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Supply Management

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RISK MANAGEMENT IN SUSTAINABLE SUPPLY CHAIN

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ABSTRACT

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Growing awareness in corporate responsibility and issues related to sustainability is seen to increase innovativeness in a company as well as in its supply chain. The stakeholders' awareness on sustainability has increased, and they demand the companies to identify sustainability risks and adapt procedures for mitigating them. The purpose of this thesis is to examine how risks are managed in sustainable supply chain.

Definition of sustainability risks and risk management procedures construct the framework of the study. It is done through an empirical study conducted on 95 Finnish companies operating in the manufacturing industry. The data is acquired via an online questionnaire. The research has been conducted as a quantitative study utilizing the methods of statistical analysis, such as correlation analysis and factor analysis. The essential results of this thesis are identified risk-procedure connections, and the importance of different risks and procedures in the respondent companies.

TIIVISTELMÄ

Kasvanut tietoisuus yritysvastuusta ja vastuullisuuteen liittyvistä ongelmista on nähty kasvattavan sekä yrityksen että sen toimitusketjun innovatiivisuutta. Sidosryhmien vastuullisuustietoisuus on myös lisääntynyt, ja he vaativat yritystä tunnistamaan vastuullisuusriskejä sekä ottaa käyttöön keinoja riskien ehkäisemiseksi. Tämän tutkielman tarkoitus on tarkastella, kuinka yritykset hallitsevat riskejä vastuullisessa toimitusketjussa.

Tutkimuksen viitekehys muodostuu vastuullisuusriskien määrittelystä sekä riskien hallinnan keinoista. Tutkimus on toteutettu empiirisellä tutkimuksella, jossa on haastateltu 95 suomalaista valmistavan teollisuuden alalla työskentelevää yritystä. Haastatteludata kerättiin Internet-kyselyllä. Tutkimus on toteutettu kvantitatiivisena tutkimuksena, käyttäen hyödyksi tilastollisen analyysin keinoja, kuten korrelaatio- ja faktorianalyysiä. Työn keskeisimmät tulokset ovat tunnistetut riski-keino-yhteydet, sekä eri riskien ja keinojen tärkeys vastaajayrityksissä.

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Now it is time for something new!

In Lappeenranta 20.10.2015

Jaana Lirkki

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1. INTRODUCTION

Sustainability has become a trend. Globalization and increased consumer awareness in sustainability have put pressure also on purchasing and supply management (PSM) function. Companies are obliged to pay attention to from where and how they source products and services and companies are held responsible for the actions of the whole supply chain. Stakeholders are expecting companies to operate in a responsible way. Recent media attention about poor and unsafe working conditions, low salaries and destruction of the environment force companies to react. The companies cannot afford the reputational losses and reclamation fines that these incidents cause when they occur in their own supply chain (Laitinen, 2012, 11).

IKEA and Nike are examples of well-known brands whose image has suffered because of their suppliers' involvement in child labor which indicates weaknesses in social responsibility. Shell and Burger King are companies that have been targets of media and customers because of their apparent lack of concern for environmentally responsible purchasing. (Maignan, Hillebrand and McAlister, 2002) Negative publicity is harmful and should be avoided by doing things right. Damage to company reputation and negative consumer perceptions may result in lower sales, which is something every company wants to avoid. It is therefore well justified that purchasing should be executed responsibly and sustainability risks managed in the supply chain.

Sustainable purchasing plays a significant role in sustainable supply chain management and company's competitiveness. Effective implementation of Corporate Social Responsibility (CSR) is in the hands of companies' PSM function. The supply management is responsible for company's external resource management, which includes finding and selecting suppliers and gathering awareness of the origin of purchased products, services or raw materials. Therefore ensuring company's responsibility starts from PSM. According to some studies,

managing sustainability risks by ensuring sustainability and transparency in supply chain is one of the main tasks of PSM (Schneider and Wallenburg, 2012). Managing CSR well however requires strong risk management skills from the company, and innovativeness is needed from the whole supply chain. (Ghagde, Dani and Kalawsky, 2012)

1.1 Background and operation environment

Nowadays, sustainability must be integrated in companies' business strategy. Sustainability should have defined and appropriate goals that companies seriously aim to achieve. Well conducted CSR is found to have positive effects on corporate financial performance (Peloza, 2006). Fossgard-Moser (2005) and Schiebel and Pochtrager (2003) identified economic and competitive advantages that CSR brought to the focal company. The identified benefits of CSR were improved business reputation, improved employee loyalty, motivation and commitment, and increased rising of capital. Companies adapt different kind of methods for ensuring sustainability: the methods might be well considered and applied, but some of the methods can be used just for the fancy outcome (an official-looking sustainability report for example), but nonetheless, both methods aim at increasing company value. Responsibility issues are widely present in several company reports; however the practical application and how sustainability is actually measured and controlled remain ambiguous and unclear.

The role of companies has increased and their operations are followed not only by the stakeholders but also by the society. Customers expect the companies to act environmentally and socially responsibly, and pure concentration on financial outcome is not acceptable. Companies face increasing pressure from stakeholders, government and non-governmental organizations about sustainability issues. Especially the purchasing function has had to face new risks and answer new demands and requirements since increased purchasing from the developing parts of the world has increased stakeholder's interest in and awareness of CSR. The stakeholder groups that need to be satisfied from the purchasing function's

perspective are the media, customers, investors, local and federal authorities and activists. Also stakeholder demands and regulations set by the government force companies to pay more attention to CSR. (Sarkis, 1998)

Not only are companies accountable for their own actions and internal practices, they are also accountable for their suppliers' behavior. It can be said that the company is as responsible as is its whole supply chain. Earlier the purchasing function has been an unnoticeable but compulsory part of the organization, therefore many purchasing managers and executives may not be accustomed to the attention that they have received recently. It is important that the purchasing department reacts to the demands and pressure, otherwise negative effects such as negative publicity and disappointed stakeholder groups can follow. Negative effects can appear in different actions like boycotts, angry customers and protests, which all then lead to negative outcomes in market shares and profitability. The purchasing companies are responsible for ensuring that their suppliers operate responsibly and fulfill the criteria and qualifications that the company states. Not only one of the three sustainability aspects, social, environmental and economical, is enough but all of them must be covered. (Maignan et al. 2002)

1.2 Objectives, research questions and limitations

The role of sustainability in today's global supply chains is increasing significantly. There are risks that need to be considered, and the most appropriate incentives for mitigating them must be found. The issue of managing sustainable risks is very current and a lot of companies are struggling with it. It is something that needs to be taken into consideration but it is hard to find out the exact methods for how and why. Companies have adapted procedures that have been proved effective. However, if the purpose of the procedures has not been properly analyzed, they may not actually even mitigate any sustainability risk that the companies face. The research gap that this thesis aims to fill is the assessment of risks and monitoring methods in responsible purchasing: which risks and controls have the biggest weight in

companies compared to which should, Finnish companies being the focus of interest. An interesting point to look at is whether the right controls are applied for answering the right risks; are there controls that actually answer only to a small risk, whereas some great sustainability risks are not mitigated at all? Also possible differences between the industries in their sustainability risks and procedures are identified. The objective being how risks are managed in sustainable supply chain, is supported by the following research questions:

What kinds of supply risks are perceived the most significant for sustainable supply management?

What kinds of sustainability procedures are perceived the most efficient for managing supply risks?

This thesis will be seen from purchasing and supply management's viewpoint. As mentioned, the issues of CSR concerns today all the functions and levels in every company, and the both ends of the supply chain must be involved. The purchasing department's role is therefore undeniable. Several methods and tools can be used to analyze, ensure, measure and monitor the actions in all the three dimensions of responsibility. These controls take place in different phases in the purchasing process, right from the start when planning the purchase and later when choosing the supplier, the responsibility criteria is applied, as well as during the relationship with a long time supplier. Some procedures are widely used and integrated in company's operations. Some methods are the same, nevertheless the industry, whereas some are very specific and even unique to some industries and companies.

A limitation that is good to clarify concerns the definition of sustainability and responsibility. There is a variety of definitions of the concepts of corporate sustainability and responsibility, and the differences between the concepts are being continuously discussed (Montiel, 2008). The confusion between the concepts is comprehensible: corporate social responsibility (CSR) has been argued to cover up

to five different dimensions; economic, environmental, social, stakeholder and voluntariness (Dahlsrud, 2006). Whereas Montiel (2008) identified that most of the CSR and sustainability studies are built on social, economic and environmental dimensions. In this thesis, the definition of Seuring and Müller (2008, p. 1700) is followed. They define sustainable supply chain management as "management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements."

The empirical part deals with the results of a survey that was conducted in spring and summer 2015. The survey data was collected with an online questionnaire that was sent to 266 Finnish companies from the target group. The companies operate in the industry of manufacturing and they should have an operating revenue of at least 10 M€ and number of employees at least 100. This thesis is done as a part of a project conducted by Lappeenranta University of Technology. The research field of the project is sustainability and innovativeness in supply management and its source as competitive advantage. It is done in cooperation with a dozen Finnish companies. The 2-year research project includes for example nationwide surveys and group meetings with project companies.

1.3 Research framework

This thesis deals with risk management in sustainable supply chain. The importance of sustainability in purchasing and supply management is elaborated and justified. The intention is to first present risks that are perceived in the supply chain, and then elaborate it to the risks that are specific to sustainable purchasing and find out how these risks are managed. Finally, the most useful and valuable sustainability procedures for risk management in company's purchasing and supply management are evaluated in an empirical study. The empirical study will provide a viewpoint on

risk management in sustainable supply chain in Finland. It is executed as a quantitative study on 95 Finnish companies. (Figure 1)
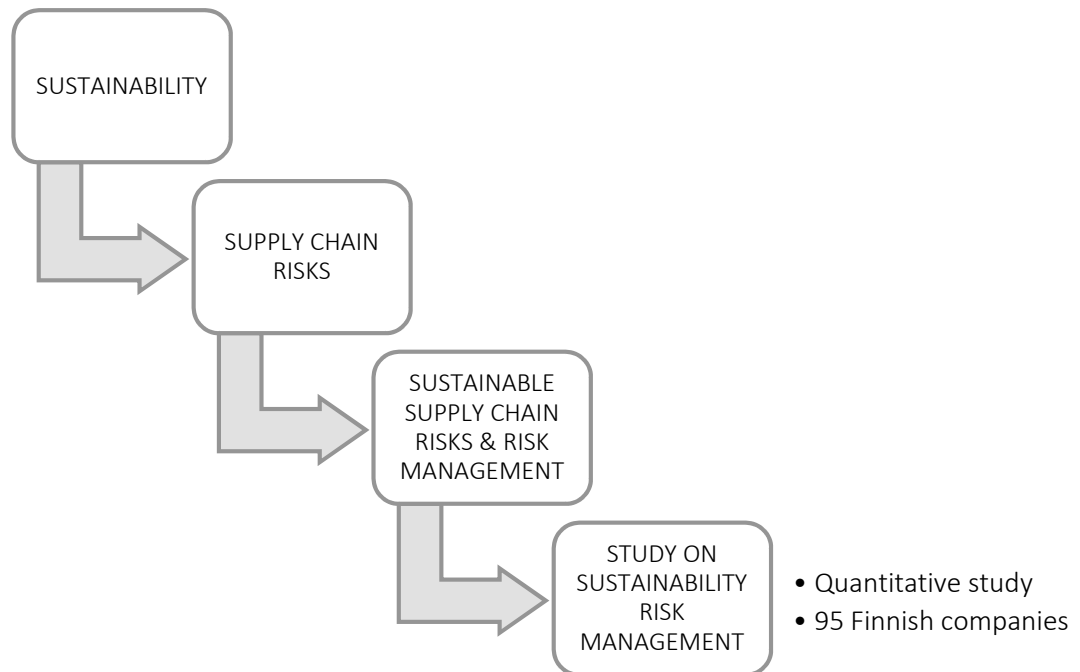
Figure 1. Research framework

In order to understand responsible purchasing it is necessary to understand the concept responsibility itself, as well as its basic ideas, since responsible purchasing is strongly based on it. Naturally, also the theories of purchasing affect in the background in this study. Responsible purchasing includes many different things; however obstacles, problematic issues, success factors and incentives are the ones that finally have the most power on realized responsibility operations.

1.4 Structure of the thesis

The thesis is structured as follows:

After the first introductive chapter, Chapter 2 presents theoretical background which is based on the literature review as well as previous theories and findings. It deals

with sustainable purchasing in supply chain. It is divided into 3 sub-chapters: Sustainability, Supply chain risks, and Sustainable supply chain risk management.

Chapter 3 presents research methodology and design, data collection and analysis methods that are utilized in the empirical part of the thesis.

Chapter 4 presents the results of the empirical study. The indicators and the collected numerical data are presented in detail.

Chapter 5 is the discussion part. The results are analyzed more in-depth, and both empirical and theoretical contributions are developed. Empirical contribution provides conclusions from each of the themes studies, and in theoretical contribution part the results are compared to literature and previous research. Finally the chapter presents limitations of the study and suggestions for future research.

Chapter 6 is conclusive and sums up the study. The main results of the study are revised and research questions answered briefly.

2. SUSTAINABLE PURCHASING IN SUPPLY CHAIN

In this chapter three main themes are presented forming theoretical framework for the thesis. Each chapter adds up information and supports the empirical part at the end.

2.1 Sustainability

Two fundamental concepts of sustainability are defined; Corporate Social Responsibility and Triple Bottom Line. The differing interpretations of sustainability are also discussed.

It has been recognized that managing sustainability performance and integrating economic, environmental and social objectives successfully in operational strategies, go hand-in-hand with the competitiveness of the business (Schaltegger, Bennett and Burritt, 2006; Schaltegger and Wagner, 2006). Definitions and interpretations of concepts are a major concern when talking about sustainability in purchasing. Some terms mean different things to different parties so therefore it is necessary to clarify sustainability-related definitions to the company and its shareholders. This way misunderstandings and wrong assumptions can be avoided and sustainability risks can be better managed in supply chain. PSM for example, is concerned for the interpretation of sustainability standards, especially for the level of compliance by the suppliers.

