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Risks and Risk Management in the Supply Chain flow - a case study based on some of Marsh's clients

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Abstract
Today many companies are operating within heavily integrated supply chains with short lead times, low levels of inventories and a high usage of single-sourcing. All this makes companies vulnerable since they are exposed to more risks and it is hard to get adequate insurance solutions. Hence it has become very important to identify and handle risks, and integrating risk management as a part of the daily work. This master thesis presents a model, a check list, which maps and highlights companies' weaknesses and strengths within the areas of risk exposure, risk management and risk handling.

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Sammanfattning

De senaste årtionden har kännetecknats av hårdare konkurrens och snabbare teknisk utveckling. De här aspekterna har påverkat företag och orsakat förändringar inom många områden, till exempel kortare ledtider, minskade lagernivåer och mer utbredd användning av single sourcing. Förändringarna gör företag mer sårbara eftersom de blir mer utsatta för risker. Därför har det blivit väldigt viktigt att identifiera och hantera risker, samt integrera risk management som en del av det dagliga arbetet. Idag driver många företag sina verksamheter i tungt integrerade försörjningskedjor. På grund av det ökade beroendet mot leverantörer och kunder är det nödvändigt att vidga den interna risk hanteringen så att den omfattar hela försörjningskedjan. Det är också viktigt att ha tydliga planer för att kunna fortsätta med verksamheten om det förekommer avbrott.

Ett huvudsakligt och traditionellt sätt att hantera risker är att använda försäkringar. De tungt integrerade försörjningskedjorna kräver lösningar med ett brett skydd, men dagens tuffa försäkringsmarknad gör detta finansiella skydd dyrt. Företag måste implementera ytterligare riskhanteringsmetoder eftersom vissa risker, som till exempel förlust av markandsandelar och negativa effekter uppåt och nedåt i försörjningskedjan, inte alltid kan försäkras.

Uppdragsgivaren till detta examensarbete är Marsh AB som huvudsakligen arbetar med försäkringsmäkling och risk konsultering. Vårt huvudsakliga mål med examensarbetet är att analysera och utvärdera fyra av Marshs klienters arbete med risker i försörjningskedjan både från en teoretisk och även empirisk synvinkel. För att uppnå detta har vi utvecklat en modell, en checklista, baserad på våra teori- och empiridelar. Den kartlägger och belyser styrkor och svagheter inom risk exponering, risk management och risk hantering. Checklistan gör det möjligt att analysera de olika företagen och utvärdera deras nuvarande situation. Det är vår avsikt att göra checklistan så generell som möjligt så att den kan appliceras på företag i olika branscher. Vi anser att vår framtagna modell är ett bra sätt att öka medvetenheten gällande arbetet med risker.

Resultaten från vår modell visar att företagens syn på risker och deras arbete med dessa varierar i stor utsträckning. Generellt kan vi dock se att det huvudsakliga sättet att hantera risker är att överföra dem genom försäkringar. Det finns emellertid en tendens att förbise andra lösningar. Idag fokuserar många företag på att tids- och kostnadseffektivisera sina flöden. Med detta följer en mer omfattande riskexponering som företagen i många fall inte är medvetna om.

Summary

Clear features of the last decades are tougher competition and faster technical development. These aspects have influenced companies and caused changes within many areas, like for example shorter lead times, decreased levels of inventories and an increased usage of single-sourcing. All this makes companies more vulnerable since they are exposed to more risks. Hence it has become very important to identify and handle risks, and integrating risk management as a part of the daily work. Today many companies are operating within heavily integrated supply chains. The higher dependencies towards suppliers and customers make it necessary to widen the internal risk management perspective to include the whole supply chain. It is also vital to have clear business continuity plans in case of a disruption.

A main and traditional way of handling risks is to transfer them by using insurances. The heavily integrated supply chains require insurance solutions to have a wide cover, but the tough conditions of today's insurance market have made this financial protection very expensive. Companies need to implement other risk handling methods as well because some risks, like loss of market shares and negative effects upstream and downstream in the supply chain, are not able to cover by insurance.

The assigner of this master thesis is Marsh AB, who mainly offers insurance broking and risk consultant services. Our main object with this master thesis is to analyse and evaluate four of Marsh's clients' work with risks in the supply chain both from a theoretical and an empirical point of view. To achieve this we have developed a model, a check list, based on our theoretical and empirical findings. It maps and highlights weaknesses and strengths within the areas of risk exposure, risk management and risk handling. The check list makes it possible to analyse different companies and evaluate the current situation. Our aim is to make the check list as general as possible so that different companies in various lines of business may use it. We believe that the check list presented in this thesis is a good way for companies to increase the awareness concerning work with risks.

The results of our model implicate that the case companies' points of view concerning risks and work with risks varies significantly. However the general method of handling risks is to transfer them through insurances. There is a tendency to overlook other solutions besides insurances. Today many companies focus on making their flows both time and cost efficient. This leads to a more extensive risk exposure that the companies in many cases are unaware of.

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1 Introduction

The chapter sets the framework for this master thesis and gives an explanation of the background, areas of inquiry, purpose, delimitations and main target groups. It also includes a disposition of the chapters to follow.

1.1 Background

Clear features over the last decades are tougher competition and faster technical development, giving the consequences of changes in companies' logistics and purchase areas. The results of these changes are among others shorter lead times, decreased storages and an increased usage of single-sourcing. The outcome is a more extensive risk exposure for companies and therefore a greater vulnerability.[1] Consequently risk management, which means the ability to identify, value and handle risks, has become an important part of most organizations. Managing these risks convey high demands on companies' flexibility.[2]

A very clear example of the consequences when using different types of risk management is the case where both Nokia and Ericsson were struck by the fire in a Philips owned factory in Albuquerque, New Mexico, in March 2000. The factory delivered rare and essential components to both telecom companies. The immediate measures which were taken by Nokia contrast greatly to the slowly reacting management at Ericsson. Within a few hours after the fire a crisis group was appointed at Nokia, involving key employees worldwide who were well aware of the severances of the accident.[3] The group began working thoroughly with the goal to minimize the consequences caused by the fire, by informing the rest of the company and putting pressure on Philips to replace the lost quantity as soon as possible. Ericsson on the other hand did not become fully aware of the proportions of the accident until one month later and even at that time they did not understand the total impact of it. Furthermore they did not succeed in putting enough pressure on Philips since they were already working overtime to cover Nokia's losses. The natural result was that Nokia suffered far less damage than their main competitor thanks to a direct and well developed risk management. In the end, Ericsson came up millions of chips short of what was needed for a new key product, and lost billions of

[1] Persson G., Virum H., 1996, *Logistik för konkurrenskraft,* Liber Ekonomi

[2] DeLoach J., (2000), *Enterprise-wide Risk Management: Strategies for linking risk and opportunity***,** Pearson Education Limited

[3] Båge J., *Nokia hanterade branden med bravur,* Dagens Industri, 02/02/2001

Swedish crowns in potential revenue.[4] In addition Nokia gained market shares on behalf of Ericsson.[5]

The objective of Risk Management is to minimize the total cost of risk, which includes reducing future loss and damage. Hence risks must be identified and handled in order to achieve the goals of the organization with a minimum of disruptions and to the lowest possible cost[6]. Today many organizations are operating within heavily integrated supply chains and in a highly competitive and increasingly global market place[7]. Due to the higher dependencies between the company and its customers and suppliers, it is necessary to widen the perspective regarding risk management to cover not only the organization but also the whole supply chain. It becomes essential to identify and analyse the risks throughout the supply chain and to have a clear plan of action in case of a disruption. A vital part of risk management is business continuity management, BCM, which constitute the conditions of the preventive work. After the terror attack on the 11th of September 2001 the awareness has increased regarding the importance of risk management and BCM.[8]

A traditional way of handling risks has been utilizing insurances in order to transfer the economical loss if a disruption takes place. The changes in character of the supply chain and the risks that have followed mean that the traditional insurances are less and less covering the total cost of the losses. In the 90s the insurance market was the buyer's market, which means that the policyholder got a very comprehensive insurance solution with good terms to a low premium. The tough competition within the insurance market was one reason to the low premiums[9]. The insurance companies actually made a loss on their customers, but their speculations on the stock market covered these losses. Today when there is an easy stock market the insurer can not offer these wide range solutions. For example, today it is difficult for the policyholder to include supplier disturbances in the insurance contract. This demands risk surveys on their suppliers' facilities as well as their own.[10]

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[4] Latour A., *Trial by fire tested mettle of rivals Ericsson and Nokia*, The Wall Street Journal Europe, 29/01/2001
[5] Aarøe Carlsen R., (2001) *Managing your value chain dependencies*, Marsh
[6] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[7] de Waij D., BCM Practice Leader, Continental Europe, Marsh, 18/09/2003
[8] Aarøe Carlsen R., Practice Leader Operational Asset Management Nordic Region, 23/09/2003
[9] Stenshamn C., *I terrorns skugga*, Veckans Affärer, 22/04/2002
[10] Stiegler J., Vice President Risk Management at Marsh AB, 25/09/2003

Our assigner for this master thesis is Marsh, a world leading firm within risk and insurance services, with roughly 59 000 employees, that works with clients in more than 100 countries[11]. The Swedish branch Marsh AB has about 120 employees at the offices in Stockholm, Göteborg and Malmö[12]. Marsh is seeing supply risk management solutions as a growing demand from the clients. There are an increased number of losses at suppliers that have impact at Marsh's clients direct production output, hence the bottom line in the annual reports. As the losses are increasing in importance at the same time as coverage for these losses are not as easy to get in the insurance market of today, proactive ways of handling these issues are searched for. Contact between Marsh AB and the Division of Engineering at Lund University was established. As this doing is doing research in this field, mutual benefits could be seen with a working relation. A thesis was announced where a number of case studies could be used. There is a hope to achieve a mutual benefit with experience from the industry today and the more theoretical side of the issue. In addition, the customers that suffered these losses might get some useful information out of this new fresh look at the events.[13]

1.2 Areas of inquiry

In order to prevent major losses due to disruptions in the supply chain it is important to have a solidly founded risk management throughout the organization. It ought to be in every company's interest to be aware of the different hazards and to have a clear line of action in case of an unexpected event. A vital part of risk management is the need of adequate insurance solutions. Companies that suffer from losses depend on how well their insurances cover the actual financial loss. A disruption in the supply chain affects not only the company by the actual loss but is also likely to have subsequent effects, such as a decrease in market shares. The complexity makes it difficult for the exposed company to estimate the total financial losses, which contributes to the impediment in how to design well functioning insurance solutions. Furthermore the interruption and its financial consequences have an impact on companies upstream and downstream in the supply chain. For companies to minimize damage it is important to be aware of present risks and make risk management a part of the company culture and organization.[14]

[11] www.marsh.com, 20/08/2003
[12] www.marsh.se, 20/08/2003
[13] Ösund F., Senior Risk Consultant at Marsh AB
[14] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB

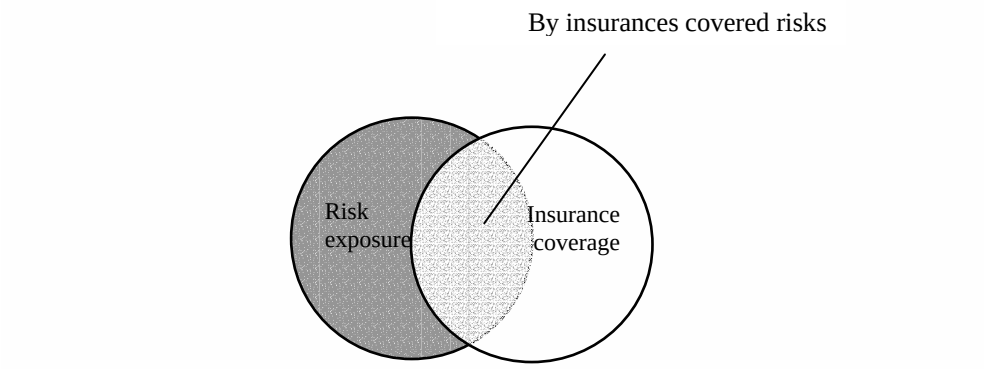

Figure 1.1 Risk exposure and insurance coverage

Different companies are exposed to different risks and therefore it is important to clarify the specific risks and how these can be covered. In picture 1.1 above the section covered by both circles represents the existing risks which are covered by insurances. The aim is to the furthest extent overlap the two circles. All other cases signify that there exists irrelevant coverage regarding the specific risk exposure within a company. However, it is common that the risk coverage circle is inferior to the risk exposure due to the fact that all risks can not be covered by insurances.

1.3 Purpose of the thesis

The purpose of this master thesis is divided into a main purpose and a number of sub purposes.

The main purpose is to analyse and evaluate, based on some case companies, the risk management in the supply chain flow from both a theoretical and an empirical point of view.

The sub purposes are:

i. to determine the existing flow-related risk exposure within each company
ii. to discuss a favourable risk handling in order to limit or cover the risk exposure
iii. to develop a descriptive model to map risks and the work with risks at the case companies
iv. to determine the risk coverage at each company based on signed insurances
v. to discuss possible improvements of today's existing insurance solutions

1.4 Focus and delimitations

The aim is to analyse the risk management in some companies, which all originates from Marsh's clientele. These analyses will focus on:

- the actual or fictitious interruption in the supply chain and its physical consequences
- the risk exposure, risk management and risk handling at each company
- the economic consequences of a disruption in the supply chain and the coverage of the subscribed insurances

In addition to this we hope to find suggestions for new insurance solutions within this area. However, it is not our intent to investigate Marsh' working procedure compared to other companies operating in the same line of business. Nor is it our purpose to elucidate the environmental and public economic effects caused by the varying interruptions in our cases.

1.5 Target group

This thesis is mainly aimed at two equally important target groups; first it is our intent to communicate theory and our conclusions concerning this particular subject field to fellow graduates, secondly to Marsh AB and its clients. Marsh has given us this assignment with the expectation of an analysis concerning risk management and the existing insurance solutions. Naturally we hope that this master thesis will have an impact on as many different interested parties as possible, like teachers and researchers who take an active part in the academicals world.

1.6 Disposition

This master thesis is divided into ten separate chapters.

The second chapter consists of the methodological considerations.

Chapter three is a description of the Marsh Incorporation including the Swedish branch Marsh AB. There will also be an account of the way in which the employees at Marsh AB look upon their company and the way they conduct their everyday assignments.

The next three chapters will describe our chosen theoretical foundations, which provide a platform for the theoretical framework.

Chapter four handles logistics and supply chain management. The next chapter concerns risk management and finally in chapter six a section regarding insurances. These three areas will constitute the foundation for the

model described in the end of chapter seven and of the empirical data for each case it will found the ground for the analysis.

The seventh chapter describes the development of the descriptive model, a check list.

Chapter eight consists of brief introductions of each case company and thorough descriptions of the cases. There will also be reports of our empirical findings.

The analyses of each case of our case studies will be presented in chapter nine.

In chapter ten the similarities and differences between the case companies will be analysed as well as possible ideas for new insurance solutions and overall discussion.

2 Methodology

This chapter describes the theoretical foundations of method and our choice of research design and practical method throughout this master thesis.

2.1 Theories of method

The common procedure is to separate between methodology and method. Methodology is a wide concept and refers to the principles of philosophical and logical nature that different methods are based on. Method generally means the practical scientific work procedure, such as data collecting and data analyses.[15]

As a consequence of dimension of this master thesis we find it relevant to highlight a number of central concepts regarding theories of method.

Ontology and epistemology[16]

The perception of knowledge and the world varies substantially from one individual to another. These basic conceptions of the world affect the choice of method; hence it is of great importance to be aware of the individual references before choosing the approach of the study. Traditional areas to consider are ontology and epistemology. Ontology is the conception of the world which depends not only on the background of the individual but also on the area of research. Epistemology means the cognitive knowledge approach which is strongly linked to the ontology. These areas determine if the researcher has an objective or a subjective way of seeing the world in general. Objective individuals want numerous observations to be able to generalize and tend to lean towards the general laws of the nature. Subjective individuals on the other hand aim to understand a specific case which only occurs once, like a historical event. These extremes seldom occur by themselves, it is more likely to find a mixture of them both. In this master thesis our aim is to have an objective point of view and thereby follow the area of epistemology. However, there are influences of a sujective approach as well.

Positivism and non-positivism

The epistemology consists in two extremes, positivism and non-positivism. Positivism is the striving for absolute knowledge and originates from science. It was first used in the 19th century by the French sociologist Auguste Comte (1798-1857). According to the positivism, individuals only have two sources of knowledge; namely what can be observed through

[15] Svenning C., (1997) *Metodboken*, Lorentz förlag
[16] Björklund M. and Paulsson U., (2003) *Seminarieboken*, Studentlitteratur

senses and things which can be calculated with logic. Hence it is important not to rely on traditions and authorities or to trust feelings. Instead positivism aims at critically evaluate all statements from facts which can be guaranteed with a certain probability.[17] Knowledge is attained by verifying and falsifying hypothesis and theories, all leading to objective and true knowledge. A positivist regards the growth of knowledge as an adding process, where new knowledge is added to old. A non-positivist on the other hand sees no difference between the observer and the investigated subject. According to this view, knowledge is obtained through understanding. The non-positivists also seek objectivity, but more like an ideal, which results in wider methods for collecting and analysing data than the positivists.[18] It is not possible for us in this thesis to obtain full positivism, but we strive towards it.

Validity, reliability and objectivity

Validity, reliability and objectivity are three dimensions of the creditability of a study[19]. The connection between the theoretical and empirical areas is known to be difficult, but nevertheless it must be present. The connection is called validity and means measuring what is really supposed to be measured.[20] A way to increase the validity is to use various perspectives when performing the study. Reliability indicates the degree of credibility concerning measuring instrument, which means to what extent a reiteration of the investigation will generate the same result. Control questions in interviews can be used to get higher reliability. The degree to which the researchers' values have an influence on the study is called objectivity. By clarifying and motivating the different choices which are made in the thesis the readers are given an opportunity to form an opinion of their own regarding the result and as a consequence the objectivity will be increased.[21]

Induction and deduction

There are two ways of making conclusions; induction and deduction. Induction consists in finding general conclusion based on empirical facts. This states that induction presuppose quantification. However by using induction as an evaluation method, a statement can only be found more or less probable, but never a hundred percent certain. Due to the direct connection to reality, the terms validity and reliability are central when using induction.[22] It is possible to base an inductive study exclusively on

[17] Thurén T., (2002) *Vetenskapsteori för nybörjare,* Liber
[18] Björklund M. and Paulsson U., (2003) *Seminarieboken,* Studentlitteratur
[19] Ibid
[20] Svenning C., (1997) *Metodboken,* Lorentz förlag
[21] Björklund M. and Paulsson U., (2003) *Seminarieboken,* Studentlitteratur
[22] Thurén T., (2002) *Vetenskapsteori för nybörjare,* Liber

empirical findings[23]. Deduction on the other hand makes a logic conclusion, which is regarded as true if there exists a consistency. However, in contradiction to induction these conclusions are not forcedly true compared to reality[24]. The origin in every deductive study is a theory. Based on this knowledge certain predictions are made on the empirical findings. The goal is then to find data which support the in advance made predictions.[25] Since this master thesis is based on a number of company cases this leads to an inductive point of view. Hence, there are some deductive influences.

Qualitative and quantitative studies

Quantitative data includes information which can be measured numerically and answer questions like "how many" and "how much". Qualitative data is more sensible and creates deeper understanding for a specific subject and answer questions like "why".[26] Quantitative studies are considered to be more precise and give better possibilities for generalization compared to qualitative studies[27]. In this master thesis one of the main purposes is to understand why. Thereby it may be considered as a qualitative study.

Explorative and descriptive studies[28]

When the amount of information regarding a certain area of inquiry is thrifty, an explorative investigation method is used. These studies are characteristically more qualitative and this form of investigation is usually utilized when there is a need to find a basic understanding regarding a certain area. However when there already exists fundamental knowledge and understanding about the area descriptive methods are used. These methods aim to describe the different existing relations. A descriptive method is more quantitative. Within the area of risk management and insurances there exist a lot of written information, which enables us to do a descriptive study. However, within the area of supply chain risk management the sources of information are very few which leads to a more explorative approach within this area.

Primary and secondary data

The collected data consists of two different types; primary and secondary data. New data which is collected with the purpose to be used in a certain project is primary data. One example is the information gathered from interviews.[29] A requirement for this type of data is that no previous

[23] Björklund M. and Paulsson U., (2003) *Seminarieboken*, Studentlitteratur
[24] Thurén T., (2002) *Vetenskapsteori för nybörjare*, Liber
[25] Björklund M. and Paulsson U., (2003) *Seminarieboken*, Studentlitteratur
[26] Lindroth R., (2003) *Course material from "introduction to master thesis"*
[27] Björklund M. and Paulsson U., (2003) *Seminarieboken*, Studentlitteratur
[28] Lindroth R., (2002) *Course material from "introduction to master thesis"*
[29] Björklund M. and Paulsson U., (2003) *Seminarieboken*, Studentlitteratur

documentation exists[30]. Primary data is important when creating understanding for an individual project. However, when seeking more universal or general patterns the importance of using primary data is lower.[31] Secondary data on the other hand may be assembled from already existing documentations[32]. Literature of all kind is secondary data which means that the information has been put together for another reason than the particular project. Therefore it becomes essential to be aware of the fact that the information can be angled in some direction. The employed search method can also contribute to an incomplete foundation of literature. [33]

2.2 Research Design

A Case Study

A research design refers to the overall structure of an investigation. A case study entails a detailed examination of one or a small number of cases[34]. Many researchers see it as the best strategy to understand the whole complexity of an area of inquiry[35]. The research method is the way in which data collection is applied. Case studies focus on holistic situations in real life settings, and tend to have set boundaries of interest, such as an organization, a particular type of operation like in this case risk management[36]. Most qualitative research like our master thesis is in the form of a case study. Even though quantitative techniques provide better statistical predictability within research areas, case studies can also result in descriptions and predictions but on a smaller scale. A combination of the two techniques offers many different possibilities, where the most obvious advantage is the ability to cross-check the validity of findings, using different forms of data collection.[37]

By using a case study, the intention is to highlight a number of aspects of risk management in the supply chain of various companies. Furthermore the aim is to study the actual coverage of today's existing insurance solutions. Initially this research design was given by our assigner Marsh AB and after some evaluation we found it very useful to explore our purpose. Although a

[30] Wiedersheim-Paul F. and Eriksson L-T, (1991) *Att utreda forska och rapportera,* Almqvist & Wiksell. Ekonomiförlagen
[31] Björklund M. and Paulsson U., (2003) *Seminarieboken,* Studentlitteratur
[32] Wiedersheim-Paul F. and Eriksson L-T, (1991) *Att utreda forska och rapportera,* Almqvist & Wiksell. Ekonomiförlagen
[33] Björklund M. and Paulsson U., (2003) *Seminarieboken,* Studentlitteratur
[34] Bryman A., (1995) *Research Methods and Organisation studies,* Routledge
[35] Lundahl U. & Skärvad P-H., (1992) *Utredningsmetodik för samhällsvetare och ekonomer,* Studentlitteratur
[36] Ellram L., *The use of case study method in logistics research,* Journal of business logistics, Vol. 17, No. 2, 1996
[37] Bryman A., (1995) *Research Methods and Organisation studies,* Routledge

case study has its weaknesses, like limits in objectivity, we trust it to be the appropriate research tool to investigate our problem. This contemporary focus allows the investigation to explore the important characteristics of real life, in contrast to fictitious data. A historical research on the other hand has the ability to deal with a full variety of evidence. However this empirical approach does not cover the contemporary phenomena which we aim to investigate.

According to Eisenhardt[38], the case study strategy focuses on understanding the dynamics present within single settings. The study can include a single case or as in our master thesis multiple cases. When using several cases the replications allows for development of a rich, theoretical framework and in addition predict differences and similarities among the studied objects.[39] The level of research can be single or multiple[40], and in this study there is a single level of research since the only intent is to investigate the risk management on a company level without exploring the risk management industry in general.

The most desirable strategy for a case study is the pattern matching technique, meaning a related approach of the empirical findings to some theoretical proposition[41]. By using this technique the intention is to compare the empirically found patterns with the theoretical one, and if they coincide; it can strengthen the internal validity of the study[42]. The case study aims to accomplish different targets, like for example analyse the current case company situation and develop a describing model for highlighting the consequences of a disruption in the supply chain. In addition theories will be tested on the real cases which are central in this thesis.[43] The goal is to find patterns and linkages of theoretical importance.

In this master thesis the course of action will be based upon a number of company cases which derives from the clientele of Marsh AB. We are going to analyse the work with preventive risk management, and additionally in the event of an interruption we will address the actual disruption in the

[38] Eisenhardt K., *Building Theories From Case Study Research,* The Academy of Management Review, Vol. 14, No. 4, 1989
[39] Ellram L., *The use of case study method in logistics research,* Journal of business logistics, Vol. 17, No. 2, 1996
[40] Eisenhardt K., *Building Theories From Case Study Research,* The Academy of Management Review, Vol. 14, No. 4, 1989
[41] Bryman A., (1995) *Research Methods and Organisation studies,* Routledge
[42] Yin R., (1984) *Case Study Research: Design and Methods,* Thousand Oaks
[43] Eisenhardt K., *Building Theories From Case Study Research,* The Academy of Management Review, Vol. 14, No. 4, 1989

supply chain and investigate the economic consequences. To the furthest extent the cases will be evaluated from the aspects described in figure 2.1.

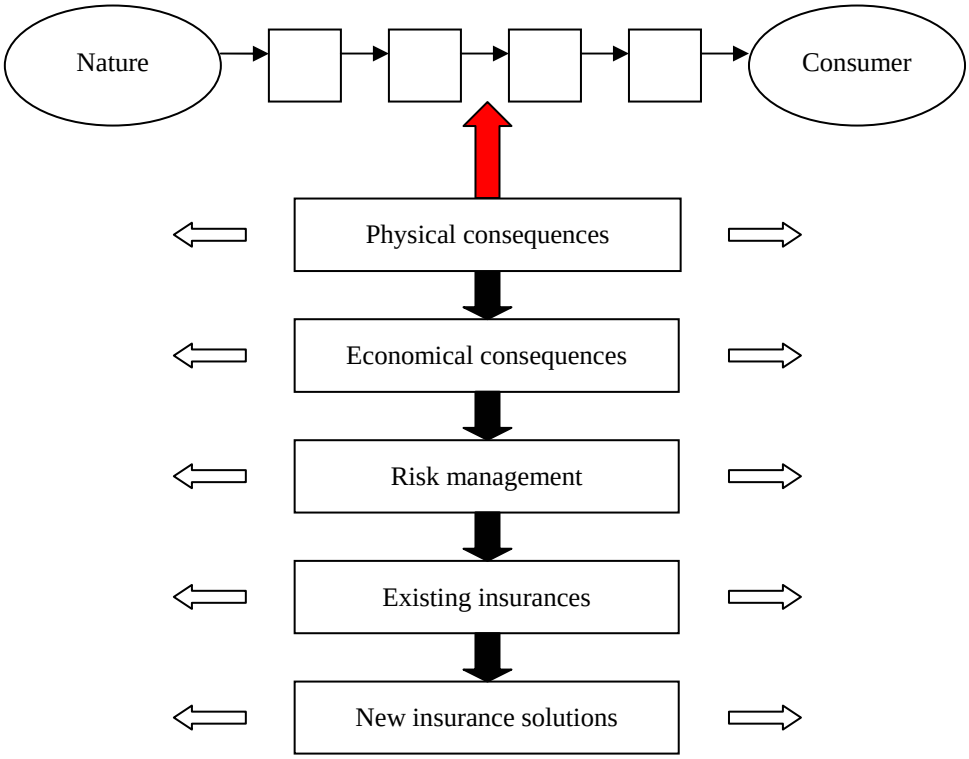

Figure 2.1 Different aspects in the analysis

The first step is to understand each company's supply chain and to make a survey of their risk management. Moreover we intend to find out if, and in which part of the course of events, a disruption has taken place and the cause of the disruption. We are going to examine the physical consequences such as delays and losses in production and the economical consequences which follow. The economical losses are difficult to estimate since they include, not only actual costs of the physical damage, but also factors like possible loss of market shares and goodwill. The way in which companies work with risks plays an important role for the future economic outcome. Preventive measures like buffer stocks, overtime in production and insurances can help to minimize the total damage. We will also examine the risk exposure, risk management and risk handling used by the different companies and to which degree the insurances covered the total economical loss and in which parts it failed. Our intent is to develop a describing model for identifying the internal and external effects after a disruption in the supply chain. A bonus would be to give Marsh AB some ideas for new insurance solutions after having examined our different cases.

After having analysed the different cases it is our intention to proceed according to figure 2.2. With a basis of literature, interviews and the case companies risk exposure, risk management and risk handling will be analysed to find patterns of similarities and differences. Our intent is to develop a describing model for illustrating the internal and external effects of a disruption in the supply chain flow.

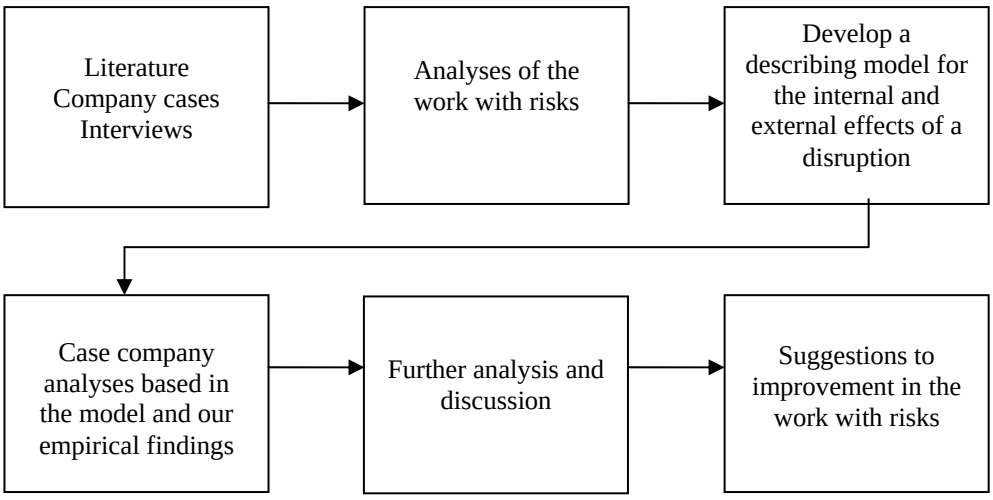

Figure 2.2 The work procedure

2.3 Practical Method

2.3.1 Data Collection

The focus of the primary data collection is on the case companies. The initial contact with the case companies was established through Fredrik Ösund[44] at Marsh AB. He presented the initial purpose of this thesis, to study a number of companies all being included in the Marsh AB clientele. Further contact was then made through different employees within the Marsh organization. The fact that all cases derives from the Marsh AB clientele shortened the data collection process. The empirical data was collected through a number of interviews with both consultants at Marsh AB and personnel at the case companies.

The theory, which constitutes the part of secondary data, was gathered through different forms of literature like books, articles, magazines and brochures. Seminars and lectures have also made contributions to the knowledge foundation. Since the area of inquiry is of great complexity we found it essential to base the theory part on various sources of information.

[44] Ösund F., Senior Risk Consultant at Marsh AB, 26/05/2003

Ulf Paulsson, our mentor, has been very helpful within the risk management area. He suggested several relevant sources of information, which saved time during the information seeking period. Within the area of insurance it was difficult to find the appropriate information much due to literature which was out of date.

Critique on sources of information

The information from interviews must always be examined critically. There are many obstacles involved when handling the information such as various degrees of subjectivity from the informants and different ways of interpreting the received facts. This master thesis has an assigner, Marsh AB. The foundation of the empirical information derives from employees at Marsh AB which contributes to a certain bias. Since all case companies are or have been clients of Marsh this implicates different obligations and loyalties which may limit their objectivity and outspokenness. When it comes to interpreting the result of our interviews the fact that there are three of us affects the outcome. Not only do we apprehend given information in various ways but we also tend to create different reconstructions of the interview material due to our previous experiences. Before initiating the collection of empirical data we discussed using a recorder as a mean of assistance, but due to the delicate nature of the company data the conclusion was that this would have a restraining influence of the information flow.

Regarding literature concerning risk management and the supply chain there is a considerable amount of sources contributing to a nuanced theory foundation. However, within the area of insurance the literature is often linked to a certain company or organization which leads to some degree of ambiguity. Therefore efforts were made to find independent sources of information even if these sometimes where somewhat out of date. The literatures used in this master thesis have been in both English and Swedish. In the cases of Swedish literature we have made the translations and thereby an interpretation of the texts.

The quality of the case study; in terms of validity, reliability and objectivity

One aspect of validity concerns the data collection phase including the usage of multiple sources of information and having key informants review the case study research[45]. To decrease the level of subjectivity the intent is to collect information regarding the different cases from multiple sources besides Marsh AB, such as employees at the case companies and the insurance company. By letting various involved parties critically review the outcome of this master thesis we hope to increase the level of validity.

[45] Ellram L., *The use of case study method in logistics research*, Journal of business logistics, Vol. 17, No. 2, 1996

Another aspect within the concept validity is the ability to generalize the results which often has been a major criticism of case studies[46]. Well aware of this scarcity our goal is to develop a describing model which may be utilized in various companies as an aid in identifying risks.

In a case study context, there are two keys to reliability; use of a case study protocol, including an interview guide, and development of a case study database[47]. In this master thesis both a study protocol and a study database will be accounted for in order to increase the level of reliability. Chapter eight consists of a thorough description of all case companies based on the information gathered during interviews. Furthermore our interview guide is shown in appendix A.

Objectivity is always affected by the frame of reference among the authors. Previous experiences influence our ability to solve problems and interpret the collected data. The fact that we are three authors in this master thesis enables us to increase the level of objectivity by having different frameworks. A certain limitation is still pointed out since we have been created after the same pattern during our education the last five years at Lunds Tekniska Högskola, LTH.

2.3.2 Interview methods

The term interview is characterized by different forms of questionings, where personal contact, telephone conversations and e-mail are all included. Through the various interviews the authors get access to primary data.[48] There are many ways of performing an interview, which can be divided into different structural forms:

- open
- directed open
- semi-structured
- structured

The open interview allows the informant to widely develop their opinions concerning an overall topic giving a general understanding. In a directed open interview the questioner focuses on specific areas and thereby controlling the information flow. The result tends to be more thorough and the informant is given few possibilities to ramble. During a semi-structured interview the subject of interest is defined in advance and the questions are

[46] Ellram L., *The use of case study method in logistics research,* Journal of business logistics, Vol. 17, No. 2, 1996
[47] Ibid
[48] Björklund M. and Paulsson U., (2003) *Seminarieboken,* Studentlitteratur

formulated as they come up. Finally in a structured form all questions are defined before the interview and are posed in a specific order. This gives the informant only one specific way to respond, which is the case in polls.[49]

The primary data in this master thesis is collected through a mixture of directed open and semi-structured interviews. Directed open questions were used during meetings regarding Marsh as a company and their functions, and also theory about insurances. This form was chosen because it allowed the informants to share with us their wide experiences within the area. Moreover our own limited knowledge in certain areas restricted the scope of questions, consequently the informants were offered to speak rather freely. The main information concerning the case companies however is assembled by using the semi-structured form of interview. The overall frame was set in advance but given our own boundaries of knowledge the case specialists were initially given an opportunity to describe the company and the course of action. Meanwhile related questions were constructed in order to fill possible blanks.

Telephone interviews and e-mails were used during the proceeding work as a complement to former meetings.

