LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT

School of Business and Management

Supply Management

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Managing Sustainability Risks in the Logistics Supply Chain

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TIIVISTELMÄ

Tekijä: Ville Rintamaa

Otsikko: Vastuullisuusriskien hallinta logistiikkaketjussa

Tiedekunta: Lappeenrannan-Lahden teknillinen yliopisto LUT, School of Business and Management

Pääaine: Hankintojen johtaminen

Vuosi: 2020

Pro gradu: 94 sivua, 10 kuvaa, 5 taulukkoa

Tarkastajat: Professori Katrina Lintukangas

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Avainsanat: Toimitusketju, hankintojen johtaminen, riskienhallinta, vastuullisuus, logistiikka

Tämän Pro gradun tehtävänä on tuoda esille mitä vastuullisuusriskejä löytyy logistiikkayrityksen toimitusketjusta ja millä tavalla näitä riskejä hallitaan. Tutkimuksessa selvitetään mikä on vastuullisuusriskien erityisluonne ja millä tavalla kestävä kehitys ilmenee yritystoiminnassa ja erityisesti logistiikka-alalla. Vastuullisuusriskien hallinta käsitellään systemaattisesti riskienhallintaprosessiin pohjautuen, missä ensiksi riskit kategorisoidaan eri osa-alueisiin. Tutkimuksessa käsitellään riskien analysointia ja mikä on riskien yhteys yrityksen sidosryhmiin ja logistisen ketjun operationaaliseen toimintaan. Riskienhallinnassa tärkeänä osana on sidosryhmien hallinta, minkä lisäksi hallintakeinoja vastuullisuusriskeihin käsitellään toimitusketjun hallinnan ja logistiikka-alan näkökulmien kautta. Lisäksi riskienhallintakeinoja käsitellään niiden reaktiivisten ja proaktiivisten luonteiden kautta, sekä miten innovaatioilla ja pitkän aikavälin kumppanuuksilla voidaan luoda uusia keinoja riskienhallintaan. Nämä havainnot käsitellään empiria-osuudessa case-yrityksen haastatteluiden kautta, missä teoriaosuuden riskit olivat havaittavissa. Vastaavasti riskienhallintakeinot olivat sidosryhmille ja toimitusketjulle yhtäläisiä ja erityisenä kysymyksenä nousi esille pitkän aikavälin kannattavuuden varmistaminen ja vastuullisen toiminnan yhdistäminen.

ABSTRACT

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Title: Managing Sustainability Risks in the Logistics Supply Chain

Faculty: Lappeenranta-Lahti University of Technology LUT, School of Business and Management

Major: Supply Management

Year: 2020

Master's Thesis: 94 pages, 10 figures, 5 tables

Examiners: Professor Katrina Lintukangas

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Key Words: Supply chain management, Risk management, Sustainability, Logistics

The aim of this master's thesis is to examine the sustainability risks found in a logistics company's supply chain and the means for managing these risks. The study examines the specific nature of sustainability risks and the way how sustainable development appears in business operations and in logistics industry. Examination of these risks is based on a risk management process, where risks are first categorized into three different areas. The study addresses risk analysis and the connection of risks into stakeholders' reactions and operational performance of the logistics chain. Stakeholder management is considered as an important part of risk management and management means are examined also through supply chain and logistics management aspects. The utilized risk management tools are addressed through their reactive and proactive natures and how innovations and long-term partnerships have the opportunity to create new means for risk management. The findings are examined in the empirical part via interviews with a case company. Similarly, same practices for managing stakeholders and the logistics chain are found in the empirical part and a specific issue of aligning long term profitability with sustainable operations was presented.

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1. Introduction

The ongoing phenomenon of globalization has led to companies and organizations balancing between achieving environmental and economical performances to obtain sustainable development in their business (Cosimato, 2015). The importance of implementing sustainability into businesses is described as a licence to do business in the twenty-first century (Carter & Easton, 2011). During the past decades logistics has become one of the main determinants for business performance and a major field of academic study. The objective has been during the past 50 years in maximizing profitability of logistics functions but the public and government concern regarding environmental issues has shifted pressure for companies to reduce their environmental impact. (McKinnon, Cullinane, Browne & Whiteing, 2010) This shift in business to implement sustainability is linked to the companies reacting to the pressure of stakeholders and avoiding loss of reputation by contributing to economic and social issues in their businesses.

This means in the context of supply chain management that the sustainability standards are implemented throughout the whole supply chain to promote transparency and life - cycle assessment of the delivered product (Seuring & Müller 2008). The topic of sustainability is new to the modern era of business studies and its role can be described as a complex entity which does not have a singular guideline that fits with every supply chain's sustainability ambitions (Boström, Jönsson, Lockie, Mol & Oosterveer 2015). The complexity of managing supply chains derives also from the demanding customers and competitive pressures with concerns related to logistical, political, cultural and infrastructural aspects. The acknowledgment of the wide array of vulnerabilities in supply chains and the challenges that risk management comes up against is apparent in the vast amount of academic literature but however, there is a lack of conceptual frameworks and empirical discoveries to create a normative guideline to manage risks in a global supply chain. (Manuj & Mentzer 2008) The whole concept consists of three complex issues; sustainability, risk management and the logistics supply chain which requires scrutiny to develop a strategical guideline for management to implement sustainability initiatives into the logistics supply chain with excellence that ensures the continuity of business performance.

