Companies are increasingly dependent on their fellow supply chain members. Supply chains, rather than companies, compete against each other. Risk awareness is simultaneously increasingly necessary since the business environment is characterized by globalization and amplified efficiency requirements. Risk management needs to take a supply chain perspective, in the form of supply chain risk management (SCRM). The overall aim of this article is to further the understanding for supply chain risk management. A framework for SCRM is constructed that includes steps from prerequisites to implementation. A representative case study (Finnlines Plc HansaLink) assesses the applicability of the framework.

Introduction

Businesses today are highly reliant on their partners and the nurturing of their partnerships. Supply chains compete against each other, and these chains grow increasingly complex as businesses strive for success. Fewer suppliers are relied upon, and these suppliers are chosen regardless of geographical positioning. Stock keeping is seen as a sign of inefficiency, and just-in-time strategies are employed. Because margins continue to fall, one little blunder can be disastrous, and companies are required to exercise great care. All of this adds up to a risky environment.

Interest in the application of risk management in a supply chain context has risen during the past few years. Originally, significant incidents such as September 11, the SARS health crisis, and large strikes have triggered companies to pay attention to supply chain risk management (SCRM). Experts warn of the dangers of overlooking smaller, mundane risks as they focus on larger risks (“Supply Chain Risk,” 2003). Those mundane risks, almost by definition, occur frequently and routinely; hence, SCRM also needs to become a part of everyday business. According to Jüttner, Peck, and Christopher (2003), SCRM “aims to identify the potential sources of risk and implement appropriate actions to avoid or contain supply chain vulnerability” (p. 201).

Regardless of the risks and problems that companies and supply chains on the whole face today, customers expect quality product and service delivery (Elkins, Handfield, Blackhurst, & Craighead, 2005). To maintain their competitive position in the marketplace and uphold their goodwill, companies need to be dedicated to SCRM. A resilient and responsive supply chain can produce a sustainable competitive advantage for a company (Elkins et al., 2005); however, risk management is not as well understood within supply chains as in individual organizations. There is a clear “lack of an integrated programme of action or access to an appropriate managerial ‘toolkit’” (Chapman, Christopher, Jüttner, Peck, & Wilding, 2002, p. 61). In general, supply chain planning and control techniques are used at a moderate level; however, “these tools and techniques are in their...
infancy," and development is called for (Olhager & Sellin, 2004, p. 357).

This article provides a framework constructed using existing SCRM techniques presented by different authors. The framework aspires to tie these techniques together to form a tool for company management. First, a literature review will be presented as the basis for constructing the framework, and then the framework will be applied to an interesting case of the Finnish shipping industry.

Supply Chain Risk Management Literature Review

This section utilizes a qualitative approach to fulfill the aim of furthering the understanding of SCRM and providing insights into the topic. It aims at providing depth and insight into a “little known phenomenon” (Eliam, 1996, p. 94; see also Strauss & Corbin, 1990). A SCRM framework will be derived based on the information found in a review of the literature. Key components of SCRM will be examined, including supply chains, supply chain management, and risk management.

The Supply Chain

Mentzer et al.’s (2001) definition of a supply chain is assumed here, namely that a supply chain is “a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer” (p. 4). The simplistic nature of the term chain can be misleading. As mentioned earlier, the increasing geographic distribution of companies has increased the complexity of supply chains. Supply chains are developing into networks rather than being simple chains (Chapman et al., 2002; Christopher, 2005; Lambert et al., 1998). Several authors, in fact, have assumed that the term supply chain implies a supply network. The discussion here will follow that line of thought and consider a supply chain as something more complex than merely a chain. The focus on “supply” in the term also has been questioned, as Christopher (2005) refers to demand chains/networks, and Kemppainen and Vepsäläinen (2003) speak of demand-supply networks. These authors make a valid point, given that supply chains are not driven solely by supply. For the purpose of simplicity and clarity, however, the term supply chain will be used because it remains the more commonly used term in the literature. Nevertheless, the importance of demand is not underestimated.

Supply Chain Risk Management is not thought of as a separate process, but as part of normal business processes

Supply Chain Management

The discussion here uses the definition of supply chain management provided by the Global Supply Chain Forum: “Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders” (Lambert, Cooper, & Pagh., 1998, p. 1). Supply chain management includes being aware of the supply chain members, which processes are to be linked between the supply chain members, and which management techniques should be used to integrate the processes of these members (Lambert et al., 1998).

Risk Management

Because companies are so reliant on their fellow supply chain members, it is natural that the formerly company-specific techniques of risk management take on a supply chain perspective. The term risk has subjective meanings and requires definition. Risk is considered here to be the “the variation in the distribution of possible outcomes, their likelihood, and their subjective values” (March & Shapira, 1987, p. 1404). The term is often used in conjunction with the terms uncertainty and vulnerability. Vulnerability is defined as the exposure to serious disturbance arising from risks (Chapman et al., 2002), whereas uncertainty arises when something “reduces the predictability of corporate performance, that is, increases risk” (Miller, 1992, p. 312). Hence, one can conclude that uncertainty can result in risk, which leads to vulnerability (see Figure 1).