2.3.3 Implementation of the case study

To accomplish the stated purposes in this master thesis we have gathered primary and secondary data to be able to develop a describing model. The model is intended to function as a tool when identifying the internal and external effects of a disruption in the supply chain. The working procedure of this study is illustrated in figure 2.3

[49] Lantz A., (1993) *Intervjumetodik,* Studentlitteratur

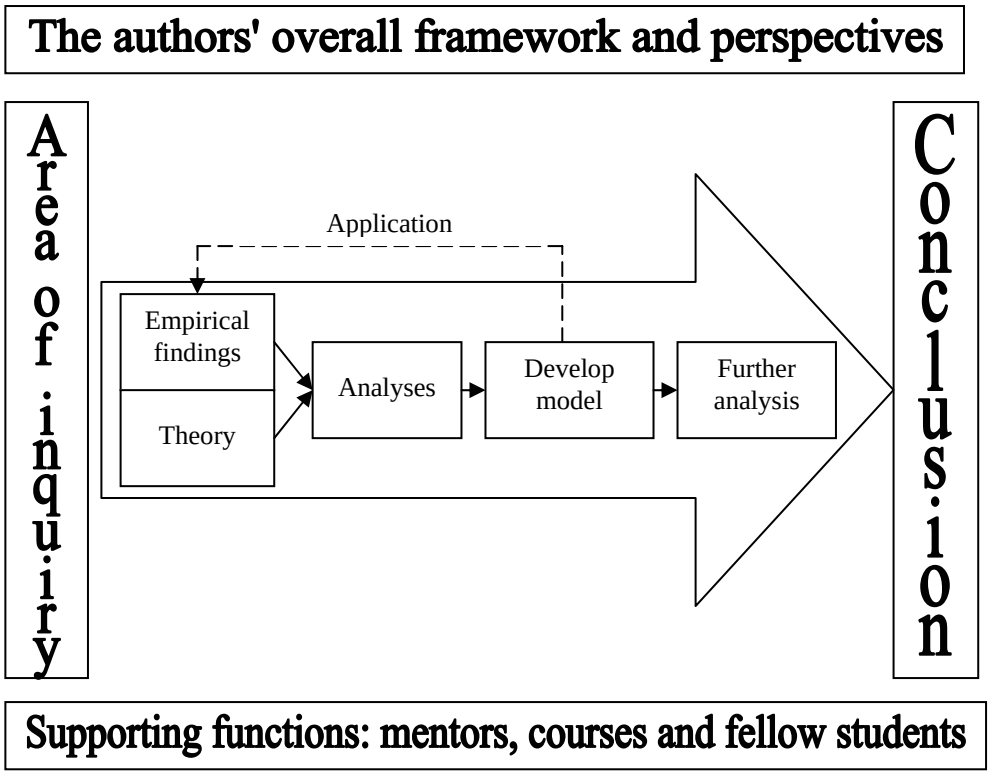

Figure 2.3 The implementation of the study

All of the work included in this study is affected by our overall framework and perspectives. As described earlier in this chapter there is always a certain amount of subjectivity involved in the design due to previous experiences. The supporting functions give guidance throughout the different steps to achieve a better result. Our mentors Ulf Paulsson and Fredrik Ösund contribute with their expert knowledge gathered from former similar situations and they help us proceed in this master thesis.

3 The MMC organization and their line of business

This chapter gives a brief introduction of the assigner of this master thesis, Marsh AB and their parent company Marsh and McLennan Companies. Further on the working methods of both risk consultants and insurance brokers in Sweden will be described.

3.1 The MMC organization

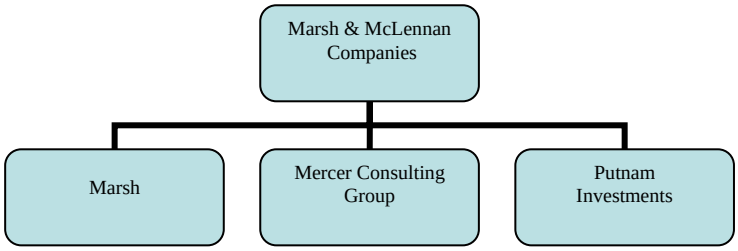

Figure 3.1 The organisational chart of MMC

MMC is a global American company with offices in more than 100 countries and about 59,000 employees. The MMC stock is listed on the New York Stock Exchange among others, and the company has an annual turnover exceeding 80 billion SEK. MMC has four main areas of business which are represented by[50]:

- **Marsh**, insurance brokers and consultants in insurance solutions and risk management. Marsh also offers reinsurance services through the Guy Carpenter company.
- **Mercer Consulting Group**, consultants regarding terms and benefits of employment and furthermore provides strategic recommendations.
- **Putnam Investment**, world leading fund and capital trustees.

In Sweden, MMC is represented by Marsh AB, Mercer Human Resource Consulting AB and Guy Carpenter AB.[51]

[50] www.marsh.com, 20/08/2003
[51] Ibid

MMC's experience of the terror attacks[52]

It is quite interesting to see how a company, like Marsh & McLennan Companies, that work with risk on a daily basis react when they are affected by a catastrophe. Do they live according to their own principles?

MMC suffered great losses in the terror attacks on the World Trade Center on the 11th of September 2001. The company had 1908 people working in or visiting the offices in the twin towers. 845 people worked on floors 93 through 100 in Tower One, the floors directly in path of the first hijacked airliner, and 934 people worked on floors 48 through 54 in Tower Two. 129 people visiting from other offices had meetings scheduled in the buildings.

At another MMC office on Manhattan the attacks where were witnessed from a window. As the second plane hit Tower Two the employees realized that the World Trade Center, and perhaps the country, was under attack. Naturally people were shocked, frightened and in need for guidance. Many questions arose concerning the status in the two towers, but it was impossible to get 100 per cent reliable information because communication lines were down and news from the outside world was confused and contradictory.

The CEO, Jeffery W. Greenberg, pulled together a group to organize the immediate response using existing disaster-recovery and business continuity plans when possible and improvising when necessary. Four major areas of concern were outlined; the MMC people, communications, operational issues and financial effects. Of course the employees were the first and foremost priority. At the end of the day they still knew little about the safety of their people. It looked like as many as 700 had perished. The following days MMC established a family assistance centre at a nearby hotel to provide information, emotional support and benefits counselling for families of missing colleagues. Also special disaster counselling services were offered to all employees.

It lasted until the 17th of September until the company knew exactly how many of their people that had perished. Everyone in Tower Two had managed to escape, but 295 of the employees in Tower One died. Still the priorities were to take care of the MMC employees and their families but also to make sure clients and shareholders were well served.

[52] Greenberg J.W., *September 11*, Harvard Business Review, 10/2002

3.2 Marsh[53]

Marsh is a subsidiary company to Marsh & McLennan Companies, MMC, and it was established in 1871. Since then Marsh has grown to be an enterprise with 38,000 employees which has clients in more than 100 countries. The annual turnover is 60 billion SEK. Marsh serves their customers within two main areas:

- Risk management, insurance broking and programme management services.
- Reinsurance broking, risk and financial modelling and associated advisory services which are provided through the Guy Carpenter company.

Marsh mission is **to create and deliver risk solutions and services that make the clients more successful**.

3.2.1 Clients and competitors

The fact that Marsh is active within the two different market areas, risk consulting and insurance broking, makes the company somewhat unique. Therefore Marsh has no overall competitor but rival firms in the separated areas.

Concerning risk consulting very few companies offer the same width of services as Marsh. It is more common to specialize in a specific area, like for example risks within IT where the main competitors are Ernst & Young and Deloitte & Touche. Another company which offers risk consulting is Willis.

Within the insurance broking market Aon Corporation and Marsh & McLennan by far forms the two largest broker companies. At third place is Willis Corroon Group, but the gap down to third place is rather significant, see below. According to Christer Witeus[54] these three organizations control the market.

[53] www.marsh.com, 20/08/2003
[54] Witeus C., Broker, Corporate Client Practice, Marsh AB, 28/08/2003

The world's 5 largest brokers 2002, in terms of brokerage revenues ($)

1. Marsh & McLennan with 10,549,000,000
2. Aon Corp with 8,822,000,000
3. Willis Corroon Group with 1,735,000,000
4. Arthur J. Gallagher with 1,120,800,000
5. Jardine Lloyd Thompson with 612,800,000

The markets of risk consulting and insurance broking are both dynamic. In many countries there are still significant parts of the markets which remain unattached to a specific broking company, giving great possibilities to increase the clientele. Since Marsh is the world leading company in many areas the main question is to keep their current position by expanding faster than the main competitors.[55]

The ways of mediating insurance solutions vary significantly in different countries, much due to traditions and the development of the insurance market. For example in UK and USA the standard procedure is to employ insurance brokers like Marsh as an intermediate between the insurance company and the client in question. Direct contact with a specific insurance company is not possible. However, in other parts of the world, like the Scandinavian countries, business is conducted slightly different. The company tradition of addressing the insurance companies directly has remained as a part of organisational culture much longer.[56] Lately though it has become more frequent to contract insurance broking companies due to an increasing need of client specific insurance solution. In spite of this fact, still today it is far from obvious that all insurance companies cooperate with an insurance broking company because of certain scepticism. This scepticism derives from the opinion that the economic dimensions are not large enough for a middle hand such as external insurance brokers.[57]

Marsh's clients consist of large organizations, mid-size businesses, small enterprises and private clients. The explosive growth of the global economy together with the expansion of US business territories means that large companies are looking for consistent, high-quality service everywhere in the world. Due to Marsh's highly developed worldwide network they have the means to satisfy the demands of large organizations.[58] Marsh's Middle Market Practice can provide assistance in helping mid-size clients improve or establish risk management controls and procedures. This can demonstrate

[55] Witeus C., Broker, Corporate Client Practice, Marsh AB, 28/08/2003
[56] Ibid
[57] Soussan D., *Försäkringsbranschen börjar vakna upp ur sin törnrosasömn,* 09/09/2003
[58] www.marsh.com, 20/08/2003

to the insurance market their commitment in managing risks, which can have an impact on the premium costs. Small businesses are the fastest growing sector of most economies around the world. This pace of growth leads to special needs for efficient risk management in order to avoid losses. If the risks are not properly addressed the costs might devastate a successful small business. Marsh is also a leader in servicing the personal insurance needs of affluent individuals and families. Those with substantial assets require a personal risk management approach for protecting the homes, automobiles, fine art and jewellery.[59]

3.2.2 The Swedish branch, Marsh AB[60]

Marsh AB was established in Sweden in 1987 and had its origin in Marsh's Scandinavian base in Köpenhamn. Marsh AB has offices in Stockholm, Göteborg and Malmö with roughly 120 employees.

The clients are categorised into three groups:

1. **Group insurances**, called affinity. This includes companies which have many offices/stores in different locations but only one standard insurance which covers them all. An example of this category is large retailer companies.
2. **Risk management**, RM. In this group large organizations with their own risk manager are found. Marsh AB mainly offers their services as insurance brokers, but also their expertise within risk management. Large international companies belong in this group.
3. **Corporate client practice**, CCP. All clients of Marsh AB who do not belong in the categories mentioned above are included in CCP. An example is traditional producing companies. This group will not be explored further in this master thesis.

Marsh AB is the leading company in their line of business in Sweden as well as in the rest of the world. A result of their position as world leader is a wide network which together with their special competences in many areas constitutes their primary competitive advantages. The main rival companies within risk consulting are Willis and FM Global Insurance Company. The main competitors within the insurance broking market in Sweden are the same as worldwide, Aon Corporation and Willis Corroon Group. Marsh AB controls roughly 10-15 percent of the supplied market. However, only 50 percent of the Swedish market utilizes the services offered by companies in Marsh AB's line of business. Hence the market is quite unexploited offering great opportunities to expand.

[59] www.marsh.com, 02/09/2003
[60] www.marsh.se, 21/08/2003

Marsh AB helps clients with the handling and the financial aspects of their risks according to specific needs and wishes, and the goal is to make the clients more successful in their line of business. This includes:

- Utilizing the global network of Marsh
- Making risk analyses
- Handling risks and financial aspects when buying or selling operations
- Professional insurance purchasing
- Administration of running insurance programmes

3.3 Working methods for risk consultants at Marsh AB

When working as a risk consultant the main task is to look at risks affecting the clients and identify the critical events. It is important to find out how the flow is affected by disruptions and imagine the consequences that might follow to be able to prevent major disasters. As an example it is important to be aware of the influences of companies both up- and downstream in the supply chain, therefore it is essential to know your suppliers and customers. When looking at a specific factory, the risk consultant spend a day at the site talking to the employees and examining the buildings and surroundings. Per-Axel Nilsson, Senior Risk Consultant at Marsh AB in Malmö[61], stresses out the importance of experience through earlier assignments when he conducts a risk survey. He knows what critical information to seek in order to elucidate the most principal fire protection such as sprinkler system and fire walls.

After the survey the findings are concluded in a report, a risk survey, with additional recommendations to prevent and restrict damages. The survey shall also include an estimation of the maximum loss, EML, which the customer can be struck by. The report forms a base for the possible adjustment which may be required to increase the security at the client. The conclusions in the risk survey are also a foundation for the insurance brokers when developing suitable insurance solutions. It is of great importance to make a thorough risk survey since the demands from insurance companies have increased, much due to the economic recession the insurance market have experienced lately[62].

Per-Axel Nilsson points out that the disruptions that follow from fires and explosions have the most serious consequences. He further means that the

[61] Nilsson P-A., Senior Risk Consultant, Marsh AB, 28/08/2003
[62] Stenshamn C., *I terrorns skugga,* Veckans affärer, 22/04/2002

awareness of risks in general has increased, partly due to the catastrophe in New York the 11th of September 2001. Still it varies from client to client.

An area included in the working methods of risk consultants is business continuity management, BCM. This means that the consultant provides the clients with prevention tools and plans concerning how to act in case of a disruption.

3.4 Working methods for insurance brokers at Marsh AB[63]

The people working as insurance brokers are divided into two main groups, the administrators and the producers. According to Christer Witeus producing broker at Marsh AB in Malmö, the producers find the customers and make the first contact. Then together with the administrator the two brokers implement a neutral evaluation where all assets, like buildings, machinery and other inventories, are specified and valued. This valuation is then combined with the survey made by a risk consultant at Marsh. Together these two documents constitute the underwriting material sent to various insurance companies on the market. The insurance companies which Marsh do their main business with are IF, Trygg Hansa, Zürich, Gerling, AIG, Chubb and XL. Based on the information given by Marsh each insurance company submit an offer each customer a specific insurance solution. When all offers have been handed in, the solutions are presented to the costumer in addition with a recommended solution from Marsh. The client then decides which offer they prefer.

It is possible for the customer to divide the whole insurances among different insurance companies. In that case it is most common to divide the property insurance and business interruption policy and the general/product liability and other casualty coverage between different companies. The whole procedure normally lasts four to five weeks. After signing an agreement with one of the insurance companies the continuous work begins. The current work, consisting of for example the running follow-up, claims handling and an annual review, is performed by the administrator together with each customer. In case of a disturbance or a change in the terms agreed upon an update of the insurances must be made.

[63] Witeus C., Broker, Corporate Client Practice, Marsh AB, 28/08/2003

4 Theories in connection with the Supply Chain

In this chapter the general theories concerning outsourcing, just-in-time and supply chain will be explored. The aim is to give an overall view of the supply chain and the factors affecting it.

4.1 The Supply Chain

4.1.1 Background

The definition of a supply chain is in many cases very wide and not always easy to narrow down. Furthermore the definition often tends to vary from one person to another. In fact the view should differ from one company to another depending on different situations because the activities that make one company successful will not work for another.[64] However, further on in this master thesis the definition of a **supply chain** will be **a stream of processes of moving goods from the customer order through the raw materials stage, supply, production, and distribution of products to the customer**. All organizations have supply chains of varying degrees, depending upon the size of the organization and the type of product manufactured. These networks obtaining supplies and components, transform the raw materials into finished products which are then distributed to the customer.[65] The supply chain is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities which produce value in the form of products and services in the hands of the final consumer[66]. A supply chain is more than a physical movement of goods. In addition it is information, financial flow and the creation and deployment of intellectual capital. This expansion is made because the traditional point of view of supply chains as only physical distribution is too limiting.[67]

Today, added value in the form of intellectual capital is vital to create profitable goods and services. Services also have supply chains. For example the production planning for a product development department, which produces designs, not products, can benefit from the same techniques

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[64] Ayers J., *A primer on supply chain management*, Information Strategy: The Executives Journal, 16/2000

[65] RCGuniversity**,** *The supply chain management in the strategy***,** www.rockfordconsulting.com, 16/9/2003

[66] Olsson G., *The theoretical foudation of supply chain management-A funtionalist theory of marketing,* International Journal of Physical Distribution & Logistics Management, 08/2002

[67] Ayers J., *A primer on supply chain management*, Information Strategy: The Executives Journal, 16/2000

used by product manufacturers.[68] Structuring the supply chain requires an understanding of the demand patterns, service level requirements, distance considerations, cost elements and other related factors. These factors are highly variable in nature and this variability needs to be considered during the supply chain analysis process. Moreover, the interplay of these complex considerations could have a significant bearing on the outcome of the supply chain analysis process.[69]

4.1.2 The Supply Chain Management

Supply chain management, SCM, can be defined as **managing the chain of events**.[70] Furthermore SCM strives to balance activities such as promotion, sales, distribution and production.[71] Effective management must take into account coordinating all the different pieces of the chain as quickly as possible without losing any of the quality or customer satisfaction, while still keeping costs down. The rapidity is the very reason for the network, giving benefits like reduced inventories, lower operating costs, product availability and customer satisfaction.[72]

The decisions associated with supply chain management cover both the long-term and short-term planning. Strategic decisions deal with corporate policies, and look at the overall design and the supply chain structure. Operational decisions are those dealing with every day activities and problems of an organization. These decisions must take into account the strategic guidelines which are already in place. Therefore, an organization must structure the supply chain through long-term analysis and at the same time focus on the daily activities. Furthermore, market demands, customer service, transport considerations, and pricing constraints must all be understood in order to structure the supply chain effectively. These are factors which change constantly and sometimes unexpectedly, and an organization must realize this fact and be prepared to structure the supply chain accordingly.[73]

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[68] Ayers J., *A primer on supply chain management,* Information Strategy: The Executives Journal, 16/2000
[69] RCGuniversity**,** *The supply chain management in the strategy***,** www.rockfordconsulting.com, 16/9/2003
[70] Ibid
[71] Olsson G., *The theoretical foudation of supply chain management-A funtionalist theory of marketing,* International Journal of Physical Distribution & Logistics Management, 08/2002
[72] RCGuniversity**,** *The supply chain management in the strategy***,** www.rockfordconsulting.com, 16/9/2003
[73] Ibid

4.1.3 Influences and disturbances in the supply chain[74]

Modern supply chains are very complex, with many physical and information flows occurring parallel in order to ensure that all products are delivered in the right quantities, to the right place in a cost efficient way. In fact, supply networks may be a more accurate term to use instead of supply chain. Further on in this master thesis the two terms are used with the same meaning. The shift towards leaner supply chains during the past years has resulted in a greater vulnerability. There often tends to be very little inventory in the system to cover disruptions in supply, and therefore these disruptions can have a serious impact on the whole supply network. Unfortunately to this day little research has been undertaken into supply chain vulnerabilities. There are a number of factors which contribute to supply chain risk and these have emerged in the last decade. These factors include:

- A focus on efficiency rather than effectiveness, with for example Just-In-Time
- The globalisation of supply chains
- The trend of outsourcing
- The lack of visibility and control procedures

All these factors may contribute to the severness of any disruption throughout the supply chain. These disruptions can arise from a number of sources:

- Natural disasters, like earthquakes and the foot and mouth disease
- Terrorist incidents, like the 11th September 2001 in the USA
- Industrial or direct action, like the fuel price protest in September 2000
- Accidents, like a fire in a component supplier, Ericsson-Nokia
- Operational difficulties, like production or supply problems at one supplier

As a consequence of the close interrelationship between different actors in the supply chain, any disruption can be far reaching. Therefore it is essential for all companies to have a clear plan of action in case a disruption occurs.

[74] *Supply chain vulnerability*, 2002, Research team, Cranfield University

The risks of supply chain disruptions can be classified in several ways. One possible classification is as follows:

1. Distinction between company-specific and industry-wide disruption
The company-specific will lead to a temporary loss of market share, and potentially longer term loss of reputation and competitiveness. The industry-wide however, which involves all companies within a line of business, means that the individual company may react in various ways:

- **Passive approach**: take no action, believing that the company's relative position in the sector is unlikely to change.

- **Opportunistic approach**: the individual company will try to gain competitive advantage by exploring alternative options or channels within the supply chain.

- **Collaborative approach**: co-operate with other companies or participate in wider industry initiatives to overcome the problem.

2. Probability of occurrence
On one hand there are the normal trading risks associated with, for example, variable customer demand, unreliable delivery and machine break-down. Often companies buffer against these events by using inventory. On the other hand there are the major crises, which are almost impossible to predict, but can potentially have a much larger impact on the specific company. Such events lie outside the normal range of inventory management, but it may however be useful to plot various chains of events on the spectrum and estimate very approximately the probability of occurrence.

4.1.4 Dependencies and vulnerabilities in the supply chain

The dependence between different business activities throughout the supply chain leads to a necessity of coordination among these companies in order to achieve internal goals. Companies in all kinds of industries suffer from high degrees of dependencies towards both the suppliers and the customers. Many industries are exposed to an extremely keen competitive environment in the marketplace. In order to stay competitive, maintain cost effectiveness, and achieve reasonable profitability, companies have implemented lean, responsive and effective supply chains. To survive, many companies make efforts to decrease the inventories, reduce the number of suppliers and at the same time increase the outsourcing of internal activities to external contractors. All this leads to an increase in the dependencies between companies' business activities. There are three kinds of dependencies; time-

dependencies, relationship-dependencies, and functional-dependencies which all cause vulnerability in the supply chain.[75]

Time-dependence[76]
Time-dependencies include all effects deriving from time related issues. The relevance of this term is motivated by the fact that time has become increasingly important in recent supply chain networks in order to achieve leanness, responsiveness and efficiency. These dependencies refer to the fact that there is a chronicle or sequential dependence between companies' business activities in the supply chain. In addition the more and more frequent use of Just-In-Time throughout a supply chain has led to a greater dependence toward time. These types of dependencies are frequently explored in logistics research.

Relationship-dependence[77]
Relationship-dependencies refer to business activities being dependent on the interaction process between companies in the supply chain. These dependencies include technical adaptations, co-ordination, knowledge concerning the different participants throughout the supply chain and economical ties. It is important to recognise these issues within close relationships and business networks. Other areas of high importance which have got increased attention are the planning, implementation, and control of lean supply chains.

One kind of relationship-dependencies is the vertical-dependence within the SCM caused by the integration of functional activities across the organizational boundaries, and the fact that it goes beyond market transactions to instead create close relationships among participants in a value-creating network.

Functional-dependence
Functional-dependence refers to the case where companies' business activities are specialized and complement each other in chains or networks. One example is the operational diffusion between companies in a network.[78]

All three types of dependencies lead to the necessity of cooperation and coordination between companies' business activities in order to achieve internal, and in some case mutual goals.[79]

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[75] Olsson G., *Vulnerability scenarios in marketing channels*, Supply Chain Management: An International Journal, Vol. 7, No. 5, 2002
[76] Ibid
[77] Olsson G., *The theoretical fondation of supply chain management*, International Journal of Physical Distribution & Logistics Management, Vol.32, No. 9, 2002
[78] Ibid

Vulnerability is a condition caused by time- and relationship-dependencies in a company's business activities. The degree of vulnerability may be interpreted as proportional to the degree of time- and relationship-dependencies, and the negative consequence of these dependencies, in a company's business activities towards suppliers and customers.[80] The more significant presence of vulnerability in today's supply chains derives from the fact that the increased complexity means higher levels of risk and hence vulnerability.[81]

4.2 Outsourcing

Although outsourcing dates back to the 18th century England and has been in continuous use in a variety of forms, it received particular attention in the 1970's when organizations often were regarded as under-performing and especially during the early 1980's when the globalization aroused. By the 1990's the emerging view was that rapid progress for a company could be achieved by focusing on the core competences. The search for finding new ways of organizing work had begun. The new structural design movement led to a radical change of the business processes in order to achieve dramatic improvements in performance in terms of cost, quality, service and speed. [82]

Outsourcing which is defined as **the process of shifting tasks and services previously performed in-house to outside vendors**, is hardly a new idea among companies. The volume, extent and character of outsourcing however, have been changing rapidly. Outsourcing can offer great opportunities to all parties when used wisely but it can also do significant damage. The most basic form of outsourcing is the make or buy type of decision. In general it is a specific part of a company that is outsourced, but it may also be a service. The trigger is often a cost comparison or a change of some sort, like managerial issues. The supplier's decision driver may initially be the opportunity to increase sales, although this may lead to other considerations such as capacity increases. This basic viewpoint may be regarded in terms of normal buying and selling. However, the outsourcing

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[79] Olsson G., *The theoretical fondation of supply chain management*, International Journal of Physical Distribution & Logistics Management, Vol.32, No. 9, 2002
[80] Olsson G., *Vulnerability scenarios in marketing channels*, Supply Chain Management: An International Journal, Vol. 7, No. 5, 2002
[81] *Supply chain vulnerability*, 2002, Research team, Cranfield University
[82] Kakabadse A., Kakabadse N., *Outsourcing Best Practice: transformational and Transactional Considerations*, Knowledge and Process Management Vol. 10, No. 1, 2003

effect can be obtained by a change in a company's management philosophy.[83]

The reason behind a company's decision whether to outsource or not is likely more complex than the traditional make or buy decision. Perhaps the strongest motive is enabling management to focus on higher priorities. This means that the supplier arrangement still must be administered, but if it all works well there ought to be only a few other problems, like personnel related questions. In addition the decision to outsource may lead to reducing costs in areas like human resource management, HRM, due to the fact that the company no longer has to solve problems regarding for example labour within the outsourced area. Outsourcing also leads to a close relationship between the buyer and the supplier where all activities are essential for the success of the buying organization. This increases the vulnerability because if there is a failure the consequences may be severe. Given all this, the decision drivers reflect a belief that this will be outweighed by the benefits gained. Both the buyer and the supplier face higher risks when outsourcing start to involve more critical activities, and for both parties there are many more strategic and organizational issues to consider if outsourcing is to succeed for both parties.[84]

Until today the most frequent quoted activities for outsourcing have been those associated with facilities management. Hence there are different opinions about what to outsource. According to the majority, each company should focus on the core competences and outsource the rest in order to remain competitive. The only difficulty is then to decide what to focus on and what to outsource, which in many cases is hard to do.[85]

Today, most companies regard outsourcing as an absolute necessity not just to handle overcapacity or to reduce costs, but to add value to the supply chain and the business as a whole. Outsourcing relationships are providing access to resources, including specialized personnel manufacturing facilities or processes. These relationships help companies to manage functions that otherwise would be difficult or out of control. Even sharing risks involved in bringing new products to market and at the same time free resources for research, development, design and expansion activities. Clearly the greatest challenge is to choose the right partner. One parameter to consider is the partner's ability to obtain a certain quantity of product and at the same time

[83] Hussey D., Jenster P., *Outsourcing: the supplier viewpoint*, Strategic Change 12: 7-20, 2003
[84] Ibid
[85] Kakabadse A., Kakabadse N., *Outsourcing Best Practice: transformational and Transactional Considerations*, Knowledge and Process Management Vol. 10, No. 1, 2003

producing it at a certain level of quality. It is also of importance that all parties are involved in the strategic vision and the long-term planning.[86]

The trend of today causes problems as well when the outsourced functions and companies are sometimes taken for granted. This implicates that the most common cause of business interruption has been linked to contract plumbers. The reason might be that few organizations feel it necessary to brief contractors working on site to follow important safety procedures which appear to be normally reserved for employees to safeguard the promises and themselves.[87]

4.3 Just-In-Time

The ways of handling the various material flows and controlling the production process has been an area of great change throughout past years and today it is regarded as one of the most important parts to focus on within a company. The point of view however, has changed radically over the decades. During the 1960's many companies made efforts to optimize the costs and storages were used primarily to compensate for fluctuations in customer demands and to decrease the impact of disruptions. A decade later the overall view changed due to the introduction of computers as a working tool. This facilitated more frequent and detailed production planning.[88]

In the 1980's completely new methods for planning, storaging and working emerged. This was the philosophy of Just-In-Time, JIT, and it originated from the Toyota manufacturing sites in Japan.[89] JIT means a continuous search for waste reduction and to make only what is needed "just in time". The philosophy signifies a demand-pulled inventory, described in figure 4.2, which produce specific products at a rapid, smooth delivery rate, with no idle inventories, no unnecessary lead-times, and an increased employee involvement towards the customers. The opposite of the pull system is the push system, which is signified by a production based on prognoses instead of customer demand. The push system may lead to queues in front of machines with long production time.[90] However, it is not necessary for the JIT concept does not necessarily mean an increase of the production rhythm, but it means that the production contains fewer disruptions, fewer disturbances and an improved quality. All this may lead to reduced costs and flexible companies which might create competitive advantages in the

[86] Szeto W., *Why technology manufacturers need outsourcing more than ever*, Electronic News, 01/02/12
[87] Kubitscheck V., *Business discontinuity- A risk too far,* Balance Sheet 9,3 2001
[88] Persson G., Virum H., 1996, *Logistik för konkurrenskraft,* Liber Ekonomi
[89] Ibid
[90] Ibid

marketplace. However, one negative set back is that working methods following JIT reinforce the time- and relationship-dependencies between the companies' activities which lead to vulnerability.[91]

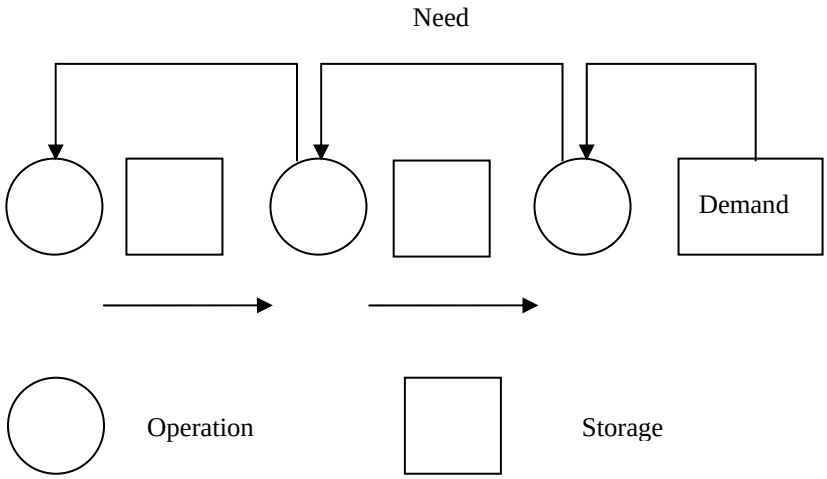

Figure 4.2 The pull system

The JIT philosophy affects all procedures within a production system, resulting in a production of the for the moment only necessary items. The ordered production is not allowed to differ more than +/- 20 per cent from the prognosis and the production programme is monthly based and updated each day. In addition the level of the production stock should never be larger than it is possible to have all production in one place.[92]

There are two main objectives when using JIT and those are; to reduce the production costs and to have a high level of quality for all products. In order to reduce costs a continuous production improvement is a part of the daily work. The whole system is focused on only performing the necessary and minimizes the waste. Moreover the high level of quality is maintained through preventive quality work and a decentralization of the responsibility.[93]

One important part of JIT is to decrease the adjustment times and to produce only short series. By reducing the number of items in each series possible decrease in quality is easier to detect. The ideal is zero defects, no adjustment times and only one object in each series. To be able to fulfil these demands it is vital to involve people into the system because in the

[91] Olsson G., *Vulnerability scenarios in marketing channels*, Supply Chain Management: An International Journal, Vol. 7, No. 5, 2002
[92] Björnland D., Persson G., Virum H., 2003, *Logistik för konkurrenskraft ett ledaransvar*, Liber
[93] Persson G., Virum H., 1996, *Logistik för konkurrenskraft*, Liber Ekonomi

end qualities as well as suggestions to improvement are produced by the human being.[94]

[94] Björnland D., Persson G., Virum H., 2003, *Logistik för konkurrenskraft ett ledaransvar*, Liber

5 Risk Management theory

The main area in this chapter is risk management. First we aim to highlight different kinds of risk and then explore methods for handling and analysing these risks. Further on various risk management strategies and the concept of business continuity management will be explored.

5.1 Background

Risk management is a concept which derives from the USA and became a topical subject in the 1950's. At that time high insurance costs, originating from commercial insurances with low deductible, was a burning issue and the American big industry companies searched for new solutions. Professor Wayne Snider at Pennsylvania University among others meant that the insurance agents should become risk managers instead. An insurance agent at Philco Corporation developed this concept in an article called "Risk Management: New Phase of Cost Control" in "Harvard Business Review", and a new era of insurances with high deductible was initiated. This however required extensive investments in preventive measures, which also became a part of the risk manager's assignment. In addition to this, risk managers soon were given the responsibility to establish and run the captives of their organization. [95]

The concept of risk management came to Sweden in the 1970's, much as a reaction to the high premiums which derived from the fact that the insurance market was characterized by oligopoly. The first risk manager in Sweden was established in 1975 and was soon followed by others with the purpose to handle questions of risk and insurance within their company. The tasks included in the work with risks have changed drastically over the years since new areas of risk have arisen, for example issues about environment and IT. The objective of risk management is to minimize the total cost of risk, which includes reducing future loss and damage.[96] The work involves identifying threats and implementing measures aimed at reducing the likelihood of those threats to occur and minimizing future damage if they do[97]. This includes implementing cost effective processes that reduce risks to an acceptable level and reject unacceptable risks[98]. **Risk** is defined as **the chance of something happening that will have an impact upon objectives and which is measured in terms of consequences an**

[95] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[96] Ibid
[97] Nosworthy J., *A Practical Risk Analysis Approach: Managing BCM Risk*, Computers Security (vol. 19, 2000)
[98] www.thebci.org/frametrial.html, 24/10/2003

likelihood.[99] Mathematically a risk can be expressed as a product of the probability for the damage to occur and the consequences of the possible damage[100].