1.1 Background of the study

Brundtland (1987) introduced a study for acknowledging the concept of sustainable development as a global issue by defining sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The study assessed the critical aspects of sustainable development, emphasized international collaboration, and provided knowledge for organizations to tackle these issues. For further applications to the business world, Elkington's (1998) paper introduced a sustainability framework called "Triple bottom line" which divides sustainability into three categories: environmental, social and economic performance. Govindan, Azevedo, Carvalho and Cruz–Machado (2014) point out that supply chain management is a key point to be considered in sustainability discussions, as lean and green paradigms implemented to the supply chain allow the company to be more competitive and sustainable in the dynamic markets. Seuring and Müller (2008) have studied broadly the sustainability issues in supply chains and they identify two main strategies with the first one being "supplier management for risks and performance" and the second one is "supply chain management for sustainable products". These findings highlight the damage inflicted to a company's reputation and to the supply chain's performance that sustainability problems can cause. Consumers' sustainability awareness leads to a demand for environmentally verified products to be implemented to the supply chain. Hofmann, Busse, Bode and Henke (2014) conceptualize supply chain risks by separating ordinary supply chain risks and sustainability related risks. Difference between the two is that ordinary risks have a disruptive effect on the supply chain and sustainability risks are triggered by stakeholder reactions. In addition to strategy and risk management, Carter and Easton (2011) identify other facilitators for sustainable supply chain management such as company's own organizational culture that aims for ethical standards and the will to communicate proactively to the stakeholders via transparency and visibility in the supply chain.

Seuring's (2013) studies identify four different models for approaching sustainable supply chain management and the findings indicate that typically environmental aspects dominate in comparison to social aspects in these models. Also, the focus on economic dimension seems to be on cost minimization. Regardless of the different approach to risk management,

Manuj and Mentzer (2008) have proposed an interactive and interdependent five – step process for risk management that not only emphasizes the importance of interacting between these steps, but also the consideration of other strategies and processes across the supply chain while implementing the sustainability initiatives. A study conducted by Boström, Jönsson, Lockie, Mol and Oosterveer (2015) assesses some of main challenges and opportunities in governing sustainable supply chains and the main issues are found to be related with geographical, information and knowledge, communication and compliance or implementation gaps. Combinatorial optimization of supply chain operations has a major impact on green logistics according to findings by Sbhisi and Eglese (2007) which indicate that optimizing vehicle routing, waste management and reverse logistics have a mutually positive effect on both economic and environmental dimensions. A research concerning sustainability innovations by Hansen, Grosse-Dunker and Reichwald (2009) proposes a comprehensive supply chain sustainability assessment with the aspect of engaging stakeholders to the sustainability innovation process. The study shows that by assessing the sustainability effects in three dimensions: need dimensions, life - cycle dimensions and target dimensions, the outcome is a structured sustainability innovation process for mitigating the risks for product innovations with a focus for promoting sustainability – oriented innovations.

1.2 Aim, limitations and research questions

First, the aim of this study is to build a basis for the study by examining sustainability according to three dimensions: economic, environmental and social dimensions. These dimensions are examined in the context of green logistics which specifically concerns the sustainability issues regarding the logistics industry. A key point in assessing the sustainability risks is to examine the role of external stakeholders in this context and how these risks relate to ordinary supply chain risks. Having formed this theoretical basis, this study aims to categorize these risks according to their nature. The study assesses the objectives of tackling these risks to find the tools and processes to mitigate these risks and to promote sustainable activities in a supply chain.

The incentives and drivers for active sustainable development are identified to vary between industries but this study is specifically limited to the context of a logistics company. Different approaches and viewpoints for risk management are identified to exist, but this study aims to specifically find the sustainability risks and management tools for a logistics supply chain. Therefore, the study excludes all the other risks related to other industries and contexts. Sustainability risks in the logistics industry are associated with both supply of materials required for enabling logistics operations and managing the flow of distribution, which are included in this study. The study is limited to only examine strategies and processes for risk management in the context of logistics supply chain management. The limitations for this study are based on the empirical part, which concerns a logistics company Posti Group. Having the scope to study a single company in the logistics industry emphasizes the importance of excluding literature related to other industries.

The research questions below serve as a foundation and guideline in this paper. While studying the main research question, the paper uses three sub questions to bring profound knowledge regarding the topic.

Table 1. *Research questions*

Main research question	*Q1. How does a logistics company manage sustainability risks in the supply chain?*
Sub research questions	*Q2.1 What kind of sustainability risks are associated with managing a logistics supply chain?*
	Q2.2 What are the means to manage sustainability risks?
	Q2.3 What are the challenges related to sustainable risk management?