The Global Reporting Initiatives (GRI) is recognized as one of the most accepted and relevant frameworks for reporting CSR performance (Ciliberti, Pontrandolfo and Scozzi, 2008). With the use of guidelines, GRI aims to overcome the large variety of reporting formats that has been a problem. The standardized reporting also facilitates organizational cross-comparison. (Gjølberg, 2009). However TBL accounting procedures still have some inconsistencies, some sustainability objectives in social aspect for example are complicated to measure and therefore

difficult to put in words. The challenge of implementation of these initiatives is that risks regarding responsible supply chain must be recognized and managed before. (Ghagde et al. 2012)

2.1.1 Corporate Social Responsibility

CSR is seen to be a good way to approach sustainability; however it might appear as a very ambiguous and manifold concept. At some cases only the social and environmental dimensions are included, and some studies include also the economical aspect. Nevertheless, the research shows that, despite the differences in the understanding of sustainability and corporate responsibility, the environmental and social concerns are taken in account each time (Montiel, 2008). And even if we speak only about social and environmental issues, the economic aspect still influences in the background. Creating profit for shareholders is every company's target so the economical side is considered in every operation and activity in the company. This includes also all the sustainability-related activities.

The purchasing function's involvement in CSR in the research literature is also labelled as Purchasing social responsibility (PSR). Drumwright (1994) defines PSR as an approach that "attempts to take into account the public consequences of organisational buying or bring about positive social change through organisational buying behaviour." Also the term socially responsible buying (SRB) appears when addressing the issue of social sustainability. This term is used by company stakeholders especially when questioning the purchasing decisions of the organization (Maignan et al. 2012)

2.1.2 Triple Bottom Line approach

Triple bottom line provides a good approach for inspecting the success of sustainability in purchasing function. The term Triple Bottom Line was originally introduced by John Elkington in 1994. It was created to help corporations with

reporting more than just their financial aspect of sustainability. TBL is thus a framework for measuring and reporting corporate's economical but also social and environmental performance. The use of TBL increases the transparency of company's sustainability decisions, which is constantly demanded by stakeholders. (Wiedmann and Lenzen, 2008)

In this thesis the concept of Triple Bottom Line (TBL) will be used as the definition for sustainability. The framework covers social, economic and environmental responsibility aspects and is a good starting point when creating an overall understanding of the concept. Economic aspect includes for example all the economic targets and results as well as applied sustainability indicators. The environmental aspect includes measuring energy, material, waste, package and noise emissions of the company. (Maignan et al. 2002) The social aspect focuses on employee healthy, development and well-being, compliance to business ethics, product safety and community involvement. All three dimensions are important and should be taken into consideration. Depending on the company or the industry for example, the accent can vary from one to another: In construction industry perhaps the social side such as wages, working conditions and safety is perhaps seen the most important of the three and more efforts are put on that, whereas in grocery industry the ecological side can have a bigger weight.

During the past years, social responsibility has received growing attention. It is the least known and measured compared to economic and environmental responsibility aspects, so therefore initiatives have been taken by promoting social responsibility through sustainability reports. (Harwood and Humby, 2008) The environmental aspect of responsibility is much widely recognized and studied compared to social aspects. Moreover, the theoretical research regarding sustainable purchasing is slightly narrow since the focus has been more in case studies than in broader theoretical modeling. The recent focus in sustainable purchasing has been on CSR success stories which may have distorted the reality, as failed CSR stories has not been brought into light or studied. (Seuring and Müller, 2008)

2.2 Supply chain risk

Having defined sustainability the focus moves to supply chain and risks that the PSM function faces, and finally to CSR in risk management. First supply chain risks are defined, and thereafter a few different types of classifications are presented. The risks that are presented are typical for global supply chains and represent all types of supply chain risks, not just sustainability related. Finally the importance and risks of CSR in the supply chain are elaborated

2.2.1 Defining supply chain risk

Nowadays as supply chains are global, managing risk in the supply chain has great importance. Supply risk is perceived as a multidimensional construct by purchasing organizations. (Shapira, 1995). Manuj and Mentzer (2008b) defined supply risk as a risk that disrupts operations of matching supply with demand. How significant a risk is, is typically determined based on two components. First are the consequences which are the potential losses suffered when the risk realizes. Second one is the probability of occurrence, that is to say how probably the risk will realize. (Manuj and Mentzer, 2008b)

Zsidisin (2003) presents another definition for supply risk in his studies. According to him, supply risk is "the probability of an incident that can be associated with inbound supply from individual supplier failure or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand (in terms of quantity and quality) within anticipated costs and time, or cause threats to customer life and safety."

There are four kinds of features that are typical for assessing supply chain risk. Firstly is, the reliability of suppliers: the closer the relationship and the more reliable the supplier, the smaller is also the risk. Secondly is the focal firm's decision between single and dual sourcing: where disruption of supply, disruption of inventory

and technology access, price escalation and quality issues affect the severity of the risk. The third feature is make or buy decisions where technological uncertainty and product complexity affects firms' decision and also determines the supply risk. Finally is the company's decision between centralized and decentralized sourcing, so how the company organizes the sourcing. Centralized sourcing favors common purchasing organization in a company, whereas in decentralized sourcing the local management makes the decisions. (Lintukangas, Kähkönen and Ritala, 2015)

2.2.2 Risk classification

Supply risks can be classified in several ways according to the characteristics of the risks. Zsidisin (2003) divides supply risk into two: the source of a risk or the outcome that follows risk incidents.
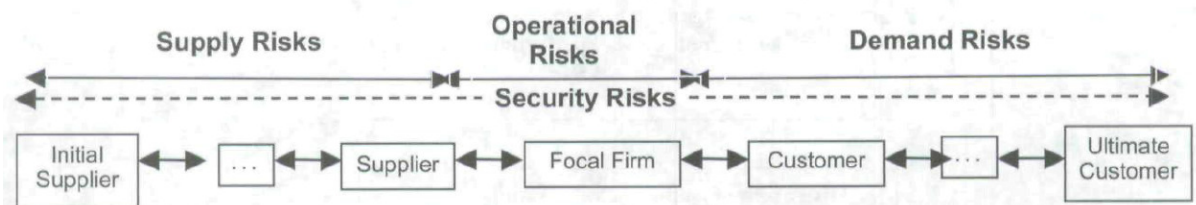
Figure 2. Risk in the extended supply chain. (Manuj and Mentzer, 2008b)

Manuj and Mentzer (2008b) divided supply chain risk into four categories according to their affecting zone in the supply chain. Figure 2 presents the division of supply chain risks in the chain. Supply risks lie in the movement of materials from supplier's supplier to the focal firm. In this category the possible risks are related to the disruption of supply, inventory, schedules, technology, price changes, and quality issues. The next category, operational risk, sources from inside the focal firm. Operational risk is the possibility of an event that might affect for example firm's ability to produce goods and services, such as breakdown of operations and inadequate manufacturing capability, quality of production and profitability of the

company. Demand risk on the other hand lies in the movement of goods from the firm to the customer's customer. It is the possibility of an event associated with demand coming from outside the focal company, for example variations in demand, such as seasonality of products, and new product introductions. The event may affect the customer orders and variance in order volume. Demand risk also varies with the nature of the product: functional products are less risky than innovative products (Fisher, 1997). The fourth category is security risk. It lies in every step of the supply chain from supplier's supplier to customer's customer, and its significance has increased along with technological development. Security risk is defined as being threat from an unknown third party, that may or may not be a member of supply chain, and it has an aim of stealing proprietary data or knowledge, or destroying company's operations. Information system security, as well as crime and vandalism are typical security risks. The risk lies in the individuals, that might leak vital information to competitors or system hackers, as well as in weak fire walls and security in the members of the supply chain (Spekman and Davis, 2004).

The study of Manuj and Mentzer (2008b) identified also four other risks regarding the PSM function: 1) macro risks, such as interest rates and currency rates, 2) policy risks, such as restrictions from the national government, 3) competitive risks such as company's lack of knowledge about competitor activities and moves, and 4) resource risks such as unanticipated requirements for resources. Those risks are not as tightly tied in the supply chain so they are not presented in further detail.

The supply chain risk can be direct or indirectly. Quality and price of a product or service are regarded as direct supply risks, whereas loss of image, decrease of brand value and violation of property rights are recognized as indirect risks. (Lintukangas et al. 2015)

Manuj and Mentzer (2008a) studied risks that global supply chain managers perceive the most salient. As a result, ten risks stood out and they are presented in Table 1. Currency risk was seen as the most important. Risk in transit time variability which refers to the unpredictable events occurred and time that products or

materials spent in transit, was also regarded significant. All in all, instability and fluctuations that create uncertainty in the supply chain operations, were seen crucial in supply chain risk management.

Table 1: The most salient risks according to global supply chain managers (modified from Manuj and Mentzer, 2008a)

Risk	Explanation
Currency	Changes in exchange rates
Transit time variability	Time spent in transit including transportation time
Forecasts	Errors in prediction of demand leads to stock-outs or excess stock
Quality	Effective, damaged or wrong product, components or materials
Safety	Products causing safety hazards
Business disruption	Inability to produce good or sell products
Inventory ownership	Confusion or dispute over inventory ownership or use or IP of tools.
Culture	Inadequate knowledge about people, culture and language
Survival	Firm going to bankruptcy
Dependency	Dependency on a third party, e.g. supplier
Oil price fluctuation	Unpredictable changes in oil price

Risk classification and identification are important. Managing risk is the next step since the aim is always to mitigate risks as effectively as possible. Risk management means identifying and assessing the probabilities and consequences of risks. It also includes selecting appropriate risk strategies to reduce the probability of adverse events, as well as the probability of losses that are associated with these events (Manuj and Mentzer, 2008a). Risk mitigation is tightly associated with risk management. The task of risk mitigation is to reduce the consequences if an adverse event is realized (Norrman and Jansson, 2004).

An efficient supply risk mitigation strategy after Micheli, Cagno and Di Giulio (2009) is integrating supply risk management already in the supplier selection step. Criteria for supplier selection can be soft; cultural, relationship-related, collaboration possibilities, learning possibilities and attitudes are valued. Hard criteria on the other hand include evaluating the elements of cost, quality, time, and flexibility. After the selection phase however it is crucial that the evaluation is done continuously throughout the whole length of the relationship. Graighead, Blackhurst and Rungtusanatham (2007) suggest that effective implementation of supply risk mitigations strategies requires, that supply risk management is tightly interconnected with supplier selection, evaluation and development processes.

2.2.3 Importance of CSR

Understanding the requirements of CSR is important in mitigating uncertainty and reputational risks. Requirements change therefore the capability to detect and react to those changes is critical and must be done rigorously in order to secure the competitiveness. (Campbell, 2007) Foerstl, Reuter, Hartmann and Blome (2010) also emphasize in their study that companies should find the balance in how much effort they put on sustainable supply chain management. Too little effort can lead to decreased competitive advantage, whereas too much can lead to weakened effectiveness and wasted resources.

Carter (2000 and 2005) and Carter and Jennings (2004) studied why CSR is important in purchasing. The reasons they identified, affected ordinary business to business practices in many ways by complicating them, and that is why the interest for CSR increases. For example differences in business practices, and in managerial attitudes, varying cultural aspects and regulations in the legislation were matters that CSR is interested in. These issues have created new kinds of risks that companies' PSM function has had to answer. The managers have had to find new processes for supervising suppliers' operations, for example (Maignan et al. 2002b).

Seuring and Müller (2008) describe the areas of sustainability and supply chain management to be an emergent and a rapidly maturing field that has several issues that require research. Besides gathering knowledge on CSR and supply chain management, also the usage of environmental and social standards in supplier evaluation was found crucial. To adopt CSR in company's purchasing, discovering suitable tools to provide guidance for identifying and developing CSR purchasing strategy, are needed. (Björklund, 2010)

Studies of e.g. Maignan et al. (2002b) claim that most purchasing executives are not aware how socially responsible purchasing should be managed. Also many researchers have identified several problems associated with managing CSR at global scope. This has led some companies to manage SCR insufficiently without a clear structure. The risk that companies face in the supplier management increases significantly if stakeholders' demands are not answered and expectations are not met regarding CSR. In other words, the risk in the supplier-buyer or supplier-shareholder relationship is bigger if the expectations for the buyer are not met.

2.3 Sustainable supply chain risk management

In this chapter sustainability risks and ways to manage them are presented. In a study conducted by Harwood and Humby (2008) 20% of the companies regarded sustainability as the largest risk that they are facing in the supply chain. It can be concluded that companies see sustainability issues very important in purchasing, and thus the issue is current.

2.3.1 Sustainable supply chain risk

Sustainability risk is defined as "a condition or a potentially occurring event that may provoke harmful stakeholder reactions" by Hofmann, Busse, Bode and Henke (2014). The risk occurs within a focal firm's supply chain. Before further actions towards sustainability are taken it is necessary to recognize the risks of supply chain

and supplier management. Risk management in the circumstances where the company aims at global sourcing or at outsourcing functions to low-cost countries is vital especially for managing company's image and brand value. (Christopher, Mena, Khan and Yurt, 2011)

In contrast to what is often thought when discussing sustainability issues, companies cannot transfer the sustainability risk for example by outsourcing part of their production to a third party. Risks related to unacceptable social and environmental performance in the company's supply chain will still be targeted at the focal firm. The firm cannot therefore overlook sustainability risks and must actively seek solutions for managing sustainably its supply base.

Sustainability risks have been studied widely. However there is a need for further research in identifying the most significant sustainability risks for the company. Also the management of sustainability risk needs further studies. Foerstl et al.(2010) studied how leading functions of PSM identify, assess and handle supplier sustainability risks, and moreover how do they strive to integrate sustainability risk management in supplier management processes.