5.2 The Circle of Risks

Traditionally the main focus within risk management has been insurable risks, but in a wider perspective commercial risks have been separated from non commercial risks. Commercial risks include decisions which can lead to profit but have a hazard of negative outturn, as oppose to the non commercial risks which can only lead to losses. Another classification of risks is dynamic risks and static risks, where dynamic risks more or less correspond to commercial risks and static risks equals to non commercial risks. Gustav Hamilton has introduced "The circle of risks" as a comprehensive view of all risks which can threaten an organization, and it illustrates the relations between risks, actions and responsibilities.[101]

The circle of risks is divided in two natural halves, see figure 5.1. The right half includes operational, static, risks within production where the risk with most impact is stoppage in the production flow. Most of the work the risk manager is conducting is represented on this right half. The left half includes dynamic risks found outside the production such as inflation, new laws and terrorism, and this half is included in the circle of risks to offer a comprehensive view of the risk situation of the organization. [102]

[99] www.upstreamsolutions.com 24/10/2003
[100] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[101] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[102] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur

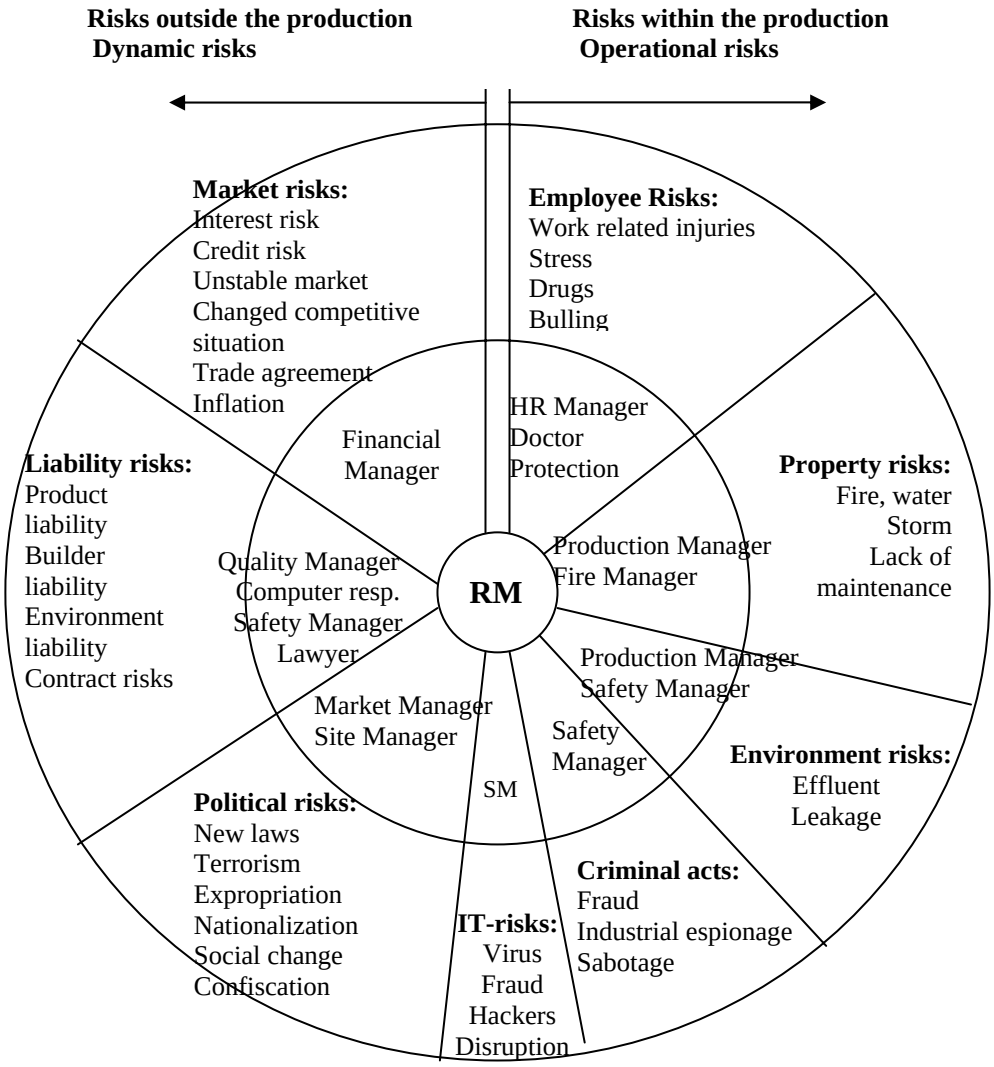

Figure 5.1 The circle of risks[103]

1. Risks within the production[104]

Employee risks include such as working injuries, problems related to stress and drugs and bullying among colleagues. A company with inferior working environment produces discomfort and working injuries which results in an increased absence and unwanted employee turnover. This creates disturbance in production which can result in poor quality. Long-term this is a major threat to the organization.

[103] Hamilton G., (1996) *Risk Management 2000*, Studentlitteratur
[104] Ibid

Property risks represent damage which can be caused by fire, water, storms and inadequate maintenance. For a long time the most dreaded risk has been fire. Lately though, new technological advances have released new forces which can not be controlled, with the clear example of Chernobyl, hence fire is no longer feared as before. Still however, the damage from fires every year is a big problem.

Environmental risks include pollutions and leakages. The environmental problems are getting more and more difficult to survey since the sources of origin are diffuse and hard to localise. Still the Swedish industry has been able to diminish the local pollutions substantially the last decades. It is obvious that politicians and governments are getting more support in carrying through environmental protection issues.

Criminal acts represent sabotage, industrial espionage, theft and fraud. During the last decade there has been a significant shift from outside criminal acts to inside operations. Today the employees in a company are responsible for most of the economic crimes in the organizations. Some ways to prevent this are clear routines and running internal records.

2. Risks outside the production[105]

Market risks covers inflation, trade agreements, changed terms of competition, risks with currency and so forth. Financial transactions have become a considerable risk lately. Speculation with currency has lead to most big companies having some form of finance policy to limit the associated risks.

Liability risks among others include responsibility of environment and product and also risks with contracts. Product liability means that a company has a liability to pay damage when their product has caused injury to another property or person. The risks of damage claims are by far most substantial in the USA since the amounts demanded for compensation are generally very high. To avoid risks associated with product liability it is important to have a quality securing system in the company which results in products and services fulfilling the quality expected by the customer.

Political risks represent new laws, terrorism, nationalization and social revolution etc. Countries with political instability are more than others affected by alterations that can change the conditions of the economic life over night. Hence it means great political risks to own companies situated in

[105] Hamilton G., (1996) *Risk Management 2000*, Studentlitteratur

such countries. The most obvious political risk is considered to be confiscation or nationalization of property.

The risk manager often lacks the economic background required to limit the risks associated with the market. It is important to put static and dynamic risks in relation to each other to get a meaningful judgement of the company's risk environment and to be able to act rational. Risks concerning IT are covered in both halves since they can occur both within and outside the production. It is essential for every company to chart their own circle of risks to fully grasp the risk environment which is specific for each organization. There are some risks which are not represented in the circle of risks like for example the human factor and loss of built up confidence. [106]

5.3 Handling risks

The process of risk management is built on systematic and common sense. Identify the risks, protect the company against these as far as possible and make sure that there is money available to cover the losses if the company is struck by an accident.[107] Handling risks is a continuous work which can be divided into five steps:

1. Risk analysis
2. Preventive actions
3. Actions to limit the consequences
4. Damage finance
5. Follow-up and control[108]

1. Risk analysis

The risk analysis charts the risk environment of an organisation and gives a perspicuous image of the existing vulnerabilities. To collect background knowledge it is often rewarding to examine previous damages and losses and their economic impact on the company.[109] The analysis means that the sources of risks are identified and valued. When valuing a risk the normal procedure is to estimate the probability of an unwanted event and consider the consequences which follow.[110] This is illustrated below in the business risk profile in figure 5.2, which maps risks in terms of severity and likelihood. Risk mapping is by far the most useful and developed tool for risk identification and prioritization. [111]

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[106] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[107] Ibid
[108] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[109] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[110] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[111] DeLoach J., (2000), *Enterprise-wide Risk Management: Strategies for linking risk and opportunity***,** Pearson Education Limited

Future expected losses are calculated in monetary, quantitative or qualitative terms, and then evaluated as acceptable or non-acceptable. The risk analysis is supposed to stipulate a foundation when planning cost effective preventive actions.[112] There are numerous methods to analyse risks, and some of them will be mentioned later in this chapter.

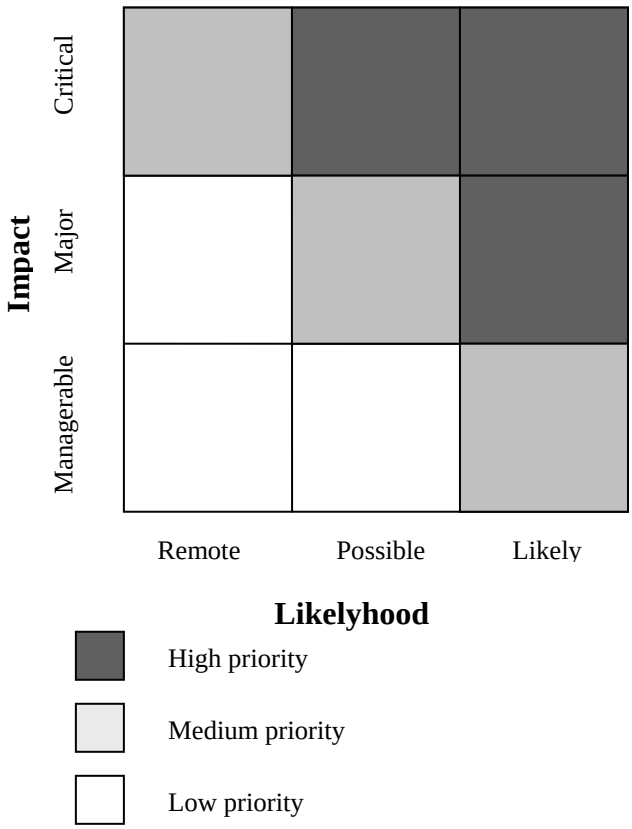

Figure 5.2 Business risk profile[113]

2. Preventive actions

Unfortunately only few risks can be eliminated, but most of them however can be reduced. This is accomplished by gathering information about the risks and how to protect the organization against them.[114] It is often very effective to make a list of measures which easily and with low costs can be taken to eliminate risks. Examples of such means are: keeping a nice and tidy working environment, informing and educating employees regarding

[112] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[113] DeLoach J., (2000), *Enterprise-wide Risk Management: Strategies for linking risk and opportunity***,** Pearson Education Limited
[114] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur

risks, developing fire protection and clarifying liabilities in agreements.[115] Since the preventive actions are never a hundred per cent safe, companies must supplement with plans to limit the damage in case of an accident.[116]

3. Actions to limit the consequences

Business without risks does not exist, and events with negative results are bound to occur sooner or later. Hence it is essential for organizations to be prepared with clear lines of action in order to overcome unexpected situations and limit the consequences. Both society and other interested parties expect companies to be well prepared especially in case of accidents where human lives are threatened. Every company should have a designed plan with a line of action with the purpose to limit the damage if they were struck by a disaster. The protections used to restrict the damage are divided into different areas:

- **Administrative actions**, which includes having routines to follow in case of an accident and also the mental preparedness of the employees.
- **Production concentrated and technical actions**, which covers the ability to use alternative processes, back-up systems and technical installations such as sprinklers and fire alarm.
- **Legal actions**, that restricts damage claims and transfers responsibility through contracts.[117]

4. Damage finance

After identifying a risk there is an option to transfer it to someone else. The most common way to transfer a risk is to use insurance, which transforms an uncontrollable risk exposure into a cost which can be accounted for in a budget.[118] Even though a company may be fully insured many hidden costs will not be covered. Hidden costs include costs attached to damage and losses which can not be insured or has been overlooked, such as loss of market shares and goodwill. Many people vindicate that the hidden costs are at least as big as the visible costs.[119] To look deeper into theory concerning insurances, read chapter six.

5. Follow-up and control

Handling risks is not a one time effort but a continuous process. It is the taken measures and the proceeding work which are the main objectives.

[115] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[116] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[117] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[118] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[119] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur

These often require a changed approach from companies which cost both money and effort.[120] It is of great importance to revise and update the risk systems on a regular basis to reflect changes in personnel, technology and essential business operations.[121]

5.4 Methods of risk analysis[122]

There exist numerous different methods for risk analysis. Most of them have their origin in a few basic methods:

Check lists
Check lists asks questions concerning risks, vulnerabilities and damage exposure and forms a control tool which evaluates an established security level. All questions in the inquiry are included in the analysis and the results from analogous analyses are comparable. This method however gives no expected damage costs. Another disadvantage is that question forms may overlook important issues.

Delphi-technique
An experienced and competent group from an organization is gathered to brainstorm about the risks within their company. The group then select the risk conditions which are to be examined. The product of the Delphi-technique is human evaluations of important exposures, which gives possibilities of the result being influenced by prejudice. Nevertheless the method often gives credible results concerning probability.

Expected damage cost analysis
This method gives a quantitative estimation of the frequency of different threats. Vulnerability factors and a calculated damage potential are also included. The analysis results in a direct choice of security measures and optimizes the costs of these.

From the above mentioned basic methods both general and more specific methods have developed. First three general methods are described, and further on three more specific methods follows.

The one-day analysis
The analysis is limited to one day since both the managing director and her co-workers (the heads of production, staff, economy and the risk manager) must be able to participate. In addition representatives from the insurance

[120] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[121] Harrington L., *If disaster strikes, are you prepared?*, Transportation & Distribution journal, (vol. 37, 1996)
[122] Hamilton G., (1996) *Risk Management 2000*, Studentlitteratur

company and municipal rescue service are included. Together the group analyse the risk environment and the risks are ranked after economical importance. The current protection against the prioritized risks and their insurances are then examined. All this gives the risk manager a good foundation for the continuing work.

The Jonsson analysis

Risks are not estimated in terms of money but in relative terms. The analysis gives a good general view of the distribution, probability and consequences of the risks. The probability and consequence are analysed and then graded after a specific scale, illustrated in figure 5.3. A level of risk is then calculated as the sum of probability and consequence. For example if there is a medium probability and little consequences (2+1=3) the risk level will be unacceptable. The three different levels of risk are shown in figure 5.3.

	Probability	Consequences
1	Low Seldom occurring	Little Low cost, damage or loss
2	Medium Neither often nor seldom occurring	Medium More cost, more damage or loss
3	High Often occurring	Big Cost which can not be carried

	Level of risk
1-2	Acceptable Can be allowed and should be dealt with
3-4	Unacceptable Not allowed and shall be dealt with
5-6	Catastrophic Inexcusable, must be dealt with immediately

Figure 5.3 Grading table in the Jonsson analysis[123]

The What-if method

This method analyses the consequences, which a deviation from the normal situation would give rise to. Investigating questions are asked to employees with experience from various risk areas. The method is regarded as simple, but requires imagination. Since it is easy to overlook essential problems the What-if technique should be applied in form of sub analyses of the total risk environment.

[123] Hamilton G., (1996) *Risk Management 2000*, Studentlitteratur

5.5 Risk Management Strategies

When confronting a risk a company have different choices concerning how to proceed when handling it. First there is a question of whether to accept or reject the risk depending on if it is desirable or undesirable. If the risk is too big to be handled or not in line with the company's strategy, it should be avoided. If the company accepts a risk, several options are available. The risk can be retained at its present level or it can be reduced in terms of severity and/or likelihood of occurrence. The risk can also be exploited by increasing the company's exposure to it, and finally, the risk can be transferred. Figure 5.4 shows different ways of handling a risk after having chosen whether to avoid or accept it.

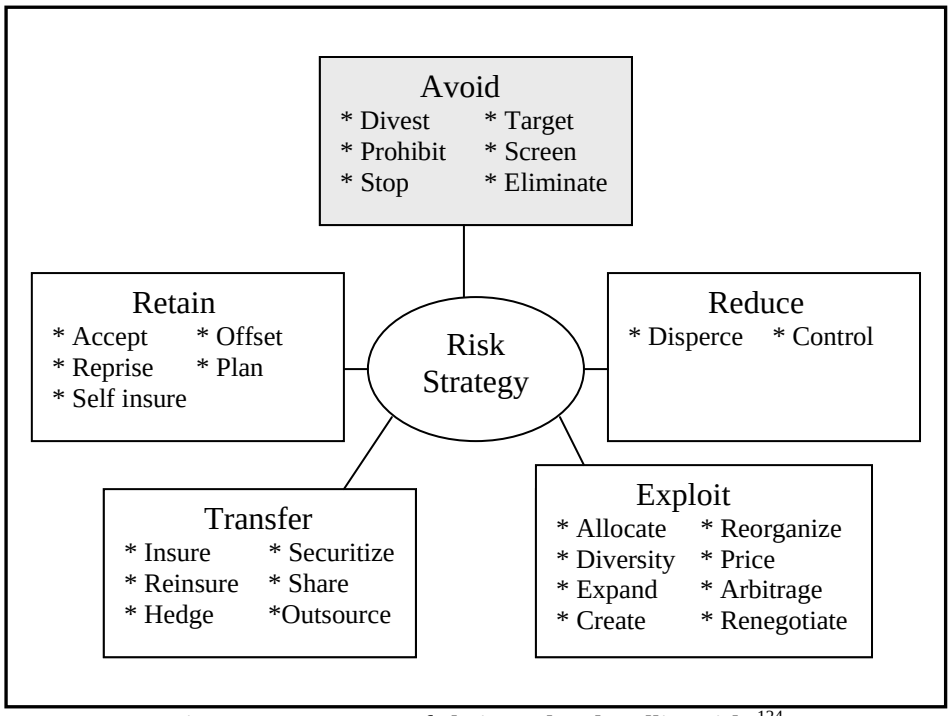

Figure 5.4 Summary of choices when handling risks[124]

Formulating risk strategies is an iterative, fluent process driven by the available facts, measures and analyses. It does not have to mean selecting one option over another because the best choices are often combinations of different options.[125]

[124] DeLoach J., (2000), *Enterprise-wide Risk Management: Strategies for linking risk and opportunity*, Pearson Education Limited
[125] Ibid

Different risk management strategies have evolved through time for different categories of risks. Three accident categories together with the related risk management are described below:

1. **Occupational safety** is focused on frequent but small scale accidents. The risk is related to a large number of work processes and the level of safety is controlled empirically from studies of past accidents.
2. **Evolutionary safety** includes medium sized, infrequent accidents. The safety deals with controlling particular accident-creating processes. Protection against these risks has been established by an evolutionary increased effort towards improved safety. In this case, risk management is focused on removing causes of particular accidents.
3. **Analytical safety** is focused on rare, large scale accidents. The frequency of these kinds of accidents is so low that a protection design can not be based on empirical material. The fast pace of technological innovation which contributes to new industrial installations is often the cause of these accidents and the risks can only be predicted from models of the processes.[126]

5.6 Business Continuity Management

The business continuity management, BCM, is defined as **a holistic management process that identifies potential impacts that threaten an organization, and provides a framework for building resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value creating activities**[127]. In other words a BCM strategy describes how the continuity of business processes is to be maintained in the event of a disaster or other serious disruptions in an organization. The strategy should cover both risk reduction and recovery options. Results from risk analyses are used to determine risk reduction options in order to diminish vulnerabilities. The business recovery strategies determine how the business is to proceed on a day to day basis. These strategies ought to provide the acceptable minimum requirements to enable the critical business processes to continue to operate in order to keep trading according to "business as usual". To obtain an effective BCM strategy there should be a cost-effective balance between risk reduction and business recovery options to minimize the risks.[128]

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[126] Rasmussen J., Svedung I., (2000) *Proactive Risk Management in a Dynamic Society*

[127] www.thebci.org/frametrial.html, 24/10/2003

[128] Nosworthy J., *A Practical Risk Analysis Approach: Managing BCM Risk*, Computers Security (vol. 19, 2000)

Without an effective BCM system, a company unnecessarily puts at risk loss of significant market shares. Every company needs an individually designed BCM plan to protect the enterprise value. An example of a BCM plan is the Roadmap to Recovery™, illustrated in figure 5.5 below.[129]

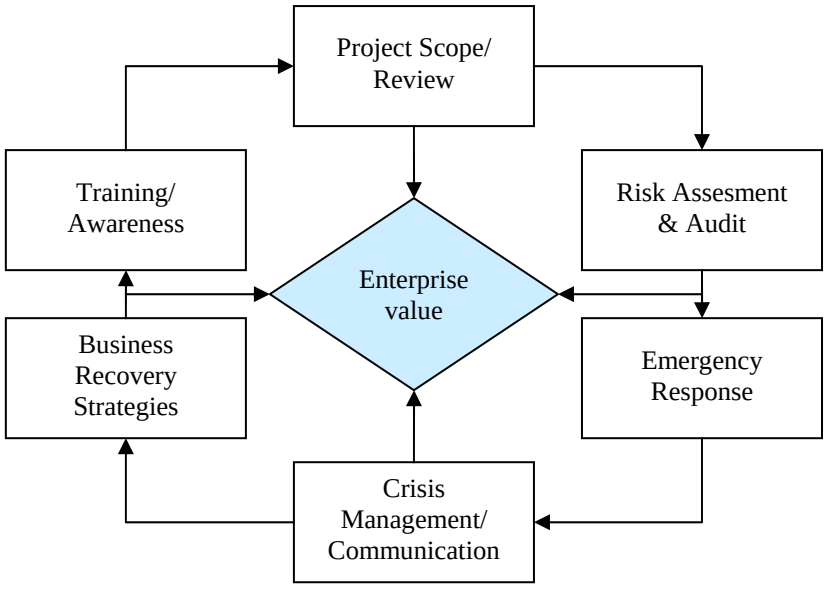


Figure 5.5 Roadmap to recovery™ [130]

This business continuity plan is based on six sub areas[131]:

- **Project scope review** formulates the scope of work, objectives and project management conditions.
- **Risk assessment and audit** identifies the internal and external critical key processes, dependencies and risks.
- **Emergency response** includes notification procedures and overall authority and layout of an emergency response structure. The delegation of tasks within a response timeframe is specified and legislation requirements examined.
- **Crisis management and communication** specifies overall authority and layout of a crisis management structure and as above notification procedures. Communication actions in relation to stakeholders and legislation concerning management of administration are also included.

[129] de Waij D., BCM Practice Leader, Continental Europe, Marsh, 18/09/2003
[130] Ibid
[131] Ibid

- **Business recovery plan** puts the recovery strategy in relation to identified value chain dependencies. The recovery of critical processes, focused on cash-flow protection, is prioritized.
- **Training and awareness** includes maintenance of the existing plans and training of crisis management teams.

Insurance is a key component of an overall BCM solution, but it does not win back lost market share. While it may provide for the financial aspects of a loss or incident, it does not provide the method to recover and rebuild the organization or win back customer confidence.[132]

5.7 Supply Chain Risk Management

Supply chain risk management aims at identifying the potential areas of risk and implementing appropriate actions to contain that risk. Hence it can be defined as **the identification and management of risks within the supply chain and risks external to it through a co-ordinated approach amongst supply chain members in order to reduce supply chain vulnerability as a whole**.[133] In addition the supply chain risk management may be regarded as a collaborative and structured approach to risk management, included in the planning and control processes of the supply chain, to handle risks which might affect the achievement of the supply chain goals[134]. The main area of the supply chain risk management may be regarded as the intersection between the supply chain management and risk management, view figure 5.6 below.[135]

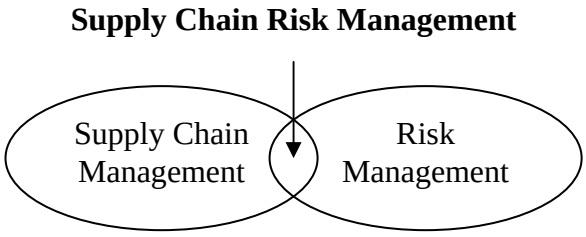


Figure 5.6 The area of supply chain risk management[136]

[132] www.thebci.org/frametrial.html, 24/10/2003
[133] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[134] Seuring S., Müller M., Goldbach M., Schneidewind U., 2003, *Strategy and Organization in Supply Chains*
[135] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[136] Paulsson U., *Managing risks in the supply chain, an article review*, 2003

The main objectives of supply chain risk management are[137]:

- to maintain the supply and continuous availability of a product
- to increase the supply chain's ability to cope with disruptions in the supply chain of products if necessary
- to avoid possible domino effects throughout the chain
- to make the supply chain more resilient to disruptions

Implementing a supply chain wide risk management is not a simple task, and therefore priorities must be made in order to establish right focus. Often it is difficult already to assess risks at a supplier's supplier and it becomes less practical and more extensive to analyse the exposure further on in the chain both up- and downstream. Therefore it may be difficult to know when the efforts exceed the benefits. A first step in supply chain risk management may be to identify and assess likely risks and their possible impact on a company's operations. When assessing risk exposure, the company must highlight not only direct risks affecting the operation, such as the loss of raw material or process capacity, but also the potential causes of those risks throughout the supply chain. Since clarifying the risk exposure of several organizations in the supply chain will probably stretch beyond the capabilities of one organization, a coordinated approach is needed. All parties involved must commit to monitor their own situation and make information available within the supply chain.[138]

To ensure that supply chain risk management is practiced in a structured way throughout the supply chain, it is necessary to define and communicate a risk strategy which sets the general rules and procedures for the risk handling. This strategy enables a common understanding of risk and risk management for the involved parties. Such a common understanding is particularly important in global supply chains whose members may be subject to different national risk management regulations and might hold different views concerning the relevance of communicating risks to supply chain partners.[139]

Shown in diagram 5.1 below is the relationship between the cost of risk management and the efficiency of an organization. The main goal is to find an optimal level of risk for each company. This is also a great challenge for the organization because in order to find the most profitable level it requires a great knowledge concerning the status of the own organization. The

[137] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[138] Ibid
[139] Seuring S., Müller M., Goldbach M., Schneidewind U., 2003, *Strategy and Organization in Supply Chains*

findings then constitute the base for different risk management strategies. In case a company is not situated within an accepted area, preventive work with risk management may help.[140]

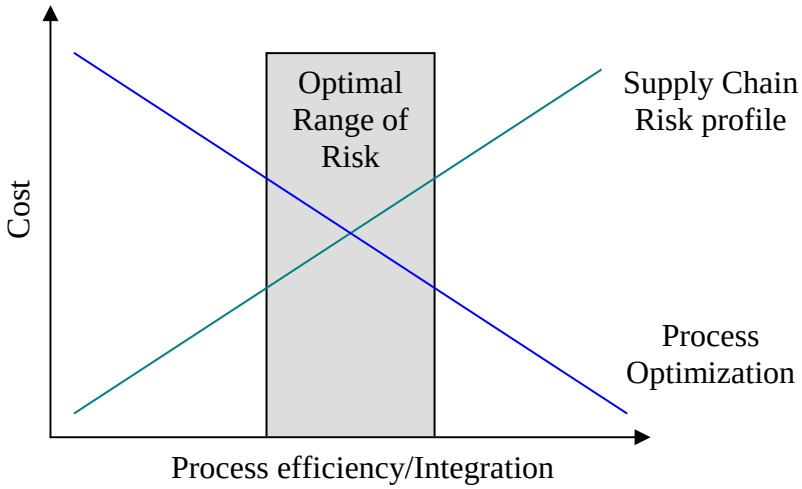


Diagram 5.1 Recommended risk management strategy when putting the risk profile in relation to the supply chain[141]

Another purpose of the strategy is to provide a guideline for the risk management process by defining a number of basic principles. These principles are[142]:

- Supply chain risk management requires close cooperation among all partners
- Risk identification is a continuous procedure in all firms
- An open communication of the identified risks is vital for supply chain performance
- If possible, risk should be insured in a cost-efficient way
- The remaining risks must be actively monitored

There are parts which should be included in a risk strategy. One important section is the identification of risk limits, which specify the maximum damage that is allowed to occur both at the individual company and within the entire supply chain. Is it essential to consider that the ability to bear losses often differs among the supply chain partners which may complicate the definition of an overall risk limit for the supply chain. Besides

[140] de Waij D., BCM Practice Leader, Continental Europe, Marsh, 18/09/2003
[141] Ibid
[142] Seuring S., Müller M., Goldbach M., Schneidewind U., 2003, *Strategy and Organization in Supply Chains*

specifying the maximum damage, risk thresholds also ensure that only significant risks are reported and considered for further handling. All this constitutes a part of effective risk reporting. Additionally the risk strategy includes the nomination of risk owners at the specific companies who are in charge of monitoring and handling the risks.[143]

A further step in the management of the risks in the supply chain is to define the supply chain's risk portfolio. Risks are not only inevitable, but risk taking can even be a competitive requirement of supply chains. However, the definition of the risk portfolio has to be integrated as a part of the supply chain in order to increase the overall risk awareness among the supply chain actors.[144]

[143] Seuring S., Müller M., Goldbach M., Schneidewind U., 2003, *Strategy and Organization in Supply Chains*
[144] *Säkra företagens flöden*, (1999) Överstyrelsen för civil beredskap, Tryckindustri AB

6 Insurance theory

This chapter will explain the context of business insurances and its constituting parts. In addition the insurance market of today is described and also the work as an insurance broker.

6.1 Background

A business market is a place where buyers and sellers can perform their business transactions. The most common scenario is that the market involves just two parties; buyers and sellers. However the insurance market is unusual since it has three major participants; the sellers, like insurance companies and brokers, the buyers, for example business firms and individuals, and the regulators, like in Sweden the Financial Supervisory Authority. The insurance market is strongly affected by the existing regulations and both buyers and sellers are influenced by these.[145] Figure 6.1 describes the insurance market and its participants.

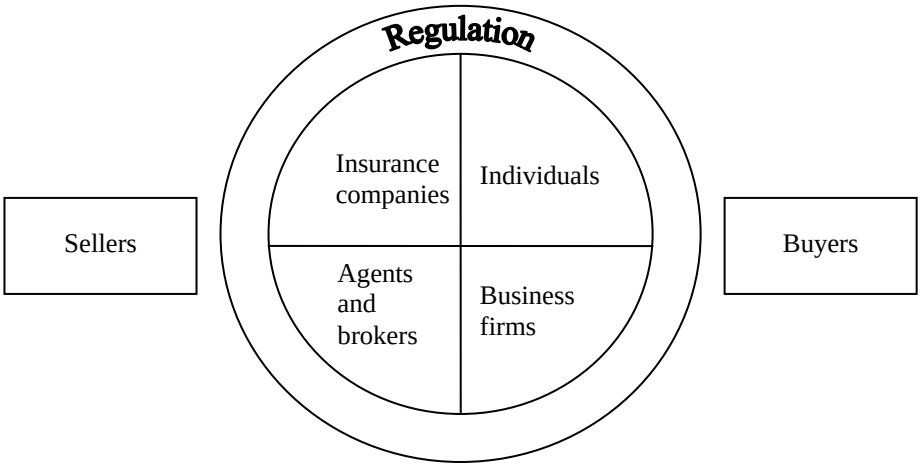


Figure 6.1 The insurance market and its participants[146]

In the 1990's the insurance market was controlled by the buyers and the competition within the market was very though. The policyholders could take out insurances which gave a comprehensive protection with good terms and low premiums. During a couple of years when the stock market gave a good return on made investments, the insurance companies discovered that the profit could compensate for the increased insurance costs. When the

[145] Dorfman M., (2002) *Introduction to Risk Managemnet and Insurance*, Prentice Hall Upper Saddle River, New Jersey
[146] Ibid

business result was equal to nil, the financial incomes from the stock exchange speculations had made it possible to keep the premiums low. However, when the stock market turned easy it gave an opposite effect. As a consequence the insurance companies were obliged to raise the premiums. Besides the stock market there were other factors which forced up the premium prices. For starters, the awareness of terror attacks since the 11th of September 2001 led to that the international reinsurance companies raised their premiums and this affected the whole insurance market. Secondly, the insurance market reached a saturation point and therefore the competition among the insurance companies was mostly about taking clients from each other and keeping the running costs as low as possible. The third reason was that the costs of damage had increased in general. As a consequence of this, the largest possibility for financial growth lied within the premiums. Today when there is an easy stock market the insurer can not offer these wide range solutions as they could before.[147] Instead, the insurance market today is characterized by higher rates, tougher terms and conditions and lower capacity[148]. Diagram 6.1 shows the difference between the insurance market today and in the 1990's.

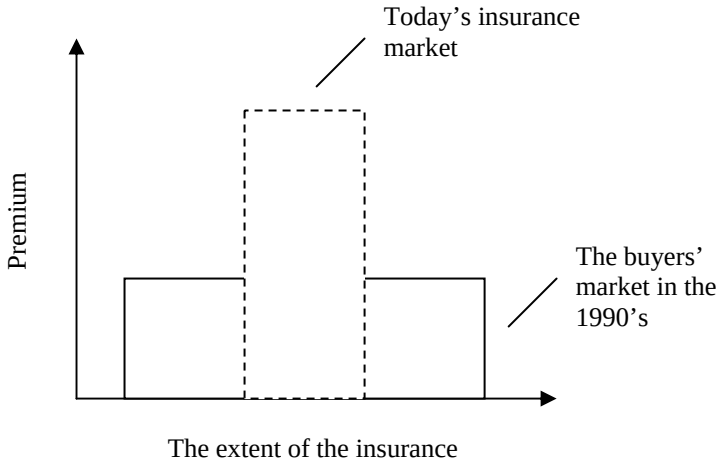


Diagram 6.1 The insurance market today and in the 1990's[149]

6.2 Insurances in general

All companies are in their everyday business confronted with different types of risks. To identify and value risks is a continuous process. The risk environment is continuously changing through new technique, new

[147] Stenshamn C., *I terrorns skugga*, Veckans Affärer, 17/04/02
[148] Goch L., *According to survey, commercial insurance still in a hard market*, Best's Review, 12/02
[149] Björkén F., Broker, Risk Management, Marsh AB, 24/09/2003

products, competition and laws etc.[150] As mentioned before, in the theory concerning risk management, risks can be categorized into different groups, like commercial and non commercial[151]. These can either be accepted or avoided, and one way to handle an accepted risk is to transfer it through insurances or outsourcing[152]. In most cases a company's non commercial risks are insurable as oppose to the commercial risks, which are often impossible to insure[153].

Insurances are one way to protect you from unexpected events, it creates economical safety[154]. The use of insurance enables companies to transform an uncontrollable risk exposure into a cost which can be accounted for in a budget. It is essential to realize that insurances are not a risk prevention tool since they do not decrease the substantial risk. Due to this insurances are not a first hand choice when a company wishes to minimize the existing risk exposure.[155] To be able to recover from financial losses due to disruptions it is essential to raise capital, and the most important instrument to finance losses is insurances. However, a negative effect deriving from the use of insurances is a false feeling of safety which may contribute to a lower awareness concerning risks among the employees. It is important to thoroughly examine all types of economical risks that are insurable, and which of these that are insured. In addition it is vital to elucidate the risks that are not insured and also the ones which are unable to be insured. Since the insurances constitute an indispensable safety net, the company has to make sure that the insurance protection is in adequate order. Therefore a company should revise the insurance plan annually.[156]

All insurances include a certain premium and deductible. The premium is the amount paid by the company to maintain a signed insurance. This amount is based on the expected loss experience during a certain time period. In addition the administrative costs, like for example brokerage, are included. Most companies choose to have a deductible in order to decrease the yearly premium. This means that losses from damage beneath a specific financial level must be covered by the company itself.[157] A motive for deductible is to reduce the administrative costs. The number of small damages is large and therefore the costs for settlement would be rather

[150] Renmar S., (2003) *Försäkring för företag,* Ifu utbildnings AB
[151] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[152] DeLoach J., (2000) *Enterprise-Wide Risk Management: Strategies for linking risk and opportunity,* Pearson Education Limited
[153] Renmar S., (2003) *Försäkring för företag,* Ifu utbildnings AB
[154] Randquist M., (2000) *Bildas guide till försäkringar*
[155] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[156] *Säkra företagens flöden,* (1999) Överstyrelsen för civil beredskap, Tryckindustri AB
[157] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur

significant. Especially the handling cost for each damage would be disproportionate large. In addition the deductible has a damage preventive mission, meaning that a company keeps better maintenance of the properties to prevent damages if the deductible is high[158]. The amount of the deductible is set by the management at a company by deciding an upper boundary which states either a maximum that can not be exceeded during the budget period or a maximum amount for each damage occasion. A basic rule is that it should not affect the company's result with more than five per cent[159], and in order to bring the deductible in line with the rate of inflation it is often attached to a base amount specific for each company[160].

6.3 Business insurances

The foundation of the business insurance is to protect the insured company's assets and business. Policyholders within the industry and commerce derive from many different categories, covering a wide range from the one-man business to large groups of companies. Within the market there are companies with similar needs and in those cases the insurance solutions can be arranged through insurance packages. But generally the insurance cover must be individual adapted to each company's needs, and hence many companies sign specific business insurances. This business insurance covers diverse interests such as material damages on property and other consequences after a disruption. In addition the insurance may cover other damages like for example loss of assets through white-collar crime. Irrespective of the choice of insurance solution there are four general conditions for business insurance; property, business interruption and liability insurances and general terms of agreement:[161]

- **Property insurance** consists of a number of different areas where compensation can be obtained when property damage occurs as a consequence of for example fire, water, burglary or machine damage.
- **Business interruption policy** protects the company in case of property damage which causes stoppage in the production. For example if the production can not proceed after a fire.
- **Liability insurance** protects the company against claims for damages.
- **General terms of agreement** is the section where the terms of the contract are specified, for instance when the insurance premium will be paid and when the insurance expires etc.