Risk management is essentially the process of responding to the existence of uncertainties (and, hence, risks) through “controlling variability from an objective, target specification or standard” (Hutchins & Gould, 2004, p. 75). Uncertainty unfortunately plays an intricate role in most business situations and is a cause of risk and vulnerability in most supply chains. It is thus important to address uncertainty with appropriate techniques.

A Framework for SCRM

A general framework for SCRM is constructed here, based on various techniques for risk management.

Figure 1: Risk-related terminology

![Diagram of risk-related terminology: Uncertainty → Risk → Vulnerability]
The 3-P approach developed by Chapman et al. (2002) will be used as the basis for the framework. The 3-P approach consists of three main components: philosophy, principles, and processes. Philosophy and principles are grouped as prerequisites for SCRM, and processes constitute the implementation of SCRM. Central themes are included in the illustration of the framework.

Prerequisites for SCRM: Philosophy and Principles

According to Chapman et al. (2002), a clear philosophy is necessary to drive change successfully. Those authors underline the importance of senior management as a driving force for risk management and a company-wide awareness of the subject. The entire organization needs to be committed for risk management techniques to be implemented successfully; every employee needs to feel that his or her input is important. Norrman and Jansson (2004) present a matrix organization that can be useful when implementing risk management techniques. Employees and managers responsible for risk management reside at all levels and in all areas to ensure the successful management of risk (see Figure 2).

Figure 2 depicts a matrix organization through which risk management is supported. Representatives from all system business areas and core units are part of a risk management council. This risk management council in turn reports to the corporate risk management team.

This ideology is supported by Hauser (2003), who believes that risk management needs to be a holistic and enterprise-wide process, involving many different influential members; thus, cross-border cooperation is called for. According to Hamilton (1985), risk management should be included in strategic planning. A company can also promote a culture of disruption awareness, making risk management a core element within the company (Elkins et al., 2005). These philosophies need to be translated into concrete principles for the company to follow in relation to SCRM.

Risk management principles should include best practice as well as specific techniques for uncertain situations (Chapman et al., 2002). Chapman et al. (2002) identify several main principles: implementing risk considerations with regard to supply chain design and structure as well as enhancing visibility, cooperation, communication, and understanding among supply chain members. These principles are mentioned by several authors. A model proposed by Elkins et al. (2005) encompasses several components of SCRM, including visibility between supply chain members. To reduce risk, processes need to be synchronized within the supply chain, and chain members must cooperate (Guinipero & Eltantawy, 2004; Miller, 1992). Members can join forces to address supply chain-wide risks that would be too costly for an individual organization to manage. Common goals and aims for suppliers and customers alike are underlined as important (Guinipero & Eltantawy, 2004; Miller, 1992). These goals can be in the form of performance requirements. These principles and the prerequisites for SCRM can be used to develop operational processes.

Implementation of SCRM: Processes

The third P in Chapman et al.’s (2002) 3-P approach refers to the “processes, techniques and tools needed to manage supply chain risks” (p. 62). This section focuses on three different implementation steps: the actual SCRM process, process continuity, and retroactive processes following risk realization. These are the three last steps of the framework.

SCRM process steps can be viewed along three dimensions (Norrman & Lindroth, 2001, p. 301; see Figure 3). According to Norrman and Lindroth framework, supply chain risks should be looked at from three dimensions—the unit of analysis, the type of risk to be analyzed, and the focus of risk handling. These three dimensions will be discussed in detail with the support of related literature to form the backbone through which the actual SCRM process will be constructed.
The first step is to define the unit of analysis, the x-axis in Figure 3. According to Norrman and Lindroth (2001), the smallest possible unit of analysis is a single logistical activity within a company, such as transportation. The next largest unit is the company. The scope of analysis can be expanded further to encompass two companies within a supply chain (a dyad), a supply chain, or a supply network, the most complex unit of analysis (Norrman & Jansson, 2004). The complexity of the unit of analysis increases outward along the x-axis. When speaking of a supply chain risk management framework, the unit of analysis should be the supply chain. The direct supply chain is the simplest form, with at least three members (Mentzer et al., 2001). Criticism therefore can be directed toward Norrman and Lindroth’s (2001) framework title, given that the supply chain is not necessarily the unit of the analysis. According to the x-axis dimension, the unit of analysis could be something as limited as a single logistical activity.