2.3.2 Managing sustainable supply risk

The sustainability risk can be external or internal, and therefore the management strategies must be appropriate and adapted case by case. The external risks and possible consequences of failed or neglected CSR can appear as negative company image and publicity, boycotts, angry customers, protests, activists and even lawsuits. All these effect on purchasing company's economic performance. Internal risks that the company may face are for example, employee-protests and refusal of cooperation. If the risk realizes, it can be hard to fix, and therefore for the company, the best way to avoid them would be to react early enough. Considering CSR risk management in purchasing and in all the supply chain is important because the responsibility of the whole supply chain reflects to the responsibility of the company. Stakeholders often point out and demand several purchasing-related issues from

the purchasing company. Respect of human rights and workers' rights, such as decent working conditions and no child labor, are required from the suppliers. The purchasing company itself is often required to take actions, too. Respect of local democratic institutions by purchasing goods from non-acknowledged institutions, protection of natural resources by favoring green suppliers, and choosing to cooperate with minority suppliers can be required. (Maignan et al., 2002)

If supplier sustainability risks are not taken into consideration the damage potential is severe if they realize. Damages such as, received fines for non-compliance, negative media exposure that affects the company reputation. Also threats from pressure groups can cause significant damage: the relationship can worsen and creating new ones can become more challenging. (Cousins, Lamming and Bowen, 2004) The more the company is in the spotlight and interacts with its stakeholders, the bigger the expectations and requirements from stakeholders are, and the better the company must perform in the responsibility field and mitigate the sustainability risks. The size of the company also affects: larger companies have more expectations, because they are seen to have the power and the resources to make an influence**. (Maignan et al., 2002)

Studies have shown that the way a company takes into account the social responsible considerations in purchasing, can have a significant effect on its reputation. The direct impact on supplier performance can be identified by measuring for example, quality, productivity, efficiency, lead time and flexibility. Increased trust, commitment and cooperation are indicators of indirect positive impacts in supplier relationship. (Carter, 2000, 2005; Carter and Jennings, 2004).

2.3.3 Barriers of sustainable supply risk management

The literature points out three main barriers in managing a responsible supply chain. First, the additional costs that it brings out. Secondly, the complexity of managing a responsible supply chain. And thirdly, the insufficient adaptation of CSR in the purchasing contracts between the parties. (Min and Galle, 2001).

As mentioned, resources are often a limiting factor in supply risk management since risk management activities are not cost-free. A study conducted in the US pointed out that additional costs are the biggest barrier in carrying out green and responsible purchasing. (Min and Galle, 2001). In order to manage sustainability risks effectively, resources are needed. However, companies rarely possess enough of resources, and sustainability risk is hard to manage. Supplier assessment and monitoring require time and financial resources. Due to limited resources, purchasing and supply function must therefore prioritize and focus on the suppliers that are perceived the most risky. Those suppliers are the most likely to cause harm in terms of sustainability and if the risk is realized, then the damage will be the most significant (Harland, Brenchley and Walker 2003). Purchasing firms also need the right knowledge how to ensure ecologically and socially acceptable supplier operations. The knowledge is often limited and here again the resources are one of the main issues (Carter and Rogers, 2008).

Risks in supply chain are multidimensional and therefore controlling and managing them is challenging. The more complex the supply chain of a company is the smaller is the company's power position in influencing other parties of the chain. When purchasing from a large and distant web of suppliers it is critical to take into account both direct (on-site, immediate) and indirect effects and risks. This applies to sustainability risk as well as to other supply chain risks. (Wiedmann and Lenzen, 2008)

Strategic planning is very important in ensuring sustainability in the supply chain. Sustainability targets and goals are set in this step and the processes should be specific in reaching the objective. Planning is the key, and some sustainability targets are difficult or even impossible to reach if they are not involved already in the strategic planning. From responsibility point of view strategic planning enhances the importance of early supplier involvement (Dou, Zhu and Sarkis, 2014).

The base for a good and close buyer-supplier relationship is built in the process of evaluation and selection of supplier. The purchasing company demands certain aspects of CSR to be fulfilled before even considering proceeding with the supplier. After the selection, engaging the supplier is done with stating the requirements for social, environmental and economic behavior in the contract. The company can also expect a CSR strategy or CSR reporting from the supplier when the relationship begins. Including supplier Code of Conduct (CoC) in the contract is a good option: it prevents problems from occurring and also helps the company to interfere if problems occur later on. CoC sets guidelines on a wide range of issues including outlets, resource usage (energy, material, and water), waste disposal, child labor, forced labor, wages, freedom of association, health, safety and education (Mamic, 2005). Sanctions for misbehaving suppliers should also be created and stated in CoC. Use of CoC in purchasing is described to be extremely important by some practitioners. Signing the CoC with the suppliers once or more often can significantly reduce the level of non-compliance. If the supplier does not comply with its requirements, the company can threaten it to terminate the relationship (Pretious and Love, 2006). IKEA for example audited its suppliers' compliance with CoC in 2006. The results pointed out that some suppliers repeatedly violated the guidelines and showed no interest in rectifying the situation, so the company ended up with terminating the relationship with six suppliers. In every case it is crucial that the company makes sure that the supplier understands the responsibility requirements and CRM aspects that are stated in the contract. This includes clarifying and defining the concepts and terms, so that both parties have the same understanding on their meaning and wrong interpretations can be avoided. In order to become a supplier, many companies have adapted selection criteria that the supplier has to fulfill. (IKEA, 2006) At H&M and IKEA for example all new suppliers have to be approved by the CSR department (H&M, 2007).

Another type of ensuring the purchasing company's and supplier's sustainability is sustainability standards. Sustainability should be adapted across all levels of planning and execution, as well as in stakeholder interaction. ISO 26000 (Social Responsibility) and SA 8000 (Social Accountability) are international norms for CSR characterized by qualitative and quantitative detailed information. Their overall goal

is to introduce CSR as a new dimension in business thinking. ISO 26000 can be implemented in the management processes within the organization. It is said to be the "first international document supporting interdisciplinary creative cooperation by linking concepts of interdependence and holistic approach, known in systems theory." SA 8000 on the other hand, is an audit based standard that addresses especially human rights and labor conditions explicitly. (Dankova, Valeva and Štrukelj, 2015)

2.3.4 CSR incentives in the purchasing process

A successful CSR requires good communication between the parties, effective monitoring of supply chain, evaluation of responsibility operations, reporting and documentation as well as pre-set sanctions for the members of the supply chain that are put in action if the requirements are not met. The role of PSM employees is important in inspecting and promoting corporate reputation. (Foerstl et al., 2010)

Even if responsibility of applying CSR in purchasing seems to fall on to the buying companies' shoulders, it is not a "one man show". If the suppliers show no interest in CSR matters, it is hard for purchasing companies to achieve a high level of CSR. Dialogue and communication between supplier and purchasing company is important for successful implementation. It is important to transfer knowledge and attitudes between companies in order to facilitate mutual efforts (Björklund, 2010).

After an audit has been carried out, a list of suggested improvements based on the results is drawn up for the supplier. The suggestions should then be implemented in order to meet the required standard. The plan of improvement includes information regarding practices that need to be changed within a particular time frame, and in some cases, how the improvements have to be carried out (Mamic, 2005; Pretious and Love, 2006; Kovács, 2008). So not only the auditing makes any difference but the actions that are taken after the inspection. The improvement plan can be written by the buyer, the supplier or by both in collaboration. By including the

supplier in the design of the improvement plan, supplier's awareness and feeling of CSR can increase (Ciliberti et al., 2008; Björklund, 2005).

Audits help the purchasing company to monitor how suppliers are doing. The auditing results must be analyzed and actions taken if necessary. Identified problems must be fixed immediately or a plan for their solving must be created. When CSR violations are corrected on short notice, it affects positively to the competitive advantage of the firm. (Campbell, 2007) Audits can be executed in several ways; it can be a self-assessment or executed by a third party or the purchasing company. They can be conducted regularly if the supplier is very risky. Sometimes simple supplier self-declarations about compliance to sustainability standards are not enough for effective supplier sustainability management. Jiang (2009) suggests that measures for identification, assessment and monitoring should replace them along with compliance incentive systems.

When the suppliers have been selected and the cooperation is in its full speed and purchasing decisions are made by the buying company, controlling the suppliers' actions is important. There are several methods how companies can monitor and audit whether their suppliers are operating according to the sustainability regulations defined in the contract. The supply chains can be long which makes the tracking difficult. The buying company quite often is seen to be responsible for its suppliers' actions. The stakeholder groups expect that suppliers are constantly being evaluated and controlled to ensure, that the sustainability promises that the company makes are kept. Transparency and traceability of the products are often demanded by the stakeholders. The inspection of suppliers is not only useful in case of suspected neglect of CSR agreements by the supplier. It is also important when the buying company and/or the supplier wants to improve and enhance some part of their common actions. Continuous improvement is crucial especially in long term relationships in order to make profits in the purchasing business. (Foerstl et al., 2010)

Maignan et al. (2002) give suggestions of actions that the purchasing company could consider taking, when monitoring its suppliers by doing audits for example. Visiting suppliers' premises is an effective but possibly an expensive way of auditing. In the course of the auditing, supplier's operations are inspected and compliance to contract is controlled. When Nike was facing negative publicity by its negligence towards responsibility issues in its suppliers, the company paid visits to its manufacturing plants. Controls were done with Nike representatives along with external parties such as activists to make sure that the controls were objective and the results transparent. Involving external parties to the monitoring process is an effective way to show the independency of the results. The aim of the visits was also to get recommendations for how to improve practices. In the auditing process, the results can be reflected and compared to a responsibility criteria set by the company. The form of the criteria can vary from general guidelines to strict numerical values. If processes and expectations are described clearly and even written down, also the results come up distinct and more rational. The contents of the guidelines can be related to social and environmental practices as well as economic issues, depending on what the company sees to be important. Workers' rights and waste management are typical themes in the guidelines. However, the criteria should be thought through carefully. The demands cannot be too severe so that the supplier has difficulties in achieving them, or even has the will to achieve them. If the limits are too loose, every supplier could achieve them, which is not the idea. Sustainability efforts require financial investments from the supplier and also from the company. A balance must be found and the resources should be targeted into accurate things that support the company's business strategy.

Paying an actual visit to the supplier and seeing their representatives face-to-face would give a more truthful picture of the reality. However if the relationship between the buyer and the supplier is already close, sustainability reports exchanged on a monthly or even on a weekly basis is an easy yet inexpensive way (documentation inspection (Ciliberti et al., 2008) such as questionnaires (inexpensive, easy to arrange but trustworthiness suffers) interviews of management and workers (Ciliberti et al., 2008; Björklund, 2005), a second inspection for monitoring the

progress). It is noteworthy, that the claims and statistics reported should be accurate and rigorous. If their reliability is suspected, the problems that occur could be very difficult to fix. Destroying a relationship is always easier than building one.

Another method for risk prevention and controlling that the buying company could introduce is education and informing its suppliers. Offering methods, such as technical assistance, internal training and internal education within the buyer-supplier relationship, are some examples. A Swedish clothing company H&M came up with a short film of CSR, child labor and other issues that the suppliers may face, and that has possibly caused some troubles before. The company then decided to show the film in every factory for all the employees as a way to communicate their worry. That acted as an educative method for ensuring SCR in the supply chain and also preventing a sustainability risk. (Lippman, 1999)

3. RESEARCH METHODS

In the research framework presented in Chapter 1.3, the research has progressed to the last step, which is the empirical study on sustainability risk management. The methods of the study as well as the results and the analysis of the results are presented in the next chapters. This chapter presents the methodology that was used in the data collection and data analysis. First, research process is elaborated, and thereafter data collection and analysis methods are presented.

3.1 Research process

The study was executed as a nationwide survey in Finland. The survey was conducted as an online questionnaire in June 2015 by using Webropol online survey software. The questionnaire was sent to 266 Finnish companies. The target group consisted of companies from manufacturing industry, such as construction and machinery. Purchasing usually acts a significant role in the activities of companies in manufacturing industry; therefore it was relevant to choose it as the focus industry. The size of the companies was determined to be large; the companies should have an operating revenue of at least 10 M€ and number of employees at least 100. Bigger companies assumingly have more power, resources and also more responsibility for their activities in the purchasing field.

The questionnaire consisted of themes related to sustainability in the company, sustainable purchasing and innovativeness in purchasing. Of these themes, sustainability and sustainable purchasing were examined, and innovativeness was left to a smaller attention. The survey questions were based on previous findings and knowledge on the handled themes.

The main objective of the survey is to explain sustainability risks and methods in purchasing. The data analysis was done with SPSS statistical analysis software.

The number of responses was 95, out of 266, which makes the response rate 35,7%. The sample is large enough to illustrate the overall situation. In the survey, the respondents were advised to answer the questions from the viewpoint of the area of PSM where they operate. The background of the respondent was specified with questions concerning the type of purchases they deal with (direct, indirect, all purchasing) and the position of the respondent in the company (leader, middle management, operative tasks, consulting tasks). As a result, almost 60 % of the respondents operate in all kind of purchasing and half (52,6 %) of the respondents operated in middle management (Appendix 1 and 2).

3.2 Data collection and data analysis

The data collection process and tests that are run follow the structure presented in Figure 3. First the data is collected according to the chosen criteria. The data is described and classified according to the represented industries. Then the data is modified to fit SPSS analysis software and descriptive tests are ran with the chosen questions, which are questions regarding sustainability risk mitigation and sustainability procedures. The first one has 13 claims to handle and the second one 18 claims. Finally a bivariate correlation test is ran with using both of the questions, and as a result the received data answers to question *which sustainability procedures affect to which risk, and how strong is the correlation between them.*

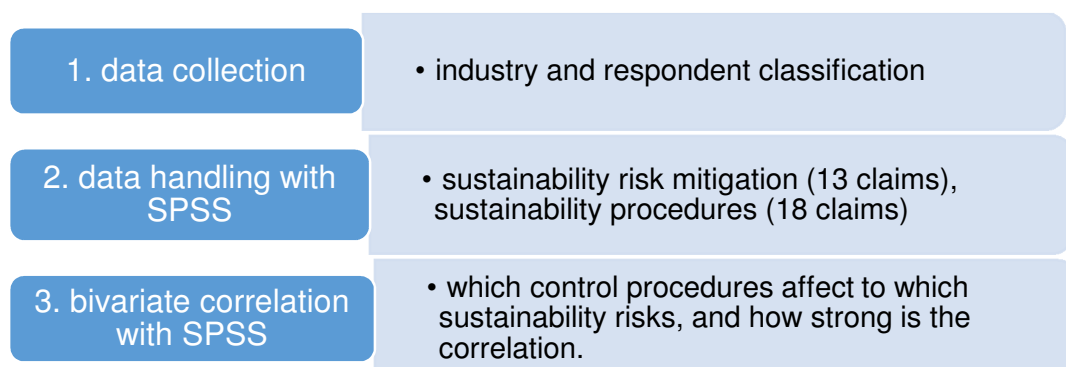| 1. data collection	• industry and respondent classification
2. data handling with SPSS	• sustainability risk mitigation (13 claims), sustainability procedures (18 claims)
3. bivariate correlation with SPSS	• which control procedures affect to which sustainability risks, and how strong is the correlation.