[158] *Boken om företagets försäkringar,* Trygg Hansa and SPP
[159] Hamilton G., (1996) *Risk Management 2000,* Studentlitteratur
[160] *Boken om företagets försäkringar,* Trygg Hansa and SPP
[161] Renmar S., (2003) *Försäkring för företag,* Ifu utbildnings AB

The insurance companies can make additions to the general agreements, so called special terms of agreement and clauses. These can contain either enlargements or reductions of the terms of the insurance and also special regulations or rules for the damage survey etc.[162]

The insurance contract is valid according to the insurance terms and the insurance policy. A general rule when constructing the different conditions is to first apply the force in law and secondly obtain the general terms of agreement. The law of insurance contracts dates from 1927 and it is noncompulsory, giving the possibility to evade the law. To start with, the regulations can be amended according to the terms of the agreement. Moreover the insurance terms can be changed through the special terms of agreement and clauses. Finally the terms can also be changed in the insurance policy. Hence this means that the insurance conditions can be changed even if these are in contrary to the regulations.[163]

The general conditions for business insurance are not a package solution. This means that the insurance in accordance with the general conditions for business insurance can be signed to the extent the company in question desire. Therefore a company can take out insurance with for example only liability insurance.[164]

6.4 Property insurance

The property insurance constitutes a vital part of the business insurance, and the basic principle is that it is valid for the policyholder in the capacity as property owner. In some cases the insurance also includes property owned by someone else, for example property which belongs to a customer or employee, property received on commission, property bought on instalment and property rented, borrowed or leased. A condition for the property to be included in the insurance is that it is in the care of the policyholder or that the policyholder by contract has taken the insurance responsibility for the property. [165]

If the insurance is in force, it is valid for damages which occur during the period of insurance. The fact that the extent of the insurance is bound to damages which take place during the period of insurance leads to that the discovery time of the damage becomes less important. However, it is more important to determine the actual time when the damage occurred and the

[162] Renmar S., (2003) *Försäkring för företag*, Ifu utbildnings AB
[163] Ibid
[164] Ibid
[165] *Boken om företagets försäkringar*, Trygg Hansa and SPP

development of the damage until the discovery. Water damage is an example of when the time between the occurrence and the discovery can be long.[166]

The insurance coverage is only fully effective at the insurance locations which are specified in the insurance policy. Besides the property which are kept at the specified insurance locations the insurance can also cover property located in the Nordic countries.[167] An insured property worth up to generally five base amounts stored in another place, so called temporary storage, can still be covered by the insurance solution. This might be the case when property is handed in for repair. Insured property which is not goods or customers' property can be stored on a different location than the one mentioned in the insurance policy and still be covered by the insurance. This situation is regulated in the law of insurance contracts and there are two possible outcomes. The first rule implies that compensation can be disbursed if damage occurs, but if the probability of damage is higher at the new location compared to the location specified in the insurance policy, the compensation will be decreased in proportion to the damage probability. The other rule denotes that if the insurer with the knowledge of the new storage location would not have written insurance, the insurance will not cover the loss in case of damage.[168]

The normal deductible for property insurance is 20 percent of the base amount. However for some damages the deductible can be raised through a higher percentage or through a percentage of the total amount of the damage. In most cases it is a combination of both alternatives and the condition must be stated in the insurance contract.[169]

6.5 Business interruption policy

The property insurance is a part of the business insurance and replaces loss of physical property. However, a company which for example is struck by fire often suffers more than material damage, like decreased production and sales. In addition the daily business might cease during the time it takes to replace the lost property. In the worst case scenario the disruption can jeopardize the survival of a company. To mitigate the effects which can follow after disruption, the business interruption policy has aroused.[170] This type of insurance was developed at the end of the 19th century in the USA and in the UK. In about 1915 the Swedish insurance companies adapted the

[166] *Boken om företagets försäkringar,* Trygg Hansa and SPP
[167] Ibid
[168] Renmar S., (2003) *Försäkring för företag,* Ifu utbildnings AB
[169] *Boken om företagets försäkringar,* Trygg Hansa and SPP
[170] Nordin E., (2000) *Avbrottsförsäkring för företag,* Ifu utbildnings AB

idea, and the business interruption policy aroused in the market. However, it was not until the 1950's that this insurance became general. The business interruption policy was developed slightly different in USA and the UK, and the Swedish model is based on the latter variant.[171]

A company can never fully be protected from occurrence of damage. However, through proper insurances there is a possibility to mitigate the effects of damage. Property insurance compensates the company in order to restore destroyed buildings and inventories. Nevertheless the property insurance does not cover the loss in production which follows if the property can not be utilized during a certain time or in a certain way. Hence, this is why business interruption policy exists. The intent with the insurance is that the policyholder through compensation should be able to maintain the same economical position as before the property damage. Some effects from a disruption like loss of goodwill and in market shares, is complicated or impossible to estimate and therefore difficult to compensate. A long indemnity period makes it partly possible to compensate for lost market shares, if the struck company is able reclaim the lost market. [172]

The meaning of disruption is defined as **such a restriction of the insured company which results in loss of contribution margin**. Insurable contribution margin means the business sales, exclusive of value-added tax, reduced with the noninsurable costs. Figure 6.2 illustrates the definition of insurable contribution margin.[173] Consequently it is the insurable contribution margin that constitutes the insured interest and this is based on the in advanced decided indemnity period.[174]

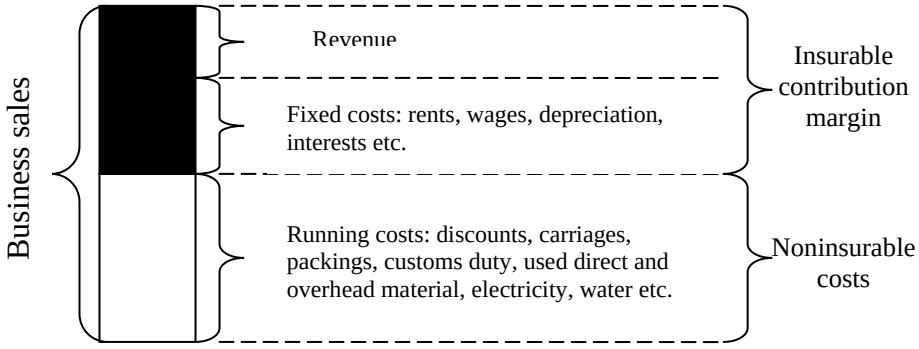


Figure 6.2 The definition of insurable contribution margin[175]

[171] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[172] Ibid
[173] Ibid
[174] *Boken om företagets försäkringar*, Trygg Hansa and SPP
[175] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB

A condition for compensation through business interruption policy is that the disruption depends on a property damage which is entitled to compensation according to terms in the property insurance or special terms in the business interruption policy. However, it is not necessary that property insurance exist, compensation can be received even if the property is not insured. [176]

The insurance is valid for the policyholder in the capacity as the owner of insured business. The insurer can be either a natural or a legal person who is the registered owner of the company. If the policyholder owns several companies which are going to be insured, these must be mentioned in the insurance policy to eliminate doubts concerning which interests that are comprehended in the insurance. It is possible for a policyholder to insure a business without owning the building in which the business takes place. The insured business can be situated in different places, but the location where the property damage occurs must be specified in the insurance policy.[177]

A company can take out insurance to cover disruption due to property damage at suppliers or customers. For example, if the delivery of an important semi-finished product has ceased due to a disruption at a supplier's facility, this can cause a production loss at the insured company. Through a notion in the insurance policy that the insurance comprehends specified property damage at a specified location within another business, it is possible for the policyholder to receive compensation in case of disruption. However, it is common that the insurance company want an additional premium, when including supplier or customer disruption in the insurance contract.[178]

The compensation which can be received after disruption damage is the loss of contribution margin which occurs during the indemnity period as a consequence of the disruption. The disruption period and indemnity period starts the same day as the property damage occurs. A condition for compensation is that the disruption has taken place during the period of insurance.[179]

[176] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[177] Ibid
[178] Ibid
[179] Ibid

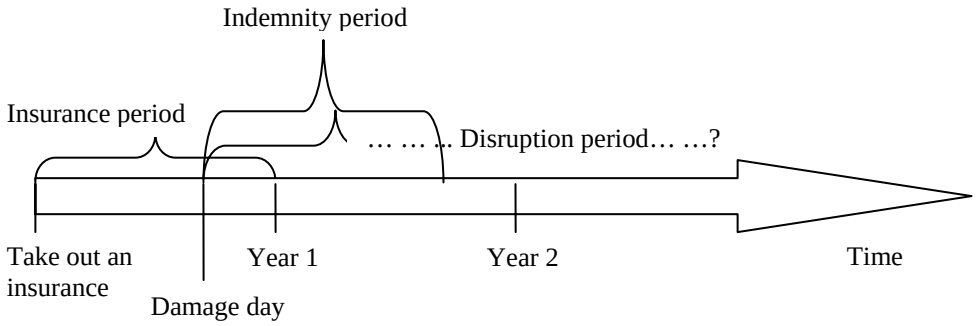


Figure 6.3 Disruption period and indemnity period[180]

The disruption period is the time during which the property damage affects the net operating income. The indemnity period is calculated from the day of the damage and defines the time when the business interruption policy compensates for loss of contribution margin. As illustrated in figure 6.3, the disruption period might last longer than the indemnity period giving the consequence that the company is not fully covered by insurance. Hence it is important to choose an indemnity period that is long enough to cover possible losses after a disruption. The general indemnity period concerning fire business interruption policy is 12 months, but it can be shorten or extended usually in three months intervals between 6 and 36 months. A long indemnity period can be necessary if, for example, it takes a long time to get a new planning permission or replace destroyed machines. Moreover, during this period the company should be able to reach full production capacity and hopefully reach their normal stock level. Shorter indemnity period than 12 months is often not enough, but it can be suitable for a machine interruption policy when the machine has got a short time of repair. An advantage with having an indemnity period of 12 months is that the possible seasonal fluctuations can be compensated for. There are many factors to take into consideration when deciding the indemnity period.[181]

The business interruption policy is a full-value insurance, which means that the sum insured should correspond to the company's expected contribution margin during the indemnity period. If the sum insured is lower than the contribution margin, then the compensation risks to be too low as well. For example if a house worth 2 MSEK but only insured to the value of 1 MSEK, burns to the ground, the insurance will give a compensation of 0.5 MSEK. Moreover, the sum insured constitutes the foundation for the estimated premium. When signing the insurance or renewing the contract, the

[180] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[181] Ibid

company's insurable contribution margin has to be calculated. Generally the calculation is founded on the company's latest closing of the books. As mentioned before, the sum insured shall correspond to the expected contribution margin during the indemnity period. If the disruption occurs at the end of the insurance period, this could be one or two years from the inception date of the insurance. Hence the numerical data from the closing must be adjusted considering the expected development during the coming year plus the indemnity period. The external business cycle should be considered as well.[182]

The business interruption policy can include both deductible and qualifying period. The latter can be described as a deductible concerning time. This means that from the time of the damage until the end of the qualifying period the company is not given any compensation for the disruption. In comparison with deductible the qualifying period has a double function. Partly the qualifying period is a kind of deductible in the sense that the policyholder is responsible for the loss during this period, and partly because measures can be taken during the qualifying period, when dealing with shorter disruptions, so that the insurance do not have to be triggered. The result is lower administrative costs. Qualifying period is often used when the frequency of short durational damages are high.[183]

6.6 Liability insurance

The direct function and purpose of the liability insurance which also is a part of the business insurance is to protect the policyholder, and others who are included in the insurance, from the surprise of claims for damages. The insurance takes over the liability for damages which can be placed on the company according to existing law. The conditions which make the company liable to pay compensation are that the company is the cause of the damage or that vicarious liability or liability without fault exists. Hence, the insurance constitutes a protection for the policyholder against claim for damages, either individual or property damage, which is inflicted on a third party. [184]

The insurance companies' undertakings through the liability insurance are the following;[185]

- Investigate if there exists liability to pay
- Negotiate with the person who claims damages

[182] *Boken om företagets försäkringar,* Trygg Hansa and SPP
[183] Ibid
[184] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[185] Ibid

- Represent the policyholder at a trial or arbitration, and also bear the costs which follows
- Pay for the damages which the policyholder is bound to pay

If a claim for damages is directed towards the insured party, the policyholder has no need to take a position or carry out an investigation. The service is an important part of the performances which are given by the insurance companies through the liability insurance. However, the insurance companies' undertakings have an upper boundary, and common limits are 10 MSEK per damage and 20 MSEK per year.[186]

The liability insurance applies for the business which is specified in the insurance policy and is valid for the policyholder and its employees if damage is caused during duty. Moreover, the insurance is also valid for the policyholder as the owner, user or as the land leasehold proprietor of the properties which are utilized in the business. Naturally the insurance must be in force to be valid. The insurance policy must also state where the insurance is in effect. Generally the liability insurance is valid worldwide with the exception of USA and Canada. The reason for the large extent is that many companies have an insurance need when for example attending conferences and exhibitions.[187]

Normally the policyholder shoulders 20 percent of the total costs for damages and investigations as a base amount for each separate damage as a deductible. An agreement can be made in the insurance policy in order to change the deductible.[188]

6.7 The role as insurance broker

The law that regulates the business of an insurance broker was instituted in 1990. Before then there existed no law, but according to the regulation for purchasing of insurances which was established a long time ago by the insurance companies on the Swedish market, practicing as a broker was not allowed.[189]

The law of insurance brokers contains legal regulations concerning both industry and civil aspects. The industry regulations give directions for the insurance conception in general, directions for registration of brokers and supervising of the brokers business. Furthermore there are regulations for

[186] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[187] *Boken om företagets försäkringar*, Trygg Hansa and SPP
[188] Ibid
[189] Riese T., (2001) *Mäklarrollen – om försäkringsmäklarens verksamhet*, Ifu utbildnings AB

sanctions against brokers who break the law or do not follow the regulations issued by the Financial Supervisory Authority. The civil regulations give the conditions for the insurance brokers' assignment and responsibility towards the assigner, insurer and other individuals who have economical interests in the broker's commission. However the civil regulations are noncompulsory, which means that the insurance broker and the assigner can draw up an agreement concerning the extent and the performance of the assignment and also the broker's responsibility. The noncompulsory rule is however not in force if the mediation concerns insurances to an individual consumer. Furthermore, the law of insurance brokers consists of general regulations which the insurance brokers have to keep to in their business, for example the insurance brokers' duty to inform. [190]

The insurance broker can be a legal or a natural person. The business that comprise in the law of insurance brokers concerns the mediation of insurances aiming to reach an insurance contract between the broker's assigner and the insurer. An insurance broker shall be registered at the Financial Supervisory Authority and be under their control. The registration can refer to the mediation of all kind of insurances, but also a specific insurance for example life insurance or business interruption policy. Moreover the broker can be registered to be able to mediate shares in securities fund. When the registration concerns a legal person, a broking firm, with business that includes all types of insurances there is a demand that there exists competence in all areas within the broking firm. The firm is responsible for that each broker works within his or hers sphere of competence. The main tasks in the broker's assignment are to perform the assignment thorough, show good sense of responsibility, elucidate the assigner's need for insurances and propose suitable solutions. The insurance broker has a two-way duty to inform. It rests upon the broker to make sure that the assigner gets complete and true information about the insurance terms etc. The duty to inform also includes aspects that the insurer has the primary information responsibility for. Moreover the broker must fulfil the policyholder's obligation to disclose against the insurer. The insurance broker must also take in consideration both the insurer and the policyholder's interest, but be aware of the fact that he or she represents the assigner which is the policyholder.[191]

[190] Riese T., (2001) *Mäklarrollen – om försäkringsmäklarens verksamhet*, Ifu utbildnings AB
[191] Ibid

7 The design of a descriptive model

In this chapter the authors describe the development of the descriptive model – a check list. This list is based on requirements, established criteria and theory and it constitutes the foundation for the analysis presented in chapter nine.

7.1 Background

Today many companies have no or little risk management as a part of the daily work. The general knowledge tends to be on insurances instead of the preventive risk work. Therefore the authors found it useful to create a comprehensive model, which may be a tool during the initial stages of identifying the strengths and weaknesses concerning risks in the supply chain flow.

As a mean to help the authors to fulfil the purpose and sub purposes of this master thesis, a need for some kind of tool to visualize the differences and similarities between the case companies emerged. Initially we had different opinions concerning the design and content of a model but as the work preceded the various views started to turn into one sole view. Several hours of discussion and brainstorming finally led to the creation of a descriptive model.

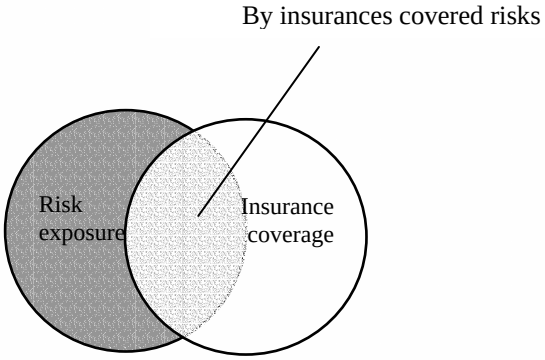


Figure 7.1 The risk exposure and the insurance coverage

The risk exposure and the insurance coverage shown in picture 7.1 above are the main areas for the model to describe. The third area, which is highlighted in the model as well, is risk management. In order to fully comprehend these areas, an analysis is required. This analysis will be presented in chapter nine. The connection between the three areas is that by using a solid risk handling, the circles of risk exposure and insurance

coverage may overlap in an optimal way. In addition a proper work with risks may reduce the circle of risk exposure,

7.2 Goals

The main goal with creating a model is to develop a tool that highlights the specific areas of risk exposure, risk management and risk handling, and contributes to more correct analyses of the case companies. The model will elucidate the company's strengths and weaknesses from a risk point of view. The focus is on the case company, but both the supply side and the demand side will, to some extent, also be evaluated. Moreover this model should be applicable on several different types of companies. The aim is to use the model as a foundation for further analyses and comparisons among various companies.

7.3 Criteria for the model

Initially when we set up the overall guidelines for the model, we agreed on certain criteria which should be fulfilled. The criteria mainly concerned methods of application and needs for generalization. We found it essential to focus on these subjects in order to create a useful model. The main criteria are listed below, and they are;

- **Easy to use.** The model is designed to be used as a tool in the continuous work with risk. Hence, the creation must be easy to use in the aspects of ranking and finding the answers to the statements.
- **Easy to understand.** It is important to comprehend both the purpose and the goals of the model. Therefore the statements have been made as unambiguous as possible.
- **Not be too complicated.** Since the goal with the model is that it may be used as a tool for further analyses and evaluations, it is vital for the result to be clear. Otherwise the result will only lead to speculations and the fields of application will decrease.
- **Highlight areas with large risk levels.** One of the main purposes is to state the risk exposure and risk handling within a supply chain. The ranking scale indicates which areas lack proper action and attention.
- **Trustworthy.** All areas and procedures must be clearly defined. The result must be reliable concerning the highlighted areas.
- **Generalizability.** In order to increase the usage of the model, the statements have been made applicable on various types of companies in different industries.

Besides these criteria a strong connection to the theory presented in chapters four, five and six is to constitute the guidelines for the model.

Based on the criteria mentioned above we discussed different alternatives for the model. Since our goal is to create a comprehensive tool for companies to use in order to highlight strengths and weaknesses in the supply chain from a risk point of view, we found that a check list fulfilled our requirements. The check list asks questions concerning risks, vulnerabilities and damage exposure and forms a control tool which evaluates an established security level. All questions in the inquiry are included in the analysis and the results from analogous analyses are comparable. Naturally there are some disadvantages with this method, for example a check list calculates no expected damage costs and the statements in the list may overlook important issues.

7.4 The model – a check list

The check list is based on the three theory chapters concerning supply chain management, risk management and insurances. We find these areas most relevant when analysing and evaluating the case companies. One important aspect of risk management is to investigate not only the single company but also, to some extent, include the supply side and the demand side. This point of view enables a more substantial result since companies both upstream and downstream in the supply chain effect the single company. Finally there is a section which summarizes the total view of the supply chain.

The model is designed as a check list. The areas which we have based the model upon are; risk exposure, risk management and risk handling. The risk exposure is divided into two sub-divisions; overall facts and risk identification. The risk management focuses on two areas; risk management strategies and supply chain risk management. Risk handling is divided into insurance coverage and other risk handling methods. The insurance coverage is only evaluated within the single company, as oppose to the two other areas which are seen from a supply chain point of view. In figure 7.2 is an example of the check list applied on a company.

Check list

		Ranking				
		- -	-	+	+ +	?
Internal						
	Risk exposure					
	Facts regarding the production:					
1	The complexity of the production				x	
2	The production lead time		x			
3	The existence of bottlenecks		x			
4	Alternatives to the production flow	x				
5	The degree of production made to order			x		
6	The flexibility within the production process	x				
7	Level of inventories			x		
8	Localisation of inventories			x		
9	The dependence on outsourced functions	x				
10	The relationship with the outsourcing companies			x		
11	The degree of JIT			x		
12	The dependence of JIT				x	
	Risk identification:					
13	Employee risks					x
14	Property risks			x		
15	Environmental risks				x	
16	Criminal acts		x			
17	Market risks		x			
18	Liability risks					x
19	Political risks				x	
20	The level of time-dependence			x		
21	The level of relationship-dependence	x				
22	The level of functional-dependence	x				
	Risk Management					
23	General knowledge of risk management	x				
24	The development of risk management strategies	x				
25	General development of business continuity plan	x				
26	Existence of emergency response procedures	x				
27	Prioritization of critical processes to recover	x				
28	Training and maintenance of existing plan	x				

	Supply chain risk management:					
29	The awareness of supply chain risk management	x				
30	Methods of choosing the right business partner					x
31	Constant evaluation of the business partners	x				
32	The business partners involvement in the long term planning			x		
	In case of a disruption in the supply chain:					
33	The resilience to disruptions	x				
34	The ability to maintain the supply of a product		x			
35	The ability to avoid domino effects		x			
36	The degree of cooperation among all business partners			x		
37	Changes in overall risk management after a disruption	x				
	Risk handling					
38	Risk identification as a continuing work	x				
39	Analyses of possible disruptions	x				
40	Valuation of existing risks	x				
41	Knowledge and ability to reduce risks	x				
42	Open communication of the identified risks	x				
43	Administrative actions	x				
44	Production concentrated and technical actions		x			
45	Legal actions			x		
46	Reflections of changes through revising and updating	x				
47	The active monitoring of risks	x				
48	Awareness of noninsurable risks	x				
	Insurance coverage:					
49	The correlation between the needs and the insurances			x		
50	The level of risks insured in a cost-efficient way				x	
51	Existence of country specific noninsurable risks				x	
	The structure of the business insurance:					
52	The extent of the property insurance				x	
53	The extent of the business interruption policy			x		
54	The extent of the liability insurance					x
55	Relation between actual value and insured value			x		
56	The length of the indemnity period		x			

	In case of a disruption:					
57	The coverage of the property insurance				x	
58	The coverage of the business interruption policy			x		
59	Financial cover of disruptions at suppliers				x	
60	Financial cover of disruptions at customers					x
	Supply side					
	Risk exposure					
	Facts regarding the supply side:					
61	Number of critical suppliers	x				
62	Alternatives to critical suppliers	x				
63	Dependence of each critical supplier	x				
	At each important supplier:					
64	The supplier's ability to maintain a certain level of quality				x	
65	The supplier's ability to maintain a certain quantity				x	
66	The degree of JIT			x		
67	The dependence of JIT			x		
68	The degree of production made to order			x		
69	The flexibility within the production process		x			
70	Alternatives to the production flow		x			
71	The existence of bottlenecks	x				
72	Level of inventories					x
73	Localisation inventories					x
	Risk identification:					
74	The level of time-dependence			x		
75	The level of relationship-dependence		x			
76	The level of functional-dependence			x		
	Risk Management					
77	General knowledge of risk management	x				
78	The development of risk management strategies	x				
79	The existence of a business continuity plan	x				
	Supply chain risk management:					
80	The awareness of supply chain risk management	x				
81	The supplier's involvement in the long term planning					x
	In case of a disruption:					
82	The resilience to disruptions	x				

83	The ability to maintain the supply of a product		x			
84	The ability to avoid domino effects		x			
	Risk handling					
85	Risk identification as a continuing work	x				
86	Analyses of possible disruptions	x				
87	Valuation of existing risks	x				
	Demand side					
	Risk exposure					
	Facts regarding the demand side:					
88	Number of customers			x		
89	Number of important customers		x			
90	Dependence of each important customer		x			
91	The understanding of the demand patterns				x	
92	The existence of alternative products on the market	x				
93	The dependence of safe delivery dates		x			
94	The dependence of JIT			x		
	Risk identification:					
95	The level of time-dependence	x				
96	The level of relationship-dependence			x		
97	The level of functional-dependence			x		
	Risk Management					
98	General knowledge of risk management					x
99	The development of risk management strategies					x
100	The existence of a business continuity plan					x
	Supply chain risk management:					
101	The awareness of supply chain risk management					x
102	The business partners involvement in the long term planning		x			
	In case of a disruption:					
103	The resilience to disruptions		x			
104	The ability to maintain the supply of a product				x	
105	The ability to avoid domino effects			x		
	Risk handling					

106	Risk identification as a continuing work					x
107	Analyses of possible disruptions					x
108	Valuation of existing risks					x
	The total view of the supply chain					
109	The complexity of the supply chain			x		
110	The level of globalisation of the supply chain			x		
111	The vulnerability of the supply chain	x				
112	The rapidity of the supply chain	x				
113	The resilience to disruptions		x			
114	The ability to maintain the supply of a product		x			
115	The ability to avoid domino effects		x			
116	The mapping of the flow in the supply chain			x		
117	The awareness of supply chain risk management	x				

Figure 7.2 The check list

All statements within the model are tied to the theory and these constitute the base when finding areas of strengths and weaknesses. Each statement is ranked from a risk point of view. The ranking scale includes:

- (- -), very negative
- (-), negative
- (+), positive
- (+ +), very positive
- (?), can not be evaluated due to lack of knowledge

The ranking steps are directly connected to the level of risk in each statement. For example, (- -) signifies very negative which means a very high level of risk for the company. The question mark indicates an insufficient level of knowledge to evaluate the statement. Often occurring question marks may be considered as negative in a risk point of view, since not knowing may be a great risk.

Based on the outcome of the descriptive model, the check list is the plotted in order to highlight the most critical areas in a practical way for all parties. The plotting shows the positive or negative level within the overall categories in the check list. We find that a plotting is easier to comprehend

because it visualizes the strengths and weaknesses in a clear way. The plot is divided into the four main areas; internal, supply side, demand side and the total view of the supply chain. To make it more understandable the different sub-areas, risk exposure, risk management and risk handling will be stressed out in the plot. Shown in figure 7.3 below is the plot of an imaginary company.

Plot					
Internal					
	-	**- -**	**+**	**+ +**	**?**
Risk exposure					
1				x	
2		x			
3		x			
4	x				
5			x		
6	x				
7			x		
8			x		
9	x				
10			x		
11			x		
12				x	
13					x
14			x		
15				x	
16		x			
17		x			
18					x
19				x	
20			x		
21	x				
22	x				
Risk Management					
23	x				
24	x				
25	x				
26	x				
27	x				
28	x				
29	x				
30					x

31	x				
32			x		
33	x				
34		x			
35		x			
36			x		
37	x				
Risk handling					
38	x				
39	x				
40	x				
41	x				
42	x				
43	x				
44		x			
45			x		
46	x				
47	x				
48	x				
49			x		
50				x	
51				x	
52				x	
53			x		
54					x
55			x		
56		x			
57				x	
58			x		
59				x	
60					x

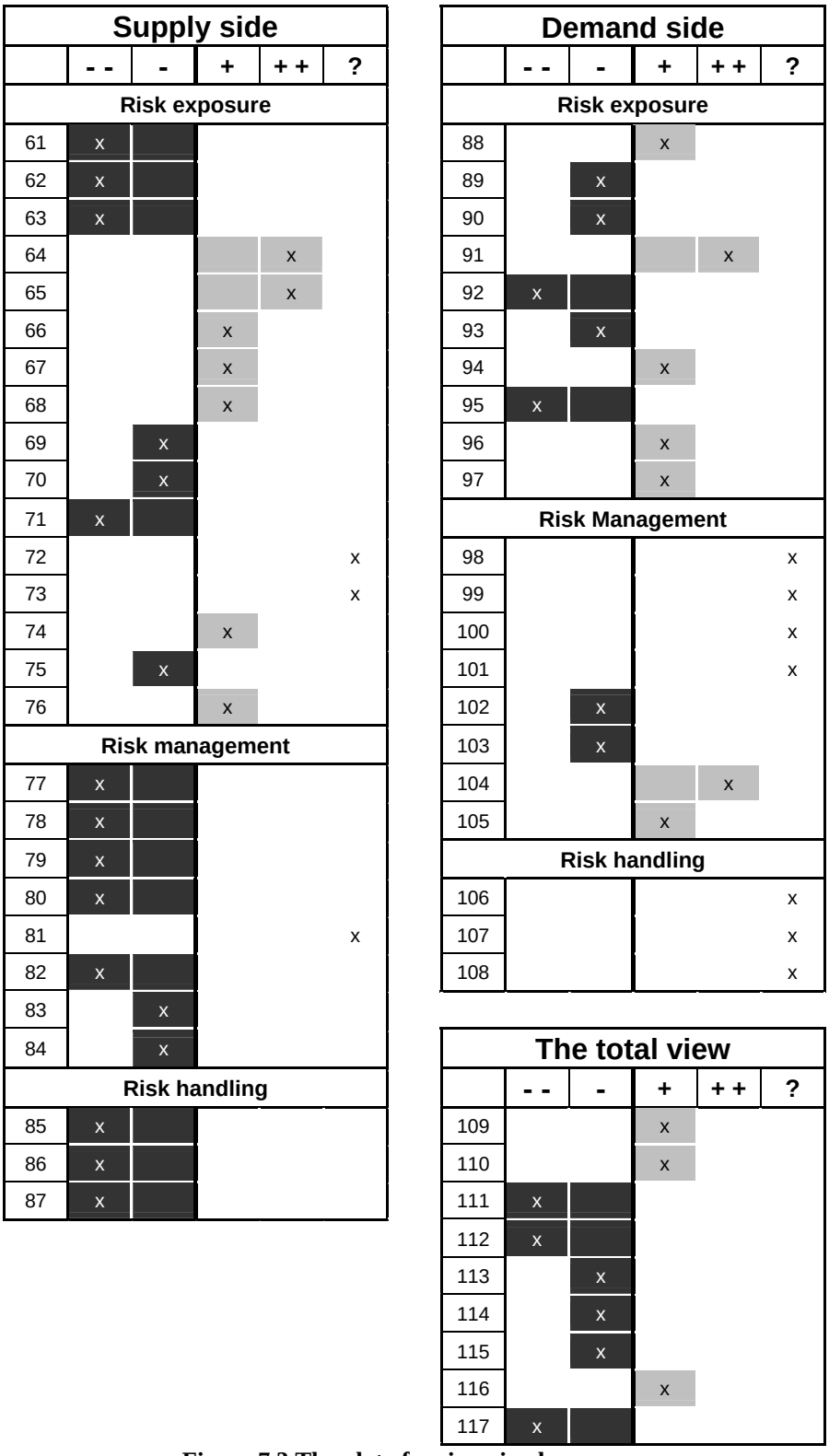


Figure 7.3 The plot of an imagined company

It is essential to connect the theoretical viewpoint to the empirical in a way, which seems relevant and meaningful.

7.5 The application areas

Our intent in this master thesis is to use the model as a tool for highlighting the risk exposure, risk management and risk handling at each case company. Furthermore the model will facilitate a comparison concerning overall risk management between the four case companies described in chapter eight.

Due to the level of generalization the model may be used on various companies as a part of their risk management.

In this master thesis the grading in the model is performed by the authors, based on the information obtained from Marsh and the case companies.

8 Empirical data collection

This chapter describes the four different case companies; Andersson, Nilsson, Olsson and Persson. In order to meet the requirements of secrecy from Marsh AB both names and some financial data have been altered. These changes have been made in proportion to each other and should thereby not affect the creditability. The information has been collected through interviews with both responsible parts at Marsh AB and management personnel at the case companies. Overall information regarding the companies has been assembled via brochures and relevant websites.

8.1 Andersson

8.1.1 The company

The Danish furniture company Andersson is a part of a large group of companies, Bear Group International, which includes about 50 organizations in 20 countries. The turnover run at roughly 500 MSEK and the number of employees today is roughly 1400. The main occupation within the group is technical components and the assembly of these components. Andersson is the only company within the Bear Group which operates in the furniture market. All other companies are wholesale dealers.

Andersson designs, produces and sells solid wood furniture. The business concept is to sell whole sets of furniture. For example a bedroom consisting of beds, bedside tables, washstands, set of drawers etc. Only a minor part of Andersson's turnover is related to the sales of single furniture products. The combination of design and high quality is a unique concept which emphasizes Andersson's market position.

The business situation for Andersson during the years 1998-99 was tough which resulted in negative financial consequences, like a decreased contribution margin. However, in the beginning of the year 2000 there was an upswing for Andersson and the solid wood furniture market as a whole. One of the reasons for this was the entrance into the UK market. Due to the positive trend in the solid wood furniture market, the company chose to revise the sales budget concerning the coming years shown in table 8.1.

	2000 (MDKK)	2001 (MDKK)	2002 (MDKK)
Estimated sales	464,7	622	682
Estimated contribution margin	57,3	77,6	87,6

Table 8.1 Figures from the sales budget.

The production

The production of Andersson's furniture is located on Jutland, Denmark, and is completely based on subcontracting work. This production is exclusively performed by external suppliers. The three main suppliers are Sun A/S, Wind A/S and Water A/S. Each subcontractor is the sole agent for a specific type of furniture and in order to decrease the possibility of design theft, different parts of a set is manufactured by different suppliers. Therefore a loss situation at one of the suppliers may have an impact on the total delivery situation of Andersson.

Andersson buys a certain fixed amount of production volume from the subcontractors. Besides this, extra volume is purchased in case of additional customer demand. Within the solid wood furniture business there exist seasonal fluctuations which have impact on the yearly production. During the fourth quarter the customer demand always has a peak.

The utilized material is solely pinewood coming from the north of Scandinavia. Andersson has chosen this kind of wood because is solid and long lasting and in the production only eco-friendly components, like glue, lacquer and oil are used. The massif wood and the traditional workmanship are the guarantee for quality of the furniture. The final step during the construction is the surface treatment with either lye or oil. This is used to bring out the structure of the wood and prolong the durability.

The design is developed for specific markets and it is general for all different sets. The goal is to create furniture with elegance and with a focus on details.

Supply and demand side

The three suppliers deliver over 90 percent of the total production volume to Andersson. Sun A/S is the largest and most important of the three and

accounts solely for 54 percent. Wind A/S and Water A/S make up for 11 respectively 26 percent. Shown in table 8.2 below is the purchased amount by Andersson during year 2000 from the different subcontractors.

	Turnover	The sales volume to Andersson	Number of employees
	(MDKK)	(MDKK)	
Sun A/S	200	190	290
Wind A/S	60	40	70
Water A/S	450	90	225
Others		30	
Total		**350**	

Table 8.2 The sales volume to Andersson.

The relationships between Andersson and the three suppliers differ. Sun A/S and Andersson have developed a close and trustful relation based on a far-reaching cooperation. The interchange is so profitable that a merger is considered as a possibility within the near future. Wind A/S is a rather small company with limited production capacity. Therefore the relation is not developed to the same extent as with Sun A/S, but it is all the same a good relationship. The third main subcontractor, Water A/S, does not only produce furniture to Andersson but also have own design and production. Hence this gives implications on the relationship between the two companies because they are not only collaborating parties but also competitors on the same market. Since nearly all production derives from these three subcontractors each relation is very important to Andersson.