The z-axis in Figure 3 describes the type of risk that to be examined. According to Norrman and Lindroth (2001), the risk type can be of various kinds and scopes. Moving along the axis, the consequence of the realized risk increases, but the frequency/probability of it occurring decreases (Norrman & Lindroth, 2001). The types of risk and the consequences that they produce are not universal; they depend greatly on the industry in which the company operates (Jüttner et al., 2003; Schwier, 2005). Jüttner et al. (2003) describe this through two extreme cases: The first case features a company producing basic goods, exposed to the risk of diminished sales; a second case features a company supplying critical health products, exposing itself to significantly greater risks if its products do not meet the demands of the market. The two cases illustrate that a company within the pharmaceutical industry faces much greater consequences of realized risk.

Operational accidents have minor consequences; examples include fires and vehicle accidents. (Norrman & Lindroth, 2001). There is some danger in underestimating the consequences of these so-called smaller risks. The mundane risks that occur more frequently, with smaller consequences, can be the ones that cause the most friction within a supply chain ("Supply Chain Risk," 2003). Incidents on a larger scale, such as the terrorist attacks of September 11, 2001, and the SARS epidemic steal attention from these important “smaller” risks. One needs to be careful not to rank risks according to consequence, but instead to consider both consequences and frequencies of occurrence.

Operational catastrophes are the result of risks that are seldom realized but have catastrophic consequences. Operational catastrophes consist of occurrences that affect a broad scale of activity. Natural disasters, such as earthquakes (Norrman & Lindroth, 2001) and hurricanes fall into this category, as do political risks. The war in Iraq, for example, can affect a supply chain by causing an increase in the price of oil, as one example, or unresolved issues between Pakistan and India can lead to disruptions, as another (Guinipero & Eltantawy, 2004). Terrorist attacks, large-scale labor strikes, and disease epidemics belong to this category.

Strategic uncertainties occur when business decisions are made under uncertain scenarios. These decisions may have great consequences. (Norrman & Lindroth, 2001). Strategic uncertainties also can be the product of companies implementing certain business strategies such as just-in-time inventory management or some other supply chain management strategy.

The y-axis in Figure 3 relates to risk handling focus. Moving along the axis, risks are first analyzed, then assessed, and finally managed.

Risk analysis is an important topic in most risk management literature. According to Hamilton (1985), risk analysis encompasses the examination of the supply chain...
and the environment in which the company operates. Different members, dependencies, and the processes within a company need to be identified.

Risk assessment is the next step after risk analysis. Risks are appraised, and their consequences are estimated. According to Hamilton (1985), statistical methods should be used to determine the probability of a risk occurring, its consequences, and hence its risk level (acceptable, unacceptable, or catastrophic). Risks should be ranked according to the gravity of their consequences as they affect and disturb the supply chain (Hamilton, 1985). Norrman and Jansson (2004) present further possibilities for quantitatively analyzing risks. The industry in which a company operates determines, in part, which risks are of significance (Jüttner et al., 2003).

As a means of risk assessment, Norrman and Jansson (2004) suggest the use of fault tree analysis and event tree analysis. Fault tree analysis looks at the different events that lead up to the final critical event. An overview of all possible failures that may occur is carried out, and with the incorporation of statistical and probability calculations, a quantitative analysis can be conducted. This method analyzes the uncertainties that lead up to the risk and later to the vulnerability. Event tree analysis focuses on the situation after a risk has been realized. Business recovery time is a common measure used in risk assessment; it is the time needed for a business to recuperate after a realized risk. Business interruption value is a calculation of the financial cost of a supply chain disruption (Norrman & Jansson, 2004).

Purely quantitative analysis of risks often is insufficient. If risk is assessed purely through the multiplication of its size with its frequency, the value of a smaller risk that occurs more frequently can be as large as that of a catastrophic risk that occurs only rarely (“Supply Chain Risk,” 2003). Assuming that these risks carry the same weight can be detrimental to a company because of the great differences in the management of catastrophic risks and everyday smaller risks.

Risk management can be achieved once risks have been analyzed and assessed. Norrman and Lindroth (2001) divide risk management into four main techniques: risk sharing, transferring, reduction, and avoidance.

Risk sharing can be achieved through contracts made with other members of the supply chain as well as through improved cooperation (Norrman & Jansson, 2004). Guinipero and Eltantawy (2004) exemplify close cooperation through reference to Dell Computer, a company that considers its suppliers as an extension of its organization. Mergers and acquisitions also are seen as tools for risk sharing (Guinipero & Eltantawy, 2004).

Risk transfer exists in the form of insurance contracts. Following the events of September 11, 2001, however, insurance contracts have become less beneficial (“Supply Chain Risk,” 2003). Norrman and Jansson (2004) believe that risks can be transferred to other members of the supply chain; for example, responsibility for warehousing and its risks can be transferred to suppliers through just-in-time deliveries and make-to-order contracts, and outsourcing can be utilized.