Figure 3. Data analysis process

3.2.1 Supply risks in sustainable purchasing

The risks were chosen based mostly on previous literature and studies. Some of the risks came up in workshops that were held during the course of the project with project companies. At the end, 13 risks stood out as the most relevant and important, and they, along with the related research, are presented in Table 2. They cover all the main parts of supply risks. Risks in *co-created innovations and immaterial rights* and *protection of knowledge and know-how* were studied by Norman and Jansson (2004). Koplin, Seuring and Mesterharm (2007) studied *brand and image* related supply risks. *Product availability, Delayed orders* and *quality related* risks were studied by Steele and Court (2007). Risks related to *delayed orders, Currency, Workforce* and *Product safety* were evaluated and analyzed by Manuj and Mentzer (2008a). Zsidisin (2003) identified *price* risks, Chiu, Choi, Hao and Li (2015) studied contract related risks, and Blackburn (2007) *Environmental harm* and *supplier bankruptcy* risks. Each risk is represented with a tag, which will be used later on in the correlation analysis. The respondents evaluated the risks in a nominal scale from 1 to 7, where 7 indicated very big effect and 1 no effect.

Tag	Claim	Source
A_1	Ownership of co-created innovations and immaterial rights	Norman and Jansson, 2004
B_1	Protection of knowledge and know-how	Norman and Jansson, 2004
C_1	Brand and image	Koplin, Seuring and Mesterharm, 2007
D_1	Product availability	Steele and Court, 1996
E_1	Delayed orders	Manuj and Mentzer 2008a; Steele and Court, 1996
F_1	Quality	Steele and Court, 1996
G_1	Expenses and prices	Zsidisin, 2003
H_1	Contract	Chiu, Choi, Hao and Li, 2015
I_1	Currency	Manuj and Mentzer, 2008a
J_1	Workforce	Manuj and Mentzer, 2008a
K_1	Product safety	Manuj and Mentzer, 2008a
L_1	Environmental harm from manufacturing products	Blackburn, 2007
M_1	Supplier bankruptcy	Blackburn, 2007

Table 2. Supply risk labels and sources

In the analysis, arithmetic mean was chosen to describe the data information. The mean describes the average value of the estimated values of the respondents. Even though other averages, such as median and mode, may represent better the data center, the arithmetic mean describes sufficiently the results of this questionnaire (Metsämuuronen, 2006, 339-340). The mean of each risk was identified by using case summary reports or descriptive statistics reports in SPSS software.

Boxplot graphs were used to point out differences between the industries. The graph shows the division of the data values. Boxplot contains information on the median, the range of the responses, possible outliers, as well as minimum and maximum values. In this thesis, boxplots are used for the description of the data; to point out quickly that the values of a certain risk differ between the industries. Whether a difference exists or not, is determined by drawing a horizontal line through the graph. If the line pierces all the boxes of each industry, there is no significant difference between the responses. If, however, a line can be drawn in a way that it does not pierce each box, there is a difference between the values.

In order to reduce the number of factors and find out possible similar characteristics within the risks in order to increase the validity of the study, a factor analysis was conducted. With factor analysis it is possible to find the factors that correlate stronger with each other. When the correlating factors are put together, a new factor can be formed. This is useful when the number of variables is large because it decreases the number of variables by grouping them into factors. In factor analysis, the information of the variables is compressed into a few main components or factors, and the analysis suit well to variable measured at the Likert scale. (Metsämuuronen, 2006, 581)

Finally, a reliability test was conducted to further analyze the reliability of the factors. The Cronbach's alpha was determined for each of the groups. It is used for measuring the internal consistency coefficient. A high value of the alpha indicates that the measured variables measure the same issues, thus the reliability increases when the value of alpha is bigger. (Metsämuuronen, 2006, 442-443) In most social

science research situations, a reliability coefficient of 0,70 or higher is considered "acceptable" (UCLA, 2015). This limit is also used in the data analysis of this thesis.

3.2.2 Sustainability procedures in supply chain management

The second theme of the survey was sustainability procedures that are used in supply chain management. The respondents were asked to evaluate how well each procedure is adapted in the area of PSM they operate in. The procedures are chosen in a way that they represent actions that occur in different phases and steps of purchasing process. Also all the aspects of TBL, environmental, social and economic, are considered in order to get a comprehensive view on companies' sustainable supply management. A wide range of procedures also enable to see whether there are differences, emphasis or trends on certain aspects in between industries. There were 18 claims to evaluate in total. The respondents evaluated the sustainability procedures at Likert scale from 1 to 7, where 7 indicated total agreement and 1 total disagreement.

Table 3 presents the claims that were evaluated by the respondents. The labels are used in the figures to facilitate and simplify the interpretation, but in a way that the label still conserves the main idea of the claim. Each label has a referring tag that is used later on in the correlations. A rough classification of the claims can be done according to the nature of each claim. Some claims deal with the PSM function and its activities as a whole whereas some concerns more the suppliers of the company. One part of the claims can be associated with the products and their sustainability. The classification is represented in colors: Yellow refers to general PSM related claims, green represents supplier related claims such as supplier expectations, and blue refers to product related sustainability claims. General PSM function sustainability procedures that were measured with the *adaptation of sustainable purchasing principles in supply management*: how well the principles are adapted and recognized; *PSM function's drive towards enhancing supply chain transparency*, *Systematically built image of responsible buying*: does the company use sustainability reports etc. to brighten the image; *Firm's compliance to*

sustainability standards: does the company follow environmental management standards (ISO 14001-Environmental Management), social responsibility standards or certifications (ISO 26000, SA 8000) or other similar; and last one of the yellow group is *company's pursue for quick CSR problem fixing*: whether the company wants to find out the bottom reasons to occurred CSR issues and fix the appeared problems quickly. The biggest part of the claims is related to suppliers because they are naturally an important part of company's supply chain. Those are marked in green color in the table. R*egular supplier self-assessments*, *supplier compliance to CSR standards* and *expectation of CSR reporting or CSR strategy from supplier* are things that can be expected from the supplier. The focal company can also do many things for evaluating and measuring the supplier, such as create *Instructions and processes for suppliers for ensuring sustainability and put them in use*, *create a register on responsible suppliers* and *create and use an indicator for measuring supplier compliance*. Auditing methods are measured with *conduct of regular supplier audits*, *use of an external party to ensure supplier compliance for responsibility* and *supplier's responsibility is considered when making audits and supplier selection.* In addition, *pay attention to ethics and environmental values in supplier field* in general and make sure that *supplier understands the CSR requirements* stated in the contract are measured in this study.

The product related claims, marked in blue, are an important aspect when creating a comprehensive view on company's procedures towards sustainable supply chain management. In this study the product sustainability is measured with asking whether the *company presents responsibility reports for purchased products*, by sending a questionnaire to the supplier for example, and whether *the company can ensure the traceability of the origin and sustainability of the product.*

Similarly to sustainability risks evaluation, the arithmetic means of each claim were taken to illustrate the dividing of the values. Also boxplot graphs were taken to point out the differences between the industries. The arithmetic mean and boxplot graph were described in the previous chapter 3.2.1.

Table 3. Labels and claims of sustainability procedures.

Tag	Label	Claim
A_2	Principles of sustainable purchasing	Principles of sustainable purchasing are adapted in supply management
B_2	Transparency of the supply chain	Supply management pursues in enhancing the supply chain transparency to end customer
C_2	Supplier instructions and processes	Supplier instructions and processes for ensuring sustainability are illustrated and in use
D_2	Supplier self-assessments	Regular supplier sustainability self-assessments conducted by the supplier
E_2	CSR standards for suppliers	Expectation of supplier compliance to CSR standards (ISO 14001) or such
F_2	Responsibility register	Responsibility register on responsible suppliers in use
G_2	Responsibility reports	Responsibility report for products (e.g. with surveys)
H_2	Traceability of the product	Origin and sustainability of product traceable
I_2	Supplier audits	Supplier audits done regularly to ensure supply chain responsibility
J_2	External party	Use of external party for compliance of sustainability principles of supplier
K_2	Image of responsibility	Image of responsible buying built systematically (e.g. sustainability reports)
L_2	CSR standards for company	Firm's compliance to CRS standards (ISO 14001, ISO 26000, SA 8000)
M_2	Ethics and environmental values	Attention to ethics and environmental values in supplier field
N_2	Responsible auditing and selection	Supplier auditing and selection pays attention to supplier CSR
O_2	CSR problem handling process	Pursue to find out the bottom reasons and fix quickly CSR problems
P_2	CSR expectation from supplier	Expect of CSR reporting or strategy from supplier
Q_2	CSR measurement	Compliance of CSR is one indicator in measuring supplier
R_2	Understanding of CSR in contracts	Ensure of suppliers' understanding of CSR aspects in contract
	Supply management related	
	Supplier related	
	Product related	

3.2.3 Creating connection between supply risks and sustainability procedures

The third theme presents the correlations between the sustainability risks (A_1-M_1) and sustainability procedures (A_2-R_2). When the respondents first evaluated, *how well sustainable purchasing can prevent the risks*, and then, *how well certain*

sustainability procedures are adapted in their PSM, the correlation analysis reveals the connections between them: whether some adapted sustainability procedures connect to the mitigation of some risks.

The connections between the two variables were examined by running a bivariate correlation test with SPSS Statistical analysis software. The bivariate correlation test connects each procedure to each risk. The connections between the variables are indicated with Pearson Correlation analysis, where the correlation coefficient is the result of the analysis. The correlation coefficient can receive values between -1 and 1, where the closer the value is to zero, the weaker is the statistical significance. Values -1 and 1 on the other hand, indicate perfect linear connection between the variables. (Metsämuuronen, 2006, 359)

The appropriateness of the correlation coefficient values, in other words, the values that indicate a sufficient correlation, can be determined. Coefficient correlation values between 0,80 and 1,0 can be considered very high, values between 0,60 and 0,80 high and values between 0,60 and 0,40 quite high or moderate. (Metsämuuronen 2006, 360) In this thesis, values above 0,40 indicate a good correlation and can be used in the further analysis.

Significance test is another result of the bivariate correlation. In the test, * signifies that the correlation is significant at the 0,05 level, and ** that the correlation is significant at the 0,01 level. Thus, the 0,01 level is more accurate of the two.

The number of respondents in this study was fairly small; only 95. Small sample size results in smaller correlations, which means that "very high" and "high" correlations are difficult to attain in this case. Therefore, in this thesis, a correlation coefficient of 0,40 or more can be accepted as "good correlation". Also, in the correlation analysis, we have only chosen to present correlations that are statistically significant with p > 0,05 (marked with * or ** in the table). As we understand the fact that small sample

size results in small correlations, and as all the correlations are statistically significant, we can utilize the received correlation coefficients in this thesis.

The results are presented by going through each procedure one by one, and presenting the correlating risks. The risk categorization made with factor analysis is also taken in account, and the results are reflected to the formed groups.

4. EMPIRICAL RESULTS

This chapter presents the results of the quantitative study. After a brief description of the data, the focus is first on sustainability risks; the ability of sustainable purchasing in preventing the risks is analyzed, and examined also in the industry-level. Secondly, the focus moves to the procedures that mitigate sustainability risks. Finally correlations between risks and procedures are identified and elaborated. The aim is to determine the most effective procedures.

The average operating revenue of the responded companies was 490 M€ and the median was 70 M€. The average number of employees was 1570 and the median 296. In both criteria the average grew high because of a couple of giant companies that participated in the study. The responses are not weighted according to the size of the company, so each response is equal nevertheless the company and the analysis can be conducted reliably.

The survey respondents represent different industries from the manufacturing industry. In order to get more specific results from the study, the industries were classified in five groups (Figure 4). This allows seeing whether there are differences or nuances between the industries when it comes to perceived sustainability risks and adapted procedures. The classification was made according to the business activities and NACE (Nomenclature of Economic Activities) code of the company. The five industry categories are Construction (1), Manufacture of machinery, equipment, metal, non-metal, plastic and electronic products (2), Chemical, paper and wood (3), Food (4), and Other industries (5). The shares of each industry are presented in Figure 4. The group 2 was the biggest according to the number of companies, with 41,1 %. Second largest group is Construction with a share of 24,2 %. Thereafter are Chemical, paper and wood (18,9 %) and Other industries (11,6%). Food industry has the smallest share (4,2 %). Even though Food industry represent only a small part of the respondents, it was seen important to keep apart because the industry might have some characteristics concerning sustainable purchasing

that are different from the others. However, if some differences are found, the lowered reliability of the result must be acknowledged.
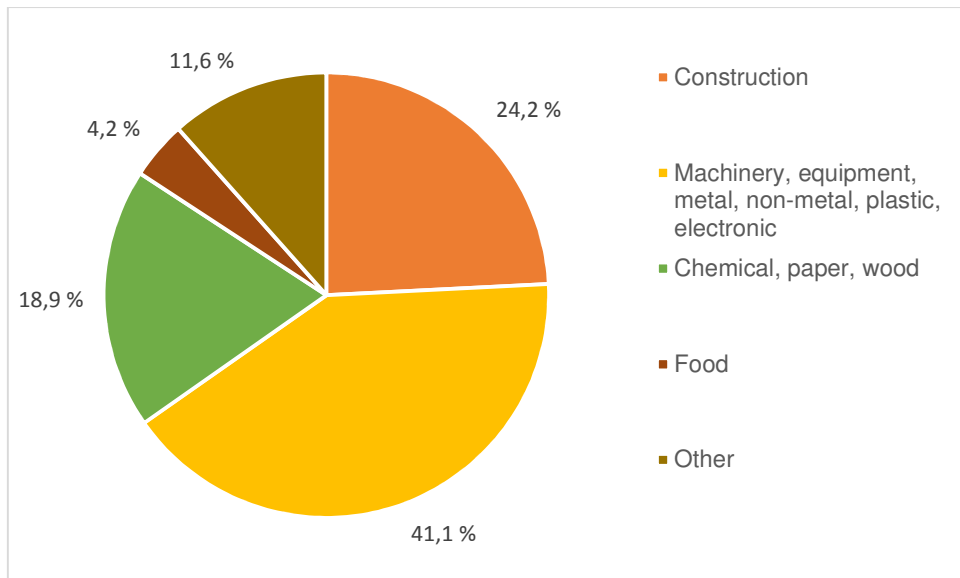
Figure 4. Segmentation of the industries.