All over Western Europe the furniture is sold via branch shops, chains of furniture dealers and large malls. The main focus is on Scandinavia, Germany, France and UK. One difficulty is to handle the great differences between the various markets. The German market, for example, is large but difficult and all customers have high demands on both quality and safe delivery. In addition to these factors the competition is tough, which leads to a thin profit margin of two percent. However, in the UK the market is fairly undeveloped, giving great opportunities to expand, and the profit margin reaches 15 percent. Andersson had recently entered this market with success. Two large chains of furniture stores were already selling the product sets. Hence the UK market is important.

<u>The logistics</u>

The logistics at Andersson is rather complex. Since the company itself do not have any storage possibilities, they have to utilize the storages among the subcontractors and other warehouses. This adds up to a total of ten different stock houses. All this storage holds very high costs due to the fact that a large storage capacity is required when handling furniture and that it is seldom possible to utilize the whole storage volume. In addition to this each set is never stored in the same warehouse due to the possibility of design theft. The furniture stored in the warehouse at Sun A/S is owned by Andersson.

All these different storage locations give implications on the procedure of delivery. Due to the fact that each set of furniture is divided among several warehouses the assembly of a whole set becomes more complex and this complexity is the most limiting factor regarding the total lead time. The delivery procedure lasts three weeks. When receiving an order from a customer, a specified picking list containing all pieces of furniture in the purchased sets is sent to the shipper during the first week. The second week the shipper collects all the furniture located at the various warehouses and finally the delivery to the customer is carried out during the following week. Andersson strives to decrease the overall lead time by constantly being online with the suppliers and shippers. This leads to a reduced need for the customers to keep large stocks within their own organization.

Unfortunately the method of delivery has a lot of shrinkage which is not well-documented and therefore difficult to estimate. All loss is regarded as damage in transit and due to this treated lightly, leading to no proper investigation of the true line of action. The control system is non-existing which leads to a careless attitude among the shippers when delivering the furniture. The lack of control causes several unnecessary errors, such as the shipper leaving the furniture without any contact with the receiving customer, which results in no verification of the delivery. Therefore when not delivering the right furniture according to the agreement the shipper has to return and recollect the false delivery, which leads to large additional costs for Andersson. This results in a lot of furniture under transit with no supervision.

Seen from a theoretical point of view Andersson believes they have a well working logistics, but when putting it into practise the logistics become very complicated and it is difficult to have a clear picture over the whole work procedure.

8.1.2 The Risk Management at Andersson before the disruption

The risk management was not regarded as a particularly important issue at Andersson. Consequently there had never been made any mapping, highlighting the existing dependencies throughout the organization and the supply chain. Nor had there been made any evaluation over the possible effects following a disruption within the own organization or at the subcontractors. In addition, the company had no continuity plan describing how to act in case of a disruption. Despite all this the overall opinion was still that the company had a good view of the potential risks. Furthermore Andersson considered that the relation towards the subcontractors was very solid and therefore no written plan was required. The company thought they knew where to get help in case of a disaster.

8.1.3 The insurances at Andersson before the disruption

The existing insurance solution at Andersson was a part of large programme which had been developed for the entire Bear Group International. The period of the insurance programme lasted from 1997 to the end of 2000. Since Andersson only constituted a minor part of the whole group of companies, no special attention had been paid to its specific needs and risks. Moreover the insurance market was, at the time of the writing of the insurance, a buyers' market which led to favourable insurance contracts to low premiums and the demand for risk surveys were weak. The comprehensive insurance solution included disruptions occurring at the suppliers' facilities. The yearly premium for the Bear Group International ran at 0.6 MSEK and the premium for Andersson was 200 SEK, 0.338 per mil of the total premium for the Bear Group International.

The specific insurance concerning Andersson had a sub-limit, meaning the maximum amount which could be received in case of a disruption in the suppliers' facilities, and this sub-limit ran at 25 MDKK. The indemnity period for the insurance was 12 months.

8.1.4 The disruption

On the 21st of June 2000 a fire made great havoc at Sun A/S production facility and 50 percent of the plant was damaged by the fire disruption. The cause of the accident was an electrical failure. One of the destroyed parts was the lacquering department which was considered as a bottleneck in the production process, but also parts of the stock in hand were damaged.

8.1.5 The consequences of the disruption

The fire damage caused a breakdown in the flow of furniture from Sun A/S facility and as a consequence there was a hold-up in the deliveries to

Andersson. Due to the fact that each subcontractor solely produced one part of a set, the whole delivery flow from Andersson was held up. However, after two weeks the production flow got started, but given the complexity of the logistic system, no deliveries from Andersson could be carried out for four weeks.

The Risk Management at Andersson during and after the disruption

Shortly after the fire had occurred at Sun A/S Andersson contacted their main customers to inform them about the accident. Unfortunately Andersson could not give any time perspectives regarding when they would be able to resume the deliveries. Simultaneously the competitors within the furniture market made contact with Andersson's clientele and offered them their services instead.

Due to the fact that there existed no continuity plan describing how to act in case of a disruption, Andersson had to improvise. The first measure was to find new production possibilities in order to compensate for the lost production at Sun A/S. Andersson chose to turn to Wind A/S for help because they knew that Wind A/S had idle capacity since the personnel only worked single shift and also the two subcontractors were located at close distance from each other. Therefore it was possible for Andersson to transport personnel from Sun A/S daily to the Wind A/S facilities in order to start working double shifts. Another advantage was that Wind A/S had similar machinery as parts of Sun A/S, which made it easier for the personnel at Sun A/S to use it and reduced the learning period. However, there still remained some problems to solve. The capacity at Wind A/S did not cover the total production loss at Sun A/S. Furthermore within the Wind A/S facilities there was no the carpenter's work which was required for some details on the furniture usually produced at Sun A/S. The largest problem with utilizing Wind A/S was however, that the lacquering department did not match the standards set by Sun A/S.

A few days before the fire occurred at Sun A/S another furniture company, Earth A/S, close to the Sun A/S site, went into liquidation. This time Andersson had fortune on its side because Earth A/S happened to have a newly built lacquering department which fulfilled all needs posed by Sun A/S. Therefore a decision was made by Andersson and Sun A/S to purchase Earth A/S with the main purpose to utilize the lacquering department. The business deal took three weeks to complete and shortly after Sun A/S was able to start to transport the unlacquered furniture by trucks from both Sun A/S and Wind A/S to Earth A/S. However, the transportation implicated that the furniture had to be loaded and unloaded several times and because the furniture requires a lot of space made the transportation circumstantial and time-consuming.

In order to cover the nonexistent carpenter's work at Wind A/S and to fully obtain the lost production at Sun A/S, Andersson turned to Water A/S. This company was the largest of the three subcontractors and they had idle capacity within the large production site. Andersson decided to not transport any personnel from Sun A/S to Water A/S and merely used as little capacity at Water A/S as possible. The reason was strategic. Andersson and Water A/S were not only business partners but also competitors, and therefore Andersson did not want to be too dependent of Water A/S.

After two weeks the production flows from Wind A/S and Water A/S were established. However it was not until the following week that the lacquering at Earth A/S could begin. In order to compensate the production loss at Sun A/S, Andersson chose to let the other two subcontractors produce quantities without regarding any specific production order. Andersson did not take into consideration the fact that all furniture only were delivered in complete sets. Given all this in addition to the complex logistics it took yet another week before any deliveries to the customers were able to start. First after six months Andersson regained full production.

As a consequence of the fire at Sun A/S the 21st of June 2000, Andersson chose to participate at the largest number of exhibitions ever during the period January to June 2001. The purpose of attending an extended number of exhibitions was to limit the decline in business volume and at the same time provide a contribution margin for Andersson. However, when attending these exhibitions it is custom to allow discounts in order to create a customer interest and hopefully establish a long term business relationship. In addition no agreements with a negative contribution margin are made, only with a lower contribution margin than in the normal case. Another consequence of the fire damage was that Andersson lost the option to market their products through furniture catalogues which were published in the end of the year by the different branch shops and chains of furniture dealers. The reason for this was that an agreement had to be reached six months before the publishing and this was not possible for Andersson due to the fire damage at Sun A/S. Hence the exhibitions became very important in a marketing point of view.

The insurance coverage

The total financial coverage ran to 24.6 MDKK, which was just below the sub-limit at 25 MDKK. The value of the stock in hand which was destroyed in the fire was calculated to 12 MDKK.

The purchase of Earth A/S, the furniture company which newly had gone bankrupt, took three weeks. The new owner was Sun A/S which accounted

for 80 percent of the total purchase price. The outstanding amount was accounted by Andersson's insurance company and the underwriter that represented Sun A/S. The two insurance companies shared and shared alike the remaining amount of approximately amount of 11 MDKK.

The measures that a company needs to undertake in order to compensate for lost production when affected by a disruption in the supply chain are often very important for the survival of the company. In this case, the transportation of Sun A/S personnel to the facility of Wind A/S and the transportation of furniture to the newly bought lacquering department at Earth A/S are made. These measures are costly and often not profitable for the insurance companies. Even so a company may receive compensation for these actions if the insurance company believes that the actions may result a decrease of loss of contribution margin in the end.

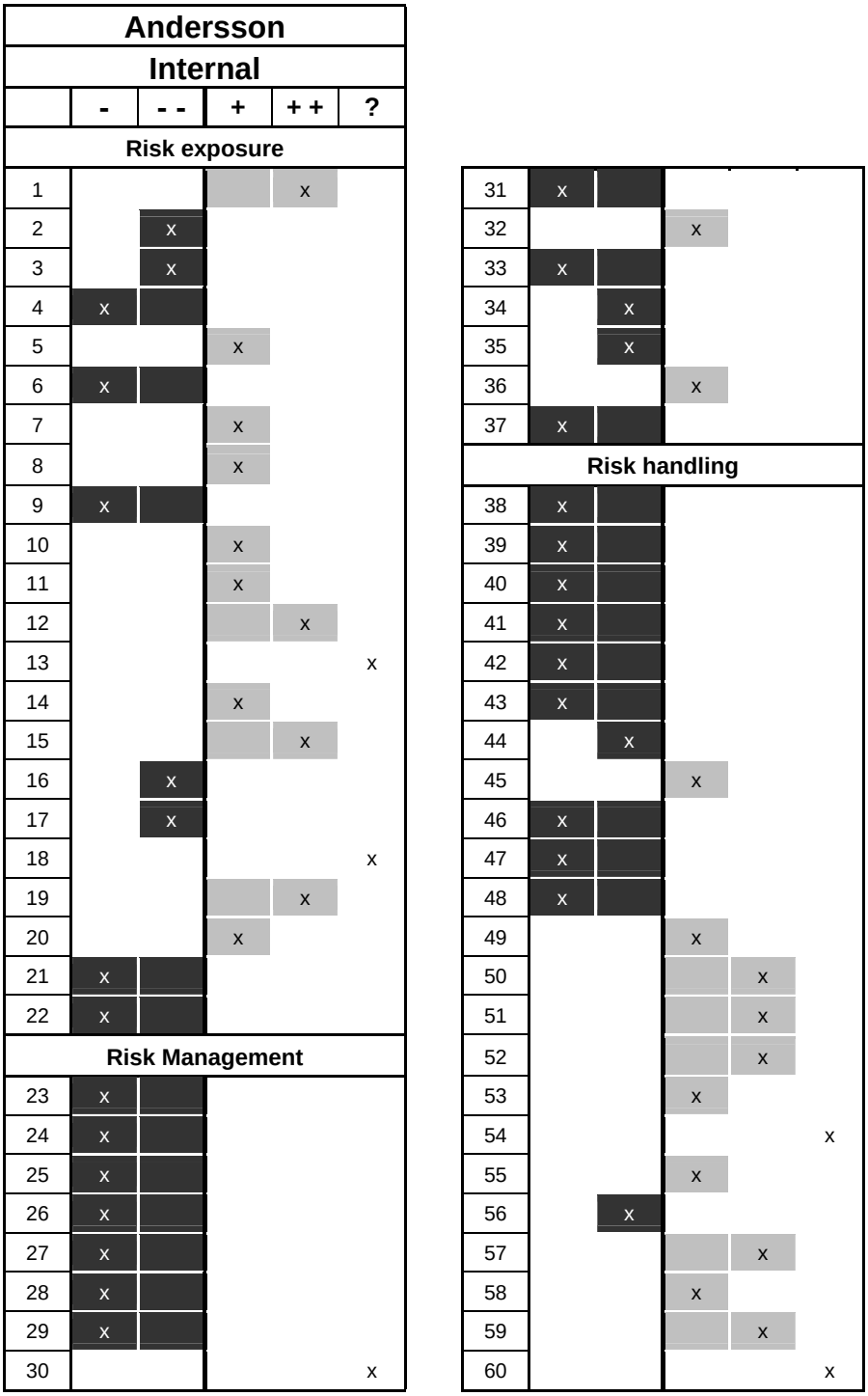
The change in the insurances at Andersson

The existing insurance solution expired at the turn of the year, the same year as the fire damage at Sun A/S. The premium for the property insurance and the business interruption policy was raised from 0.338 per mil to 5.09 per mil by the 1st of January 2001. There were many reasons for this, for example the overall changes within the insurance market and a general dislike among the insurance companies to include disruptions at the suppliers' facilities in the insurance contracts. Furthermore, the rather large fire damage at Sun A/S had an impact on the new insurance solution. The high premium comprised a certain pay-back for the indemnification of insurance that was paid out for the disruption at Sun A/S.

Another change in the newly signed insurance policy was the duration of the indemnity period of the insurance. Andersson wanted to prolong the indemnity period from 12 months to 18 months for two main reasons. First and foremost because Andersson realized that the effects caused by the fire damage at Sun A/S would proceed after the 12 months, which was the indemnity period of the existing insurance, and therefore Andersson wanted a higher degree of safety in case of a similar disruption. Secondly Andersson hoped that a longer indemnity period would entail the psychological effects on the opposite party, the insurance company, when the indemnification of insurance was to be paid out. It can be difficult to come to an agreement between the different parties after a disruption.

8.1.6 Summary

In appendix C1 is shown a summary of the Andersson company in terms of the checklist described in chapter seven. Below is the plotting of the results of this summary.


Andersson
Internal
-
- -
+
+ +
?
Risk exposure
1 x
2 x
3 x
4 x
5 x
6 x
7 x
8 x
9 x
10 x
11 x
12 x
13 x
14 x
15 x
16 x
17 x
18 x
19 x
20 x
21 x
22 x
Risk Management
23 x
24 x
25 x
26 x
27 x
28 x
29 x
30 x
31 x
32 x
33 x
34 x
35 x
36 x
37 x
Risk handling
38 x
39 x
40 x
41 x
42 x
43 x
44 x
45 x
46 x
47 x
48 x
49 x
50 x
51 x
52 x
53 x
54 x
55 x
56 x
57 x
58 x
59 x
60 x

Supply side

	- -	-	+	+ +	?
Risk exposure					
61	x				
62	x				
63	x				
64				x	
65				x	
66			x		
67			x		
68			x		
69		x			
70		x			
71	x				
72					x
73					x
74			x		
75		x			
76			x		
Risk management					
77	x				
78	x				
79	x				
80	x				
81					x
82	x				
83		x			
84		x			
Risk handling					
85	x				
86	x				
87	x				

Demand side

	- -	-	+	+ +	?
Risk exposure					
88			x		
89		x			
90		x			
91				x	
92	x				
93		x			
94			x		
95	x				
96			x		
97			x		
Risk Management					
98					x
99					x
100					x
101					x
102		x			
103		x			
104				x	
105			x		
Risk handling					
106					x
107					x
108					x

The total view

	- -	-	+	+ +	?
109			x		
110			x		
111	x				
112	x				
113		x			
114		x			
115		x			
116			x		
117	x				

8.2 Nilsson

8.2.1 The company

Nilsson is a public company originating from a 1600th century iron works in Bergsslagen, Sweden. One of the most important products manufactured at this time was railway wheels. Later on the company developed into a complete iron works which meant that they produced most parts in house. Nilsson had mines, blast furnaces and iron works of their own. Today however, the situation is changed and the company has outsourced many of their competences, leading to greater dependencies towards their suppliers. Nilsson's core competences lie within electrical steel sheet and special features in the cold rolled steel. They are the only manufacturers in Scandinavia, with a production of approximately 145,000 tons per year and 85 percent of the production in Sweden is exported, primarily to USA and countries within EU. In the year 2000 Nilsson controlled 17 percent of the EU market. Today Nilsson's products are found in roughly 20 countries around the world.

The overall steel business in Europe produced a total amount of 159 millions of tons during 2002, which was the same amount as the year before. The declining trade conditions during 2001 reached a low point towards the end of the year, but the situation gradually improved the following year. Naturally this also affected Nilsson's branch of business. The electric sheet branch has distinctive traits of oligopoly, which is characterized by a few, large actors who contributes to the majority of the total production on the market. The steel branch is a traditional line of business in Sweden.

During the year 2002 Nilsson had about 260 employees and a turnover at roughly 800 MSEK. Until the beginning of the 1990's the company was entirely Swedish owned, though the proprietor varied over the years. During the years 1986 to 1991 the Swedish company, shown in figure 8.1, was the sole owner of Nilsson, which was at that time an affiliated company. Today however, the company is owned by Lion Ltd which in turn is a joint venture between a British company and the Swedish company which was the former sole owner of Nilsson.

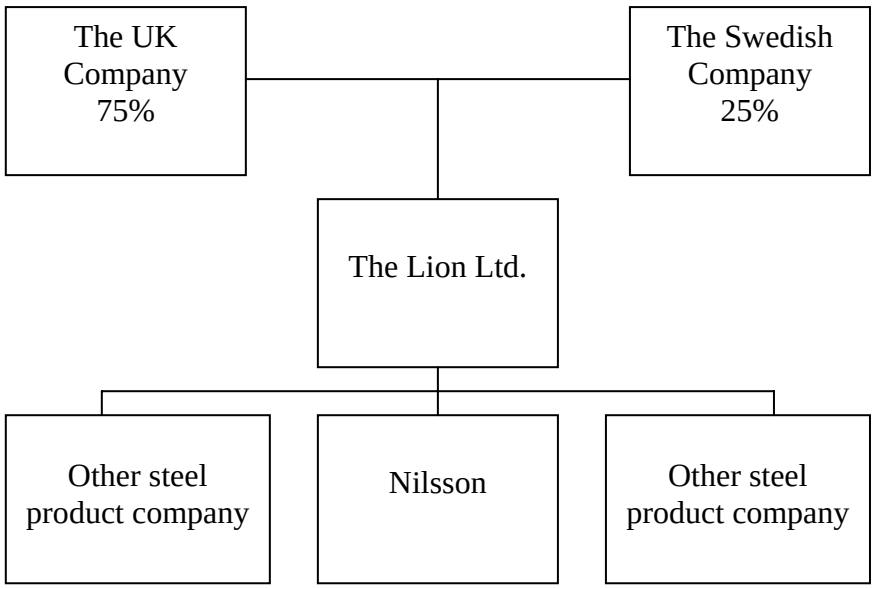


Figure 8.1 Illustration of the owner structure of Nilsson

The production

Nilsson is manufacturing cold rolled silicon alloyed electrical steel used to build electrical machines and apparatuses, like motors. Electrical steels play a vital role in the generation, transmission, distribution and use of electrical power and are one of the most important magnetic materials produced today. Given the specific nature of the products the average lead time is rather long. Nilsson's goods have a general lead time of approximately one year. In order to start the production Nilsson is dependent on the input of hot coils. Further on the process mainly relies on the in-house machinery and the constant flow of hydrogen gas. All this and the far reaching planning horizon affect the working procedures.

Supply and demand side

When producing electrical steel sheet Nilsson is totally dependent on a constant access of hydrogen gas as a cooling instrument in the rolling process. The gas is almost exclusively provided by The Cooling Company. Since the production continuously requires large quantities of gas, the gas company has installed a hydrogen gas station right next to Nilsson's production facility. The gas is delivered according to the JIT concept to the production. The liquid hydrogen is transported through pipes into a storage station. The liquid hydrogen is then transformed into gas to be used within the production. The station is a small building situated inside the production site at Nilsson. The building is owned by Nilsson, but the content of the storage station is owned by The Cooling Company.

Liquid petroleum gas, LPG, a raw material used in the production process is stored in two tanks outside the main building. It is delivered by railway and an outside contractor is responsible for both distributing and unloading the LPG.

Throughout the production of sheets, it is essential to have a low electrical energy loss during the magnetization process, since the price of the electrical steel sheet is related to the energy loss. Lower losses mean higher prices. The hot coils used in the process originate from three main suppliers, located in Sweden, Germany and the UK, and is transported to Nilsson by railway and trucks.

The major customer group is producers of motors and generators, but manufacturers of fluorescent tube reactors are also important purchasers. As a result of the specific features in Nilsson's electrical steel their market share is relatively stable. This gives the customers few options to change supplier. Consequently the market is quite solid with a well known combination of customers and suppliers.

The logistics

The daily planning of the production is founded on customer orders and prognoses provided by the clients and established customers who base their judgements of needs on previous experiences. This means that the actual mixture of products and customers can differ significantly from the budget set in advance, while the total capacity is unchanged.

Nilsson has both an inventory of finished goods situated near the production site in Sweden and consignment stock in the UK. The latter was installed in order to meet the requirements of JIT from one important customer. The average quantity of this storage was set at 2500 tons.

8.2.2 The Risk Management at Nilsson before the disruption

The traditional view regarding risk management at Nilsson has been to handle it within the company. Before the disruption the company had the opinion that the situation was under control and no external help was acquired, even though there had never been made any substantial risk analyses concerning the production facilities. According to the management at the company minor incidents were a part of the daily work and this was nothing worth paying attention to. Throughout the recent years Nilsson has experienced some machinery damage, resulting in interruptions in the production flow. Despite these disturbances there were no plans made

regarding how to react in case of a disruption and the past events had had low affect on the overall awareness of the preventive work with risks.

Even though no formulized risk management existed, a worst case scenario however, was imagined by the company. This was stressed out to be an explosion in one of the two liquefied petroleum gas, LPG, tanks situated outside the main building. The expected repercussion was a major demolition of the production site. The probability of this event however, is extremely low and therefore Nilsson has no specific recovery procedures for it.

8.2.3 The insurances at Nilsson before the disruption

Due to the soft insurance market which characterized the 1990s, Nilsson had signed a very favourable insurance solution, which covered the period from 1996 to the end of 2001. This solution had a low premium and provided a substantial insurance coverage.

The business interruption policy had an insured contribution margin at 150 MSEK and was defined according to Litt C, see appendix B. The indemnity period for the existing insurance solution was 12 months. The combined deductible at 0.5 MSEK was the same for both the business interruption policy and the property insurance. Moreover, there existed no sub-limit, i.e. the sum insured in the business interruption policy was fully valid for property damage occurring at a customer or supplier.

The total property value at Nilsson including buildings, machineries, goods etc. was estimated at 2.355 MSEK.

8.2.4 The disruption

On the 5th of April in 2001 Nilsson had a severe accident in form of a hydrogen gas explosion. The Cooling Company was going to do a minor repair in the pipes inside the storage building on Nilsson's property. The work was going to be performed by two external plumbers. The two workers started to dismantle a pipe which, in contrary with the given information, unfortunately was loaded with hydrogen gas. This caused a major explosion with severe consequences.

8.2.5 The consequences of the disruption

The direct results of the explosion were extensive damage on the surrounding buildings. The total property damage was estimated to 1 MSEK. The explosion destroyed the Cooling Company's delivery system of hydrogen gas to Nilsson. The explosion in combination with the destroyed

property led to an immediate total stoppage in Nilsson's production. This total stop lasted one month.

Furthermore, in the long run Nilsson lost market shares as a consequence of their delivery problems related to the production stoppage. During the disruption period the company's market share decreased from 17 to 9 percent. At the end of the year, approximately eight months after the accident, Nilsson's market share had only recovered to 12 percent. According to statistics of the market Nilsson's average share should have been fully 14 percent for the same period. However, it is difficult to estimate the total value of the lost market shares caused by the disruption, since there at the same time was a decline in the trade conditions.

The Risk Management at Nilsson during and after the disruption

Since there existed no written continuity plan describing how to act, Nilsson had to improvise many of the measures taken after the disruption. One of the first things the company dealt with was to place the different customers in order of precedence and there after treat them according to rang. Clients with substantial order quantities who required JIT deliveries were prioritized and Nilsson put a lot of effort into fulfilling their demands in order to minimize the damage.

To be able to serve their customers, Nilsson obtained a temporary permission allowing them to utilize parts of the consignment stock situated in the UK. This led to an occasional decrease in this stock from 2500 to 1800 tons of goods during April to June. Even though the original volume was restored in August the important customer in the UK still chose to turn to another supplier since they considered Nilsson to have insufficient delivery security.

During the period April to June, Nilsson also used the inventory of finished goods situated near the production site in Sweden, to partly cover the production loss. As soon as the new hydrogen gas station was functioning the company reinstalled the level of inventory back to normal in order to guarantee their important clients JIT deliveries. This was done at a time when all produced goods could be delivered. Nilsson chose to prioritize the JIT function to their existing customers instead of taking orders from new clients. Unfortunately the demand decreased during the end of the year leaving the company with idle capacity.

After one month of complete stoppage, Nilsson succeeded in establishing a temporary hydrogen gas station with gas tubes delivered by trucks from the Cooling Company and other hydrogen gas companies. This improvisation and temporary supply made it possible to start parts of the production again.

Due to the fact that there existed only one way to provide the production with hydrogen gas, the only possibility was to use trucks as a mean of transport. The supplied quantity was thereby strongly limited, considering that it requires enormous amounts of hydrogen gas to be able to produce at full speed, and that it was impossible to obtain these volumes at the temporary gas station. During the second month the production gradually increased, but nevertheless it lasted roughly two months until the production was back at normal capacity and a new gas station was built.

After the disruption Nilsson somewhat realized the importance of having risk management and therefore they contacted Marsh in order to increase their knowledge.

The insurance coverage

The initial payments from the insurance company were based on an average of six capricious customers according to the budgets from Nilsson. This leads to a misguiding interpretation of the circumstances because the actual mixture of products and customers often differ significantly from the budget set in advance. Therefore Nilsson considered that the insurance company in many ways had made incorrect conclusions regarding the refunds to Nilsson.

In order to cover the loss of market shares, a shrinkage from the average 14 to 12 percent, Nilsson claimed a refund at approximately 8.3 MSEK, which covered a decrease in the production volume corresponding to 8,800 tons. The total loss in the production volume was 19,700 tons. However, the company could only seek compensation for those customers who unequivocal stated that the reason for choosing another supplier was the low safety of delivery at Nilsson following the disruption. The remaining 10,900 tons could not be tied directly to the disruption and could therefore not easily be compensated. As mentioned earlier it is difficult to estimate the total value of the lost market shares since there at the same time was a decline in the trade conditions.

The explosion was classified as a fire according to the insurance wording and it was thereby possible to claim compensation for the property damage. Concerning the inventory of finished goods Nilsson claimed roughly 0.75 MSEK in order to cover the reinstalling of the inventory instead of taking orders from new clients. According to the company this measure was made to minimize the damage of the disruption towards the existing customers and it should therefore be regarded as a pure act of protection in order to guarantee JIT deliveries.

The change in the insurances at Nilsson

The previous insurance solution lasted from 1996 to the end of 2001. At the time of renewal the existing insurance company chose to terminate the cooperation with Nilsson. This was the result of a restructure of the insurance company which lead to a decentralization. Hence each part of the insurance company became smaller and the new departments regarded Nilsson's risks to extensive to bear. Therefore Nilsson had to take out a new insurance at another insurance company.

Due to the changes in the insurance market, the conditions regarding the new insurance solution were significantly more demanding. For example the premiums increased while the coverage shrunk. Moreover the possibility to take out a new insurance including disruptions at the suppliers required detailed surveys highlighting the potential risks and additionally higher premiums. In order to widen the protection given by the insurances the insurance companies demanded more information concerning both the suppliers and the customers.

Nilsson contacted Marsh AB to help them make a detailed survey which would form the basic data in finding a suitable insurance solution. As before the total property value at Nilsson including buildings, machineries, goods etc. was estimated at 2.355 MSEK. Moreover the business interruption policy was set at 163 MSEK. Marsh found the estimated maximum loss, EML, to be 767 MSEK. The EML is for single fires only which have a certain probability of occurring and exclude catastrophic occurrences such as explosions, earthquakes, tidal waves and falling aircraft. The EML at Nilsson was stated to be a fire in the oil well leading to a demolition of the machinery of the cold rolling mill with a recovery time of one year.

The property insurance covers fire, burglary, water damages and all-risk insurance including machinery breakdown. It is a floating insurance concerning buildings, machinery and goods within the facility. The deductible amounts to 0.5 MSEK and five days qualifying period after each disruption. The new sub-limit was subscribed to 100 MSEK of suppliers' extensions, interruption in supply chain. In case of leasing any property included in the insurance; damages are covered in the agreement. In addition, all buildings are full value insured.

The business interruption policy also covers fire, burglary, water damages and all-risk insurance including machinery breakdown. The insured contribution margin is 150 MSEK and defined according to the general definition. The indemnity period lasts 12 months and the deductible common with the property insurance amounts to 1 MSEK. Disruptions at

suppliers or customers contracted with Nilsson are included as well as interruptions caused by a failure in the electricity supply.

The plant is estimated to have small risk of fire due to the construction, small amounts of fire load and a good house keeping. Therefore it is unnecessary for Nilsson to sprinkle the production site. Nevertheless in case of a fire the consequences might be devastating since Nilsson only has a manual evacuation alarm.

8.2.6 Summary

In appendix C2 is shown a summary of the Nilsson company in terms of the checklist described in chapter seven. Below is the plotting of the results of this summary.

Nilsson Internal					
	-	- -	+	+ +	?
Risk exposure					
1	x				
2		x			
3		x			
4		x			
5			x		
6		x			
7			x		
8			x		
9			x		
10					x
11			x		
12	x				
13		x			
14		x			
15					x
16			x		
17			x		
18			x		
19				x	
20		x			
21			x		
22		x			
Risk Management					
23	x				
24	x				
25	x				
26	x				
27		x			
28	x				
29	x				
30	x				
31	x				
32					x
33		x			
34		x			
35		x			
36					x
37			x		
Risk handling					
38	x				
39		x			
40		x			
41	x				
42	x				
43	x				
44		x			
45			x		
46	x				
47	x				
48	x				
49				x	
50				x	
51				x	
52				x	
53			x		
54					x
55			x		
56		x			
57				x	
58			x		
59				x	
60					x

Supply side

	- -	-	+	+ +	?
Risk exposure					
61			x		
62	x				
63	x				
64				x	
65				x	
66		x			
67		x			
68			x		
69		x			
70		x			
71					x
72		x			
73		x			
74	x				
75			x		
76		x			
Risk Management					
77	x				
78	x				
79	x				
80	x				
81					x
82	x				
83	x				
84	x				
Risk handling					
85					x
86					x
87					x

Demand side

	- -	-	+	+ +	?
Risk exposure					
88			x		
89			x		
90		x			
91			x		
92				x	
93			x		
94		x			
95		x			
96			x		
97			x		
Risk Management					
98					x
99					x
100					x
101					x
102		x			
103		x			
104		x			
105		x			
Risk handling					
106					x
107					x
108					x

The total view

	- -	-	+	+ +	?
109		x			
110		x			
111		x			
112	x				
113		x			
114		x			
115		x			
116			x		
117	x				

8.3 Olsson

8.3.1 The company

Olsson is a Danish office furniture manufacturing and selling company, deriving from a merger in 2002 between Olsson Furniture A/S and Chair A/S. Olsson Furniture A/S was established in the late 1930's and was presented on the stock market in 1972. Initially they produced mostly kitchen tables and book shelves on order, but further on the company developed and offered complete selections of office furniture. Through the years Olsson Furniture A/S has cooperated with a number of leading Danish designers and has brought many furniture classics on the Danish market. Chair A/S was set up in the mid 1940's and originally made headlights for agricultural machines and jacks. Later on they started to produce school furniture and in the late 1960's Chair A/S found their niche within office furniture and especially chairs. These chairs were characterized by good ergonomics which led to the development of a strong trade mark.

At the time of the merger both Olsson Furniture A/S and Chair A/S were companies within the Marble company which is one of the major office furniture producers in Europe. The Stone company is the owner of the Marble company and the two sister concerns the Flint company, which is also a furniture company, and the Granite company, see figure 8.2. In the past the Granite company has been the owner of Chair A/S. Since the merger Olsson has continued to market office chairs under the name Chair A/S because it is such a solid brand in the line of business.

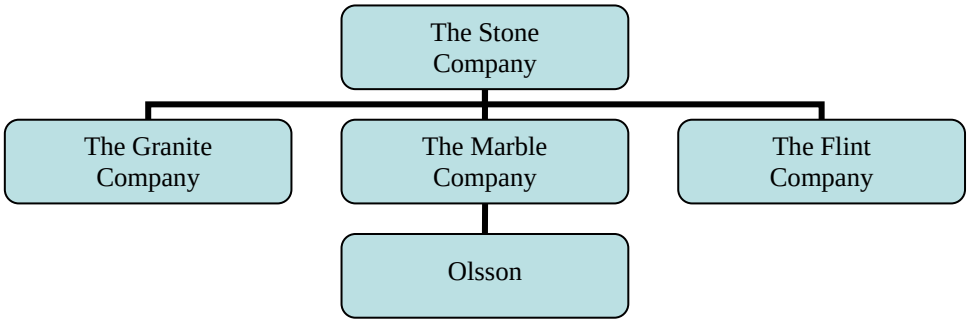


Figure 8.2 Illustration of the owner structure at Olsson

In 2003 Olsson had approximately 120 employees located in the four main offices in Denmark. Their total annual turnover in 2002 was approximately 170 MDKK, but the next year the amount is estimated to decrease somewhat. This is the consequence of a stagnant office furniture market

which has characterized the line of business the last decade. Another important event which has negatively affected the market conditions is the terror attack on 11th of September 2001. As a result of this event there was an overall decrease in demand.

Europe is by far Olsson's largest market, but a minor part is sold on the US market and in the past the company has generally grown in an organic way. Olsson has three main competitors in Denmark, among them the Flint company which has a competitive advantage in their specific design. Because of the design the Flint company has managed to maintain good results in despite of the stagnant market. The two other competitors and Olsson are planning a merger which would strengthen their position on the office furniture market and enable higher price levels. The most significant competitive advantage for Olsson is the high quality of the products and a wide selection of products. The company also benefits from the well known trade mark of Chair A/S. Both the quality and the good reputation enable Olsson to maintain high price levels.

The production

Olsson does not produce any parts to the complete furniture, but put together components, all delivered from different suppliers. All production is made to order. As a mean for decreasing the lead time the company has rationalized parts of the flow to a stream line production. The average lead time is two weeks, but if the orders are customer specific it varies from two to six weeks. The specific nature of the furniture makes it difficult to find alternatives to the existing flow. Earlier Olsson had some production of their own, but the management decided to outsource these functions and focus on development and assembling of products. All activities and storages are included in the same building.

As part of the constant product evolvement Olsson has a development division which for example designs moulds used in Pebble's production. They design prototypes which are later refined by the supplier in question. The development division is separated from the other production site.

Olsson's design philosophy is to make flexible solutions with light materials to be able to move the furniture according to necessity. The models are characterized by easy and functional shapes which ties the different furniture series together. To keep the products light Olsson extensively apply slim dimensions in the designs and often use aluminium as a material.

Supply and demand side

Since Olsson has no production in-house they are dependent on their suppliers. The number of suppliers is numerous and rarely changes. Most of

them have large production capacity and delivers to various branches of industry. The majority of the suppliers deliver specific parts according to JIT which increase Olsson's vulnerability towards each partner. The relationship between Olsson and their business partners is often close and long term. Both parties participate in the developing work, which for instance regards the development of moulds. Depending on the complexity of the product the work lasts from one month up to a year.