Risk reduction can be achieved through several different means. Miller (1992) presents five main techniques for risk management: (a) control, (b) cooperation, (c) imitation, (d) flexibility, and (e) risk avoidance. The first four can be considered risk reduction techniques. To acquire control of uncertainties for the purpose of reducing risks, companies can engage in political lobbying, acquire market power, and control competitors through different means. A cooperative strategy is a less strict form of control. Cooperation includes contracts and alliances between different companies, but the level of interaction is not as intense as the cooperation during risk sharing. Imitation of other companies’ strategies, including pricing and product development, can reduce risk as well. Flexibility includes diversification and operational flexibility. An organization can attain flexibility by having a diversified product line and making use of several different suppliers (Miller, 1992). Norrman and Jansson (2004) believe that organizations should be careful not to trust a single supplier, but instead to have a backup plan or even a parallel system in case the usual supplier is unable to deliver as promised.

Avoidance is the last of Miller’s (1992) five risk management techniques and one of Norrman and Lindroth’s (2001) four risk management techniques. If a risk is seen as being unacceptable, the company must avoid the product, geographical area, supplier, or the customer organization that causes the risk (Norrman & Lindroth, 2001).

Process Continuity

It is important to remember that the SCRM process needs to be continuous because of the dynamic nature of the supply chain environment. To maintain a balanced risk profile, companies need to measure and monitor their performance. In other words, companies need to include risk related issues in their customary performance measures. A company can observe the entire supply chain and measure the various suppliers’ focus on risk management. These measurements need to be updated frequently both to follow the development of current events and circumstances and to be valid in analyses of how well the implementation of risk management techniques has worked (Hauser, 2003). Elkins et al. (2005) believe that a company should have a supply chain monitoring team that gathers intelligence about the supply chain and different risks. Risks that are of
significance but that cannot be mitigated should be monitored (Norrman & Jansson, 2004). Hamilton (1985) refers to a risk cycle when speaking of risk management, in order to underline the need for continuity and constant updating. Because circumstances change, risks also vary, requiring appropriate revision of risk management techniques.

**Realized Risk and Retroactive Processes**

Various preventive measures used to manage risk were discussed previously, but not all negative effects of risk can be prevented. Companies therefore need techniques for dealing with risk realization. This step is not present in all frameworks that deal with risk management.

Norrman and Jansson (2004) discuss business continuity management (BCM), which includes techniques used to ensure that realized risks do not disturb a company's business processes, or that they do so minimally. They base their discussion on the work of the Chartered Management Institute (2002). (The Chartered Management Institute's Web site is obsolete, and the authors' references are assumed correct.) BCM encompasses contingency planning, crisis management, disaster recovery, and business recovery (Chartered Management Institute, 2002, as quoted in Norrman and Jansson, 2004).

Hamilton (1985) underlines the importance of creating a BCM plan that can easily be applied when necessary. Contingency plans must be based on specific scenarios (Elkins et al., 2005). Important elements of a BCM plan include organization of reconstruction and dissemination of information spreading, along with immediate emergency procedures (Hamilton, 1985) Damage treatment, in essence identical to the crisis management of BCM, is defined by Hamilton (1985) as a means to limit the extent of damage from a realized risk, including production disruptions. Information transfer in the event of a realized risk may need to be rapid, for example through the use of an alarm that is connected internally or to an external party such as an alarm center, the local fire station, or paid guards. Resources may need to be mobilized swiftly in some emergency situations, such as an oil spill, a fire, illness, or human injuries (Hamilton, 1985). With the help of decision support tools, a company can reconfigure its supply chain in real time just after a risk has been realized, implementing disaster and business recovery procedures. Important elements of plans are the availability of information and tools for assessing different options for supply change redesign, which might include changing transportation modes, routes, or suppliers. Decisions regarding these solutions should be reached very quickly (Elkins et al., 2005).

The company needs to learn from the event that has happened and prevent it from reoccurring. Elkins et al. (2005) remind managers of the importance of making detailed incident reports and conducting analyses after a disruption has taken place.

**Illustration of the SCRM framework**

A SCRM framework, from prerequisites to implementation, has been constructed throughout this paper. The framework has been subcategorized into three different chronologically ordered phases: philosophy, principles, and processes. The processes were further divided into the supply chain risk management process, process continuity, and retroactive processes. Figure 4 illustrates the SCRM framework.

The framework is in the form of a loop, symbolizing its continuous nature. From a philosophy, the following step is setting up principles prior to beginning the actual risk management process. In the case of risk realization, the retroactive process is executed. This area is shaded, as risks are not always realized. Based on what is learned during the retroactive processes, a new loop is started with new and improved philosophy, principles, and processes. Though the figure is static, the framework is dynamic. One could instead picture it as being a spiral, with one loop evolving from another as the SCRM prerequisites and implementation procedures are revised.
develop. The following section assesses the application of the SCRM framework.