4.1 Mitigation of sustainability risk

Sustainability risks were one theme in the survey, and the issue was approached with a question *How well sustainable purchasing can prevent the following risks?* In other words, what would be the benefits if a company's PSM function adapted sustainability more profoundly in its operations? The aim was to find out how well the respondents thought that sustainable certain purchasing could prevent or mitigate purchasing risks.

The means of each risk were taken and are illustrated in Figure 5. All of the means were situated above the median which is 4 receiving values between 4,19 and 5,58. The number of respondents varied between 93 and 94.

As a result, Sustainable purchasing was seen having the biggest effect on contractual risks. The contractual risks received the value of 5,58 on average.

Product availability was valued high as well, receiving an average of 5,56. The other risks that got a value above 5 were risks related to expenses and prices (5,44), product quality (5,30), delayed orders (5,43) and risks that raise from the ownership of innovations and immaterial rights created in co-operation (5,12). The respondents estimated that sustainable purchasing prevents workforce related risks the least, with an average of 4,19. Sustainable PSM was seen to prevent quite well, having the value between 4 and 5, the risks related to protection of knowledge and knowhow (4,93), brand and image (4,96), currency fluctuations (4,39), product safety (4,77), harm to the environment caused resulting from production (4,65) and supplier bankruptcy (4,63).
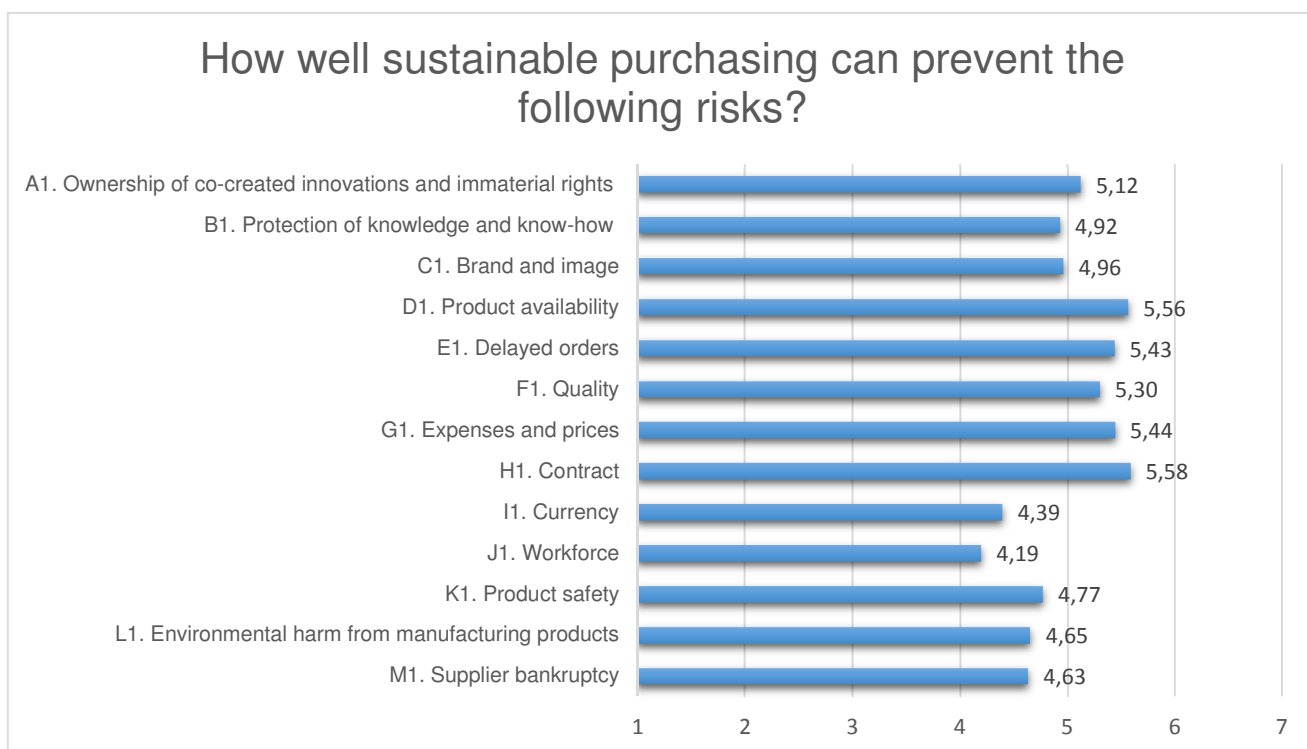

Figure 5. Average values for supply risks.

According to the boxplot graphs, no significant difference between the industries was found in the responses. A slight difference was found in risks related to workforce (J_1) and environmental harm from manufacturing (L_1). The boxplot graphs of the two risks are presented in Figure 6. When a horizontal line is drawn in the

graphs, food industry stands out since the line does not pierce the industry box. The food industry values lie above the values of other industries, and therefore it can be said that, in both variables, the food manufacturing industry valued sustainable purchasing in risk prevention to be more effective than other industries.
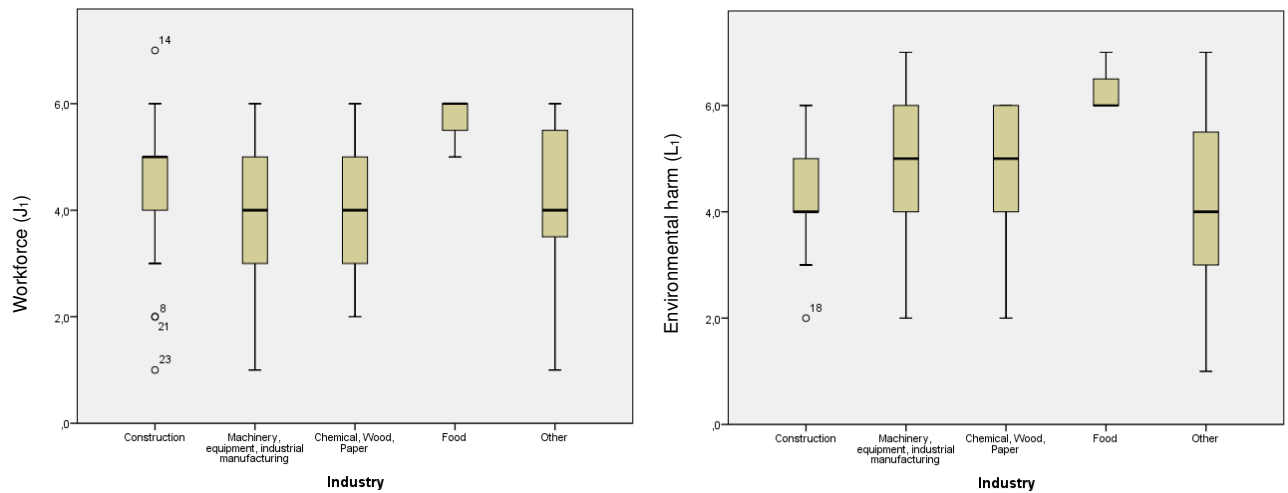
Figure 6. Boxplot graphs of risks related to workforce (J_1) and environmental harm from manufacturing products (L_1) by industries.

For further describe the results, factor analysis and reliability test were conducted. The results are presented in Figure 7. As a result, four new factors were created: To the group 1 were loaded the variables D_1 (loading 0,731), E_1 (0,898), F_1 (0,565), G_1 (0,523) and M_1 (0,422), to group 2 variables C_1 (0,399), I_1 (0,487), J_1 (0,918), K_1 (0,685) and L_1 (0,448), group 3 variables A_1 (0,713) and B_1 (0,857) and to group 4 variable H_1 (0,942).

Variable C_1 (Brand and image related risks) was not loaded clearly on one factor but on several factors. In order to find the most suitable factor for C_1 and increase the reliability of the results, reliability test was conducted. In the analysis, all the created factors were tested on alpha (α); First without variable C_1 and then with C_1. As a result, the alpha value in group 2 was higher with C_1 so the variable was places in that group. In other groups the alpha value was lower when C_1 was included. All

in all, the alpha values in reliability analysis should exceed 0,7 in order to be determined *good reliability.* This criteria was fulfilled as the alpha values were 0,749 for group 1; 0,713 for group 2; 0,75 for group 3; and as group 4 consisted of one variable, the reliability test could not be conducted.

Variable H_1 had clearly the biggest loading (0,942) on a separate factor 4. After conducting reliability test with testing H_1 being part of groups 1, 2 and 3, the alpha value was lower, so H_1 therefore was left in its own group.

In factor analysis, each factor is constituted of variables to which the respondents had a tendency to answer in a similar way. In reliability test, a high value of the alpha (>0,7) indicates that the measured variables measure the same issues. Therefore, each factor has its own characteristics that could be summed up in a common theme. Group 1 represents risks related to *Product availability, Delayed orders, Quality, Expenses and prices* and *Supplier bankruptcy* so the title refers to risks occurred in the purchasing process. Group 2 includes risk related to *Brand and image, Currency*, *Workforce*, *Product safety* and *Environmental harm from manufacturing products*, and it can be found out that all the risks are related to CSR especially. To group 3 are charged risks related to *Ownership of innovations created in co-operation and immaterial rights*, and *Protection of knowledge and know-how* so the title refers to immaterial properties of the company. Group 4 is *Contract* and it stands out as its own. The connections between the risk mitigation ability studied in the survey and groups formed in factor analysis, are examined in the discussion chapter (5.1.1)

Group number	Title of the group	Items		Loading	α
1	Purchasing process	D_1	Product availability	0,731	0,749
		E_1	Delayed orders	0,898	
		F_1	Quality	0,565	
		G_1	Expenses and prices	0,523	
		M_1	Supplier bankcruptcy	0,422	
2	CSR	I_1	Currency	0,487	0,713
		J_1	Workforce	0,918	
		K_1	Product safety	0,685	
		L_1	Environmental harm from manufacturing	0,448	
		C_1	Brand and image	0,399	
3	Immaterial properties of the company	A_1	Ownership of innovations and immaterial rights	0,713	0,75
		B_1	Protection of knowledge	0,857	
4	Contract	H_1	Contract	0,942	-

Figure 7. Grouping according to factor analysis and reliability test.

4.2 Sustainability procedures

The question that was asked from the respondents was *How would you evaluate the following sustainability procedures in your company?*

The number of respondents varied between 92 and 94. The means of each claim were taken to illustrate how the answers were divided. The division of the average values are presented in Figure 8. Averages show which claims turned out to be more important than others. Also whether any conclusions or generalizations can be drawn from them.

All in all the means varied more than in the risk evaluation. The range was from 2,72 to 5,73. The respondents estimated that *principles of sustainable purchasing* are

well adapted in supply management (5,73). Also *measuring supplier with its compliance of CSR* was valued high (5,36). Above 5 on average were s*upply management's pursue in enhancing supply chain transparency* (5,03), *attention to ethics and environmental values in purchasing* (5,12) and *CSR attention in supplier auditing and selection process* (5,20). Seven claims got an average of 4,00 to 4,99, so which is a sign of a good level of adaptation. Supplier instructions and processes were valued 4,48; supplier self-assessments 4,00; CSR standards for suppliers 4,92; Product traceability 4,42; Supplier audits 4,28; CSR standards for the company 4,53; and Understanding of CSR in supplier contracts 4,51.
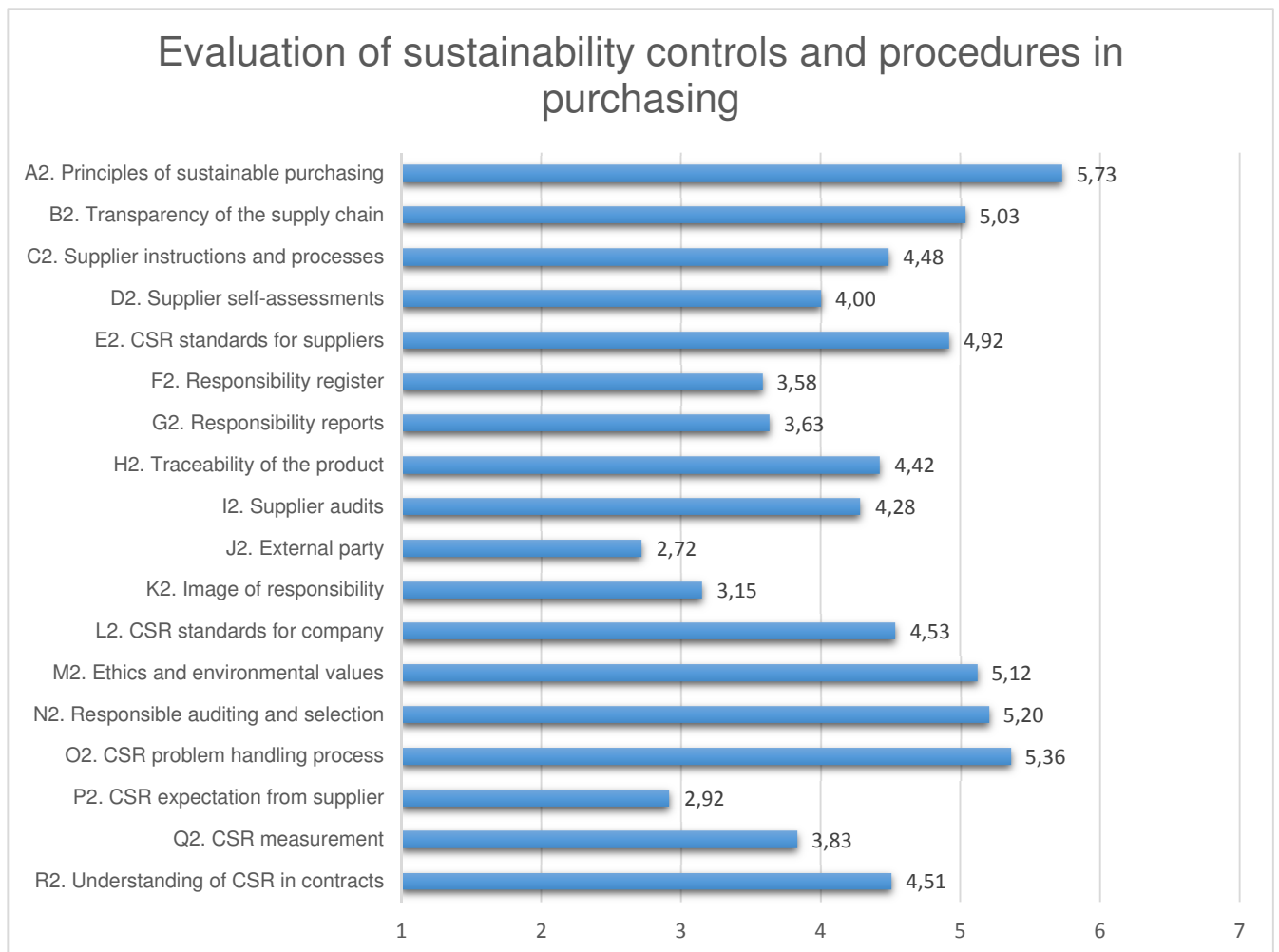