One of Olsson's most important suppliers is Pebbles which was established in 1994. They produce advanced moulded plastic and metallic parts which are delivered to furniture companies and other Danish industries. Pebbles pressure moulds parts in aluminium and magnesium alloys, and as mentioned above Olsson apply many aluminium details in their furniture. Olsson owns the moulds and tools used in the production of their parts at Pebbles.

The company has many important customers which mainly consist of wholesalers that normally order large quantities. Olsson is often involved in large furnishing projects. Sometimes these orders require furniture which is not included in Olsson's selection. In those cases the company combine their own products with purchased furniture from other companies. The wholesalers in turn sell and advertise Olsson's products mostly to furniture chain stores. Some wholesalers are dependent on JIT deliveries and most require Olsson meet the delivery dates set in advance. Olsson is not 100 per cent dependent on one single customer, but due to the large volumes ordered the loss of a customer would affect the company. Even though the competition is tough and the relation to customers is not very close, the average customer tends to keep Olsson as a supplier for a rather long period.

The logistics

Since Olsson is responsible for their products all the way to customer, they are dependent on a well functioning logistic system both from a supply and a demand point of view. On the supply side Olsson has their own transportation system which collects the specific parts. The reason for this is the need for a rapid and reliable transportation in order to decrease the total lead time. As a mean for simplifying the logistics flow Olsson has decided to decrease the number of suppliers and thereby limit the purchases.

The transportation to customers is also carried out by the company itself, much due to the substantial risk of damage when handling finished furniture. Hired carriers are only responsible for goods which are correctly packed, which are very difficult to do, and these drivers have a tendency to drive more careless than Olsson's own drivers. Therefore Olsson chooses to

handle the deliveries themselves. However, all export is carried out by external transportation companies.

Olsson does not keep any inventory of finished goods since all production is made to order and they control their own transporting system. Nevertheless the company has a component storage to last a few weeks of production. The time varies depending on the specific customer orders.

In the past Olsson had problems with meeting the delivery dates, but the implementation of stream line production made it possible for the company to decrease the overall lead time. Hence, these problems are no longer existence.

8.3.2 The Risk Management at Olsson before the disruption

Olsson has no formulated risk policy and the general knowledge concerning risk management is fairly low. However, the company has identified fire as one of the major risks and sees this as the main objective for risk management. Therefore guidelines for responsive work, in case of a fire, have been developed. The employees have practised evacuation and procedures regarding notification of concerned business partners are stated.

The company has a person in charge for the maintenance of all sites, but the primary work has to do with fire safety. It is recognized that a fire by far is the most threatening risk for Olsson. Not just because a fire easily can break out due to all exposed wood materials, but also because fires have a tendency of spreading and often cause great damages.

Throughout the facilities Olsson has installed sprinklers. This is not very common in Denmark since there is a law which allows buildings up to 2000 m^2 to be unsprinkled. The Marble company has a policy that all their companies must undertake an annual fire inspection carried out by an unbiased part. This leads to an evaluation of the current site status and suggestions to improvements. Furthermore the inspection leads to a discount in the insurance premiums. Olsson continuously monitors that these suggestions are implemented.

8.3.3 The insurances at Olsson before the disruption

The Marble company together with the Flint company, see figure 8.2, applies a world wide overall insurance solution called a master policy. The solution is common for all subsidiaries, like Olsson, also including not fully owned companies where the Marble company holds the majority of shares. The objective of the master policy is to secure the individual operating company as well as the group of companies as a whole against major losses

and to minimize the total insurance costs. This programme consists of locally issued material damage insurances for buildings and contents as well as business interruption insurance for each operating company. The master policy is therefore integrated with local policies. The overall insurance describes the agreed minimum insurance cover in place for the Marble company, regardless of the actual wordings of the local policies. However, it may in some cases very well provide a better coverage than the master policy. This is because the local policies are written in order to match terms and conditions generally agreed on at the local insurance market, as well as complying with relevant national insurance legislation. In the case of Olsson, however, there is no need for a local insurance since the master policy is signed in Denmark.

The insurance programmes have been arranged for a three-year period expiring on 30 June 2004, but are subject to annual renewal. Since the master policy is signed with a Danish insurance company all damage settlements for the Marble company must be approved in Denmark. The annual premium of the master plan for both the property insurance and the business interruption policy amounts to 1.3 MDKK. The sub-limit for loss of property at unspecified location is 15 MDKK. The sub-limit for the business interruption policy is 125 MDKK for internal dependencies, 50 MDKK for suppliers and customers and 10 MDKK for unspecified suppliers and customers. It is rather unusual to get compensation for interruptions at unspecified suppliers and customers. The indemnity period for the business interruption policy is 18 months. The business interruption policy in the master plan is extended to include interdependencies of other companies within the Marble company as well as suppliers and customers. The sub-limit concerning losses due to an insured event at named suppliers and customers is 50 MDKK. The deductible for each and every loss is set to 50 000 DKK.

8.3.4 The disruption

On the 1st of March 2003 Pebbles had a disruption caused by a fire. The local fire brigade was notified and arrived when the production facility was in flames. Together with the firemen many of the employees struggled to save important equipment and helped to keep the fire under control when waiting for reinforcement. 12 of Pebbles employees were brought to the hospital to receive treatment for smoke poisoning. The site of the fire was roped off by the police since they did not know if the smoke was poisonous and the media were warned not to inhale the smoke. The local authorities were aware of that the company used magnesium in the production, and this is extremely poisonous in case of fire.

8.3.5 The consequences of the disruption

During the fire at Pebbles only one of Olsson's moulds were totally destroyed, and it had to be remanufactured. Some other moulds were soot and smoke damaged and had to be cleaned very thoroughly to insure that no corrosion had affected the tools as a result from the fumes at the fire. Since the mould was not in use at the time of the fire, Olsson suffered no production stop.

The Risk Management at Olsson during and after the disruption

In order to clean the damage tools a specialized cleaning company was contacted. They tried to stop the corrosion from affecting the moulds, but their efforts were not sufficient. Therefore when this was discovered, employees at Pebbles had to carry out the work themselves to very high costs. Fortunately Olsson's tools, which at the current time were used in the production, were rapidly restored.

As soon as Olsson were notified of the fire they contacted Pebbles. Shortly after they got the information and understood the extent of the damage all involved customers were briefed about the situation. Since there was an extensive smoke development at Pebbles, Olsson also got in touch with media to reassure the public that the situation was under control.

The insurance coverage

Since the cleaning company did not succeed with their work, the total amount concerning the moulds increased significantly. In the end the cost for the new mould and the cleaning of the damaged moulds amounted to 130000 DKK. Olsson had to pay the deductible of 50 000 by them selves, but the rest was compensated by the insurance company.

The change in the insurances at Olsson

In June 2004 Olsson's current insurance will expire and they will be obliged to negotiate for a new insurance solution. Because of outsourcing of vital functions and a far reaching decrease in sales the overall conditions will be negatively affected. All this will probably lead to a premium increase and general deterioration in the insurance terms.

8.3.6 Summary

In appendix C3 is shown a summary of the Olsson company in terms of the checklist described in chapter seven. Below is the plotting of the results of this summary.

Olsson					
Internal					
	-	- -	+	+ +	?
Risk exposure					
1			x		
2			x		
3			x		
4		x			
5	x				
6		x			
7		x			
8	x				
9	x				
10			x		
11		x			
12		x			
13					x
14		x			
15				x	
16			x		
17		x			
18					x
19				x	
20		x			
21	x				
22	x				
Risk Management					
23		x			
24		x			
25			x		
26			x		
27		x			
28			x		
29		x			
30					x
31		x			
32				x	
33		x			
34		x			
35		x			
36				x	
37	x				
Risk handling					
38		x			
39		x			
40	x				
41		x			
42		x			
43				x	
44				x	
45		x			
46				x	
47		x			
48	x				
49				x	
50				x	
51					x
52					x
53					x
54					x
55				x	
56					x
57				x	
58					x
59					x
60					x

Supply side					
	- -	-	+	+ +	?
Risk exposure					
61		x			
62	x				
63	x				
64				x	
65				x	
66		x			
67		x			
68		x			
69			x		
70		x			
71		x			
72					x
73					x
74		x			
75		x			
76		x			
Risk Management					
77		x			
78		x			
79			x		
80		x			
81					x
82		x			
83	x				
84	x				
Risk handling					
85					x
86					x
87					x

Demand side					
	- -	-	+	+ +	?
Risk exposure					
88			x		
89			x		
90		x			
91			x		
92		x			
93		x			
94		x			
95		x			
96		x			
97		x			
Risk Management					
98					x
99					x
100					x
101					x
102		x			
103			x		
104			x		
105			x		
Risk handling					
106					x
107					x
108					x

The total view					
	- -	-	+	+ +	?
109			x		
110			x		
111		x			
112			x		
113		x			
114		x			
115		x			
116			x		
117		x			

8.4 Persson

8.4.1 The company

Persson Group is an international engineering industry which operates within two main field of activities; pumps and doors. The pump area was initiated in 1918 in Göteborg, and thereafter it has grown mainly through acquisitions. The line of business concerning doors was started in 1960 and has expanded through both internal and external growth. The doors and pumps have been included in the same industrial concern since 1982. The organization had a total of approximately 7,850 employees and a turnover of 3.9 MEURO in 2002. Persson Group consists of 110 sub companies of which 90 are located outside of Sweden. This company description will not concern Persson's pumps, but mainly Persson's doors which is the largest part of the organization.

The company has door manufacturing units in 11 countries, like for example Sweden, Denmark, Holland, China and the USA. Sales are made through distributors in some 30 countries in both Europe and Asia. As illustrated in diagram 8.1, most of Persson Group's customers derive from Europe. Western Europe contributes today with more clients than Eastern Europe, but the latter is considered as an area of growth. Another important area of growth is Asia with a focus on China, where Persson Group continues to expand.

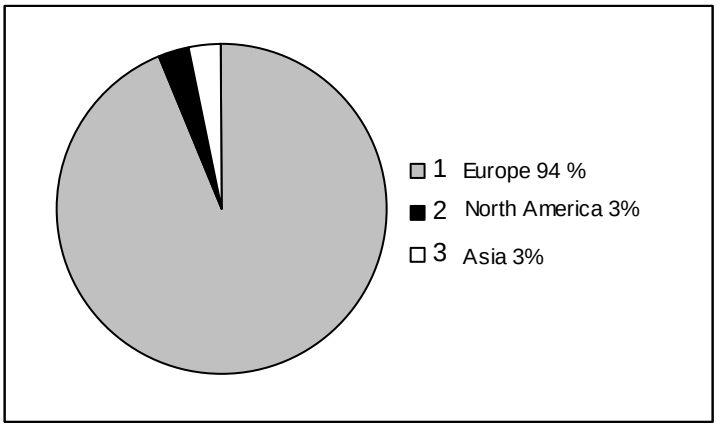


Diagram 8.1 Invoicing concerning doors divided into geographical markets

Persson's doors have activities within four main categories; industrial doors, service, garage doors and docking systems. The company has strong international market positions within all four areas. The invoicing 2002 divided into the categories, illustrated in diagram 8.2, clearly shows that

industrial doors compared to the other operations contributes most to the company.

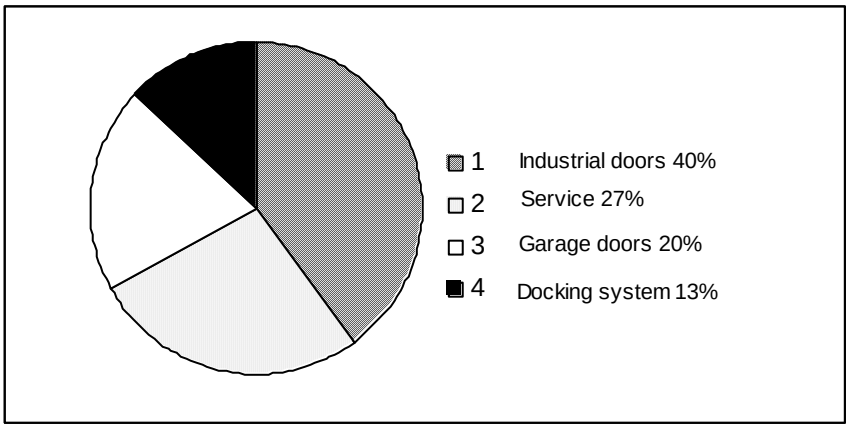


Diagram 8.2 Invoicing 2002 divided into operations

- **Industrial doors.** Persson Group is one of the world's leading manufacturers of industrial doors, and is significantly bigger than their main competitors in Germany and Denmark. The segment continues to grow through acquisitions and establishment on new markets.

- **Service operations.** The service operations which include repairs, maintenance and upgrading, are very extensive compared to other companies' services. The competitors are found mostly within other traditional door manufacturing organizations. The expansion in this segment is based on Persson's installed product base and also an increasingly advanced IT-support.

- **Docking system.** Persson Group is a distinct leader in Europe concerning docking systems. The main competitors are situated in Spain and Holland. To maintain the present growth, the company has a strategy to gradually increase their supply of complete system solutions.

- **Garage doors.** Persson Group occupies a split second position in Europe in this segment after a German company. The company is oriented towards higher price segments, but widens their distribution channels on both existing and new markets.

<u>The production</u>
Persson Group's largest and most important site is situated in Holland consisting of two plants and one leased warehouse, all producing and

assembling insulated industrial doors, fast acting doors and spare parts. The number of employees amounts to 265. Further on in the master thesis this site will be referred to as Persson Plant.

The doors are manufactured in the industrial door plant. The industrial doors consist of pre-painted panels, tracks, balancing systems and fittings. All parts except the latter are produced in-house, and 10% of the panels are painted externally. In case of a disruption in the panel line in the industrial door plant the replacement and start-up time amounts to 12 months. This is considered as a bottleneck in the production.

In the year of 2000 the panel production was developed to include a new type of panel. Today Persson Plant produce two types of panel, A and B. Type A, the old model, can also be produced at a location in Sweden, whereas type B, the new model, only can be made at the Persson Plant. For the moment there is only a slight overweight of type B in the production, but in the future it is estimated that at least 90% of the industrial doors are going to be produced with the type B panel. Beyond approximately 2,100 insulated industrial doors per year this plant also produces panels and other parts corresponding to roughly 700 doors. The additional items are sold internally as spare parts to other Persson companies. All doors are made to order, and the finished products are transported to the leased warehouse called the distribution centre.

In the fast acting door plant 150 doors per year are produced as well as various spare parts for industrial doors. The finished doors are transported to the distribution centre. This building also includes a two storey office used by a sales company within Persson Group.

The leased distribution centre is used for storage and shipment of finished goods.

Supply and demand side

The delivery times for raw material and components are two to eight weeks and the average stock available at Persson Plant is four weeks. Persson Plant has two main suppliers which deliver the steel that constitutes the base material in the panels. A set target for the Persson Group is that there should be at least two suppliers of everything in order to decrease the dependence. Persson Group strives for long term relationships with their suppliers, a mutual confidence is important. There exists one critical supplier; the Swedish company within the Persson Group, which delivers driving units and electrical control units. Another critical aspect is an internal part, which owns the tools and moulds used by most suppliers when producing the

components to Persson Plant. The replacement time for these tools can be up to three months.

The most important customers are building entrepreneurs, manufacturing and food industry and transport and distribution companies. The company has a large number of customers usually ordering small quantities, and from a business interruption point of view there are no critical customers.

The logistics

Since all industrial and fast acting doors are made to customer order there is no buffer storage. The finished products are stored in the distribution centre. Normally two days of production of panels are stored within the industrial door plant. Spare parts are stored in the fast acting doors/spare parts building for an average of one month's need.

The finished goods are delivered to end customer and solely transported by trucks, but the goods are sold to the internal holding companies. In turn the holding companies sell the doors to the sale companies within the Persson Group and finally the sale companies charge the external customers. All this leads to a high level of internal dependence. The lead time, from order to delivery, is six weeks.

8.4.2 The Risk Management at Persson Plant

Persson Group is a company that has come very far in the work with risk management, and has made a thorough survey on the Dutch plant. The intention is to conduct this kind of survey throughout the organization in order to increase the awareness of the existing risks. The purposes of the survey are to highlight various risks within the organization, give suggestions for improvements and produce underwriting material for the insurance companies. Often an external part is assigned to do this and depending on the needs posed by the company, the survey various in extent. Before, the different plants were responsible for their own risk management but as a result of these surveys there will be an internal risk management policy developed for the whole organization and local risk managers will be appointed.

The primary risks which are highlighted are the existence of hazardous materials in the production, the fire and explosion exposure and natural perils. The fact that the plant is situated in Holland implicates that the risk of flooding is large and never covered by the insurance. Furthermore in the distribution centre the vulnerability of goods is medium and there is a low risk of burglary. The greatest external exposure to the Persson Plant comes from the neighbour company, which use flammable materials in the

production. The distance between the two companies is at the closest 1.2 meters. In order to decrease the risk of fire spreading from the neighbour, Persson Plant will install sprinklers on the facade facing the company.

The fire protection in the production area consists of a fire wall and sprinklers which cover nearly all areas in the industrial door plant. In addition smoke detectors are installed throughout the industrial door plant. However, there exists no fire protection of this kind in the fast acting doors or the distribution centre.

Since Persson Plant is well aware of the importance of risk management, they have developed a thorough disaster recovery plan describing how to act in case of an accident. The plan has been prepared to facilitate the most rapid response to any major incident. It details the contact network of key personnel and their responsibilities, among with a detailed pre-disaster plan on how manufacturing may be resumed as quickly as possible given a certain incident. Every six months the plan is reviewed to insure that it is still valid. All affected parties like manufacturing director and production manager carries a copy of this plan with them at all times.

Due to the nature of production of doors at Persson Plant, a certain amount of capital equipment is involved in the process. The largest risk was regarded to be connected with the hazardous materials involved in the manufacturing. In order to reduce a possible fire spreading, a firewall has been constructed to separate the exposed area. However, it is not the actual fire which constitutes the most severe threat but the consequences of the production stop.

If the distribution area in the industrial door plant was destroyed there exist alternative options for loading within the production facilities. In the case of having to build a temporary production this would require an 18-24 week lead time.

An important part of the disaster recovery plan is to identify critical procedures in the production and critical suppliers. These should be reviewed every six months. Furthermore the need to contact customers is determined by a specific network.

8.4.3 The insurances at Persson Plant

Due to the fact that Persson Group is a huge concern operating in several countries the insurance program is divided into a master policy and specific local solution. Both insurances last from July 2003 to July 2004. The master is mutual for all parts of the organization world wide and its main purpose is

to cover all possible events which can occur. In addition to this insurance many countries have laws forcing the sub companies to sign local insurance programs. These laws may for instant include tax conditions.

The master policy

The master policy is signed in Sweden which means that all damage settlements are carried out in this country. The master is designed to cover differences in limits, DIL, and differences in conditions, DIC, between the local and overall insurance solution. The total annual premium for the business interruption policy is roughly 4.7 MSEK and the indemnity period is 24 months. The total annual premium for the property insurance is 0.9 MSEK. The difference between these premiums can be motivated by that most sub companies sign local property insurances and in those cases the total property value must be included. The sub-limit is set to 1,000 MSEK. Furthermore there is an additional sub-limit of 250 MSEK for internal dependencies. Disruptions at Persson's customers or suppliers are covered to an amount of 20 MSEK in the master policy.

The local insurance solution at Persson Plant

The local insurance solution covers all property but only a minor part of the business interruption policy. The total property value insured is 3.1 MSEK and the deductible is 0.25 MSEK and 48 hours qualifying period per damage. The premium for the property insurance is 0.82 per mil of the property value. The deductible of the business interruption policy amounts to a maximum of 0.5 MSEK per damage and the annual premium is 0.43 per mil of the turnover budget. The local sub-limit is set to 1,000 MSEK but it does not cover interruptions at customers or suppliers.

The local estimated maximum loss, EML, in the industrial door plant amounts to 20 MSEK for the property and 96 MSEK for the business interruption. This gives a total of 116 MSEK. The property EML is based on a fire spreading throughout the facility. Due to the exposed steel construction of the frame, the buildings are expected to collapse relatively fast leading to almost a complete loss. Such property damage will take 12 months to reinstate the buildings and machinery and to achieve full production. The EML for the business interruption is based on the above described scenario. For the first 12 months the loss of contribution margin is estimated to 85 percent of the total, leading to a loss of 60 MSEK. The panels of type A can be produced to some extent in Sweden, whereas the type B have no alternative production possibility. After these 12 months the Persson Plant has estimated that the sales will gradually increase, giving a loss of contribution margin of 50 percent. The total loss for this period amounts to 36 MSEK.

8.4.4 The fictitious disruption

In August 2003 one of the facilities in Persson Plant caught fire and was partly burnt down. The affected building was producing industrial doors and approximately 10 per cent of the production area was damaged by the fire. Because of an installed fire wall the most vital parts of the production suffered no damage.

8.4.5 The consequences of the fictitious disruption

The existence of a detailed disaster recovery plan facilitated the handling of the disruption. The first immediate measure was to evacuate all personnel within the facility and also the nearby sites. Since the employees at Persson Plant had practiced the evacuation several times, there were no complications and no one was injured. The personnel were assembled in a nearby location while waiting for the fire-extinction and the disappearance of the toxic smog.

The section of the building which had caught fire was totally destroyed, but the fire did not spread to the rest of the facility due to an installed fire wall. Fortunately no vital parts of the production were burnt down. The condition of the rest of the site was in such a good state that production continued within 24 hours and involving all personnel.

At an early stage the Managing Director of Persson Plant informed the media, the employees and other affected parties upstream and downstream in the supply chain the course of action and the measures taken by the management. He also ensured that Persson Plant was well prepared for this kind of event and that the production could be resumed the following day, leading to no delay of the goods. This frankness towards the media had a reassuring affect which led to a positive image of the company and less speculations from customers and competitors. The management used the media to convince the market that no substantial damage had occurred even though the fire seemed rather severe.

<u>The fictive insurance coverage</u>

The well performed work following the predetermined disaster recovery plan led to no decrease in sales and therefore no need to use the business interruption policy.

One of the most important findings in the survey made by the external part was that Persson Plant had underestimated the value of the business interruption part by one third of the actual value. This led to an increased premium but also a much more accurate financial coverage in case of damage. The local property insurance covered the reinstalment of the

building and the machineries. The only expense Persson Plant had to make was the deductible of 0.25 MSEK.

8.4.6 Summary

In appendix C4 is shown a summary of the Persson company in terms of the checklist described in chapter seven. Below is the plotting of the results of this summary.

Persson					
Internal					
	-	- -	+	+ +	?
Risk exposure					
1			x		
2			x		
3			x		
4	x				
5	x				
6		x			
7	x				
8		x			
9			x		
10			x		
11	x				
12	x				
13			x		
14	x				
15			x		
16			x		
17		x			
18			x		
19				x	
20		x			
21			x		
22		x			
Risk Management					
23			x		
24			x		
25			x		
26			x		
27			x		
28			x		
29			x		
30			x		

31		x			
32			x		
33		x			
34		x			
35			x		
36			x		
37					x
Risk handling					
38			x		
39			x		
40			x		
41			x		
42			x		
43			x		
44				x	
45					x
46			x		
47			x		
48			x		
49				x	
50	x				
51	x				
52				x	
53			x		
54					x
55				x	
56				x	
57				x	
58			x		
59			x		
60			x		

Supply side

	- -	-	+	+ +	?
Risk exposure					
61			x		
62		x			
63		x			
64				x	
65				x	
66	x				
67	x				
68	x				
69					x
70					x
71					x
72		x			
73		x			
74	x				
75		x			
76			x		
Risk Management					
77			x		
78			x		
79			x		
80			x		
81					x
82			x		
83		x			
84		x			
Risk handling					
85			x		
86			x		
87			x		

Demand side

	- -	-	+	+ +	?
Risk exposure					
88				x	
89			x		
90			x		
91				x	
92		x			
93	x				
94			x		
95		x			
96		x			
97		x			
Risk Management					
98					x
99					x
100					x
101					x
102		x			
103			x		
104			x		
105			x		
Risk handling					
106					x
107					x
108					x

The total view

	- -	-	+	+ +	?
109			x		
110		x			
111			x		
112			x		
113		x			
114		x			
115		x			
116				x	
117			x		

9 Analysis

Each case company is analysed in this chapter based on theory, empirical findings and the check list.

9.1 Andersson

9.1.1 Internal

Risk exposure

The overall risk exposure within Andersson is scattered across the ranking spectra. The sensitivity regarding the production is especially high when it comes to the flexibility and alternatives to the existing flow. The reason might be the high level of outsourcing of core parts of the products. Since Andersson has no production of their own the dependence towards suppliers is substantial, which increases the risk exposure.

Andersson has chosen to subcontract all parts of the production to different suppliers, and only allow each supplier to produce small parts of a whole set. This leads to a decreased risk regarding design theft, but it increases the vulnerability and thereby risks concerning disturbances and flexibility in the flow. Each delivering company can become a bottleneck. Fortunately Andersson has established good relationships with the main part of the suppliers, which reduces the sensitivity somewhat.

One positive aspect regarding the internal risk exposure is the low degree of complexity in Andersson's products, but it is dependent on a skilled working staff. Furthermore the existence and location of various storages result in a lower time-dependence. The low degree of JIT in the flow and the prognoses based production lead to a decrease in the risk profile. The complicated transportation procedures, however, have negative influences on the time-dependence and the overall flexibility of the supply chain.

Andersson has substantial risks concerning both criminal acts and market conditions. The existence of shrinkage in the delivery process and constant threat of design theft contribute to two weaknesses within the company. The current competitive situation on the important German market and the delicate initial phase when entering the UK market increases the need for correct deliveries on time. The stable political situation in Denmark does not contribute to any direct risks for Danish companies.

Risk Management

The general result of risk management showed great weaknesses. It is quite clear that Andersson has no deliberate work within this area. The non-existence of both risk management and supply chain risk management make

the company vulnerable for disturbances. Therefore the consequences of the disruption at the supplier, Sun A/S, caused far more damage than necessary. If Andersson had been better prepared, the impacts of the event had not taken such large proportions.

- **Business continuity management, BCM**
  The existence of a business continuity plan would have made the continuous work with risks easier and more efficient. One vital part when developing a plan is to have a clear view of the risk profile. Based on this knowledge the guidelines for emergency response and recovery will be facilitated.

  In the case of Andersson all actions following the disruption had to be improvised and therefore probably not optimal regarding time and cost. If Andersson had been more aware of their current vulnerability towards the three suppliers, they could have used the existing resources in a more structured way. The management's fear of design theft probably prevented Andersson from considering all production alternatives equally. Since the company did not want to increase the level of dependence towards Water A/S the only remaining option was Wind A/S. An evaluation made in advance might have elucidated the advantages of choosing the more extensive production facilities at Water A/S. We believe that these advantages would have outweighed the disadvantages.

  When Andersson finally found replacement production, they chose to produce as much as possible instead of taking into considerations the completing of full furniture sets. This led to a further delay in the deliveries since the company only distributed whole sets. A prepared plan might have clarified which parts to produce in which order.

  The fact that Andersson could not give their customers any specific time for resumed deliveries made it possible for the competitors to take market shares on behalf of Andersson. Furthermore Andersson did not prioritize any market or specific customer. It might have been wise to focus more on the UK market considering the sensitive entering phase and the high profit margin. A business continuity plan had probably indicated these factors and it may have changed the course of action.

- **Supply chain risk management, SCRM**
  The awareness of SCRM was also a neglected part of risk management. We believe that the statements which have been positively ranked, like the business involvement in the long term planning and the degree of cooperation among all business partners derive from other viewpoints

rather than planned risk management. The good relation towards Wind A/S made it possible for Andersson to redirect some of the production to them quite rapidly. Still it might have been better to turn to Water A/S instead.

The majority of the activities involved with the disruption probably could have been better performed if Andersson had developed the procedures regarding SCRM.

Despite of the need for improvements Andersson, to our knowledge, made no major efforts to change the attitude concerning risk management after the disruption.

Risk handling

Since Andersson has neither a clear picture over the risk exposure nor sufficient risk management, these factors strongly affect the risk handling. So far insurances constitute the only method for protection.

- **Insurance coverage**

  Andersson has an overall good insurance solution regarding both business interruption policy and property insurance. It includes a substantial coverage to a low premium, in other words a very cost-efficient solution. The only weakness in the insurance at the time of the disruption was the indemnity period which lasted only 12 months. This turned out to be too short to cover the losses due to the business interruption at Sun A/S. As a consequence the indemnity period was extended to 18 month at the time of the insurance renewal.

  Our opinion is that the insurance solution at Andersson softened the financial consequences of the disruption very well within its limits. However, the insurance coverage can rarely make up for a neglected risk management. Money does not have the ability to regain, in this case, lost market shares and decreased credibility.

- **Other solutions**

Unfortunately Andersson had few other strategies for handling risks besides signing insurances. The reason might be aspects like lack of knowledge, misdirected management actions or overconfidence in the power of insurances.

9.1.2 Supply side

Risk exposure

The check list clearly shows Andersson's high degree of dependence towards the suppliers. The decision to limit the number of suppliers and the fact that there exists few alternatives, leads to an increased risk exposure. Moreover, since the production is partly based on skilled employees, the conversion to another partner is both time and cost demanding. It is our belief that the lack of competition on the supply side may impede the suppliers will to evolve and improve.

The suppliers are reliable concerning both quality and quantity, which might be one reason why Andersson has sought no new cooperation partners. A risk with the secure formation is that it may obstruct the company from evaluating and improving the current relations. It can also reduce the incentives to seek other possible suppliers on the market.

In terms of risk exposure the level of time-dependence, both including JIT and production made to order, is fairly low. The relationship-dependence on the other hand is significant for both Sun A/S and Wind A/S, because they deliver almost all their production to Andersson.

Risk Management

Since Sun A/S is the most important supplier to Andersson, this section concerns their aspects. There is little presence of neither risk management nor supply chain risk management at Sun A/S as a part of the daily work. This becomes quite clear when looking at their actions following the fire. As stated before, Sun A/S together with Andersson had to improvise all proceedings.

The lacquering department, destroyed by the fire at Sun A/S, turned out to be a major bottleneck, since the rest of the production was diverted to Wind A/S. Fortunately for Andersson, they got the opportunity to buy the bankruptcy estate of Earth A/S. Still the non-existence of BCM led to high costs and time efforts. A business continuity plan might have increased the abilities to maintain the supply of products and reduce the domino effects.

The rather low level of time-dependence ought to convey certain resilience towards disruptions, but due to the high degree of dependence on each supplier the assembly process became complex and sluggish.

Risk handling
We establish, based on the result in the check list, that the risk handling was defective. This affected Andersson negatively and made the recovery process more difficult to manage.

9.1.3 Demand side

Risk exposure
Andersson has a large number of customers. Many of these are important, but unreliable due to the existence of substitutes on the furniture market. A risk for Andersson arises from the fact that many customers order large quantities but at the same time are not very loyal.

Since both the relationship- and the functional-dependence are low, the time factor increases in importance. If Andersson does not succeed in meeting the requirements of exact delivery dates, the risk of loosing customers increases significantly.

Risk Management
Our general knowledge of risk management at the demand side is partly limited due to the available sources of information. However, it is rather easy for customers to protect themselves from consequences of disruptions earlier on in the supply chain, due to the wide selection of equivalent products. Even so the lead time of the furniture may cause some problems.

Risk handling
Our general knowledge of risk handling at the demand side is partly limited due to the available sources of information. Therefore we can not analyse the methods of risk handling on the demand side.

9.1.4 The total view of the supply chain

Even if the low degree of complexity in the supply chain decreases the overall level of risk, the common features of having insufficient procedures regarding risks involved in the daily work lead to high risk exposure in the supply chain.

Since few parts of the chain has an acceptable level of risk management or risk handling, many disturbances are likely to have effects both upstream and downstream in the supply chain. This together with a slow network makes the vulnerability high.

9.1.5 Summary

Table 9.1 below displays the main strengths and weaknesses within risk exposure, risk management and risk handling at Andersson.

Andersson	
Strengths	**Weaknesses**
Risk exposure	
Low degree of complexity in the supply chain	Dependence towards the suppliers
Low time-dependence	Little flexibility within the supply chain
Risk Management	
Good relationship with the suppliers	Low prioritization of risk management and SCRM
Business partners involvement in the long term planning	No existence of BCM
Risk handling	
Cost efficient insurance solution	Few other strategies for handling risks
The extent of the property insurance	Short indemnity period

Table 9.1 Summary of strengths and weaknesses

9.2 Nilsson

9.2.1 Internal

Risk exposure

The complexity and the long lead times within Nilsson's production both contribute to vulnerabilities. Since the company has no alternatives to the inflexible production flow and there exists bottlenecks, Nilsson has a high level of risk exposure within the production. The risks are somewhat reduced though by the facts that Nilsson keep inventories of finished goods and that they mainly do not work according to JIT principles. However, the few functions that are dependent on JIT, like the constant flow of hydrogen gas, are vital for the rest of the production and we consider this to be a great weakness.

Nilsson keeps most of the production in-house which can be a result of the high complexity of the products. In addition the steel sheets have special features that Nilsson does not want to expose to other companies in the same line of business. All this decreases the risks in the supply chain flow.

Nilsson's heavy industrial production with potentially dangerous materials contributes to substantial risks for employees as well as property. This makes all kinds of safety systems and procedures extra important. It seems to us that the company has not fully grasped the severeness of a potential accident since they currently, for example only have manual evacuation alarms. Our advice is that Nilsson puts more effort into these aspects.

Even though the overall steel business has declined the past years, Nilsson's specialized products have strengthened their position on the market, enabling them to maintain most of their customers. Moreover the specific nature of the steel sheets creates a positive relationship-dependence towards the customers. The current position might inhibit the company from making the production process more resource and time efficient. However, if the competition becomes more intense we consider it vital for Nilsson to overlook their in-house activities.

Risk Management

In terms of risk management Nilsson is highly vulnerable. It seems like the company, to some extent, is aware of the importance of the concept, but they do not have enough knowledge or financial means for implementing it. Since Nilsson is a traditional company with a high degree of workers, there might be a lack of employees to implement the procedures and knowledge of risk management throughout the organization.

- **Business continuity management, BCM**

  Nilsson has not established any written business continuity plans. Regarding the dependence of various parts of the production and the existence of bottlenecks, we recommend the company to put some efforts into this area even though we are aware of the substantial costs it requires. Nilsson might not consider that they have the time or financial resources today, but a good start for BCM may be to increase the overall awareness among the staff.

  The weaknesses were elucidated when the Cooling company had an explosion. Not only was Nilsson highly dependent on the constant access of gas, but also lacked alternative means to supply the production. A business continuity plan probably would have stressed out the dependence of the critical processes and the fact that there existed no substitutes. Furthermore, we think that a well developed plan would have made the recovery work more resource and time efficient. For example the plan ought to have described how to maintain the production flow and means for reinstalling lost functions as quickly as possible.

Another part of a business continuity plan includes notifying involved business partners. Since Nilsson had no plan at the time of the disruption, they improvised all measures within this area. The company chose to prioritize the existing customers with JIT requirements instead of taking orders from new customers. We understand these choices, but a more comprehensive evaluation might have displayed the advantages of taking some new customers, considering the current market conditions.

- **Supply chain risk management, SCRM**
  Nilsson seems to have very little knowledge of supply chain risk management. Since the company has mainly in-house production, we find it natural to first implement internal risk management and thereafter start looking at the whole supply chain.

  It is possible that Nilsson believes that observing the whole supply chain is somewhat irrelevant. However, the major area which is disregarded then is the dependence towards critical suppliers to maintain the production flow. We have not received enough information concerning the degree of cooperation among all business partners, but we think that Nilsson would benefit from keeping good relations. A common understanding of critical processes might facilitate a more efficient recovery work.

  The company has to some extent protected themselves towards disruptions by having inventories of finished goods, but this is far from enough. An existence of inventories can only moderate the domino effects which follow from a disruption. They do not change the fact that there might be a total stop in the production or prevent future accidents from occurring.