The main research question Q1. sets the framework for exploring how the three main dimensions of sustainability, risk management and the logistics supply chain can be aligned adequately to ensure business performance and continuity of the supply chain. This study recognizes the assessment of the nature of these sustainability risks as a key issue in the question Q2.1, where these risks are reflected to the logistics supply chain operations to explore the specific sustainability concerns in this industry. The question Q2.2 aims to reveal the management means that are utilized in handling these risks in the logistics chain. While examining the generic approaches to mitigate sustainability risks, the study examines the specific means in the logistics industry and how these have effect on stakeholders' reactions. The question Q2.3 is related to the former notion that simultaneously managing a logistics chain and thriving towards sustainability goals is a challenging task which sets specific barriers for operations to be carried out effortlessly and gaining understanding about these issues is the final question to be answered.

1.3 Conceptual framework

The conceptual framework of this study is presented in the following figure 1. This framework is presented visually to provide insight to the main topics under scrutiny in this study.

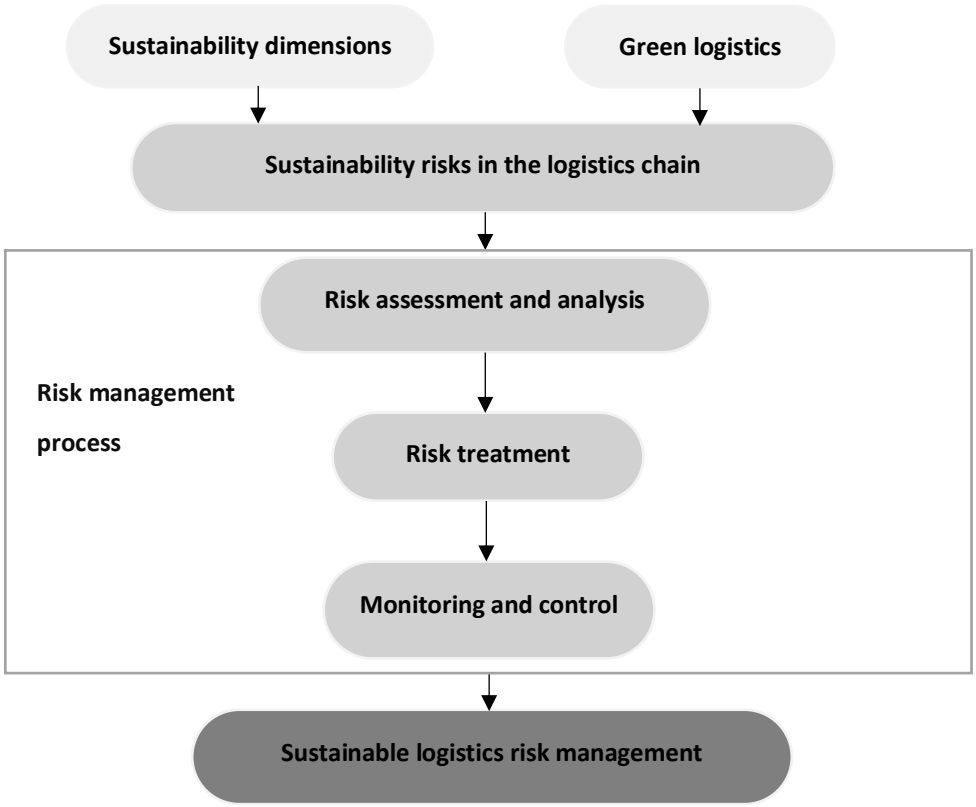

Figure 1. *Conceptual framework*

The first two sections starting from the top of the presented conceptual framework serve as a foundation for the study to form the background for understanding the nature of sustainability and its role in green logistics. Having the knowledge about sustainability and its main issues in the context of green logistics, the study systematically explores the management of these risks with a process which starts with the assessment and categorization of the risks that are related to the logistics supply chain management. The next step is to examine the means, tools and approaches for managing these risks. As the tools and procedures for mitigating and managing these risks are created, the study examines how

monitoring and control is carried out for further development. The theoretical background from the risk management process is applied to the empirical part, where the final step is to gather information from a logistics company to address these issues that have been surfaced formerly in academic literature. The result is a summary of how sustainability risks are managed in a logistics supply chain.

1.4 Definitions and key concepts

Sustainable development

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987)

Logistics supply chain management

"Logistics is the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfilment of orders" (Christopher, 2005)

Supply chain risk management

"Managing probabilistic and unwanted situations by identifying risk sources, analyzing likelihood of these risks and present a viable solution to avoid, and mitigate or minimize the effects of these sources" (Shahbaz, Rasi, Ahmad & Rehma, 2017)

Sustainable supply chain management

"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. (Seuring & Müller, 2008)

Reverse logistics

"The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal." (Rogers & Tibben-Lembke, 1999)

2. Sustainable development

Sustainable development was defined by Brundtland (1987) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability was introduced as a major global challenge for all organizations to be concerned in their operations. Acknowledgement of how global integration has promoted the transfer of goods and information vastly during the last decades ought to be realized as an ability to study the future hazards of earth and align economic interests with potential risks that we are facing. (Brundtland, 1987) The triple bottom line (TBL) was introduced by Elkington (1998) as a mean to assess the three dimensions of sustainability; economic, social and environmental. The findings emphasize the importance of implementing long-term partnerships in transition to sustainability and it proposes three key points for a sustainable enterprise: companionships within industry sectors and symbiosis with non-governmental organizations, earned loyalty between stakeholders and companies, creating trust as an investment in relationships to raise social capital. (Elkington, 1998)