Figure 8. Average values for sustainability procedures

The lowest average was 2,72; using an external or a third party for conducting supplier CSR compliance. Expectation of CSR strategy or certain CSR standards from supplier also got a relatively low mean; 2,92.A systematic responsibility image building was not in the heart of companies sustainability investments, it was valued 3,15. Register of responsible suppliers and responsibility reports for products were valued in the median in the scale (3,58; 3,63), and a CSR indicator adaptation for measuring CSR just above (3,83).

The division of the results according to industries was studied with boxplots. The aim was simply to find out whether the responses in each procedure differ along the industry. The boxplot figures were taken of each claim. The results point out that only in two of the claims, *sustainability reports* (G$_2$) and *image of responsibility* (K$_2$), the responses differ between the industries. Below in Figure 9 are presented the two boxplots of the claims that stood out from the rest.
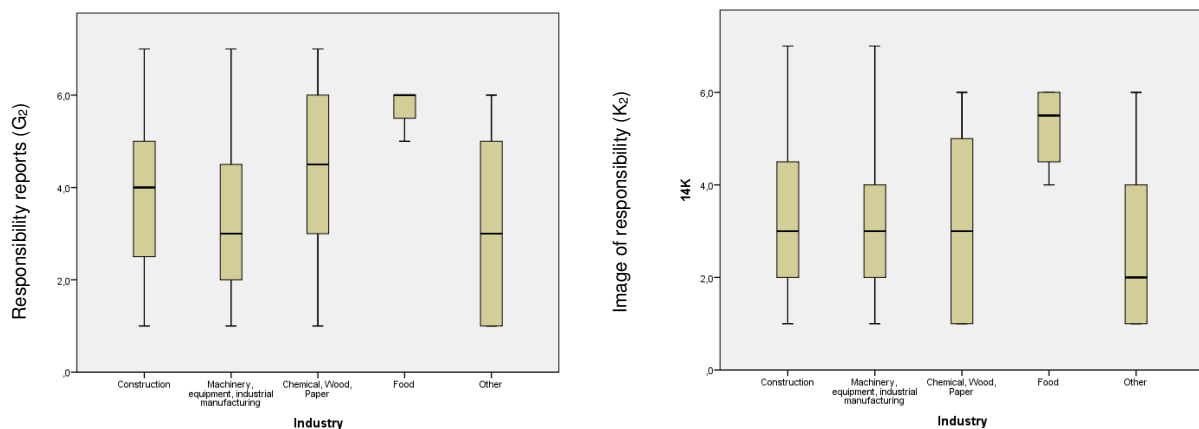
Figure 9. Boxplots graphs of responsibility reports (G$_2$) and image of responsibility (K$_2$) by industries.

In both cases it was food industry that stood out. Companies operating in food industry perceive it important to conduct sustainability reports for purchased products. Food industry also values systematic sustainability image building higher compared to other industries. No other remarkable notice could be made on the adapted sustainability procedures between the studied industries.

4.3 Bivariate correlation analysis

Table 4 presents the correlations that exist between the risks and controls. Only the correlations that are significant are presented in the table. All of the correlations turned out positive, which means, the bigger the variable A, the bigger is also variable B. The correlations that are significant at the 0,01 level are represented with **, which expresses a better significance of the correlation. The correlation coefficients at that level vary between 0,266 and 0,456. Correlations significant at the 0,05 level are represented with *. They express a significance that is not as strong. The correlation coefficients vary between 0,204 and 0,297. All in all, the coefficients remained small, as was expected in 3.2.3. Only two correlations were over 0,40, which is the limit for quite high correlation according to Metsämuuronen (2006, 360). There were 14 correlations between 0,3 and 0,4, and the rest 61 correlations below that. However, as stated previously, in this case, all the significant correlations can be examined whether they exceed 0,40 or not.

		A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2	L2	M2	N2	O2	P2	Q2	R2
A1	Pearson Correlation	,242*					,206*		,219*	,273**				,306**	,255*			,334**	
	Significance	0,02					0,048		0,035	0,008				0,003	0,014			0,001	
B1	Pearson Correlation	,227*	,208*											,257*	,260*			,245*	
	Significance	0,028	0,046											0,013	0,012			0,018	
C1	Pearson Correlation		,305**										,209*	,242*	,233*	,261*		,237*	
	Significance		0,003										0,044	0,02	0,025	0,011		0,022	
D1	Pearson Correlation																		
	Significance																		
E1	Pearson Correlation																		
	Significance																		
F1	Pearson Correlation	,259*	,257*							,283**			,259*	,224*	,207*	,290**		,207*	
	Significance	0,012	0,012							0,006			0,012	0,031	0,047	0,005		0,047	
G1	Pearson Correlation	,277**			,210*	,257*		,276**		,228*			,365**	,319**	,406**	,386**		,236*	,237*
	Significance	0,007			0,043	0,012		0,007		0,027			0	0,002	0	0		0,023	0,021
H1	Pearson Correlation	,294**				,276**	,207*						,296**	,302**	,287**	,318**			
	Significance	0,004				0,008	0,046						0,004	0,003	0,006	0,002			
I1	Pearson Correlation					,258*	,226*												
	Significance					0,012	0,029												
J1	Pearson Correlation		,255*	,266**														,267**	
	Significance		0,013	0,009														0,01	
K1	Pearson Correlation	,273**	,371**	,293**	,209*	,219*			,254*				,234*	,250*	,241*	,297**		,338**	
	Significance	0,008	0	0,004	0,044	0,034			0,013				0,024	0,016	0,02	0,004		0,001	
L1	Pearson Correlation	,206*	,252*	,284**	,357**		,247*	,311**	,317**	,246*				,341**	,337**	,456**	,261*	,357**	
	Significance	0,047	0,014	0,005	0		0,016	0,002	0,002	0,017				0,001	0,001	0	0,011	0	
M1	Pearson Correlation	,225*					,291**							,204*					,205*
	Significance	0,029					0,004							0,05					0,047
Sum		2,00	1,65	0,84	0,78	1,01	1,18	0,59	0,79	1,03	0,00	0,00	1,36	2,45	2,23	2,01	0,26	2,22	0,44
Average		0,25	0,27	0,28	0,26	0,25	0,24	0,29	0,26	0,26	0,00	0,00	0,27	0,27	0,28	0,33	0,26	0,28	0,22

* . Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed). N= 92-94

Table 4. bivariate correlation analysis between variables 1 and 2.

The coefficients are presented next. The procedures are gone through one by one and correlating risks are listed, in order to find out, which procedures correlate with which risks, and how strongly. Later on, in chapter 5.1.3, the results are interpreted and agreements as well as disagreements are presented.

The procedure of *adapted sustainable purchasing principles* (A$_2$) correlates with 8 of 13 studied risks. There are significant correlations with risks from all the groups of factor analysis. The coefficients lie between 0,206 and 0,294, so they are not very remarkable, but still worth analyzing. According to the results, adaptation of the principles of sustainable purchasing in the supply management of a company correlates with risks related to immaterial property: *Ownership of co-created innovations and immaterial rights* (0,242) and *Protection of knowledge and know-how* (0,227). The biggest correlation is found with *contractual risks* (0,294). Also CSR risks *product safety* (0,273) and *environmental harm from manufacturing products* (0,206) correlate with the procedure.

Pursue for a transparent supply chain (B$_2$) correlates positively with many risks from the CSR group: brand and image risks (0,305), workforce risks (0,255), product safety risks (0,371) and environmental harm from manufacturing (0,252). A significant correlation was found with protection of knowledge and know-how related (0,208) and quality related risks (0,257). A positive correlation was found between *Supplier instructions and processes for ensuring sustainability* (C$_2$) and CSR related risks (workforce 0,266; product safety 0,293; environmental harm 0,284). *Self-assessments conducted by the supplier* (D$_2$) correlated positively with product safety (0,209) and expenses and price (0,210) risks. A strong correlation was found with environmental harm from production (0,357). Supplier compliancy *with CSR standards* (E$_2$), such as ISO 26000 was found to correlate positively with risks related to expenses and prices (0,257), contractual risks (0,276), currency risks (0,258) and product safety risks (0,219). Keeping *a register on responsible suppliers* (F2) correlated with risks from all the groups: ownership of immaterial rights (0,206), contract (0,207), currency (0,226), environmental harm (0,226), and supplier bankruptcy (0,291).

Conducting *sustainability reports for products* (G_2) has connection with expenses and prices (0,276) and environmental harm (0,311). On average the correlation coefficient of the procedure is 0,29 which is the highest in the study. Making the origin and sustainability of the products *traceable* (H_2) was considered a procedure that has connection to CSR related risks (product safety 0,254; environmental harm 0,317) and also ownership of immaterial rights (0,219). Regular *supplier audits* conducted by the purchasing company (I_2) correlated with quality risks (0,283) and expense and price risk (0,228) from the purchasing process related risks. A significant correlation was also found with risk of ownership of immaterial rights (0,273) and environmental harm (0,246). Audits conducted by an *external party* (J_2) did not correlate significantly with any risk. Neither did *systematically built company's CSR image* (K_2). Not only the supplier has to comply with CSR standards, but it can also be demanded from the purchasing company (L_2). A significant positive correlation was found with brand and image (0,209), quality (0,259), expenses and prices (0,365), contractual (0,296) and product safety (0,234) risks. Thus, the correlation was the highest with expenses and prices.

The procedure *attention to ethics and environmental values in supplier field* (M_2) correlated with the most supply risks, at the total of 9 out of 13, receiving a total value of correlation coefficients of 2,445. The coefficients were also quite high on average; 0,272. The procedure being quite comprehensive and multidimensional, the results could be expected. The procedure is very general but useful, and preventive regarding supply risks. The risks that the procedure did not correlate with related to purchasing process (product availability, delayed orders) and external risks (currency and workforce).

The procedure *company pays attention to supplier's sustainability in supplier auditing and selection* (N_2) correlated with 8 risks. It received 2,226 as the sum of correlation coefficients, which is the second highest after the procedure presented above. The average value of coefficients was quite high; 0,278. The procedure correlated the strongest with risk of expenses and prices (0,406), which attains the critical 0,40 level, and thus can be stated as "quite high correlation" according to the classification of Metsämuuronen (2006, 360). Other correlative risks were the same as in M_2, except that in this case there is no significant correlation with risk of supplier bankruptcy.