  Nilsson was strongly affected in a negative way with a total stop for over a month resulting in a loss of market shares. Even though they have started to work with risk management internally, they still seem top overlook the SCRM. Our opinion is that the company does not fully realize the advantages of using risk management throughout the chain to prevent the most obvious consequences from disruptions.

<u>Risk handling</u>
The check list indicates that Nilsson uses insurances as the main part for risk handling. To our knowledge few other measures has been taken to handle the current risk exposure. Perhaps the company finds it uncalled to maintain other solutions because they consider the extensive insurances enough.

- **Insurance coverage**
  Nilsson has a substantial insurance coverage and the level of risks is insured in a cost-efficient way. Moreover, there exists a good relation between the needs and the coverage. Both the property insurance and the business interruption policy form an extensive cover which is a clear advantage for Nilsson. However, a weakness in the business interruption policy is the short indemnity period, which was exposed after the disruption.

  Nilsson was rather well financially compensated after the disruption due to the wide insurance coverage. A longer indemnity period would have improved the overall refunds concerning lost sales and we find that this would have been more optimal.

- **Other solutions**
  It seems like Nilsson believes that disruptions is a natural part of the daily work and not possible to prevent or avoid. We find this way of thinking somewhat out of date and a revise would be motivated. However, after the disruption Nilsson has in some way understood the importance of working with risks because they have contacted Marsh to help them somewhat improve this area.

9.2.2 Supply side

Risk exposure

Nilsson has few critical suppliers, but the dependence towards these is high. Clear examples of this are the Cooling company and the liquid petroleum gas supplier, which are vital for the production. Since there are no alternatives to these suppliers this poses a risk for Nilsson.

The majority of the critical suppliers succeed in fulfilling Nilsson's demands of quality and quantity. Since the largest part of the critical supply side concerns the transportation of gas, the rest of this section will be concentrated on that area. Gas handling requires special treatment and only allows low flexibility. This together with JIT demands and inventory restrictions constitute a high risk exposure.

The present relationship-dependence between Nilsson and the gas suppliers is positive for Nilsson since the delivery is integrated in the production process. However, it constitutes a risk for the Cooling company, since the large quantity required by Nilsson has increased their dependence.

Risk Management
Our analysis is based on the risk management during the disruption which followed the accident. The gas from the Cooling company was one of the most vital parts for Nilsson in order to resume the production. The actions made by the gas supplier appeared to be unstructured, which indicates a lack of both risk management and business continuity plans.

The already described circumstances for the gas flow made the recovery work more complex and time demanding. This led to the inability to keep the supply of a product and avoid domino effects.

Risk handling
Our general knowledge of risk handling at the supply side is partly limited due to the available sources of information. Therefore we can not analyse the methods of risk handling on the supply side.

9.2.3 Demand side

Risk exposure
Nilsson has several different customers, but there exists one which is particularly important for the company. This leads to a dependence which increases the risk exposure for Nilsson. Since the important customer requires JIT deliveries, the time-dependence increases. Nilsson has to have a good understanding of the demand patterns in order to fulfil the needs of each customer.

The specific nature of Nilsson's products makes it more difficult for their customers to replace them. Therefore, the functional-dependence is quite high for the customers and this favours Nilsson.

Risk Management
Within the risk management area at the demand side, we only have had access to a limited amount of information and therefore our analysis mainly concerns the risk management during and after the disruption.

In order to meet the important customer's specific demands of JIT, Nilsson established an inventory of finished goods. This inventory made it possible for Nilsson to carry out deliveries during the disruption. However, after the disruption the customer still chose to end the business relation. This was unfortunate for Nilsson since they had made specific efforts in order to meet the customer's demand.

Since Nilsson's products have special features and the lead time is very long, the customers are likely to be affected by a disruption earlier on in the supply chain.

Risk handling

Our general knowledge of risk handling at the demand side is partly limited due to the available sources of information. Therefore we can not analyse the methods of risk handling on the demand side.

9.2.4 The total view of the supply chain

The total view of the supply chain strengthens our opinion that work with risk is not highly prioritized. The chain has weaknesses within the areas of rapidity, globalization and complexity. This means that stops anywhere in the production flow are likely to cause serious domino effects throughout the supply chain. This increases the importance of supply chain risk management, but few parties seem to have taken this into consideration.

9.2.5 Summary

Table 9.2 below displays the main strengths and weaknesses within risk exposure, risk management and risk handling at Nilsson.

Nilsson	
Strengths	**Weaknesses**
Risk exposure	
Existence of inventories	Time-dependence towards critical suppliers
Special features of the products	Vulnerabilities within the production
Risk Management	
Efforts to somewhat improve the risk management	No existence of BCM
Alternatives to some suppliers	Little awareness of SCRM
Risk handling	
Wide extent of the insurance solution	Few other strategies for handling risks
Including suppliers in the business interruption policy	Short indemnity period

Table 9.2 Summary of strengths and weaknesses

9.3 Olsson

9.3.1 Internal

Risk exposure

Olsson's production is not especially complex since they merely assemble parts into complete furniture. Due to the newly installed stream line production, the company has managed to reduce the overall lead time.

Factors which contribute to a production using few resources often tend to increase the risks. In Olsson's case the low level of inventories, the high degree of production made to order, the substantial dependence on outsourced functions and the frequent use of JIT all lead to great vulnerabilities. Since the company does not have any in-house manufacturing, the dependence towards skilled personnel at the suppliers is vital for the survival. Therefore Olsson has realized the importance of having good relationships with the suppliers.

Olsson as well as other office furniture companies has been affected by the deterioration of the market conditions. We believe that the company is

aware of the risks following the tough competition and that the future merger with the two main rivals on the market is a mean for better survival. However, an amalgamation often leads to other risk exposures within new parts of the organization and sometimes it is difficult to discover these weaknesses since they emerge when trying to integrate separate company cultures.

The fact that Olsson keeps the entire production and storage in one building and that furniture materials easily catch fire contributes to a substantial property risk. Our suggestion is that the company at least separates the production from the storage in order to decrease the risk exposure of the site. One positive aspect is that the development section is located in a detached building.

The company's decisions to outsource nearly all functions and frequently apply JIT in addition with almost no storages all lead to high time-, relationship- and function-dependencies. As mentioned before, Olsson's philosophy of creating a slim organization lower the costs but increases the risks. It ought to be in their interest to be aware of and monitor their risk exposure since there is a lack of alternatives which can reduce the vulnerabilities.

Risk Management

The general knowledge about risk management and strategies concerning this area is restricted to potential fires and is far from sufficient. Olsson themselves however, seems to believe that their thorough plans and response procedures to apply in case of a fire constitute a very good risk management. This is a great vulnerability since many other areas unconsciously are overlooked.

- **Business continuity management, BCM**
  Olsson has a well developed business continuity plan concerning how to react in case of a fire. The response procedures, which mainly include instructions about contacting business partners, are clear and also known among the employees. This was prominent when the supplier Pebbles had a fire and Olsson responded quickly by notifying both the customers and the media. In addition there exists an evacuation plan in case of a fire at the site. A positive aspect is that the employees continuously practise these evacuations. We think that the plan is a good start but not quite enough to manage the risks. Since the company has great dependencies towards many suppliers, a more substantial work needs to be done in order to improve the BCM.

The company is of the opinion that there exist no bottlenecks in their flow today. We find this strange since almost every production chain includes activities which are more or less time requiring. In addition we think that Olsson should start by highlighting the key processes and consider possible improvements. During the fire at Pebbles one of Olsson's moulds, which was not in use, was destroyed. Since the moulds are owned by Olsson, their business continuity plan should cover response procedures at the suppliers as well considering the specific nature of the production.

- **Supply chain risk management, SCRM**
  The general knowledge concerning SCRM is fairly low, and this is definitively not good considering the great dependencies which characterizes Olsson's current situation. This lack of knowledge constitutes a great threat to the survival in case of a disruption.

  One of the first measures to be taken should be mapping the existing flow and elucidating the weaknesses followed by Olsson's dependencies towards their suppliers. The company is currently trying to decrease the number of suppliers in order to make the purchases and logistics more efficient. It would be desirable if Olsson at the same time made efforts to evaluate their partners and find alternatives to the most critical suppliers. The specific nature of the production process might make it impossible to find equivalent substitutes to the existing partners. Therefore, our suggestion is to involve the existing suppliers in the risk management work. Since many of the partners have large productions, they might, in a case of a disruption, be able to temporarily expand Olsson's part of the total production. This implies that Olsson's development section rapidly can produce the required moulds. The company already has good, long term relations with many suppliers and we believe that further cooperation would be profitable for both parties.

  An increased flexibility at the supply side would improve the overall conditions of how to recover in case of a disruption. Olsson was very fortunate when Pebbles had a fire since no essential moulds were destroyed. If instead the mould had been vital for the current production, we believe that the consequences had been more devastating. To our knowledge Olsson has no duplicate moulds.

<u>Risk handling</u>
Risk handling at Olsson is mainly focused on insurances and handling the risk of fire. As mentioned before, the company seems to think that fire is the only great risk exposure and has therefore put their resources in this area. If

they are aware of other risks Olsson relies entirely on the insurance coverage.

- **Insurance coverage**
  Regarding the insurance solution Olsson has a very extensive cover, mainly due to the master policy which they are part of. The business interruption policy in particular has many advantages in form of a long indemnity period and coverage for disruptions at both suppliers and customers. Even unspecified customers and suppliers are covered to some extent. This is probably a consequence of Olsson's substantial vulnerabilities towards many parts of the supply chain.

  In terms of financial coverage, Olsson is very well prepared in a case of disruption. Our conclusion is that they regard insurances to be the main solution for handling risks.

- **Other solutions**
  As mentioned above Olsson's other risk handling solutions only concerns the fire aspect. Both knowledge and ability to reduce the fire risk is good, and actions have been taken to reduce the risk probability. The fact that Olsson reflects changes and updates the fire preventive work is also positive. We are of the opinion that Olsson could be good at handling other risks as well, but the key process is to acknowledge these weaknesses and the importance of handling them.

9.3.2 Supply side

Risk exposure

The check list clearly emphasizes the previous stated fact of Olsson's heavy dependence towards their many critical suppliers.

Many of the suppliers are traditional companies with a substantial production. The routine that they possess contributes to both good quality and reliable deliveries, which are essential to Olsson since they have no alternatives. Suppliers that use moulds owned by the company have restricted options to use alternatives to the production flow since Olsson, to our knowledge, rarely have duplicates ready if a mould would be destroyed. This means a great risk exposure, which is increased even more by the aspect that the suppliers often are dependent on various time factors. Having extra moulds in storage could reduce some of the risk, but this is a responsibility that lies on both Olsson and their suppliers. Another area which could reduce the risks is inventories, but we have received too little information about these to be able to analyse the situation from that point of view.

The result of the check list shows that both relationship- and functional-dependence are rather substantial on the supply side. It is our opinion though that it is rather difficult to reduce them, which means that the companies must accept and learn to handle the risks resulting from these dependencies.

Risk Management

Since Pebbles is a very important supplier to Olsson, this section concerns their aspects. The overall knowledge and awareness of both risk management and supply chain risk management is low in this company, and the check list clearly indicates the vulnerabilities connected with a disruption. If one of Olsson's vital moulds had been destroyed in the fire at Pebbles, their flow could not have been maintained. In turn this would have caused great problems for Olsson since they have no alternative to Pebbles production and low level of component inventories.

There is a possibility that Pebbles feel that Olsson, and perhaps other companies, are safe and loyal customers and that the extra work with risk management is not necessary. Olsson need to put pressure on their suppliers to include this work in the daily procedures to secure the production flow. Both parties will benefit from the results.

Risk handling

Our general knowledge of risk handling at the supply side is limited due to the available sources of information. Therefore we can not analyse the methods of risk handling on the demand side.

9.3.3 Demand side

Risk exposure

The risk exposure regarding the customer side mainly concerns time aspects like delivery safety and dependence of JIT. The company has many customers which are loyal to the trademarks of both Olsson and Chair A/S. Today however, the competitive situation is tough and there exists many equal products on the office furniture market. This force Olsson to optimize their customer services in order to keep their clientele. It seems like Olsson has been aware of these vulnerabilities since they have made efforts to decrease their total lead time and understand the demand patters of their customers. Due to the importance of Olsson's trademark, the company should do its utmost to combine the special features of design, high quality and special ergonomics with safe delivery dates and other important customer services.

Risk Management
Our general knowledge of risk management at the demand side is limited due to the available sources of information. Therefore, the analyse in this section will be restricted.

The rankings in the check list show that most customers can maintain their product flow in case of a disruption at their suppliers. This is because there is a wide selection of equivalent products on the market. The requirements of short lead times may cause some problems though.

Risk handling
Our general knowledge of risk handling at the demand side is partly limited due to the available sources of information. Therefore we can not analyse the methods of risk handling on the demand side.

9.3.4 The total view of the supply chain

When looking at the total view of Olsson's supply chain there is a low level of complexity and globalization. These factors together with a rather high rapidity decrease the total level of risk. The vulnerability is still quite high, much due to great dependencies throughout the chain. Since these dependencies often are difficult to reduce, an extensive work with supply chain risk management is required. To our knowledge this work is insufficient. Consequently most disturbances in the supply chain would probably cause effects both upstream and downstream.

9.3.5 Summary

Table 9.3 below displays the main strengths and weaknesses within risk exposure, risk management and risk handling at Olsson.

Olsson	
Strengths	**Weaknesses**
Risk exposure	
Customers loyal to the trade mark	Almost no inventories
Large and reliable suppliers	High level of time-, relationship- and functional dependence
Risk Management	
Some procedures concerning BCM	Too much confidence in current risk management
Business partners involvement in the long term planning	Low evaluation of critical suppliers
Risk handling	
Substantial insurance coverage	Few other strategies besides handling the risk of fire
The including of both suppliers and customers in the business interruption policy	

Table 9.3 Summary of strengths and weaknesses

9.4 Persson

9.4.1 Internal

Risk exposure

Persson Plant's efficient production flow regarding both time and resources has lead to an increased risk exposure. Especially the time factor causes great vulnerabilities since the company has a high degree of JIT combined with no inventories. We as well as Persson Group are aware of that the lack of buffers contributes to the risk exposures. The company has clearly chosen to take these risks in order to decrease the level of unfinished goods in the production process.

Persson Group keeps most production in-house and thereby lowers the dependence on outsourced functions. However, the company applies many internal activities which increase the dependence within the organization. The lead time for industrial doors is not short, but causes no risk since it is

easy to meet the delivery times due to many customers' good planning horizon.

The risk exposure at Persson Plant's properties is a great weakness. The various factors like flooding, neighbour company which uses hazardous materials and existence of dangerous chemicals within the own production affect the company negatively. The awareness of these risks has implicated on the risk management.

Persson Group's line of business is strongly affected by the market conditions of the building industry which can lead to great fluctuations in order quantities. This together with tough competition results in high market risks. Persson Group has reduced this risk by implementing far-reaching service operations as a special niche to attract customers.

The fact that Persson Group applies many internal activities in the production contributes to a high functional-dependence. Even though this is a risk, we find it easier to monitor since it lies within the boundaries of the organization.

Risk Management

Persson Group has understood the importance of integrating risk management as a part of the daily work throughout the organization. We believe that the wide spread knowledge derives from strong management guidelines. The wide extent of the organization requires an overall perspective in order to avoid sub-optimizations and implement a homogenous risk management.

- **Business continuity management, BCM**
  Persson Plant has identified and considered the critical processes within the production flow and also developed a disaster recovery plan. We find this plan to be thorough especially in terms of the contact network. It also includes practical guidelines in a pre-disaster plan. BCM is a necessity for Persson Plant due to the many risk linked to the production.

  The presence of hazardous materials in the facilities increases the importance of well developed and practised evacuation procedures. It often requires specific methods when dealing with accidents involving chemicals, which need additional training.

  The internal activities make it essential for all parts of the organization to follow the same business continuity directions in order to secure the production flow.

We believe that Persson Plant is likely to survive the repercussions in case of a disruption because they have a thorough business continuity plan. However, the company has great weaknesses both towards critical suppliers and within the production line, which would require both time and cost demanding measures. Marsh AB has recommended Persson Plant to establish a contingency plan including alternative external options in case of a disruption at the internal critical supplier. Persson Plant would probably benefit from expanding this part of BCM.

- **Supply chain risk management, SCRM**
  Since the main part of the product refinement is carried out in-house at Persson Plant, the vulnerabilities towards the rest of the chain decreases. This facilitates the work with SCRM.

  Persson Plant has made efforts to increase the resilience to disruptions but they are still very vulnerable. Especially the production of type B panels, which has all its production concentrated to the facilities in Holland. In case of a disruption Persson Plant has some alternative production plans, but we think that these are somewhat unrealistic both in terms of implementation and costs. We find it strange that there are no established alternatives to the flow of panel B, since these panels are to dominate the total production in the near future. Furthermore, we have concerns regarding the concentration of the operations to the Dutch factory. Perhaps Persson Group should consider installing means for producing panel B at the site in Sweden as well.

  The long term relationship towards most of the suppliers is positive in terms of high degree of cooperation and understanding, but there exists a risk for Persson Plant to become impeded. There is a need for constant evaluation and critical examination of all business partners, even the internal alternatives.

<u>Risk handling</u>
Persson Plant is generally well prepared when it comes to risk handling. They are aware of the greatest risks, but in some cases they do nothing about them. One example is the conscious choice not to keep any storages, which is a substantial risk concerning panel B. We believe the reasons to be cost related. Persson Group has had some years of declined profits and has found it necessary to slim the production. Cost reduction often leads to a raised level of risk which requires more risk handling. Unfortunately risk handling is also expensive and we have concerns that Persson Plant has not implemented all needed improvements but only made some adjustments. The reason for this might be that the company not yet has had any severe

disruption. Furthermore, we wonder if the company have compared the cost savings from slimmer production with the potential costs of a disruption.

- **Insurance coverage**
  Persson Group has a substantial insurance coverage, but it is expensive for the organization. The only obvious disadvantage is that a potential flooding in Holland is not covered. However, this is not anything that the company can change since all insurance companies have the same exclusions in the policy.

  Before Marsh's involvement the correlation between the actual value of the gross profit and the insured business interruption value was very low. After changing to more correct values, the premium increased but the protection became much more sufficient. Persson Group has also understood the importance of having a long indemnity period, since many consequences from a disruption may be far-reaching in time.

  Disruptions at suppliers and customers are covered both internal and external in the master policy. This is vital because there exists a great dependence between many parts of the organization.

- **Other solutions**
  Insurances are not the only mean for handling risks at Persson Plant. Since they have risk identification as a continuing work, they realize that other preventive actions also are required.

  Sprinklers are installed in most facilities in order to reduce the possible damage. Furthermore, the wall facing the nearby company will be equipped with outside sprinklers as well. We believe that Persson Plant has made great efforts in this area following the advices from risk consultants at Marsh. Moreover, we think that Persson Plant has come a long way trying to explore other solutions for risk handling besides insurances.

  One important aspect is to have the risk perspective as an overall policy in all parts of the organisation. Thereby the open communication among employees is a good way to handle and reduce risks.

9.4.2 Supply side

Risk exposure

Persson Plant has one critical supplier, but the dependence towards this is substantial. There exists no alternative flow in this case as oppose to the general idea of having at least two suppliers of all parts. A clear observation

is that Persson Plant should try to get alternatives to this partner as well. We believe that the company has been somewhat slow in finding substitutes to the internal critical supplier much depending on the fact they are seen more as cooperation partner instead of a supplier

The supply side is affected by Persson Plant's made to order production since this requires JIT deliveries. This contributes to a considerable time-dependence which in most cases is connected with a higher risk exposure. However, it seems like the suppliers succeed in meeting Persson's demands of both high quality and quantity.

We have limited information about the suppliers' flexibility within the production process and the existence of alternatives. In most cases we do not think that these factors will cause any problems for Persson Plant as the majority only delivers materials with a low degree of refinement.

Risk Management
From a risk management point of view we have decided to focus on Persson Plant's critical supplier. We consider the supplier to be aware of risk management since they are a part of the whole Persson organization. Even so there exists limitation in their production flow.

Risk handling
The same critical supplier as above is evaluated in this area regarding risk handling. The internal supplier is part of Persson Group's active work concerning risk handling, and therefore they have established identification and evaluation of risks.

9.4.3 Demand side

Risk exposure
Since Persson Plant has many customers which normally orders rather small quantities, the company does not have high dependence towards any specific client. Still however it is important to make efforts to keep the present customers since many equal products exist on the market and it is fairly easy to change supplier. Persson Plant must be able to meet the high needs of delivery safety to avoiding the risk of loosing customers to competitors.

Persson Plant's far developed service operations are a great competitive advantage which helps the company attract and keep customers. Persson Plant's ability to meet changes in the market improves if they keep developing the after sales services and thereby manages to create a strong product identity.

The fact that the company delivers a finished product which is rather easy to replace, leads to risks of loosing customers due a low level of both functional- and relationship-dependence. Regarding the nature of the product we believe that service and good quality is important means for Persson Plant to guarantee long term survival. Since many customers only order doors once or twice in a life time Persson Plant has to have a strong trade mark to be able to attract new customers.

Risk Management
Our general knowledge of risk management at the demand side is partly limited due to the available sources of information. Therefore we can not analyse the methods of overall risk management on the demand side. However, in the case of a disruption, the customers can replace Persson Plant's products, but the rather long lead time can be an obstacle.

Risk handling
Our general knowledge of risk handling at the demand side is partly limited due to the available sources of information. Therefore we can not analyse the methods of overall risk handling on the demand side.

9.4.4 The total view of the supply chain

Looking at the total view of the supply chain the awareness of both risk management and SCRM contribute to less vulnerability. However in the case of a disruption the chain has a great weakness when it comes to panels of type B. It would probably be difficult to maintain a flow in the production if panel line was destroyed. Many other areas within the supply chain are well prepared and have established recovery procedures, and these are likely to manage a disruption in a cost and time efficient way.

Our concern is that Persson Plant, which is the core of the supply chain, might be satisfied with the current situation because they have a well developed risk perspective. It is important that they continuously keep working with risks.

9.4.5 Summary

Table 9.4 below displays the main strengths and weaknesses within risk exposure, risk management and risk handling at Persson.

Persson	
Strengths	**Weaknesses**
Risk exposure	
Low dependence on outsourced functions	Process optimization in order to reduce costs
Good service operations to attract customers	High risks regarding both business interruption and property
Risk Management	
High awareness of risk management	No alternative production for panel B
Implemented risk management through for example BCM	Too large internal focus
Risk handling	
Good correlation between the need and the insurances	Deliberate choices not to reduce risks
Awareness of other strategies for risk handling besides insurances	Expensive insurance solution

Table 9.4 Summary of strengths and weaknesses

10 Further analysis and discussion

This chapter includes an analysis of the similarities and the differences between the case companies, suggestions to new insurance solutions and also final reflections regarding the analysis and our work.

10.1 Similarities between the case companies

Risk exposure

In general, the case companies concentrate on the in-house risks and are often unaware of the risk exposure caused by other parts in the supply chain. These risks may be more difficult to detect, but they must be included in order to fully grasp the risk profile of an organization. This is essential since each studied company has at least one critical supplier which affects the flow significantly in case of disruption.

A common feature for most companies is the high level of time-dependence towards both suppliers and customers. We believe this to be a result of rationalized production processes, leading to shorter lead times and more efficient resource utilization. However, in terms of vulnerability the companies expose themselves to greater risks, but perhaps they are not fully aware of this aspect. The customers require a high level of delivery safety, which surely may be classified as time-dependence.

The relationship towards important suppliers is generally close and far-reaching. It seems like all case companies value the cooperation and the involvement in the long term planning. We think that the main focus is to obtain a time and resource efficient flow between the parties, but the extended risk exposure does not seem to be highlighted. The cause for this might be that the companies consider the cost perspective to be the most vital aspect. Correct quality and quantity have been achieved through this cooperation, but also a higher degree of risk in the case where no alternative suppliers exist.

All companies which have an in-house production process are exposed to high property risks in different areas. The risk of fire is by far regarded as the most obvious and also resulting in the most severe damage. These companies have all production concentrated to a limited number of sites which increases the risks in case of a disruption. We are of the opinion that these companies to some extent ought to seek alternative, financially feasible, production possibilities.

The political climate in the countries where the case companies head offices is situated is favourable which decreases the associated risks and gives a

more stable working environment. This facilitates the long term planning and creates overall safety. The companies which operate within a global supply chain must be aware of the effects that political climates in other nations can bring.

Two of the case companies, Andersson and Olsson, operate within the furniture business. Even though their specific line of business differs, we find it interesting to take an extra notice of the similarities between these two actors. Both parties have a very high level of outsourcing which leads to great vulnerabilities in the supply chain. The relationships towards the suppliers are good and they are highly integrated in the long term product development. The specific cooperation leads to an extended dependence between the parties. If a disruption takes place the repercussions tend to be quite severe for the single company since no adequate alternatives is explored. Another common problem is the difficulties related to the furniture transportation. The overall market conditions are similar and characterized by tough competition, large order quantities and high demands of delivery safety. Since many orders are specific projects and the customers can find equal options on the market, a way of securing the position is to establish a well-known trade mark including specific features like design and quality. We think that there is a trend among furniture companies to merge with either parties in the supply chain or with competitors in order to strengthen their market position.

A wider risk perspective would make the strengths and weaknesses in the supply chain visible and thereby create a more solid foundation for further work with risks. Obstacles when implementing this different way of thinking are that it is costly and time demanding. Our opinion is that managements choose to disregard charting the supply chain flow risks because of the obstacles and the belief that serious disturbances will not happened to them.

Risk Management

Insufficient risk management results in overall vulnerabilities concerning disturbances in the supply chain. Even minor incidents may lead to serious consequences if necessary recovery procedures do not exist. It is not enough to have plans if they are not implemented throughout the different parts of the organization. Furthermore a lack of proper risk management might result in an underestimated risk exposure, which can cause a false sense of security. Since all case companies are large or included in a large group of companies, we think that a sufficient risk management is hard to implement. One reason is the need of a comprehensive view of the organization which increases the degree of difficulty as a company expands. Another reason is

the extended requirement of both time and money which does not agree with the strained economy conditions of today.

We are not surprised by the present lack of supply chain risk management among the analysed companies since SCRM is based on a well functioning internal risk management. In our analysis Persson has received positive results in this area, but the main reason for this is that they have integrated many functions into their organization. The other three companies seem to have low awareness of the concept. Despite the lack of knowledge they have received some positive ratings in the check list, but we are of the opinion that these derive from other perspectives than the risk view.

Our analysis indicates that a disruption in the supply chain displays the potential weaknesses like the inability to maintain the supply of products and avoiding domino effects. The case companies all lack procedures to limit these consequences and therefore the resilience to disruptions decreases. At Persson Plant this weakness is restricted to some parts of the production flow, but no chain is stronger than its weakest link.

One remark is that none of the companies which suffered from a disruption made efforts to improve the overall risk management, even though they must have discovered weaknesses within the work with risks.

Risk handling

All companies use insurances as the main tool for risk handling and thereby more or less overlook other possibilities. Whether this is intentional or not is difficult to determine, but based on our collected information we believe the reason to be a lack of knowledge. Since insurances constitute a more traditional way of handling risks all companies have made efforts in this area in order to obtain adequate insurance coverage. A common feature for these companies is that they have consulted Marsh AB to improve the correlation between the needs and the insurances and also get a favourable solution. The companies are aware of the importance of having insurances since these are their main area of working with risks. They are also highly dependent on transferring risks because this is a vital financial function which they can not handle internally.

In general, the wide extent of the insurances constitutes a strength in the many other aspects inadequate risk handling. The property insurances signed by the case companies are quite sufficient. A disruption at a supplier is more or less covered by the business interruption policies, which is important due to the, in many cases, high degree of dependence towards these partners.

Among other risk handling areas fire occurrence is regarded as the most obvious risk for the companies, which have in-house production or inventories. Consequently some measures have been taken in order to reduce the extent of the fire damage.

Table 10.1 below shows a summary of the similarities between the case companies.

Summary
Risk exposure
There is a general focus on the in-house risks High level of time-dependence towards both suppliers and customers Often a close and far-reaching relationship towards important suppliers Focus on time and resource efficient flow and a tendency to overlook the associated risks Companies with in-house production are exposed to property risks Favourable political climate
Risk Management
Risk management implementations might be obstructed be the size of a company The time and cost perspectives do not correlate with the work with risks Lack of SCRM Few procedures to limit consequences from disruptions exist Few improvements in risk management after a disruption
Risk handling
Insurance constitute the main tool for risk handling Tendency to overlook other solutions High dependence on transferring risk through insurances In general comprehensive insurance solutions

Table 10.1 Summary of the similarities between the case companies

10.2 Differences between the case companies

Risk exposure

Since all the case companies have a different degree of in-house production and inventories the level of risk exposure varies. Depending on the situation different risks arises, leading to company specific risk portfolios. The companies Nilsson and Persson have an in-house based production and many of their risks concern the internal flow, like fire and different disruptions in the production process. Andersson and Olsson on the other hand base the production on partners with outsourced functions and thereby many of their risks in related to the flow between the parties. It might be easier to identify internal risks since these are more evident. This could an advantage for both Nilsson and Persson.

Nilsson and Persson have a higher globalization of the supply chain which may result in greater risk exposure if the flow is not thoroughly mapped and easy to comprehend. A wider supply chain demands better knowledge of the conditions and restraints on different markets and countries.

Persson distinguish themselves by deliberately having focused most production to the site in Holland. They are aware of the higher risk exposure, but still choose to centre the manufacturing in order to obtain efficient production flow. We believe that Persson is somewhat blinded by the cost reduction from the process optimization and overlooks the increased risk exposure. In addition, there exists a possibility of being affected by a flood in Holland and this risk is not transferable. The other three case companies also have rather concentrated business operations, but it does not seem like this is a deliberate choice.

Regarding inventories the case companies are exposed to different kinds of risks. Olsson and Persson have chosen not to keep inventories of finished goods. Thereby they increase the level of time-dependence and make the supply chain more vulnerable to disturbances. Nilsson has a few large inventories and we believe that this spreads the risks. Andersson on the other hand has somewhat exaggerated their number of inventories, leading to a complex and strained logistic system. Our opinion is that a certain level of inventories is favourable since this decreases the risk exposure.

Nilsson as oppose to the other companies does not deliver to end customer, but refines the product to a certain level. Thereby they increase the functional-dependence from the customers which we consider to be positive for Nilsson. We believe this to be one of the reasons why the company managed to survive the severe disruption, resulting in a total production stop

for one month. Other reasons are the specific features of the product and the long lead time. The remaining three companies deliver to end customers which increase their functional-dependence to the suppliers.

The degree of JIT in the flow varies among the case companies. Persson is most vulnerable in this aspect since most deliveries follow the concept. Nilsson does not generally apply JIT, but a few vital functions like for example gas deliveries are depending on this function. Olsson uses JIT when it is required by the customers and suppliers, but our impression is that Olsson does not focus of implementing this throughout the organization. Andersson is the company with the lowest degree of JIT, which decreases the risk exposure within this area. We believe that the companies would benefit from having a certain degree of JIT, but a level too high leads to unnecessary risk exposure.

The demand side differs when it comes to markets and the case companies' dependence of important customers. This is quite obvious taken the separate lines of business into account.

Risk Management

Risk management is one of the aspects which differ significantly between the case companies. Andersson and Nilsson have low awareness and few developed strategies within this area. Olsson on the other hand has started to implement some procedures and Persson has put most efforts into this work.

The different degree of implementation of risk management depends on various factors. Persson has an obvious and widespread risk exposure within the organization, which together with strong management guidelines may lead to the development of the concept. Nilsson also has a large degree of in-house production contributing to high internal risks. However their risk management is somewhat inferior to Persson's. The reasons for this might be that their long lead time gives a false feeling of safety, that the specific product features need many resources and also that management does not have the required means. Olsson only has procedures for assembling the products and the risk management is focused on dealing with the associated risk. We believe that Olsson would benefit from including their suppliers more in the procedures, since the risks within the supply chain flow are most significant. The main part of Andersson's risks derives from the outsourced functions. Our opinion is that these are difficult to detect and manage. Andersson still needs to put more efforts into this area.

In case of a disruption the communication between the case companies and their customers varies according to the development of business continuity plans. We think that Andersson and to some extent Nilsson lost customers

because they failed to inform the customers of the relevant recovery data, like lead time and resumed production. In order to keep important customers it is vital to present clear plans displaying concrete actions and prioritization. Since both Andersson and Nilsson had no plans they had to improvise all recovery actions. This improvisation led to potential new risks like putting too many resources into wrong areas and thereby slowing down the resumption of the production.

When the case companies suffer from disruptions in the flow they need to make efforts in different areas. Nilsson and Persson which have much production in-house must try to redirect their production flow, and this makes is essential to investigate alternative processes in advance. The other companies that rely on outsourced functions, should however, focus more on finding alternative business partners or develop recovery plans together with the present partners.

A difficulty with SCRM is that many actions regarding risks have a tendency to end up in the interface areas between the actors throughout the supply chain. We believe that this might lead to a difficulty to detect the risks and an ambiguity concerning the responsibilities. Persson has the highest level of internal suppliers which may be a reason for their made efforts within this area. The responsibility becomes an internal affair which is easier to spread among concerned parties.

Risk handling

There are two significant differences between the companies' insurance solutions; the existence of a master and the length of the liability period. Based on the analysis we find that a master can offer a good coverage because its comprehensive extent and the financial possibilities within large groups of companies. It seems like many companies need a long indemnity period in order to fully cover the financial losses of a disruption. Some of the case companies did not realized the importance of an adequate length, which led to unnecessary economic losses. When renewing the insurance solution these companies chose to prolong the indemnity period.

As oppose to the other companies, Persson and, to some extent, also Olsson are more aware of the importance of other solutions than insurances within risk handling. This is displayed by the different fire measures, like sprinklers and fire inspections. The two companies more developed risk handling methods indicates that they regard insurances as necessary but not enough for the continuing work with risks. Companies relying too much on insurances might focus on procedures limiting the consequences after a disruption, like financial coverage and evacuation training. Hence, they may overlook the importance of preventive work.

Each company has its specific way of reducing the customer risks and thereby securing a more stable flow. Nilsson relies on the specific features in their steel sheets. Persson on the hand has a rather standardized product and has chosen to offer a superior service in order to maintain the customers. The two furniture companies put efforts in design.

Persson is the only case company which has turned to Marsh and bought their extended risk consultant services. We think that this indicates an interest to use risk handling as a part of the daily work, which is a good start.

Table 10.2 below shows a summary of the differences between the case companies.

Summary
Risk exposure
The risks varies in character depending on the degree of in-house production The different degree of globalization of the supply chain leads to various needs to map the flow The level of inventories affects the risk exposure in terms of: - time-dependence - resilience to disruptions - property The functional dependence from the customers increases with the level of refinement The different degree of JIT leads to various level of vulnerability in the supply chain flow
Risk Management
The different level of awareness is strongly correlated to the implementation of risk management The importance of relevant communication towards business partners is clearly shown when trying to keep customers after a disruption The degree of outsourcing leads to needs of different measures in case of a disruption Management guidelines affects the implementation of risk management
Risk handling
The existence of a master policy often improves the insurance coverage A long indemnity period is many times required as a mean for improving the business interruption policy cover The use of other solutions varies among the case companies and these are often tied to concrete risks, like fire Handling customer risks is something all case companies do, but in specific ways

Table 10.2 Summary of the differences between the case companies

10.3 Suggestions to new insurance solutions

As mentioned in previous chapters, the insurance solutions that are available on the market today do not fully cover the financial losses from possible disruptions. A sub-purpose in this master thesis is to suggest improvements, which perhaps better would meet companies' needs regarding insurance.