Table 2. *Seven sustainability revolutions*

Revolution	Paradigm
Markets	Pressure from competition and customers shifts businesses into proving TBL commitments and performance.
Values	Acknowledgement of worldwide shift in human and societal values that transform business platforms.
Transparency	Growing demand from a wide range of stakeholders for information.
Life-cycle technology	Challenge of tracking far back down the supply chain the implications that the product has had during its lifecycle.
Partnerships	Accelerating rate of new partnerships between companies and other organizations.
Time	Time based competition and expansion of time horizon with techniques promoting long time – dimensions and the pace of competition.
Corporate governance	Growing responsibility to the corporate board in implementing TBL – agenda

The seven sustainability revolutions presented in the table above depict seven drivers for promoting sustainability in businesses. The transition in the markets compels companies to explore new market conditions and means to ensure future business survival. As the growing pressure deriving from economic, environment and social factors begin to accelerate, these challenges become apparent in a new approach of combining TBL – thinking with accounting to build a business case for action and investment. (Elkington, 2004) The revolution of sustainability derives historically from decay that industrial revolution had caused to the environment and well-being of people. Even though sustainability has been associated with protest and campaigns to promote these issues, its values represent a broad range of issues concerning all sectors of society throughout the world. (Edwards, 2005. 5) Formerly, companies have felt a solid ground below their businesses and neglecting the demand of promoting values in business processes has caused many companies to go down. Transparency is related to the notion that companies have become functions under global scrutiny concerning their priorities, commitments and activities in sustainability. Promoting

transparency has become to some extent obligatory, but companies also uphold this action voluntarily. (Elkington, 2004)

Associated with promoting transparency, companies are increasingly linked with partners and suppliers in their visions and commerce which further adds responsibility for managing the sustainability of the entire supply chain and the product's life - cycle (Lubin & Esty, 2010). Assessing the life - cycle of a product is one of the most well – developed concept, as it aims to analyse the actual and potential environmental impact of a product from the acquisition of material to production process and customer use and all the way to the disposal of the product. (Lindfors, 1995) Advancing corporate and sustainability goals through partnerships with other businesses and stakeholders has accelerated which results in new variety of different relationships (Gray & Stites, 2013). Companies that have formerly seen themselves as competitors in the market have begun to propose partnerships by realizing the key contribution that the opposition can bring to sustainability. The revolution of time is evident in companies starting to expand their timeframe in business. Instead of solely focusing on traditional techniques based on providing the product in a "just in time "– manner, companies become more creative in exploring also the possibilities of using "long time" – dimension as an innovation for competition (Elkington, 2004). The role of corporate governance has increased during the beginning of the twentieth – first century as a function for protecting shareholders' wealth, which can be under great threat from such allegations as corporate fraud, misconduct or neglect towards sustainability issues (Baker & Anderson, 2010). Driven by all of the formerly addressed revolutions, it is proposed that the TBL agenda needs to implemented deep into the corporate DNA, as it shifts the focus from assessing the issue to the corporation contemplating its orientation to sustainability and stakeholder engagement. (Elkington, 2004)

Sustainability is considered as an integration of three historically separate concepts; profits, the people and the planet which poses an issue of how managers should implement this entity into business. The issue was highlighted by a study conducted by Crews (2010) which proposed five leadership challenges that need to be considered when implementing

sustainability: stakeholder engagement, creating the culture, organizational learning, holistic thinking and measurement and reporting. Acknowledging the fact that promoting sustainability is created in a relationship with stakeholders that resembles symbiosis, companies have a requirement of integrating needs and interests of all stakeholders to find mutually beneficial gains (Crews 2010). Creating an organizational culture emphasizes the importance of addressing the unfavourable effects of major organizational changes into employee morale and productivity (Crews 2010). Organizational culture can also be regarded as an informal function that drives corporate sustainability forward and it is found to be one of the essential elements in middle-management for simultaneously thriving for social, environmental and financial performance (Epstein, Buhovac & Yuthas 2010). Holistic approach finds that in comparison to former business strategies, organizational leaders face more complexity and unpredictability in business. This means that managers are compelled to innovatively find ways to differentiate their products and services to tackle the paradox of simultaneously lowering costs while promoting sustainable efforts. (Crews 2010) The last challenge handles the issue of measuring and reporting sustainability as there is not a singular indicator for measuring sustainability. The real challenge is related to holistic thinking as rather than following an outdated guideline, managers should create an innovative and unique culture and a measurement system that will work in that specific culture. (Crews 2010)

2.1 Green logistics

The risks that global warming is posing to the society has also surfaced the scrutiny of the impact that the logistics sector has to this phenomenon. This has resulted in an increased amount of regulations in terms of tightening controls for emissions, pollution and road safety controls. (McKinnon et. al. 2010) Green logistics is noted as a relatively new concept for management in which reducing resource consumption for diminishing emissions is becoming an increasingly important aspect in logistics (Lee & Wu, 2012). Transferring billions of products every day requires a large amount of fossil fuels which leads to harmful greenhouse gases and especially carbon dioxide which may have a major impact to people's health and the environment (Dey, LaGuardia & Srinivasan, 2011). Transportation is found to have a significantly broad contribution to global energy consumption, as 28% of all energy consumed worldwide derives from transportation. From all the greenhouse emissions caused by

economic sectors, transportation sector considers 14% of the total amount generated. (Holmberg & Erdemir, 2017)