Fixing emerged CSR problems and finding the bottom reason (O_2), correlated with relatively many risks related to both purchasing process and CSR. The strongest correlation emerged with risk of environmental harm in manufacturing with a correlation coefficient of 0,456. The correlation is the highest of the study. On average, the correlation were strong receiving an average of 0,33. *Expecting CSR reporting or CSR strategy from the supplier* (P_2) only correlated with the risk of environmental harm. *Compliance to CSR being one indicator* in measuring supplier (Q_2) had a strong connection in sustainable supply risk management. 8 risks correlated with the procedure, and the average correlation was 0,278 and total correlation 2,221. Ensuring supplier's *understanding of contract's* CSR aspects (R_2) correlated significantly with risk of expenses and prices (0,237) and supplier bankruptcy (0,205)

The results show that there are two risks that do not correlate significantly with any procedures: risk related to product availability (D_1) and risk related to delayed orders (E_1). Risks that correlate with the most procedures are risks related to Expenses and prices (G_1), Environmental harm caused from manufacturing (L_1) and Product safety (K_1)**.**

The effectiveness of a procedure was studied with calculating the sum of each correlation coefficient of each procedure. This gives information on how many risks are affected with each procedure. The results presented at the bottom of Table 4 are put into a line graph in an order starting from the procedure that has the highest sum of coefficient. The graph is illustrated in Figure 10. Variable *Attention is paid to ethics and environmental values in supplier field* (M_2) as a risk mitigation procedure stood out the most effective according to the table. It affected to nine risks (A, B, C, F, G, H, K, L, M) and when its correlation values were summed, it got 2,445 as a result. In comparison, the second most effective procedure was *attention to supplier's sustainability in supplier auditing and selection* (N_2) with 2,226 and *Compliance to CSR* (Q_2) with 2,221. Both of them affected to 8 procedures. Also *sustainable purchasing principles* (A_2) affected to 8 procedures with 2,003 as the sum of correlations, being the fourth most powerful. In comparison, Procedure *Expect of CSR strategy or reporting from supplier* (P_2) only affected to one risk, *Risk of environmental harm from*

manufacturing products. The sum of correlations only is directional and the values are not absolute but the results still give some hint.
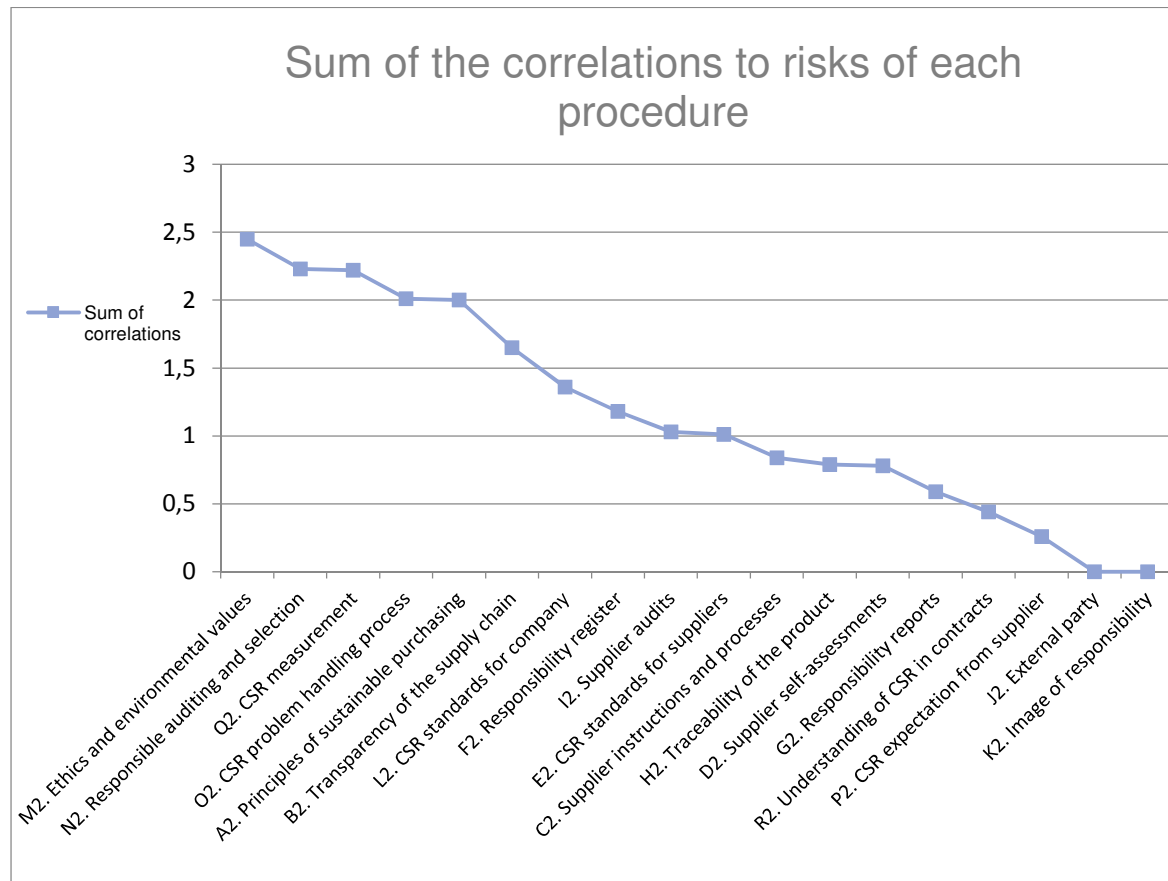

Figure 10. Line graph on the sums of each correlation.

To get information on how strongly each procedure effects on average, the relative effectiveness was studied. It was done by calculating the average of correlation coefficient in each procedure variable, and the results are shown at the bottom of Table 4. The averages varied between 0,22 and 0,33 with p*ursue to find out the bottom reasons and fix quickly CSR problems* (O_2) having the strongest effect on sustainability risks that it mitigates, and *ensuring supplier's understanding of contract's* CSR aspects (R_2) having the weakest effect. The procedures that did not correlate with any risks were excluded because the relative effectiveness is 0. All in all the value for the strongest effectiveness remained relatively small.

5. DISCUSSIONS

In this chapter, three issues are covered: the empirical and theoretical contribution of this thesis and its limitations. In the empirical contribution the results of each phase of the empirical study are discussed with further detail and analysis. In the theoretical contribution the results are reflected to theoretical background that was presented in chapters 2 and 3.

5.1 Empirical contribution

5.1.1   Sustainability risks

The aim of analyzing sustainability risks in the survey was to get the viewpoint of purchasing professionals' in Finland: How do they experience and perceive sustainability in their day-to-day work. What do they understand with sustainable purchasing in the first place: do they consider it important or a vain but necessary issue? And most importantly, are they aware of the risks that they face?

The results indicate that purchasing professionals find sustainable purchasing to have at least some effect on the mentioned risks. This is deduced from the fact that each risk was evaluated above 4 in the scale. For some risks the effect was seen greater than for others but, all in all, sustainability seems to have a positive effect in mitigating the risks. Sustainability has become more and more important as the awareness and demands of the stakeholders has increased. Companies have realized that sustainability concerns the PSM function as well as all the other functions of the firm. They are aware of what could be done; however, real efforts of sustainability in purchasing have remained quite small. The issue is quite recent and companies want more proof that investing in sustainability is profitable.

When the averages of each group from factor analysis was taken (table 5), the results point out that purchasing process related risks (group 1) could be mitigated the most effectively with sustainable purchasing. Surprisingly according to the respondents, CSR related risks (group 2) were the most difficult to mitigate with sustainable purchasing. The results may sound illogical, however they can be explained. With sustainable purchasing, the sustainability risks in group 2 (CSR related risks) did not have a significant effect, as it got 4,592 out of 7 as an average. This can be explained with, for example, that the respondents might think that overall, sustainability risks cannot be affected much because they are so unspecific and immeasurable. Also companies might lack power to make the needed change, especially if it is the supplier that has issues with sustainability. Instead, purchasing process related risks (group 1) could be mitigated quite well (average 5,272). The industry of interest may have influence on that; the manufacturing industry operates mostly with order-related actions, and the companies might have a bigger power position when it comes to deciding on making the order from the supplier.

Table 5. Average values for each factor analysis group.

Group no	Group name	Mean
1	Purchasing process	5,272
2	CSR	4,592
3	Immaterial properties of the company	5,025
4	Contract	5,58

As mentioned, purchasing process related risks, such as product quality and delayed orders, stood out with the highest averages, whereas CSR related risks, such as product safety and workforce, were not seen very effective in risk mitigation by sustainable purchasing. At the end, the main task of company's purchasing and supply function is to purchase right products and get them at the right time at a good price. When a purchasing company invests in sustainable purchasing, it takes in account foremost its main purpose, and the CSR objectives come right after. CSR issues are only considered when those mentioned main tasks are in order. Price is still seen to

play a great role, and CSR related problems are handled when the benefits are economically efficient. In other words, none or only little investments are made on CSR if no benefits for company's PSM function could be brought. Therefore, the importance of purchasing process related risks are justified.

5.1.2 Sustainability procedures

The results indicate that in Finland, supply and purchasing management of the companies pay some attention to sustainability. Actions towards a more sustainable purchasing are taken in a general level: principles of sustainable purchasing are adapted, suppliers' CSR aspects, such as ethics and environmental behavior are taken into consideration, and the requirements are adapted as early as in the supplier selection.

All in all, some procedures are more widely used that some others since there were variation in the means. Fundamental and the most basic principles of sustainable procedures, such as *principles of sustainable purchasing* or *responsible auditing and selection*, were adapted in most of the companies at some level. Companies seem to be quite aware of what they are expected from their stakeholders, and they strive to execute those things. In more specific procedures there were more variation in the averages, such as *expecting CSR strategy or reporting from the supplier*. Image building could be invisible to the company and they can do it without even knowing because it is adapted to the operations. It can also be systematic and done on purpose.

Auditing as a sustainability procedure was measured with three indicators: use of external party in auditing, audits on supplier conducted by the purchasing company, and supplier self-assessments. External party is barely used (2,7). Audits conducted by the buyer are better adapted and so are supplier self-assessments (average around 4). Suppliers are monitored somehow but using a third party remains a more rare option. Nike was given as an example, in chapter 2.3.5, of a company that had used

a third party in supplier audits in order to make the supply chain more transparent to its stakeholders. Perhaps the company was under so much pressure due to received negative media attention, that it was the only option. In Finland also, the negative publicity is focused mostly on the multinational foreign companies, but not on Finnish companies themselves. That can be one reason why a third party auditing is not so widely recognized. Relatively inexpensive self-assessments are easy to conduct, and supplier audits are a traditional way of monitoring key suppliers, which explain the higher average in those two other methods of supplier auditing.

Expecting CSR efforts from suppliers was evaluated especially with two claims: expectation of supplier compliance to CSR standards, and expectation of CSR strategy or reporting from the supplier. The former was evaluated high compared to the latter. CSR strategy requires a more profound familiarization to sustainability, which many companies either cannot afford or do not see interest in executing. CSR standards however, are an international indicator, and are a simple and also comparable method for the purchasing company to use. The company might also comply to certain CSR standards itself, which makes also reasonable to require compliance to these standards from the suppliers.

Overall, CSR issues were managed well on the supply management level. Systematic building of sustainability image however, was an exception and was not that well adapted. The controls that enhance external image building might not be completely understood by the respondent companies, which could explain the result. Also the current bad economic situation affects almost every company in Finland, and might decrease the efforts on building responsibility image. It is possible that the industry that the companies represent does not typically require sustainability element in the image. Also marketing plays relatively small role compared to other industries because industrial manufacturing enhances foremost effectiveness, reduced lead times and low prices. All in all, the average result in image building was surprisingly low in all the examined industries except food industry, which stood out also in product-centralized thinking. The box plots bring to light the trend in food industry: product-centralized thinking (procedure G_2) and image building are considered more important than in other industries. Products are visible to consumers and demand drives the industry. If

the stakeholders, such as consumers, are unsatisfied with the products, they can easily boycott them and find a substitute.

Transparency of the supply chain was seen more important than traceability of the products. In this case, as seems to be the trend, the more comprehensive procedure is more adapted than the more narrow procedure. Transparency of the supply chain is more comprehensive since the variety of actions that increase it, is relatively large. Transparency in the supply chain means that the purchasing company openly shares information on e.g. where the products are supplied, without deeper insight. Traceability of a product is often demanded by the stakeholders, however it can be difficult or even impossible to execute due to the long global supply network. This might be one explanation for the difference of the results between the two procedures.

For an overall description of the results, the averages of each three groups of sustainability procedures were taken and are presented in Table 6. The results point out that in the companies, the sustainability procedures related to supply management (group 1) were adapted the best on average (4,454). The evaluated procedures covered areas such as CSR standards and principles, image and problem handling. Regardless of the relatively small value of image of responsibility, the overall average was the highest. Supplier related procedures (group 2) were adapted be quite well (average 4,14). Surprisingly according to the respondents, product related procedures (group 3) were the least adapted in purchasing function's operations, with an average of 4,025.

Table 6. Average values for each sustainability procedure group.

Group no	Group name	Mean
1	Supply management related	4,454
2	Supplier related	4,14
3	Product related	4,025

Compared to claims related to risk prevention dealt in the previous chapter, the averages were slightly smaller in the evaluation of procedures. The risk evaluations were also more stable and coherent compared to procedures; no big variation was perceived among the evaluatios. Risk prevention therefore seems to be in a fairly good state in the PSM of the companies. In sustainability procedures however, the level of adaptation varies more; some procedures are part of the company's daily operations and were evaluated high, whereas some are used less and were evaluated clearly below the median.

5.1.3 Role of sustainability procedures in company's risk prevention

The correlations are discussed first briefly from the risk point of view, and after more deeply from the procedure viewpoint.

Risks related to product safety (K1) have a significant role and are in a central position in dealing with sustainability issues. Companies see that it has to be in order and mitigated. Naturally many procedures affect it and many operations in a company are executed to ensure product safety. Another important risk was environmental harm caused from manufacturing (L1): in the manufacturing industry environmental issues are probably the most notified in media and in stakeholder's eyes. One might think that efforts to sustainable purchasing mitigate risks related to product availability (D1) but the results of the survey revealed that none of the evaluated procedures has any affect on the risks. Maybe there are other procedures to control it, or in the worst case; companies think that the risk is under a control, when the control actually does not mitigate the risk at all.

The results are discussed and the chapter is structured using the three groups of sustainability procedures that were constituted previously: supply management related, supplier related and product related procedures. The idea is to find out which procedures affect to which risks, and an analysis of the result is provided.

On the supply management related sustainability controls, connection between CSR risks and transparent supply chain (B2) is understandable. Correlation with brand and image risks can be explained with the fact that the stakeholders expect transparency, which is transmitted through company brand. When the supply chain becomes more transparent, the sustainability image of the company is improved as well. In the chapter 4.1, the respondents evaluated that brand and image risk (C1) could be mitigated fairly well with sustainable purchasing (4,96). In chapter 4.2, the systematic building of image however was not regarded very important among the sustainability procedures that companies have adapted (3,15). And according to the correlation analysis systematic building of company's CSR image did not correlate significantly with any risk. Surprisingly, not even with image and brand risk. Maybe the procedure is not regarded very important in the respondent companies, even if the stakeholders, e.g. the media consider that the sustainability image should be taken care of. Especially in the case when the company acts as a leader in CSR issues and promotes them as its strengths. One explanation could also be that, even if the company considers CSR very important, it does not think that it has enough power to affect the CSR risks that it faces. The risks are mitigated in other ways than through systematical image building. For example, promoting ISO standards at the webpage or other media has a connection to company's image and brand. Compliance to international standards saves the company from explanations because the requirements for the standards are defined by an external party. If the company complies with a CSR standard, then it can more easily demand it from its suppliers as well.

Supplier related sustainability procedures formed group 2, and the results are discussed next.