**Case study: Finnlines PLC HansaLink**

In Finland, more than 80% of all trade relies on the shipping industry (Brady, 2002). Finland is seen as an island (Karrus, 1998), with 1,500 km of coastline and 60 ports (Brady, 2002). The shipping industry is hence vitally important, especially as Finland becomes increasingly dependent on EU trade (S. Herlin, senior vice president of Finnlines Plc HansaLink, personal communication, June 8, 2006).

Finnlines Plc is a noteworthy Finnish shipping company specialized in liner cargo services and port services. During 2005, Finnlines Plc kept an average of 65 vessels in service (RoRo, RoPax, and container vessels). Port services are sold by Finnlines Plc’s subsidiary Finnsteve Oy Ab, which operates in Helsinki, Turku, Naantali, and six other ports. In 2005, Finnlines Plc’s revenue amounted to 747 million, and the operating profit was 41 million. On average, the company employed 2,212 people. Finnlines Plc HansaLink is responsible for the company’s traffic between Helsinki/Turku and Travemünde (Finnlines Plc Annual Report, 2005).

Risk management is extremely important in a transportation company because disruptions can interrupt an entire supply chain (Giunipero & Eltantawy, 2004). This case study intends to determine how Finnlines Plc HansaLink addresses the issue of SCRM when it comes to operating risks such as damage and delay. The applicability of the SCRM framework will be assessed. Finnlines Plc HansaLink is of particular interest because it is one of Finland’s largest shipping companies. As mentioned, Finland’s trade is highly reliant on the shipping industry. Finland’s vulnerability to disruptions within the shipping industry has been made clear during large port strikes. The shipping industry, and Finnlines as a large player in this industry in Finland, thus makes an interesting case for discussion of SCRM.

**Methods, Validity, and reliability**

A qualitative study was carried out to assess how well the SCRM framework can be applied in practice. Strauss and Corbin (1990) mention three major components of qualitative research. First, the data sources typically are interviews and observations, the former being utilized in this article. Four relevant people with key roles with regard to risk management were interviewed. Two of these interviewees were in upper management levels and in different geographical areas; one was in Finland and one in Germany. This provided a broader view of the shipping line between Finland and Germany. On a more operational level, the other two interviews were carried out with Finnlines’s ship management responsible and with the fleet manager. Second, analytic or interpretive procedures are used to conceptualize data; in this case, categorization is used. The answers and information provided have been categorized according to the themes in the framework. Third, written and oral reports are used; this empirical study employed both forms.

This study aimed to provide data that are both valid and reliable. The relevant forms of validity for this study are construct and external validity (Ellram, 1996; Ghauri & Grønhaug, 2005; Yin, 2003). Construct validity is ensured through the data collection process, in which multiple sources of evidence and a chain of evidence were used (Yin, 2003). The chain of evidence is retained throughout the study; the research questions are reflected in the case study database, the interview questions, and the conclusions. External validity, referring to generalizability (Ellram, 1996; Ghauri & Grønhaug, 2005; Yin, 2003), is achieved through the links to the theories related to SCRM in the literature. Reliability in the study comes in the form of following a consistent procedure throughout its duration (Ellram, 1996; Yin, 2003).

**SCRM at Finnlines Plc HansaLink**

**Prerequisites for SCRM: Philosophy and Principles**

Before the actual SCRM processes can be implemented, prerequisites need to be established. The following sections describe the development of the prerequisite philosophy and principles.

General risk management philosophies exist at Finnlines Plc HansaLink (hereafter denoted Finnlines and as Finnlines Plc when referring to the group). According to the strategic goals presented in Finnlines Plc’s annual report (2005), the group aims at increasing its profitability through efficiently handling safety issues. Risk planning on a strategic level is underlined by Hamilton (1985). Finnlines Plc’s annual report (2005, p. 4) shows evidence of a driving force with regard to risk management issues; Finnlines Plc’s business concept is to “provide efficient, high-quality sea transport.” In addition, “to avoid accidents, the company performs risk analyses, emphasises safety in operational procedures, and engages in the continuous training and professional development of personnel” (Finnlines Plc, 2005, p. 19). The quality of risk management is stated as being overseen at the corporate level.

Different functions are involved to create holistic and cross-border risk management. This is in accordance with what Hauser (2003) proposes. The size of the risk determines who is in charge of handling it. The CEO is responsible for large issues related to the transportation of dangerous goods. Safety issues on board are handled by the vessel master, with the CEO jointly responsible (S. Herlin, personal communication, June 8, 2006). Regarding more specific risk management, responsibilities are divided through a matrix...
organization, with responsibilities allocated both at the managerial level and at lower levels. Security officers and the employees booking the vessels naturally need to be aware of issues related to the booking of dangerous goods. In a sense, each employee is involved in risk management, which is positive according to Norrman and Jansson (2004). An organized “Alarm Group” is responsible for operative matters, and an “Emergency Response Team” represents the commercial side (J-E. Dahlberg, ship management [Finland] at Finnlines Oyj, personal communication, April 4, 2005). These entities are summoned in case of a vessel accident (e.g., a collision, grounding, a fire, or other damage to the vessel or environment).