Insurance in general

Since many companies have great dependencies towards both single suppliers and important customers we find it essential to include these in the insurance. This is very expensive today and we are of the opinion that there is a need for more standardised and less costly solutions. A way to solve this is to develop a master covering sequences of whole supply chains in a special business interruption policy. This would mean insuring a flow rather than a company. However, the exact dividing of the premium among the companies is hard for us to comment due to our limited knowledge within this area. Today, large organizations may have a master, but it does not cover the whole supply chain even though it constitutes a good coverage for the group of companies. Some companies that have the main production in-house, like the case company Persson, already have a similar solution within the organization, where the insurance in a case of a disruption covers interdependencies. Our belief is that smaller companies in a supply chain also might have great effects on the vulnerability of the chain. Therefore a master covering the flow would limit the financial consequences of a disruption in the supply chain flow. Moreover a common insurance solution may increase the overall awareness of the different parts of the chain. Due to the substantial degree of complexity in many supply chains it may only be possible to include a certain sequence with especially high dependencies in the insurance.

The insurances of today do not offer any cover against lost intellectual assets, which in some cases are far more important than for example property. Even though it is very difficult to estimate the value of these assets the insurance companies should try to develop some kind of insurance for cover against lost know-how. A possible solution is to design a part of the business insurance, which covers the expenses for the head-hunting process and thereby helps to regain lost know-how. The same way of thinking is applicable for a company's loss of good will. In those cases a part of the business interruption policy a sum of money could be set aside for campaigns and participation at trade shows.

Another suggestion to alternative insurances is to widen the cover in the aspect of rebuilding lost assets. Instead of just refunding a company financially, the insurance company could also take care of all practical

details like for example hiring labour to rebuild lost facilities. This would rationalize the money transactions and perhaps make the expenses less costly, since the insurance company probably would get discounts for being an important and frequent customer.

When a company suffers from losses due to a disruption they have to wait until the end of the liability period to get business interruption policy refunds. Since there might be a need for money during this period we believe that the insurance company could make continuous repayments for example once a month. At the end of the liability period the total sum would be adjusted to assure that the right amount was paid. This would probably make the recover process easier for the company and perhaps also less expensive.

The premium

To further improve the cooperation between the insurance companies and their customers we think that they need to engage each other more. A way to increase the insurance companies' interests is to have a premium which is divided into a fixed sum and a percentage of the client's return or company. This vested interest as a stakeholder would probably mean more optimized insurance solutions and agreements at refund situations for both parties.

Since insurance in many cases are a substantial expense we think that companies in some situations should be rewarded with lower premiums, like for example if:

- the company has a well functioning risk management, including a business continuity plan
- the company has highlighted the critical parts of the production flow and found adequate alternatives
- the relation between the two parties has been long
- the company have good results and stable market shares

10.4 Final discussion

Final discussion of the analysis

After having analysed our case companies we have found that their work with risks is not nearly as developed as it could be. Even though many information sources have stressed out the increased awareness of working with risks after the terror attack of the 11th of September 2001, we have not experienced any direct correlation. The attacks seem to have caused many discussions but few concrete actions. This probably depends on a mixture of various factors, like for example a lack of knowledge and the amount of required resources. We find it to be of great importance to make companies

more aware of the benefits which well functioning risk management and business continuity plans can result in. It would be favourable for both Marsh and their clients if they could find a way to communicate these advantages.

Stated below are some of our suggestions to arguments for implementing work with risks as a part of the whole supply chain;

- To implement the risk perspective as a part of the continuing work, may influence the decision making positively and thereby prevent some risks already as early as the planning phase.
- One main object for risk management is to highlight potential weaknesses within the flow and hence have the option to take action.
- Risk management and business continuity plans can be of crucial importance for survival in case of a disruption in the supply chain.
- Using work with risks as a competitive advantage in order to gain the customers trust through communicating existing preventive measures and recovery plans.
- An increased awareness concerning risks might lead to a more efficient resource allocation, since time and money often are limiting factors.
- A mean for implementing risk awareness in all parts of a company may be to tie this to a reward system and encourage preventive measures.
- A proper risk management displays risks which are in most need of insurance coverage. This should lead to a more cost efficient solution.
- A reduction of the premium if a company can present that they have integrated risk management throughout the organization.

Based on both empirical and theoretical findings we believe that the ambition of making the production process more time and resource efficient may limit many companies' way of thinking. When trying to reduce the costs, the fact that a higher level of process efficiency increases the supply chain risk profile often seems to be overlooked. These risks may derive from JIT, outsourcing and a higher level of globalization of the supply chain. However, these areas have become a more frequent part of a company's environment and therefore each organization must find ways of dealing with the associated risks. Not taking these risks into account can turn out to be very expensive in case of a disruption, and in the long run it is probably more profitable to accept a lower level of process efficiency and thereby gain a decreased risk profile. It might be difficult however, to see the future benefits from a more costly but reduced risk exposure.

Our case study is based on merely four companies, which in some aspects may limit our ability to implement our discussion on other branches.

Nevertheless we find indications that the rapidity of the network affects the level of awareness concerning the work with risks. Long lead times and stable markets may contribute to the false image that risk management is unnecessary.

One way to make the work with risks visible might be to use check lists designed to map each department's specific strengths and weaknesses from a risk point of view. Based on the outcome of the mapping, guidelines should be presented to the involved employees in order to increase their knowledge.

We have found that the traditional and primary method for handling risks is to transfer them through insurances. These give some financial safety but fail to cover hidden costs, like for instance loss of credibility, which can not be replaced with money alone. Our impression is that some companies put too much confidence in the power of insurances, and believe this to be a sufficient and complete way of taking care of risks. We consider insurances to be an important damage finance tool, but they are only one of the aspects within risk handling. Most companies need to develop other areas as well. It is important to map the risks to be able to reduce them and also to have a line of action to limit the damage in case of an accident. All companies examined in this master thesis were subjected to risks connected with dependencies towards single suppliers. Finding alternative flows clearly would have reduced these risks and restricted the damage if one supplier had suffered from a stoppage in production.

Another aspect regarding insurances is that they have become much more expensive, and efforts to reduce risks before transferring them may decrease the insurance premium. In some situations a risk might even be so costly to transfer that the company is forced to avoid it.

Concluding thoughts concerning our work

We have made efforts to fulfil our purposes throughout the work with this master thesis. During the process it has become more and more clear that some areas have been easier to analyse and evaluate than others. It is our opinion that we have managed to accomplish our main purpose and most of the sub purposes. However, the time has somewhat restricted our ability to fully seek into insurances and therefore limited our thoughts about possible improvements concerning this area. The main purpose has been fulfilled throughout the different chapters. The analysis is described in chapters nine and ten, but it is strongly connected with both the theoretical and empirical chapters. The sub-purpose regarding flow-related risk exposure is dealt with in chapter nine. A discussion about the favourable risk handling is included in both chapters nine and ten. The model is developed in chapter seven and

used in chapters eight, nine and ten. The insurance coverage at each company is described in chapter eight and evaluated in chapter nine. Finally possible improvements of today's insurance solutions are somewhat discussed in chapter ten.

Throughout the work we have been highly dependent on information given by Marsh and the case companies. Without the generous flow of valuable data it is unlikely that the purposes to the same extent would have been fulfilled. We realize that the received information from both Marsh and the companies are coloured by their obligations and loyalties. As an external part it is difficult to determine the level of objectivity since we have not made any observations of our own at the companies. The two separated sources combined with information from the internet should decrease the level of subjectivity though.

Our aim has been to make the check list as general as possible so that different companies in various lines of business may use it as a tool for mapping the existing risk exposure, risk management and risk handling. We believe that the model could be very useful in areas of making companies more aware of the different aspects of work with risks and also to evaluate the current situation. Since companies often are participants on highly dynamic markets it is recommendable to use the check list on a continuous basis. Due to the fact that the check list to a high degree is based on our theory in this master thesis, we recognize that it might be a problem in the cases when external parties are to use the model. It is essential to fully understand all the statements in the check list when evaluating the company to avoid creating an incorrect image of the organization. To get a comprehensive view it is probably necessary to read the theory chapters before grading the company.

As mentioned before it is the authors who have graded the case companies in this master thesis. We would have found it very interesting to see the results if the companies themselves had used the check list. A comparison and discussion about similarities and differences probably could have been useful and enlightening for both parties. This aspect however has not been able to be explored due to the limited time, but it might be a good idea for further studies.

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Interviews with management at Nilsson, Olsson and Persson.

Appendix

Appendix A – the interview guides

A1. Questions to interviews with employees at Marsh responsible for the company cases.

1. Clients at Marsh AB?
   - How long has the company been a client at Marsh?
   - Which services has Marsh delivered to the company?
   - How did Marsh come in contact with the company?

2. The company's line of business:
   - Which markets is the company currently participating at?
   - How much of the market does the company control?
   - Are there plans to enter new markets? If so, which?
   - Is the company a growing company?
   - How long of a disruption can the company manage without going bankruptcy?

3. Competitors
   - Which are the main competitors?
   - How big are the competitors' market shares?
   - Which are the company's strengths and weaknesses compared to their competitors?

4. Customers
   - Characterize the company's customers. Many minor or few big?
   - Are there any especially important customers?
   - Describe the order quantities.
   - Describe the relationship between the company and their customers.

5. Suppliers
   - Characterize the company's suppliers. Many/few? Big/small?
   - Are there any critical suppliers? If so, which?
   - Does the company have alternative suppliers if the ordinary suppliers would have problems with delivering the goods?
   - Are the suppliers internal or external?
   - Describe the relationship between the company and their suppliers.

6. Production
   - Describe the production flow at the company.
   - Are there any bottlenecks?
   - Are there any special risks within the production?
   - Does the company produce to order or to stock?
   - Is the production based on the JIT-principle?
   - To what extent is the production outsourced?

7. Logistics
   - Describe the logistics system.
   - How long is the lead time of the company's products?
   - Does the company have inventories? If so, how big?

8. Risk management
   - How is the awareness about risk management at the company?
   - Do they have a separate division working with these questions?
   - Which are the company's most extensive risks?
   - Are they aware of these risks?
   - What is the company doing to protect against these risks?

9. The disruption
   - Describe the course of events.
   - What caused the disruption?
   - How did the company react? Did the company have a business continuity plan?
   - Which consequences followed from the disruption?
   - How did the company deal with the problems that arose?
   - How were the customers notified of the disruption and how did they react?
   - How soon after the disruption did the production reach normal levels again?
   - Did the company loose any customers because of the disruption?

10. Insurance (we are most interested in property insurance and business interruption policy)
    - How is the insurance constructed?
    - What is the period of the insurance?
    - What is the insured amount?
    - What is the deductible? What is the premium? What is the indemnity period?
    - What is the structure of the business interruption policy? Does it cover important suppliers as well?
    - Are there any big differences in the insurance before and after Marsh's involvement?

- To what extent did the insurance cover the financial losses which followed from the disruption?
- What was not covered?
- Were there any changes in the insurance after the disruption?
- Does the company have risks which they choose not to insure?
- Are there any factors that you would which to insure but are uninsurable?

A2. Questions to the interview with Rikke Aarøe Carlsen, Practice Leader Operational Asset Management Nordic Region at Marsh, 23/09/2003.

1. Working at Marsh.
   - How long have you been working within the company?
   - What is included in your every day work?
   - Why did you choose to work for Marsh?

2. When was Marsh established in Denmark? Were there any obstacles when entering the market?

3. Which are Marsh's strengths and weaknesses?

4. How much of the market within risk consulting does Marsh control?

5. Which are Marsh's main competitors within risk management?

6. What is Marsh's goal/vision?

7. Describe the most common obstacles when working with risk management.

8. How does Marsh help their clients to find an optimal risk range?

9. Describe different prevention tools to use in order to minimize risks.

10. BCM
    - What is included in the BCM concept?
    - How does Marsh work with BCM? Is it long-range projects?
    - How is the awareness concerning the importance of BCM among the clients?
    - Do you use any basic BCM models as a tool?

11. Risk management within the supply chain
    - Describe the work procedure.
    - How much of the supply chain is analysed?
    - Which are the difficulties when working with this?
    - Is it common for suppliers to a client of yours to become new clients?

12. Insurances
    - What do you think about existing insurance solutions?
    - How do you help clients within areas which are unable to insure, like loss of knowledge and good will?
    - Do you have any suggestions of how to design insurance solutions for these areas?

13. Describe the connection between risk consultants and insurance brokers.

Appendix B – Litt C

The contribution margin can be calculated in different ways, depending on the character of the insured business. The fundamental definition of contribution margin is stated in the general condition of the business insurance. The definition is the following; **the sales value based on sold and delivered goods or performed services, exclusive of value-added tax, reduced with the noninsurable costs, which for example are discounts, carriages, packing, customs duty, used direct costs and overhead**.[192]

Litt C differs from the general condition in the business interruption policy because the sales value is based on the goods manufactured instead of sold and delivered goods. The reduced costs follow the general condition, apart from the wages which are excluded and do not constitute a part of the contribution margin. Therefore it is common that business interruption policy which includes Litt C is complemented with a so called fractional insurance for these wages. [193]

Litt C is first and foremost intended for large companies which have a sole production and mainly export the finished goods. These companies usually have delivery contracts which last for several years. The deliveries often contain large quantities and the payment does not always correspond to the deliveries. Therefore, it can be difficult to determine the exact value of sold and delivered goods and thereby it is preferable to base the calculations on goods manufactured instead of sold during the indemnity period. The sales value will then be calculated according to agreed prices and contracted quantities during the period. Moreover, for eventual goods which are manufactured extra the calculation will be based on the average of the daily price for the last quarter.[194]

The fact that the contribution margin is related to the company's production, and not to the sale of finished goods, can in some situations result in losses due to disruptions that are not covered in the business interruption policy. This depends on the valuation rules of the property insurance, which specifies how to calculate the compensation for damaged goods. There exist two different ways to calculate the compensation depending on the goods:[195]

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[192] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB
[193] Trygg Hansa and SPP, *Boken om företagets försäkringar*
[194] Ibid
[195] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB

- The agreed sales price, if the goods are sold and ready to be delivered but the delivery can not be completed with other goods
- The cost of manufacturing at the time of the disruption for other goods than above, and hence no compensation for the profit

This means that if an inventory of finished goods is damaged in a fire, there arises a gap between the property insurance and the business interruption policy. For these goods no compensation for lost profit can be received through the property insurance. The business interruption policy does not offer any compensation in this case. According to the definitions of contribution margin in Litt C the loss must occur as a result of a disruption in the production, if not no financial compensation. A way to avoid this situation is to complete the property insurance with a notion specifying that finished goods, which are not yet sold, will be replaced according to a fair price.[196]

[196] Nordin E., (2000) *Avbrottsförsäkring för företag*, Ifu utbildnings AB

Appendix C – the check lists

C1. The check list for Andersson

Check list - Andersson						
		Ranking				
		- -	-	+	+ +	?
	Internal					
	Risk exposure					
	Facts regarding the production:					
1	The complexity of the production				x	
2	The production lead time		x			
3	The existence of bottlenecks		x			
4	Alternatives to the production flow	x				
5	The degree of production made to order			x		
6	The flexibility within the production process	x				
7	Level of inventories			x		
8	Localisation of inventories			x		
9	The dependence on outsourced functions	x				
10	The relationship with the outsourcing companies			x		
11	The degree of JIT			x		
12	The dependence of JIT				x	
	Risk identification:					
13	Employee risks					x
14	Property risks			x		
15	Environmental risks				x	
16	Criminal acts		x			
17	Market risks		x			
18	Liability risks					x
19	Political risks				x	
20	The level of time-dependence			x		
21	The level of relationship-dependence	x				
22	The level of functional-dependence	x				
	Risk Management					
23	General knowledge of risk management	x				
24	The development of risk management strategies	x				

25	General development of business continuity plan	x					
26	Existence of emergency response procedures	x					
27	Prioritization of critical processes to recover	x					
28	Training and maintenance of existing plan	x					
	Supply chain risk management:						
29	The awareness of supply chain risk management	x					
30	Methods of choosing the right business partner						x
31	Constant evaluation of the business partners	x					
32	The business partners involvement in the long term planning			x			
	In case of a disruption in the supply chain:						
33	The resilience to disruptions	x					
34	The ability to maintain the supply of a product		x				
35	The ability to avoid domino effects		x				
36	The degree of cooperation among all business partners			x			
37	Changes in overall risk management after a disruption	x					
	Risk handling						
38	Risk identification as a continuing work	x					
39	Analyses of possible disruptions	x					
40	Valuation of existing risks	x					
41	Knowledge and ability to reduce risks	x					
42	Open communication of the identified risks	x					
43	Administrative actions	x					
44	Production concentrated and technical actions		x				
45	Legal actions			x			
46	Reflections of changes through revising and updating	x					
47	The active monitoring of risks	x					
48	Awareness of noninsurable risks	x					
	Insurance coverage:						
49	The correlation between the needs and the insurances			x			
50	The level of risks insured in a cost-efficient way				x		
51	Existence of country specific noninsurable risks				x		
	The structure of the business insurance:						
52	The extent of the property insurance				x		

53	The extent of the business interruption policy			x		
54	The extent of the liability insurance					x
55	Relation between actual value and insured value			x		
56	The length of the indemnity period		x			
	In case of a disruption:					
57	The coverage of the property insurance				x	
58	The coverage of the business interruption policy			x		
59	Financial cover of disruptions at suppliers				x	
60	Financial cover of disruptions at customers					x
	Supply side					
	Risk exposure					
	Facts regarding the supply side:					
61	Number of critical suppliers	x				
62	Alternatives to critical suppliers	x				
63	Dependence of each critical supplier	x				
	At each important supplier:					
64	The supplier's ability to maintain a certain level of quality				x	
65	The supplier's ability to maintain a certain quantity				x	
66	The degree of JIT			x		
67	The dependence of JIT			x		
68	The degree of production made to order			x		
69	The flexibility within the production process		x			
70	Alternatives to the production flow		x			
71	The existence of bottlenecks	x				
72	Level of inventories					x
73	Localisation inventories					x
	Risk identification:					
74	The level of time-dependence			x		
75	The level of relationship-dependence		x			
76	The level of functional-dependence			x		
	Risk Management					
77	General knowledge of risk management	x				
78	The development of risk management strategies	x				
79	The existence of a business continuity plan	x				
	Supply chain risk management:					

80	The awareness of supply chain risk management	x				
81	The supplier's involvement in the long term planning					x
	In case of a disruption:					
82	The resilience to disruptions	x				
83	The ability to maintain the supply of a product		x			
84	The ability to avoid domino effects		x			
	Risk handling					
85	Risk identification as a continuing work	x				
86	Analyses of possible disruptions	x				
87	Valuation of existing risks	x				
	Demand side					
	Risk exposure					
	Facts regarding the demand side:					
88	Number of customers			x		
89	Number of important customers		x			
90	Dependence of each important customer		x			
91	The understanding of the demand patterns				x	
92	The existence of alternative products on the market	x				
93	The dependence of safe delivery dates		x			
94	The dependence of JIT			x		
	Risk identification:					
95	The level of time-dependence	x				
96	The level of relationship-dependence			x		
97	The level of functional-dependence			x		
	Risk Management					
98	General knowledge of risk management					x
99	The development of risk management strategies					x
100	The existence of a business continuity plan					x
	Supply chain risk management:					
101	The awareness of supply chain risk management					x
102	The business partners involvement in the long term planning		x			
	In case of a disruption:					
103	The resilience to disruptions		x			

104	The ability to maintain the supply of a product				x	
105	The ability to avoid domino effects			x		
	Risk handling					
106	Risk identification as a continuing work					x
107	Analyses of possible disruptions					x
108	Valuation of existing risks					x
	The total view of the supply chain					
109	The complexity of the supply chain			x		
110	The level of globalisation of the supply chain			x		
111	The vulnerability of the supply chain	x				
112	The rapidity of the supply chain	x				
113	The resilience to disruptions		x			
114	The ability to maintain the supply of a product		x			
115	The ability to avoid domino effects		x			
116	The mapping of the flow in the supply chain			x		
117	The awareness of supply chain risk management	x				

C2. The check list for Nilsson

Check list - Nilsson						
		Ranking				
		- -	-	+	+ +	?
Internal						
	Risk exposure					
	Facts regarding the production:					
1	The complexity of the production	x				
2	The production lead time		x			
3	The existence of bottlenecks		x			
4	Alternatives to the production flow		x			
5	The degree of production made to order			x		
6	The flexibility within the production process		x			
7	Level of inventories			x		
8	Localisation of inventories			x		
9	The dependence on outsourced functions			x		
10	The relationship with the outsourcing companies					x
11	The degree of JIT			x		
12	The dependence of JIT	x				
	Risk identification:					
13	Employee risks		x			
14	Property risks		x			
15	Environmental risks					x
16	Criminal acts			x		
17	Market risks			x		
18	Liability risks			x		
19	Political risks				x	
20	The level of time-dependence		x			
21	The level of relationship-dependence			x		
22	The level of functional-dependence		x			
	Risk Management					
23	General knowledge of risk management	x				
24	The development of risk management strategies	x				
25	General development of business continuity plan	x				

26	Existence of emergency response procedures	x				
27	Prioritization of critical processes to recover		x			
28	Training and maintenance of existing plan	x				
	Supply chain risk management:					
29	The awareness of supply chain risk management	x				
30	Methods of choosing the right business partner	x				
31	Constant evaluation of the business partners	x				
32	The business partners involvement in the long term planning					x
	In case of a disruption in the supply chain:					
33	The resilience to disruptions		x			
34	The ability to maintain the supply of a product		x			
35	The ability to avoid domino effects		x			
36	The degree of cooperation among all business partners					x
37	Changes in overall risk management after a disruption			x		
	Risk handling					
38	Risk identification as a continuing work	x				
39	Analyses of possible disruptions		x			
40	Valuation of existing risks		x			
41	Knowledge and ability to reduce risks	x				
42	Open communication of the identified risks	x				
43	Administrative actions	x				
44	Production concentrated and technical actions		x			
45	Legal actions			x		
46	Reflections of changes through revising and updating	x				
47	The active monitoring of risks	x				
48	Awareness of noninsurable risks	x				
	Insurance coverage:					
49	The correlation between the needs and the insurances				x	
50	The level of risks insured in a cost-efficient way				x	
51	Existence of country specific noninsurable risks				x	
	The structure of the business insurance:					
52	The extent of the property insurance				x	
53	The extent of the business interruption policy			x		
54	The extent of the liability insurance					x

55	Relation between actual value and insured value			x		
56	The length of the indemnity period		x			
	In case of a disruption:					
57	The coverage of the property insurance				x	
58	The coverage of the business interruption policy			x		
59	Financial cover of disruptions at suppliers			x		
60	Financial cover of disruptions at customers					x
	Supply side					
	Risk exposure					
	Facts regarding the supply side					
61	Number of critical suppliers			x		
62	Alternatives to critical suppliers	x				
63	Dependence of each critical supplier	x				
	At each important supplier:					
64	The supplier's ability to maintain a certain level of quality				x	
65	The supplier's ability to maintain a certain quantity				x	
66	The degree of JIT		x			
67	The dependence of JIT		x			
68	The degree of production made to order			x		
69	The flexibility within the production process			x		
70	Alternatives to the production flow		x			
71	The existence of bottlenecks					x
72	Level of inventories		x			
73	Localisation inventories		x			
	Risk identification:					
74	The level of time-dependence	x				
75	The level of relationship-dependence			x		
76	The level of functional-dependence		x			
	Risk Management					
77	General knowledge of risk management	x				
78	The development of risk management strategies	x				
79	The existence of a business continuity plan	x				
	Supply chain risk management:					
80	The awareness of supply chain risk management	x				
81	The supplier's involvement in the long term planning					x

	In case of a disruption:					
82	The resilience to disruptions	x				
83	The ability to maintain the supply of a product	x				
84	The ability to avoid domino effects	x				
	Risk handling					
85	Risk identification as a continuing work					x
86	Analyses of possible disruptions					x
87	Valuation of existing risks					x
	Demand side					
	Risk exposure					
	Facts regarding the demand side:					
88	Number of customers			x		
89	Number of important customers			x		
90	Dependence of each important customer		x			
91	The understanding of the demand patterns			x		
92	The existence of alternative products on the market				x	
93	The dependence of safe delivery dates		x			
94	The dependence of JIT		x			
	Risk identification:					
95	The level of time-dependence		x			
96	The level of relationship-dependence		x			
97	The level of functional-dependence	x				
	Risk Management					
98	General knowledge of risk management					x
99	The development of risk management strategies					x
100	The existence of a business continuity plan					x
	Supply chain risk management:					
101	The awareness of supply chain risk management					x
102	The business partners involvement in the long term planning		x			
	In case of a disruption:					
103	The resilience to disruptions		x			
104	The ability to maintain the supply of a product		x			
105	The ability to avoid domino effects		x			

	Risk handling					
106	Risk identification as a continuing work					x
107	Analyses of possible disruptions					x
108	Valuation of existing risks					x
	The total view of the supply chain					
109	The complexity of the supply chain		x			
110	The level of globalisation of the supply chain		x			
111	The vulnerability of the supply chain		x			
112	The rapidity of the supply chain	x				
113	The resilience to disruptions		x			
114	The ability to maintain the supply of a product		x			
115	The ability to avoid domino effects		x			
116	The mapping of the flow in the supply chain			x		
117	The awareness of supply chain risk management	x				

C3. The check list for Olsson

Check list - Olsson						
		Ranking				
		- -	-	+	+ +	?
Internal						
	Risk exposure					
	Facts regarding the production:					
1	The complexity of the production			x		
2	The production lead time			x		
3	The existence of bottlenecks			x		
4	Alternatives to the production flow		x			
5	The degree of production made to order	x				
6	The flexibility within the production process		x			
7	Level of inventories		x			
8	Localisation of inventories	x				
9	The dependence on outsourced functions	x				
10	The relationship with the outsourcing companies			x		
11	The degree of JIT		x			
12	The dependence of JIT		x			
	Risk identification:					
13	Employee risks					x
14	Property risks		x			
15	Environmental risks				x	
16	Criminal acts			x		
17	Market risks		x			
18	Liability risks					x
19	Political risks				x	
20	The level of time-dependence		x			
21	The level of relationship-dependence	x				
22	The level of functional-dependence	x				
	Risk Management					
23	General knowledge of risk management		x			
24	The development of risk management strategies		x			
25	General development of business continuity plan			x		

26	Existence of emergency response procedures			x		
27	Prioritization of critical processes to recover		x			
28	Training and maintenance of existing plan			x		
	Supply chain risk management:					
29	The awareness of supply chain risk management		x			
30	Methods of choosing the right business partner					x
31	Constant evaluation of the business partners		x			
32	The business partners involvement in the long term planning			x		
	In case of a disruption in the supply chain:					
33	The resilience to disruptions		x			
34	The ability to maintain the supply of a product		x			
35	The ability to avoid domino effects		x			
36	The degree of cooperation among all business partners			x		
37	Changes in overall risk management after a disruption	x				
	Risk handling					
38	Risk identification as a continuing work		x			
39	Analyses of possible disruptions		x			
40	Valuation of existing risks	x				
41	Knowledge and ability to reduce risks		x			
42	Open communication of the identified risks		x			
43	Administrative actions			x		
44	Production concentrated and technical actions			x		
45	Legal actions		x			
46	Reflections of changes through revising and updating			x		
47	The active monitoring of risks		x			
48	Awareness of noninsurable risks	x				
	Insurance coverage:					
49	The correlation between the needs and the insurances			x		
50	The level of risks insured in a cost-efficient way			x		
51	Existence of country specific noninsurable risks					x
	The structure of the business insurance:					
52	The extent of the property insurance				x	
53	The extent of the business interruption policy				x	
54	The extent of the liability insurance					x

55	Relation between actual value and insured value			x		
56	The length of the indemnity period				x	
	In case of a disruption:					
57	The coverage of the property insurance			x		
58	The coverage of the business interruption policy				x	
59	Financial cover of disruptions at suppliers				x	
60	Financial cover of disruptions at customers				x	
	Supply side					
	Risk exposure					
	Facts regarding the supply side					
61	Number of critical suppliers		x			
62	Alternatives to critical suppliers	x				
63	Dependence of each critical supplier	x				
	At each important supplier:					
64	The supplier's ability to maintain a certain level of quality				x	
65	The supplier's ability to maintain a certain quantity				x	
66	The degree of JIT		x			
67	The dependence of JIT		x			
68	The degree of production made to order		x			
69	The flexibility within the production process			x		
70	Alternatives to the production flow		x			
71	The existence of bottlenecks		x			
72	Level of inventories					x
73	Localisation inventories					x
	Risk identification:					
74	The level of time-dependence		x			
75	The level of relationship-dependence		x			
76	The level of functional-dependence		x			
	Risk Management					
77	General knowledge of risk management		x			
78	The development of risk management strategies		x			
79	The existence of a business continuity plan			x		
	Supply chain risk management:					
80	The awareness of supply chain risk management		x			
81	The supplier's involvement in the long term planning					x

	In case of a disruption:					
82	The resilience to disruptions		x			
83	The ability to maintain the supply of a product	x				
84	The ability to avoid domino effects	x				
	Risk handling					
85	Risk identification as a continuing work					x
86	Analyses of possible disruptions					x
87	Valuation of existing risks					x
	Demand side					
	Risk exposure					
	Facts regarding the demand side:					
88	Number of customers			x		
89	Number of important customers			x		
90	Dependence of each important customer		x			
91	The understanding of the demand patterns			x		
92	The existence of alternative products on the market		x			
93	The dependence of safe delivery dates		x			
94	The dependence of JIT		x			
	Risk identification:					
95	The level of time-dependence		x			
96	The level of relationship-dependence			x		
97	The level of functional-dependence			x		
	Risk Management					
98	General knowledge of risk management					x
99	The development of risk management strategies					x
100	The existence of a business continuity plan					x
	Supply chain risk management:					
101	The awareness of supply chain risk management					x
102	The business partners involvement in the long term planning		x			
	In case of a disruption:					
103	The resilience to disruptions			x		
104	The ability to maintain the supply of a product			x		
105	The ability to avoid domino effects			x		

	Risk handling					
106	Risk identification as a continuing work					x
107	Analyses of possible disruptions					x
108	Valuation of existing risks					x
	The total view of the supply chain					
109	The complexity of the supply chain			x		
110	The level of globalisation of the supply chain			x		
111	The vulnerability of the supply chain		x			
112	The rapidity of the supply chain			x		
113	The resilience to disruptions		x			
114	The ability to maintain the supply of a product		x			
115	The ability to avoid domino effects		x			
116	The mapping of the flow in the supply chain			x		
117	The awareness of supply chain risk management		x			

C4. The check list for Persson

Check list - Persson						
		Ranking				
		- -	-	+	+ +	?
Internal						
	Risk exposure					
	Facts regarding the production:					
1	The complexity of the production			x		
2	The production lead time			x		
3	The existence of bottlenecks			x		
4	Alternatives to the production flow	x				
5	The degree of production made to order	x				
6	The flexibility within the production process		x			
7	Level of inventories	x				
8	Localisation of inventories		x			
9	The dependence on outsourced functions			x		
10	The relationship with the outsourcing companies			x		
11	The degree of JIT	x				
12	The dependence of JIT	x				
	Risk identification:					
13	Employee risks			x		
14	Property risks	x				
15	Environmental risks			x		
16	Criminal acts			x		
17	Market risks		x			
18	Liability risks			x		
19	Political risks				x	
20	The level of time-dependence		x			
21	The level of relationship-dependence			x		
22	The level of functional-dependence		x			
	Risk Management					
23	General knowledge of risk management			x		
24	The development of risk management strategies			x		
25	General development of business continuity plan			x		

26	Existence of emergency response procedures			x		
27	Prioritization of critical processes to recover			x		
28	Training and maintenance of existing plan			x		
	Supply chain risk management:					
29	The awareness of supply chain risk management			x		
30	Methods of choosing the right business partner			x		
31	Constant evaluation of the business partners		x			
32	The business partners involvement in the long term planning			x		
	In case of a disruption in the supply chain:					
33	The resilience to disruptions		x			
34	The ability to maintain the supply of a product		x			
35	The ability to avoid domino effects			x		
36	The degree of cooperation among all business partners			x		
37	Changes in overall risk management after a disruption					x
	Risk handling					
38	Risk identification as a continuing work			x		
39	Analyses of possible disruptions			x		
40	Valuation of existing risks			x		
41	Knowledge and ability to reduce risks			x		
42	Open communication of the identified risks			x		
43	Administrative actions			x		
44	Production concentrated and technical actions				x	
45	Legal actions					x
46	Reflections of changes through revising and updating			x		
47	The active monitoring of risks			x		
48	Awareness of noninsurable risks			x		
	Insurance coverage:					
49	The correlation between the needs and the insurances				x	
50	The level of risks insured in a cost-efficient way	x				
51	Existence of country specific noninsurable risks	x				
	The structure of the business insurance:					
52	The extent of the property insurance				x	
53	The extent of the business interruption policy			x		
54	The extent of the liability insurance					x

55	Relation between actual value and insured value				x	
56	The length of the indemnity period				x	
	In case of a disruption:					
57	The coverage of the property insurance				x	
58	The coverage of the business interruption policy			x		
59	Financial cover of disruptions at suppliers			x		
60	Financial cover of disruptions at customers			x		
	Supply side					
	Risk exposure					
	Facts regarding the supply side					
61	Number of critical suppliers			x		
62	Alternatives to critical suppliers		x			
63	Dependence of each critical supplier		x			
	At each important supplier:					
64	The supplier's ability to maintain a certain level of quality				x	
65	The supplier's ability to maintain a certain quantity				x	
66	The degree of JIT	x				
67	The dependence of JIT	x				
68	The degree of production made to order	x				
69	The flexibility within the production process					x
70	Alternatives to the production flow					x
71	The existence of bottlenecks					x
72	Level of inventories		x			
73	Localisation inventories		x			
	Risk identification:					
74	The level of time-dependence	x				
75	The level of relationship-dependence		x			
76	The level of functional-dependence			x		
	Risk Management					
77	General knowledge of risk management			x		
78	The development of risk management strategies			x		
79	The existence of a business continuity plan			x		
	Supply chain risk management:					
80	The awareness of supply chain risk management			x		
81	The supplier's involvement in the long term planning					x

	In case of a disruption:					
82	The resilience to disruptions			x		
83	The ability to maintain the supply of a product		x			
84	The ability to avoid domino effects		x			
	Risk handling					
85	Risk identification as a continuing work			x		
86	Analyses of possible disruptions			x		
87	Valuation of existing risks			x		
	Demand side					
	Risk exposure					
	Facts regarding the demand side:					
88	Number of customers				x	
89	Number of important customers			x		
90	Dependence of each important customer			x		
91	The understanding of the demand patterns				x	
92	The existence of alternative products on the market		x			
93	The dependence of safe delivery dates	x				
94	The dependence of JIT			x		
	Risk identification:					
95	The level of time-dependence		x			
96	The level of relationship-dependence			x		
97	The level of functional-dependence			x		
	Risk Management					
98	General knowledge of risk management					x
99	The development of risk management strategies					x
100	The existence of a business continuity plan					
						x
	Supply chain risk management:					
101	The awareness of supply chain risk management					x
102	The business partners involvement in the long term planning		x			
	In case of a disruption:					
103	The resilience to disruptions			x		
104	The ability to maintain the supply of a product			x		
105	The ability to avoid domino effects			x		

	Risk handling					
106	Risk identification as a continuing work					x
107	Analyses of possible disruptions					x
108	Valuation of existing risks					x
	The total view of the supply chain					
109	The complexity of the supply chain			x		
110	The level of globalisation of the supply chain		x			
111	The vulnerability of the supply chain		x			
112	The rapidity of the supply chain			x		
113	The resilience to disruptions		x			
114	The ability to maintain the supply of a product		x			
115	The ability to avoid domino effects		x			
116	The mapping of the flow in the supply chain				x	
117	The awareness of supply chain risk management			x		