This increasing attention towards the logistics industry has resulted in methods for improving vehicle efficiency during their operations and development for alternative or hybrid fuel technologies to reduce the dependency for fossil fuels (Dey et al., 2011) The systematic issue related to logistics is that the growing trend of supply chain globalization leads to increasing amounts of emissions, as we have not yet achieved the desired clean fuels revolution. Enhanced infrastructures enable cheaper and easier long-distance sourcing and transferring operations to remote areas effect on social structures as local enterprises are going out of business. In addition to labour and environmental concerns, fluctuations of oil prices compel companies to evaluate costs of transport and overall costs of the supply chain. (Garrett, 2010) Reducing warehousing in the supply chain not only has a positive economic effect but it also has a positive impact on the company's carbon footprint as well (Dey et al., 2011). Managing a warehouse with low inventory quantities will result to less energy consumed from upkeeping raw materials, finished goods and employees working in the premises (Franchetti, Bedal, Ulloa & Grodek, 2009).

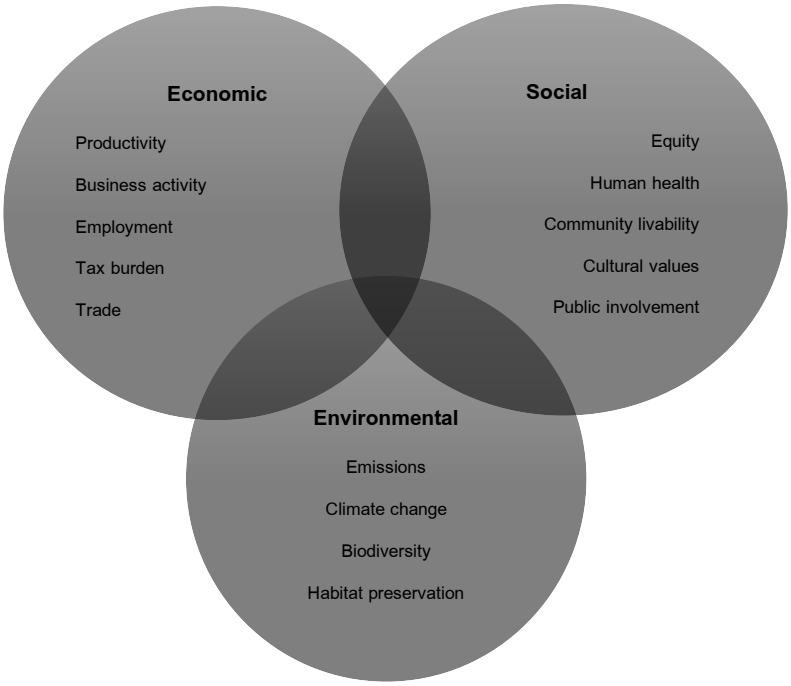

Figure 2. *Sustainability issues in logistics*

The main sustainability issues are described in the figure above by Litman and Burwell (2006). Issues are categorized in the TBL – principles, of which environmental aspects have raised awareness by the statistics regarding emissions and energy consumption. Environmental sustainability is defined by Morelli (2011) as "meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them". Ideally, green supply chain management functions act as a closed loop which means that waste in production process, transportation and waste produced by the end – customer must be recycled (Ma, Yao & Huang, 2012). The main goals of green logistics are reducing the consumption of resources, advancing in logistics technology planning, implementation of technology in transport and improving issues regarding warehousing, packaging, handling, processing and distribution (Zhang & Zhao, 2012). Even though green logistics is mostly highlighted with the importance of environmental issues, Lai and Wong (2012) describe green logistics management as "an ability to conserve reduce waste, improve operational efficiency and satisfy the social expectation for environmental protection", which also highlights economic and social issues of the subject. Economic impacts of transportation

are damages caused from accidents, consumer costs and traffic congestions and mobility barriers (Litman & Burwell, 2006). These impacts are visibly seen as an economic burden to the society which are also related to the environmental issues. The formerly presented figure of sustainability issues in logistics emphasizes the sound alignment of the three sustainability dimensions and how considering business performance vital to ensure productivity of the supply chain. Green logistics considers the variety of issues and goals associated with promoting the production of new working models and interesting applications for operational research and development (Sbhisi & & Eglese, 2007). Hence, financial prosperity enables the development of sustainable innovations and solutions.

Continuing with the former subject, economic sustainability is defined by Hassini, Surti and Searcy (2012) as "the ability to conduct business with a long term goal of maintaining the well-being of the economy, environment and society" The complexity of the economic issue is outlined by Al Khdir and Zailani (2009) as being an economic barrier, which means that engaging in environmental management requires direct costs and transaction costs. These costs may pose a barrier for transferring supply chains to promote sustainability. The figure enlists the main issues regarding social wellbeing, which are supported by a research made by Labuschange, Brent and van Erck (2005) where these issues are categorized to promote equity, job opportunities, labour sources, flexible working arrangements and safety within internal human resource management while tackling discrimination in the working environment.