Principles for risk management can be formed based on the established philosophies. According to Chapman et al. (2002), the handling of risks needs to be encompassed in the design of the supply chain as well as in its structuring. With regard to general SCRM principles, Finnlines is well aware of the fact that there are elements within the supply chain design and structure that it is not able to control. For example, if its primary customer were to go bankrupt, there is little that Finnlines could do; in general it is not possible to fully safeguard against such situations. When transportation is planned on routes with a small number of customers, risk regarding those customers needs to be taken into consideration, and the company needs to evaluate whether it is worth investing in the traffic (S. Herlin, personal communication, June 8, 2006). Herlin stated that “though not always possible, we strive for trafficking on routes with a broad customer and wide cargo base.” Market development is changing the structure and design of the supply chain; fewer warehouses are utilized, and direct deliveries are preferred. Postal orders have increased, placing different requirements on transportation times and shipping frequencies. In general, according to Herlin, Finnish foreign trade is constantly developing, and risk management at Finnlines requires updated information on such changes.

Visibility across the supply chain is relatively good regarding first-tier suppliers and customers, according to Herlin, so that the company receives timely and accurate information regarding the truly relevant issues. Visibility could be improved regarding customers’ customers, the second tier. Little is known about their requirements regarding schedules, quality, the goods transported, and the criteria for using a specific route. This information would be relevant for service development. Customers, however, may see Finnlines as their competitor. Cooperation is upheld through various meetings and discussions with customers and suppliers, according to Herlin.

Communication occurs through in-person meetings and the utilization of computer systems, telephone contact, and different reporting systems (J-E. Dahlberg, personal communication, April 4, 2005; H. Modig, fleet management manager at Finnlines Oyj, personal communication, March 29, 2005). More structured meeting procedures exist as well; Finnlines maintains contact with its suppliers through regular operative meetings during which performance, processes, and quality issues are discussed. Strategic meetings with suppliers are held approximately twice a year, and commercial meetings are used for going through tariff changes, for example. Daily contact with suppliers is handled by the booking department (S. Herlin, personal communication, June 8, 2006; G. Ranke, managing director at Finnlines Deutschland GmbH, personal communication, June 8, 2006).

Implementation of SCRM

The SCRM process

Following the Norrman and Lindroth (2001) SCRM framework, risk management processes begin with establishing the unit of analysis, the type of risk, and the risk management focus. Because the framework is a supply chain risk management framework, the unit of analysis is the supply chain. Finnlines Plc can be considered the focal company in a direct supply chain. The industry and the forwarding companies are Finnlines Plc’s customers, and Finnsteve Oy Ab as well as other stevedoring companies are the suppliers. According to Modig, the customer sees the product provided by Finnlines Plc as a port-to-port service even though the service involves port operations that are purchased from external suppliers.

The general risks facing Finnlines can be identified. Operational risks, related to damage and delay, and possibly resulting in operational accidents (as categorized by Norrman & Lindroth, 2001) need to be considered. Herlin and Ranke also identified safety issues, vessel security, cargo availability, and delays. Herlin further mentioned strikes as a cause of delay. The risk to human life is exceptionally large in numbers for Finnlines because it holds the responsibility for its own personnel, the passengers on the vessels, and customers’ chauffeurs.

Risk to nature is ranked by Herlin as second in importance after risk to human life. Operational accidents that are left untreated can result in operational catastrophes. Choosing to operate within the shipping industry can be classified as a strategic uncertainty in and of itself, according to Herlin, because shipping and port operations both carry large risks in comparison to the risks involved in other modes of transportation, such as trucking. Ranking risks according to consequence, however, is fraught with problems (“Supply Chain Risk,” 2003). Jüttner et al. (2003) and Schwier (2005) state that the types of risks a business faces depend greatly on the industry in which it operates. According to Herlin and Ranke, Finnlines’s business risks cannot be separated geographically and are present in the company’s everyday doings.
The risk handling focus begins with risk analysis, through which the company acknowledges which risks exist. Finnlines has carried out SWOT analyses to analyze the risks that the company faces. Analyses have been made to determine the development of certain customer industries, such as the forestry industry. According to Modig, the supply chain structure is analyzed so that management is aware of changes regarding the market as a whole, customers, type of goods transported, and the loading of goods, among other factors.