Adapting CSR principles in the company operations may lead to a positive effect in all parts of the PSM. Correlations were found with risks that the company can affect already when making the selection of suppliers: Bankruptcy can be anticipated by analyzing the financial situation of the supplier; Expenses and prices can be negotiated before signing the contract; Ownership and handling of immaterial property rights can be negotiated in the contract. This being said, risks that are out of the reach of the buyer, such as delayed orders and product availability, the procedures barely

correlated with. The risks are typical in purchasing and probably can be mitigated with other, non-sustainable controls. Supplier selection process and supplier relationship management (SRM) typically deal with issues related to supplier's abilities and those are handled in an early phase of the co-operation. Those risks are very important and create the base in buyer-supplier relationship. When sustainable purchasing principles are adapted in supply management, the correlation with CSR risks is understandable, especially with risks that are clearly sustainability related, such as product safety and environmental harm from manufacturing.

The supplier can be demanded to comply with named CSR standards (E2), and correlation to some risks was found explicable. The buyer can regulate contractual risks by stating the demand clearly in the contract. International CSR standards and regulations can be applied to any supplier regardless of the industry. The buyer saves resources when the limitations and other requirements are set in the standard, and it does not have to make them up itself. Compliance to the limitations also increases product safety. All in all, with this procedure, the supplier can control risks that occur in the buyer-supplier relationship, not external risks such as currency fluctuations.

(M2) Paying attention to CSR values in the supplier field is quite a comprehensive procedure for ensuring sustainability. Thus, correlations with as many as 9 supply risks were expected. The risks that it did not correlate with were risks that a purchasing company barely can effect on. (N2) Paying attention to supplier's CSR in supplier auditing and supplier selection, on the other hand, correlates with many risks, and the correlation is very strong in general. It is quite difficult to measure the recognition of CSR aspects because the aspects are probably included somewhere inside the process. The remarkable correlation was found with expenses and prices; maybe the purchasing company's first mission in supplier relationship management is to keep the expenses and prices as low as possible. Profits can be made in the future when the CSR aspects of the supplier are controlled, and additional expenses do not emerge.(P2) Expecting CSR reporting or CSR strategy from the supplier only correlated with the risk of environmental harm. If a purchasing company sets criteria that its suppliers should have a proper strategy or reporting of CSR, it can be very challenging for many suppliers to fulfill. Therefore this procedure is more applicable to

the most important key suppliers of the company. As the requirements are demanding, the company should understand how it could benefit from it when the supplier fulfills the requirement. The procedure significantly correlated with one risk; therefore CSR demands from supplier are not seen effective in supply risk management.

It was surprising also that traceability did not correlate with quality risks. When you know better the origin of the product, the quality is thought to improve as well. This study however did not reveal any connection between them. Also, one might think that traceability and supply chain transparency correlate with the same risks. In this study, the transparency was seen to correlate with twice as many risks as product traceability.

Of supplier related procedures, finally are inspected supplier auditing and other preventive methods for risk mitigation.

(I2) Supplier audits conducted by the purchasing company correlated with slightly more risks than supplier self-assessments. Supplier audits correlated more with external product-related issues such as quality and expenses and prices, whereas self-assessments correlated with "internal" product related issues such as product safety and environmental harm. Audits are often conducted to ensure the quality and supplier compliance to contract, whereas self-assessments are more for a continuous supplier inspection. The inspected issues in audits can be rather descriptive and qualitative analysis, whereas self-assessments tend to be quantitative and measurable forms to be filled in. Through regular self-assessments (D2), the supplier is able to measure and follow indicators that are easily measurable, such as concentrations of toxic and hazardous substances in products, amount of waste, energy consumption, and expenses. With these indicators, the buyer is kept updated with part of supplier CSR requirements, and it can easily control whether the received values are not satisfactory. The self-assessments are an inexpensive way for the supplier to reduce risks, especially risks that correlated with the procedure: product safety, environmental harm and expenses and prices. External parties can also conduct audits for example in a case when the company wants to increase transparency of its supply chain operations. External audits might also affect indirectly

to company's image and brand; a reliable external organization gives an objective statement of the supplier's CSR operations, and the purchasing companies' stakeholders' demands can be satisfied. It might also save precious time and resources if an external expert does the inspection. However, external audits did not have any significant correlation with mitigating any supply risk in this study. The real benefit of external audits remains perhaps discrete for the company, and therefore external parties might not be the first option for supplier inspection in Finnish companies. It is also noteworthy that using external auditing as a sustainability procedure did not receive much attention when the respondents' evaluation.

(F2) Responsibility refers to economic, environmental and social aspects. Keeping register of responsible suppliers can be seen to help the buyer's risk mitigation beforehand. When the responsibility is defined, making the selection of suppliers with who to sign a contract gets easier. If the supplier has issues with e.g. financial situation or attaining the demanded waste limits, the contract can be left unsigned and the risks could be prevented. Supplier instructions and processes for ensuring sustainability (C2) is another way of supplier risk prevention. Clear instructions have an effect in the everyday operations of the supplier: instructions on employee safety and healthcare assist in the mitigation of workforce related risks; instructions on waste limits and dangerous substances can increase product safety and environmental protection. In the survey, the procedure connected only with CSR risks, and more precisely, with the CSR risks that are in the buyer-supplier relationship, which is compatible with the analysis. Thus, brand and image, and currency related risks did not correlate with it.

Correlations with product related procedures resulted in quite expected outcome. Making the origin and sustainability of the products traceable (H2) connected with CSR related risks that occur in the buyer-supplier relationship: product safety and environmental harm. The connection is understandable since when the sustainability of the product manufacturing is known, the environmental and safety harm can be avoided. It was surprising that there was no correlation with brand and image risks; one might think that being able to prove where the product comes from, affects the company's sustainability image positively. Perhaps Finnish companies have not taken the advantage of promoting the origins of the product. Tracing the whole supply chain

of one product can be very challenging as the global supply networks are multidimentional. It can also come costly to the company, if there is no direct benefit that the company receives from the tracing. As mentioned in the introduction of the thesis, nowadays the company is regarded as responsible as its whole supply chain, therefore it is important that the company pays attention to the origins of the supplied products. It is not enough to have only the own manufacturing operations as responsible as possible, because the CSR issues can rise from the supply chain.

5.2 Theoretical contribution

If we draw a conclusion on the achieved survey results, and compare them to previous and recent related studies, image-related and reputational sustainability characteristics were considered slightly differently. In the survey, image and reputation were not seen very important procedures, even if according to the results from the question 1, companies were aware that they can affect it. In the previous studies, image and reputational issues were considered very important and its effect on company's financial results has been evaluated. The survey results can be explained with for example with the following: perhaps there has been no destruction of reputation in the manufacturing industry in Finland that has raised a lot of attention. The companies won't therefore put much effort in keeping the image clean since it is not obligatory, and especially if the economic situation of the company is not good (which seem to be the case in almost every company these days). Previous studies claim, however, that the reputation is perhaps the biggest threat the sustainability issues can cause. Multinational companies such as Nike, have faced some reputational issues in the past years, and have suffered from it. (Maignan et al. 2002) But local Finnish companies cannot relate to them and see that as a warning example. As Min and Galle (2001) stated, additional costs are the biggest barrier in carrying out sustainable purchasing. The issue of resources is thus a considerable reason for Finnish companies in the manufacturing industry, for refraining from carrying out sustainable purchasing.

Another explanation for little effort put on image and reputational threats could be Finnish nature. The issues are not put on a podium and set as the main concern, but instead, they are affected through company's daily operations. Image and reputation are seen to get better as good things are done in the company. Finnish loyalty highlights that company's efforts for sustainability are not presented out loud if they do not have a reason to be presented or a good proof and reliability. It is possible that Finnish companies also see sustainability to be more of marketing, product development and manufacturing's issue rather than PSM function's issue.

The study of Manuj and Mentzer (2008a) that was presented in chapter 2.2.2 listed risks that were perceived salient according to global supply chain managers. In that listing, the currency risk was evaluated the most salient before quality and safety risks, for example. However, the empirical survey conducted for the thesis revealed that currency risk could not be prevented with sustainable purchasing very well. In the correlation analysis currency risk was not found to connect with any procedures, which explains the first result.

Conducting self-assessments and audits were regarded as an effective way to control supply risks both according to scholars and the survey results of this thesis. Studies consider auditing as a fairly inexpensive way of monitoring. It can also be conducted regularly, and the indicators and results are often measurable and comparable. From the concept of triple bottom line, financial and environmental aspects fit to that statement; they can be measured at some point, and thus they have an active and important role in mitigating related supply risks. However, the social aspect of TBL still lacks clear and measurable indicators. Standardized and common limitations and criteria for e.g. decent employee working conditions can be difficult to define. Thus, it can be acknowledged that controlling social responsibility risks is not simple. It exists standards for social responsibility, such as ISO 26000 (Social Responsibility) and SA 8000 (Social Accountability) which promote the third aspect of triple bottom line. Following the standards and controlling suppliers' compliance to them is often the biggest issue.

5.3 Limitations and suggestions for future research

This thesis, as any other, is bound to some limitations. Firstly, the analyzed questions were part of a larger survey, and could not be modified. The nature as well as the scaling of the questions were also given, which made the data certain kind. More precise questions or explanations could not be presented to the respondents, as the survey was a quantitative online questionnaire. The analysis and argumentation were slightly more difficult than expected because they can only be based on survey data values and theoretical knowledge, which might decrease the validity of the analysis. Also the respondents' position in the company varies, so the response that they have given might not represent the whole company's statement but that of an individual. The respondents should however be in a position where they have a good understanding of company's purchasing and supply management, so that the responses would be as valid as possible.

Secondly, the analyzed survey questions were based on information gathered from different places, such as literature, group meetings and previous knowledge. They should comprehend all aspects in purchasing risks and procedures but there is a chance that some were not taken into considerations.

Thirdly, the survey had relatively few respondents, under 100, which could decrease the validity of the analysis. The period of time was challenging as the survey was conducted in spring and summer, close to the holiday period. Under the circumstances however, the number of respondents was sufficient to fill the requirements for the thesis. The geographical limitation (companies in Finland) as well as the limitations set on companies' size, were necessary to apply, and they naturally affect the validity of the thesis.

The future suggestions are partly based on the limitations mentioned above. First, as the sample size was fairly small, the research could be conducted with a larger sample size in order to get even more significant results. The main idea of a quantitative study is to get results that can be generalized, so larger sample size would result in more

generalized results. Larger sample would give better correlations for the correlation analysis, which allows finding some factors that this study did not reveal.

Secondly, the classifications that were made in the thesis, were mostly decided by the writer of the thesis. Classification of industries, classification of sustainability procedures, and also the group names in the factor analysis were decided to best represent the data, but another person could have done it differently. Also the final analysis of the results could be different if the classifications were unlike.

Thirdly, the themes of the thesis handle only the supply chain from supplier to buyer. The analysis could be elaborated and extended to concern also the chain from buyer to customer. This viewpoint could examine the value creation side of sustainable purchasing: how do the sustainability efforts made in purchasing add value to customers and end-products?

6. CONCLUSIONS

The objective of this thesis was to study how risks are managed in sustainable supply chain. The objective was approached with first setting two research questions, and thereafter answering those questions by elaborating the theoretical part and empirical part. The theoretical part defined the concepts of sustainability and supply chain risk, and culminated into the chapter of sustainable supply risk management. The empirical part was a natural follow-up for it as a survey based on theoretical knowledge was conducted, the focus group being Finnish companies operating in the manufacturing industry. The survey consisted of three phases: supply risks, sustainability procedures, and connection between those two.

The first research question being "Which supply risks are perceived the most significant for sustainable supply management?", it was found out that purchasing process related risks could be mitigated the most effectively with sustainable purchasing. No significant difference was found between the different manufacturing industries. Only food industry received slightly higher averages on two risks compared to other industries. The theoretical approach enhances the importance of reputational and image-related risks, which however, was not the case in the empirical results.

The second research question being "Which sustainability procedures are perceived the most efficient for managing supply risks?", based on the empirical approach, it was found out that fundamental and the most basic principles of sustainable procedures, such as *principles of sustainable purchasing* or *responsible auditing and selection*, were adapted in most of the companies at some level. Auditing was also highlighted by the theoretical approach.

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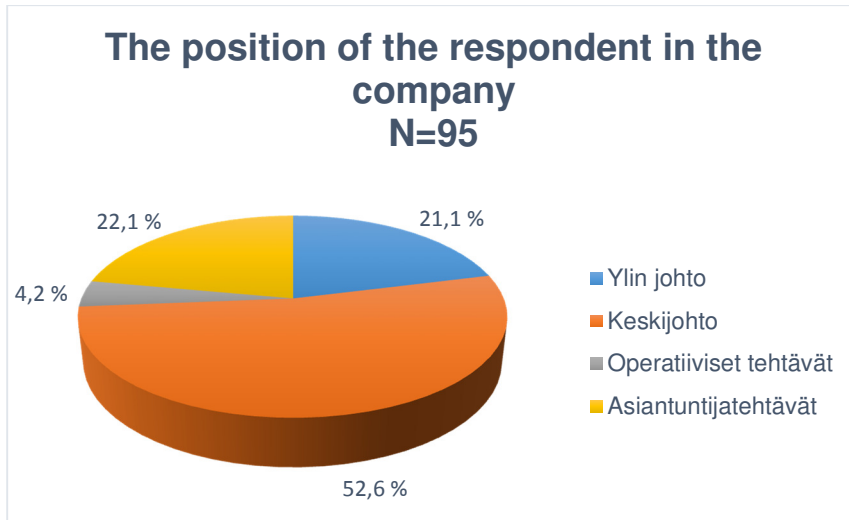
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APPENDIXES

Appendix 1. The position of the respondent in the company

The position of the respondent in the company
N=95

22,1 %

21,1 %

4,2 %

■ Ylin johto
■ Keskijohto
■ Operatiiviset tehtävät
■ Asiantuntijatehtävät

52,6 %

Appendix 2. Division of the purchasing tasks of the respondents.

Division of the purchasing tasks of the respondents
N = 94

35,1 %

■ Suorat hankinnat
■ Epäsuorat hankinnat
■ Kaikkeen hankintaan

59,6 %

5,3 %