2.2 Green supply chain management

A study by Carter and Rogers (2008) lists four aspects that express how these TBL principals affect in supply chain management. First is risk management, as companies need to be able to manage the risk factors caused by the sustainability in terms of products, waste, working conditions and public safety (Srivastava, 1995). Having a future scope for ensuring the continuity of business and analysing supply chain resilience to handle risks enables companies to assess rather unpredictable risks such as fluctuations in fuel prices to consider other modes of transport. (Woodburn & Whiteing, 2010) In that sense, sustainable development considers

both internal and external operations of a company and this includes the analysis of the upstream and downstream functions of the supply chain, meaning that the company needs to address functions of the procurement and inbound logistics with processes regarding distributor and customer side of the supply chain (Carter & Easton, 2011; Shkoukani, Alnagi & Abulail, 2013). Second aspect is transparency which is described as "proactively engaging and communicating with key stakeholders and having traceability and visibility into upstream and downstream supply chain operations" (Carter & Easton, 2011). Unsustainable practices in the supply chain have potential to become public information easily and quickly as companies are constantly under the eye of the public (Dey et. al., 2011). Green supply management recognizes the environment consisting also from government rules, cultural environment and values to comply with (Ma, Yao & Huang, 2012). Interaction with the public and government is the key for ensuring and developing sustainability in the supply chain, as Carter and Rogers (2008) find that the principal of transparency promotes active involvement of stakeholders and utilizing their feedback to secure the operations of the supply chain.

The third aspect is the corporate strategy which has a purpose to comprehensively identify sustainability initiatives and align them with the overall sustainability strategy (Carter & Easton, 2011). Traditionally, production and distribution models for logistics have been designed to minimize costs to meet the operational objectives (Sbihi & Eglese, 2007). Quite similarly, a financial incentive can be identified for driving green initiatives into logistics supply chain, as reducing environmental impacts are found to have a connection for claiming competitive advantage and attaining additional sales revenue by marketing their strategy of contributing to social responsibility (Woodburn & Whiteing, 2010). An organizational barrier for going green is identified by Al Khidir and Zailani (2009) as implementing a fundamental green change inside the supply chain which requires difficult changes in core features such as organizational goals, forms of authority, core technology and marketing strategies. Associated with the previous finding, the fourth aspect refers to organizational culture and company's high ethical standards which reflect to respect for improving sustainability. (Carter & Easton, 2011). The increasing pressure to ensure and demonstrate sustainable development in a supply chain motivates companies to understand risk for profoundly which

allows the twin goals of enhanced sustainability and risk reduction to be achieved. (Christopher & Gaudenzi, 2015)

3. Managing sustainability related risks

Risk has always been present in supply management and there is a variety of different trends and themes that are linked to increased risks supply chains: focus on efficiency instead of effectiveness, supply chain globalization, centralized distribution, outsourcing suppliers and reduction of supplier base. Reacting and acting upon these trends to change the structure of the supply chain affect directly into network-related risk sources and may pose vulnerabilities to the supply chain. (Jüttner, Peck & Christopher, 2003). Acknowledging the new array of risks that are posed to companies due to stakeholder reactions and global concerns, risk management involves the scrutiny of these risks and deciding which issues are significant and require preventive and mitigation measures for reducing the risk level to acceptable levels (Blackburn, 2007). The controversy that has emerged between economists and environmentalists over sustainability is not solely focused on how the technological progress meets the needs of transferring businesses to utilizing sustainable substitutes, but there are disputes of how to mitigate indeterminate or unpredictable risks.

To put it bluntly, economists tend to advocate riskier approaches to environmental issues by ruling out worst case scenarios in the average and environmentalists emphasize these scenarios to be considered with extra efforts in order to be prevented from occurring. (Dresner, 2008) However, aligning these perspectives is a key issue in sustainable supply management, as according to Yilmaz and Flouris (2010): “While corporate sustainability recognizes that corporate growth and profitability are important, it also requires the corporation to pursue societal goals, specifically those related to sustainable development, environmental protection, social justice and equity, and economic development”. From a company’s perspective, economic sustainability is considered as a priority and performance in this area is a crucial metric for the management. Failure to meet the economic expectations of stakeholders can also be as harmful to the management as failing to acknowledge the importance of social and environmental risks to a company. Consequently, this neglection

may result also into a weakened competitive position and to a decline in economic performance. (Blackburn, 2007)

It is essential to consider the measurement of both financial and non-financial performance in order to achieve proper sustainable supply management in a logistics supply chain (Lee & Wu, 2012). The challenge for embracing sustainability in logistics and supply chain management is to connect and balance environmental performance with sound business practices (Lee, 2012). Responsibility and sustainability are increasingly becoming an integral part of organizations' vision and mission, and commonly these two are not integrated properly into the operative business management models and therefore they remain detached in practice from the company's strategy. This means that sustainability initiatives appear mostly as humanitarian activities and societal actions that are only related to improving the community in the external environment. (Petrini & Pozzebon, 2009) Even though the intention and effect of these actions are positive, it is essential to integrate risk management into company's operations and not solely focus on activities and initiatives that appear externally in communities. Financial investments to improve supply chain's robustness and agility for preventing and absorbing risks leads to a product with higher quality passing the supply chain which has been found to have a great contribution for customer value. (Wieland & Wallenburg, 2012) Therefore integrating an adequate strategy for risk management in sustainability operations is essential, as it ensures the performance of the core business of a company.