Furthermore, risk assessment needs to be carried out to determine the probability of a risk occurring (Hamilton, 1985). Finnlines Plc regularly updates statistics regarding damages per customer and vessel so as to assess the risks related to vessel accidents, according to Modig. Reports regarding deviations in the form of risk situations and accidents are analyzed by a “Safety and Quality” group that convenes every three weeks. It is significantly more difficult to assess the probability of a port strike occurring, according to Modig, but it is important to keep up to date with what is happening in the market.

Companies try to achieve risk management through the previous steps. Finnlines shares its risks. Finnlines Plc’s ownership of Finnsteve can be considered a form of risk management through realized synergies resulting in risk sharing. Guinipero and Eltantawy (2004) mention mergers and acquisitions as a form of risk sharing. Finnlines has two business areas (shipping and port operations), so that it could be looked at as a “merged” company; in certain ports, the two happen to overlap, according to (Herlin. Finnlines also transfers some of its risks through insuring its vessels using a P&I insurance, according to Herlin and Ranke). In addition, Herlin noted, customers are informed about the Standard Conditions of Carriage and therefore are aware of which insurances they need to carry so that their goods are insured fully during the sea transport.

Finnlines’s risks are reduced through different means. First, Finnlines controls different steps of the process. Herlin described a well-developed safety plan. An alarm schedule has been developed to handle problem situations (e.g., a vessel grounding). The alarm schedule defines the different responsibilities assigned to various employees during such situations. Dahlberg noted that the ISM (International Safety Management) Code provides safety regulations that all shipping companies must follow. The objective of the ISM Code is “to ensure safety, to prevent human injury or loss of life, and to avoid damage to the environment, in particular, the marine environment, and to property” (Safety Management, 2005). In addition, the company has established four primary procedures to be followed in the case of a port strike. These are (a) estimating what the strike entails for cargo and scheduling, (b) checking to see how the schedule can be optimized, (d) deciding whether to ship partially empty cargo vessels, and (d) engaging in discussions at the political level. Through these means, Finnlines controls uncertainties and also engages in political lobbying, as suggested by Miller (1992).

Finnlines controls risks related to its suppliers as well. Finnlines maintains permanent representatives in ports, according to Herlin and Ranke, who also stated that the gate procedure is well defined in both Germany and Finland. Ranke noted that the standards are not exactly the same in both ports. Supplier deficits can be discovered through these methods and means (Lasch & Janker, 2005), and the Finnlines representatives in the ports act as “control points” at the customer site.

Finnlines also uses cooperation to reduce risks associated with its suppliers. Finnlines cooperates with both suppliers and customers to improve gate processes. Ranke explained how Finnlines uses cooperation to control supplier-related risks: “We state how our overall process runs and we then ask our partners, Lübecker Hafen-Gesellschaft mbH, a port operator in Travemünde] and Finnsteve, to please act accordingly so that our demands will be fulfilled.” Herlin and Ranke also noted that process training is carried out in cooperation with Finnsteve and LHG to improve their risk handling techniques. Ranke stated that IT systems have been developed in cooperation with suppliers. Finnlines also evaluates whether the port operator has the resources and machinery needed and that the port’s methods of operation are suitable, according to Herlin.

Finnlines has limited flexibility regarding risk reduction. “Alternative scenario thinking,” as Herlin put it, is not often engaged in prior to risk realization. Numerous authorities, including “Contingency Plans for Handling a Loss of Critical Supply” (2005), Miller (1992) and Ndubisi, Janant, Hing, and Ayub (2005), all support flexibility in relation to supplier management and selection; Finnlines therefore appears deficient in this area of SCRM.

Choy and Lee (2003) and Miller (1992), suggest risk avoidance as a risk management tactic. Ranke stated his belief that only an extreme scenario could result in Finnlines changing port as a result of bad performance on the part of the port operator.

**Process continuity**

On the general SCRM framework level, Finnlines maintains internal statistics on performance measures related to its risk management. Claims provide information for these statistics. According to Herlin, and as recommended in the literature, the statistics are continuously updated, and Finnlines’s performance is monitored. Ranke stated, “If one sees deviations from a norm or
routine, you need to look at what the reasons for these are.” He did not specifically mention a supply chain monitoring team, as proposed by Elkins et al. (2005). Responsibility for risk management is instead spread throughout the company, as mentioned previously. In essence, the Safety and Quality group deals with risk. Risk related issues are discussed during meetings of managers from different areas. Risk management within Finnlines is based on well-functioning confirmed processes that do not require specific risk management meetings. Risk related themes are handled when deemed necessary, according to Herlin.

**Realized Risk and Retrospective Processes**

Contingency planning and damage treatment are not taken lightly at Finnlines. Safety plans and alarm schedules are put into action as needed. These contingency plans (Elkins et al., 2005) are a part of business continuity management (Norrman & Jansson, 2004). In addition, claims made against Finnlines are analyzed by Finnlines employees and go through a very tight filter (e.g., pictures from vehicles entering and exiting the port are examined carefully). This process was developed to increase objectivity during analysis of claims, according to Herlin.

