the percentage (%) of total activities in each supply chain area that are currently outsourced
0% 1–25% 26–50% 51–75% Greater than 75

The next set of the questions relates of your perception of supply risk for the purchased item you just desribed.

When making sourcing or supply management for a product, to what extent are you concerned about each of the following factors which may contribute to supply risk?

5-point scale 1=not at all, 2=slightly, 3=moderately, 4=very, 5=extremely	1	2	3	4	5
Ineffective management in the supplier firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Financial instability or financial failure of a supplier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suppliers incorrectly interpreting our requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incoming product quality problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Labor/management problems at suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of alternative suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inability to influence suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inability of suppliers to meet significant (>20%) increases in required volumes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation disruptions with inbound supply channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variability in transportation times with inbound supply channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Political instability / war affecting suppliers' operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural disasters or "acts of God" affecting suppliers' operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long physical distances between you and your suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In your opinion, to which extent do the following developments contribute to an increase of risk within your supply chain?

1=do not agree 5= do agree absolutely	1	2	3	4	5
Focus on efficiency instead of security aspects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Globalization of the supply chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Focus on central distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Inforced outsourcing	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Reduction of suppliers	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Increased product variety	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Centralized production	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
In general, do you consider your supply chain as vulnerable to incidences?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Indicate the most appropriate response regarding your firm's practice of the following areas of supply base management:

On a scale of 1 = strongly disagree to 7 = strongly agree	1 2 3 4 5 6 7
Commodity management teams set the levels of cost, quality and lead time for supplier performance.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Local plant managers are given authority to execute purchase orders and daily supply flows.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Our company has a quality-assurance (certified) program for our supplier's specific product.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Our company has a quality-assurance program for our supplier's manufacturing process.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Our company takes advantage of supplier-provided technical support and test capabilities.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Our manufacturing personnel regularly visit our supplier's facility.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Suppliers receive changes to our specifications after we develop a new product design.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We share a great deal of sensitive information with our suppliers.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We undertake annual negotiations to establish the price for key-input items from our suppliers.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

What are the motivators or inhibitors for companies to share risk related information?

Which risks are accepted by companies as shared supply chain risks?

How can the risk performance trade-offs in supply chain strategies be analyzed and minimised?

How can the implementation of SCRM processes be organized within and across companies?

APPENDIX 5 References of Survey

No	Variables of Supply Related Risks	Researcher who developed questionnaire scale	Frequency	Researcher who used in Qualitative / Conceptual studies	Frequency
1	Ineffective management in the supplier firm	Zsidisin and Wagner, 2010	1	Chopra and Sodhi, 2004	1
2	Financial instability or financial failure of a supplier	Zsidisin and Wagner, 2010; Thun and Hoenig, 2011	2	Chopra and Sodhi, 2004; Zeng, Berger, and Gerstenfeld, 2005	1
3	Suppliers incorrectly interpreting our requirements	Zsidisin and Wagner, 2010; Murugesan et al. 2013	2	Manuj and Mentzer, 2008	1
4	Incoming product quality problems	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner, 2005; Sofyalioğlu and Kartal, 2012; Thun and Hoenig, 2011; Wagner and Bode, 2006	4	Manuj and Mentzer, 2008; Miller 1992; Treleven and Schweikhart, 1988; Chopra and Sodhi, 2004; Jüttner, Peck, and Christopher, 2003; Zeng, Berger, and Gerstenfeld, 2005	6
5	Labor/management problems at suppliers	Zsidisin and Wagner, 2010; Jüttner, 2005; Sofyalioğlu and Kartal, 2012	3	Miller 1992; Machalaba and Kim, 2002; Chopra and Sodhi, 2004; Jüttner, Peck, and Christopher, 2003	4
6	Problems in electronically sharing information (e.g., through EDI, ERP) with suppliers	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner, 2005; Zsidisin and Ellram, 2001; Sofyalioğlu and Kartal, 2012; Thun and Hoenig, 2011	4	Manuj and Mentzer, 2008; Chopra and Sodhi, 2004; Zeng, Berger, and Gerstenfeld, 2005	2
7	Lack of alternative suppliers	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Thun and Hoenig, 2011	3	Chopra and Sodhi, 2004	1
8	Inability to influence suppliers	Zsidisin and Wagner, 2010	1	Chopra and Sodhi, 2004	1
9	Inability of suppliers to meet significant (>20%) increases in required volumes	Zsidisin and Wagner, 2010	2	Manuj and Mentzer, 2008; Chopra and Sodhi, 2004; Jüttner, 2005; Zeng, Berger, and Gerstenfeld, 2005	4
10	Transportation disruptions with inbound supply channels	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner, 2005; Svensson, 2002; Thun and Hoenig, 2011	4	Manuj and Mentzer, 2008; Machalaba and Kim, 2002; Chopra and Sodhi, 2004; Zeng, Berger, and Gerstenfeld, 2005	4
11	Variability in transportation times with inbound supply channels	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner, 2005; Svensson, 2002; Thun and	5	Manuj and Mentzer, 2008; Chopra and Sodhi, 2004; Zeng, Berger, and Gerstenfeld, 2005	3