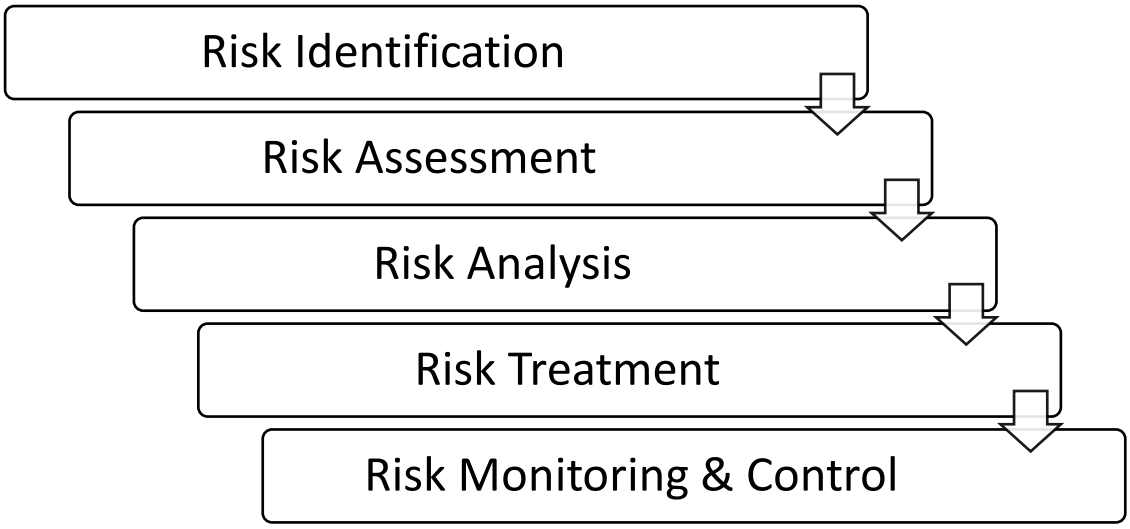

Figure 3. *Sustainable risk management process*

This paper begins to analyse sustainable risk management with the process above provided by Giannakis and Papadopoulos (2016). The process begins with identifying the risks that are related to sustainability. This first step identifies the nature of sustainability risks and how they differ from the traditional supply chain risks. In next phase these risks are more specifically categorized in the TBL – context and how they occur in business operations and supply management. After the risks have been identified and assessed, a further analysis is conducted to evaluate the probability and effects of the risks. The risk treatment phase finds the means to mitigate these risks which are categorized in four major responses: avoidance, controlling, sharing and retaining. These major responses are applied to the context of logistics supply chain management with their nature of being either proactive or reactive methods for risk mitigation. The last step considers the establishment and monitoring of indicators regarding the performance of sustainability and how these results can be utilized for controlling the corrective actions for improvement.

3.1 Risk identification

There is a need to identify the difference between the ordinary supply chain related risks and the sustainability related risks. This study identifies the difference by presenting the following

risk path illustration provided by Hofmann et. al. (2014). Both sustainability – related and ordinary supply chain risks can place serious damage to the focal firm regardless of whether the threat derives from operational issues in the supply chain or from external sources and actors. Both should be considered in the concept of supply chain risk management but materializing these two mechanisms from each other differs greatly. (Hofmann et. al., 2014)

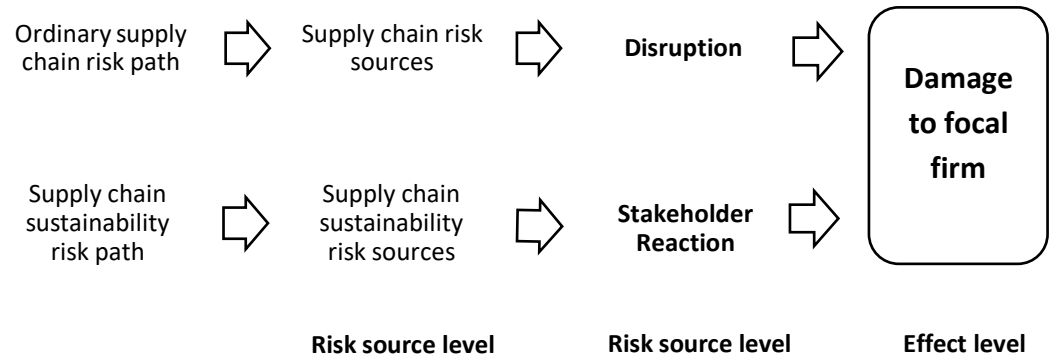

Figure 4. *Ordinary and sustainability risks in supply chain management*

Beginning with assessing the nature of ordinary risks, Zsidisin (2003) identifies that ordinary risks which cause disruption to supply chains stem from supplier's inability to adapt to demand fluctuations, defaults in quality and delivery issues. Shafiq, Fraser, Klassen and Awayseh (2017) separate these risks from sustainability risks by describing them as operational risks which prioritize three important competitive factors of cost, capacity and delivery efficiency in the supply chain. These observations demonstrate how ordinary risks are related to the operational performance of the supply chain and how supply chain risk management has traditionally had a strong focus on financial goals and minimizing the possibility of disruptions.