Herlin emphasized that innovation is needed to redesign a supply chain. Finnlines cooperates with VR Ltd (a Finnish state-owned railway company) and other suppliers to help customers reroute their cargo when labor strikes occur. A full backup system, however, would be prohibitively expensive, according to Herlin. In Germany, Ranke stated, Finnlines has no particular predetermined methods to use when it becomes necessary to redesign the supply chain. Vessels can be deviated to another port if the port of Travemünde is blocked; in the case of a larger strike, however, the situation is naturally more complex.

In order to learn from past incidents, Finnlines works with its customers as well as its suppliers to improve operations in the port. Improvements are needed through the involvement of different members and the exchange of information. Claims have been a significant teaching tool for Finnlines, according to Herlin, and have led to improved risk management techniques and practices. The claims and reports filed can be compared to the incident reports that Elkins et al. (2005) believe should be analyzed following a disruption.

**Conclusion**

Through a literature review, a supply chain risk management (SCRM) framework has been developed. Different SCRM techniques were combined to construct an all-encompassing tool for management. The framework assumes that successful SCRM relies on a strong basis in the form of philosophies and principles, with processes built on those foundations. This article has attempted to fill the gap in the literature that Chapman et al. (2002) describe: the lack of a toolkit to address risks that span the supply chain. Previous frameworks, unlike the one developed here, have been unable to provide tools for SCRM from prerequisites through implementation, as well as including methods for addressing realized risks. The framework presented, as well as the case study, is intended to provide a base for further research and development of SCRM tools. Practitioners can use the framework as a basis for addressing the subject of SCRM, which seems to be an “abstract” subject for many managers. The case study presented in this article illustrated the applicability of the SCRM framework. Although the prerequisites for SCRM typically exist, specific SCRM processes are not developed as fully. As part of the prerequisites, the existence of goals that are stated clearly at the corporate level and encouragement of widespread employee involvement in SCRM proved to be applicable. Companies need to be alert to changes in their business environment and their supply chain; risk management processes need to be revised constantly as the environment changes and develops. Information flow between different supply chain tiers proved to be vital for successful SCRM. Efficient information transfer also is important; it can include personal meetings, various forms of communication, and various IT tools. Priorities need to be clear regarding which risks require the greatest focus.

The actual SCRM process could involve mergers and acquisitions. Although specialization currently receives particular attention, one needs to weigh a broad versus narrow business portfolio from a risk perspective. If the choice is made to outsource, it is important to determine how much onsite supervision is required at supplier locations for risks to be managed adequately.

When a risk was realized, it proved useful for Finnlines Plc to have preset codes of conduct. Alternative scenario thinking was not applied in the case of Finnlines Plc. An avenue for further research is to explore the possibilities for this type of thinking and whether it is plausible as an applicable SCRM method given the volatility of many business environments: A scenario that was tested yesterday may not be relevant today.

It is dangerous to assume that a company’s SCRM is adequate without testing that assumption. Statistics on performance measures proved to be important tools for successful SCRM in the case of Finnlines. This type of data should be both monitored and updated regularly.

SCRM is not thought of as a separate process, but instead as part of normal business processes. Further development and increased awareness of SCRM are called for. Companies are not accustomed to using the term “supply chain risk management,” even though it exists in some form in most or all organizations.
Theoretically speaking, the literature review presented here could be expanded to include financial, environmental, and legal risks, not merely operational ones. As discussed in the conclusion, alternative scenario techniques could be further explored in conjunction with SCRM.

The empirical study could be extended to include more respondents, in other members of the supply chains, at different tiers. Different industries and different geographical locations could be examined and compared. Service supply chains could be compared to product supply chains.

Further research related to SCRM suggests itself in the light of current events. For example, the Russian natural gas company Gazprom would make an interesting case study. Its near monopoly position caused serious risk situations in 2006, when Gazprom was unable to reach an agreement with the Ukraine and Belarus regarding the delivery of gas. Another example concerns the risks inherent in global warming: How will environmental standards and requirements placed on companies affect SCRM?

References


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**Interviews**

Dahlberg, J-E. (2005), Interview. [Interview with Jan-Eric Dahlberg, Ship Management (Finland) at Finnlines Oyj, 04.04.2005, length: 45 min.]

Herlin, S. (2006), Interview [Interview with Staffan Herlin, Senior Vice President at Finnlines Pte HansaLink, 08.06.2006, length: 60 min.]

Modig, H. (2005), Interview. [Interview with Håkan Modig, Fleet Management Manager at Finnlines Oyj, 29.03.2005, length: 60 min.]

Ranke, G. (2006), Interview [Telephone interview with Günther Ranke, Managing Director at Finnlines Deutschland GmbH, 08.06.2006, length: 45 min.]