		Hoening, 2011			
12	Political instability / war affecting suppliers' operations	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner 2005; Wagner and Bode, 2006; Sofyaloğlu and Kartal, 2012; Thun and Hoening, 2011	6	Manuj and Mentzer, 2008; Miller 1992; van der Vorst and Beulens, 2002; Wu, Blackhurst, and Chidambaram, 2006; Chopra and Sodhi, 2004; Blos et al., 2009; Rao and Goldsby, 2009; Jüttner, Peck, and Christopher, 2003; Zeng, Berger, and Gerstenfeld, 2005; Christopher and Peck, 2004; Mitroff and Alpalsan, 2003	11
13	Natural disasters or "acts of God" affecting suppliers' operations	Zsidisin and Wagner, 2010; Murugesan et al. 2013; Jüttner, 2005; Wagner and Bode, 2006; Sofyaloğlu and Kartal, 2012; Thun and Hoening, 2011	6	Manuj and Mentzer, 2008; Miller 1992; Mitroff and Alpalsan, 2003; Sofyaloğlu and Kartal, 2012; Wu, Blackhurst, and Vellayappan, 2006; Chopra and Sodhi, 2004; Blos et al., 2009; Rao and Goldsby, 2009; Jüttner, Peck, and Christopher, 2003; Zeng, Berger, and Gerstenfeld, 2005; Christopher and Peck, 2004	11
14	Long physical distances between you and your suppliers	Zsidisin and Wagner, 2010	1	Miller 1992; Chopra and Sodhi, 2004	2

1	Focus on efficiency instead of security aspects	Thun and Hoening, 2011; Thun, Drüke, and Hoening, 2011	2	Norrman and Jansson, 2004; Sheffi, 2005; Jüttner, 2005; Tang, 2006; Pfohl, Köhler, and Thomas, 2010; Lavastre, Gunasekaran, and Spalanzani, 2012; Wagner and Neshat, 2012	7
2	Globalization of the supply chain	Thun and Hoening, 2011; Thun, Drüke, and Hoening, 2011	2	Huchzermeier and Cohen, 1996; Cohen and Huchzermeier, 1999; Novaes, 2000; Harland, Brenchley, and Walker, 2003; Novaes and Souza, 2005; Jüttner, Peck, and Christopher, 2003; Norrman and Jansson, 2004; Jüttner, 2005; Tang, 2006; Pfohl, Köhler, and Thomas,	11

				2010; Lavastre, Gunasekaran, and Spalanzani, 2012	
3	Focus on central distribution	Thun and Hoenig, 2011; Thun, Drüke, and Hoenig, 2011	2	Jüttner, Peck, and Christopher, 2003; Jüttner, 2005; Pfohl, Köhler, and Thomas, 2010; Lavastre, Gunasekaran, and Spalanzani, 2012	4
4	Inforced outsourcing	Thun and Hoenig, 2011	1	Wagner and Bode, 2006; Chopra and Sodhi, 2004; Wagner and Neshat, 2012	3
5	Reduction of suppliers	Thun and Hoenig, 2011; Thun, Drüke, and Hoenig, 2011	2	Jüttner, Peck, and Christopher, 2003; Norrman and Jansson, 2004; Jüttner, 2005; Wagner and Bode, 2006; Wagner and Neshat, 2012; Lavastre, Gunasekaran, and Spalanzani, 2012	6
6	Increased product variety	Thun and Hoenig, 2011; Thun, Drüke, and Hoenig, 2011	2	Harland, Brenchley, and Walker, 2003; Pfohl, Köhler, and Thomas, 2010	2
7	Centralized production	Thun and Hoenig, 2011; Thun, Drüke, and Hoenig, 2011	2	Jüttner, 2005; Pfohl, Köhler, and Thomas, 2010; Lavastre, Gunasekaran, and Spalanzani, 2012	3

2	Commodity management teams set the levels of cost, quality and lead time for supplier performance.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
3	Low volume, low cost materials are handled by individual plant staff based on local needs.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
4	Our company has a quality-assurance (certified) program for our supplier's specific product.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
5	Our company has a quality-assurance program for our supplier's manufacturing process.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
6	Our company takes advantage of supplier-provided	Tan, Kannan, Handfield, and Ghosh, 1999	1		

	technical support and test capabilities.				
7	Our manufacturing personnel regularly visit our supplier's facility.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
8	Suppliers receive changes to our specifications after we develop a new product design.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
9	We share a great deal of sensitive information with our suppliers.	Tan, Kannan, Handfield, and Ghosh, 1999	1		
10	We undertake annual negotiations to establish the price for key-input items from our suppliers.	Tan, Kannan, Handfield, and Ghosh, 1999	1		

1	What are the motivators or inhibitors for companies to share risk related information?			Jüttner, 2005	1
2	Which risks are accepted by companies as shared supply chain risks?			Jüttner, 2005	1
3	How can the risk performance trade-offs in supply chain strategies be analyzed and minimised?			Jüttner, 2005	1
4	How can the implementation of SCRM processes be organized within and across companies?			Jüttner, 2005	1