The main difference between the two is that sustainability risks result in a stakeholder reaction and ordinary risks cause disruption in a supply chain. Starting with the description of sustainability risks, a study conducted by Hofmann et. al. (2014) identifies the difference by introducing four practices for managing the latter: stakeholder involvement function, translator function, supplier management function and stakeholder management function. Stakeholder function refers to the company identifying the most important stakeholders to the business environment and understanding their expectations. These stakeholders who have the expectations and put pressure to the supply chain for performing sustainably sound, are generally recognized as external stakeholders in terms of customers, investors, regulating operators, media and general public. (Kocabasoglu, Prahinski & Klassen, 2007) These expectations are utilized to form assessment criteria for operating sustainability in the translator function step. These criteria form operations instructions, which are transferred into suppliers' operations in the supplier management function and the assessment criteria must be carried out with continuous compliance in terms of audits and quality controls. (Hofmann et. al. 2014) Sustainability is not solely a matter of good management, but rather the growing expectations and standards deriving from legal duties which demand an active role for sustainability risks to be considered in the whole enterprise risk management (Blackburn, 2007). Lastly, the stakeholder management practice allows the company to promote transparency with the demonstration of these conducted sustainability activities and to create an outlook for improving these activities (Hofmann et. al. 2014).

However, the nature of these risks is not as simple as it seems as operational risks may have the possibility to be sustainability risks. By not interfering with suppliers' neglect towards accidents and safety measures, this may expose the supply chain to an excessive amount of risk in terms of safety disasters, fires and even explosions Blackburn (2007). The connection between the two is evident in a case situation where a hazardous accident occurred in a supplier's function may simultaneously lead to a disruption and cause an unwanted reaction among stakeholders. (Hofmann et. al. 2014) Operational and sustainable performance have a certain connection which highlights the importance of sustainability risk management being a component of ordinary risk management, and Blackburn (2007) also supports the

operational benefits of sustainability programs, as they can help to ensure the flow of materials to customers by minimizing costly disruptions.

3.2 Risk assessment

As this paper has assessed the nature of sustainability risks and their connection to ordinary risks, a further scrutiny of sustainability risks is required in the context of supply chain risk management. Sustainable risk management includes the identification of potential liabilities and losses that arise from sustainability issues which can significantly affect the company (Blackburn, 2007). Supply chain risk assessment is an integral part of a company and its development but assessing the potential risks can be challenging for managers without a proactive and comprehensive risk management tool. Work breakdown structure (WBS) can be used as one primary function to assess risks by to establishing a supply chain process map. WBS is a hierarchical decomposition of assignments to be carried out by a specific project. The planned assignments are divided into work packages where required work is to be estimated, monitored and controlled. (Hidayah, Latief & Riantini, 2018) Adopting this tool for assessing the wide array of factors and risks that surface along the supply chain is supported by Braunscheidel and Suresh (2009) who note that one of the advantages of this mapping is that it makes companies more aware of their business processes and the activities to be carried out for reducing supply chain vulnerability.

***Table 3**. Sustainability risks*

	Endogenous	Exogenous
Environmental	• Environmental accidents (e.g. fires, explosions) • Pollution (air, water, soil) • Non-compliance with sustainability laws • Emission of greenhouse gases, ozone depletion • Energy consumption (unproductive use of energy) • Excessive or unnecessary packaging • Product waste	• Natural disasters (hurricanes, floods, earthquakes) • Water scarcity • Heatwaves • Droughts
Social	• Excessive working time: work-life imbalance • Unfair wages • Child labour/forced labour • Discrimination (race, sex, religion, disability, age, political views) • Healthy and safe working environment • Exploitative hiring policies (lack of contract, insurance)	• Pandemic • Social instability • Demographic challenges / ageing population
Financial/Economic	• Bribery False claims/dishonesty • Price fixing accusations • Antitrust claims • Patent infringements • Tax evasion	• Boycotts • Litigations • Energy prices volatility • Financial crises

The table above provided by Giannakis and Papadopoulos (2016) lists the main sustainability risks according to three sustainability categories which also demonstrates an outcome of risks that have surfaced along the risk mapping and assessment process. The risks have been divided according to their endogenous or exogenous nature, of which the first nature considers the risks that are caused by the company's actions inside the supply chain. (Faisal, 2009 Endogenous risks are also described as inside in – risks, which consider the factors that pose risks from the actions occurring from of the production of products and services. (Christopher & Gaudenzi, 2015). The exogenous risks that are posed to the company are a result of their interaction with the external environment that they operate in. (Faisal, 2009)

Similarly, these are addressed as outside in – risks, which include the risks that global environment poses to each organizational unit (Christopher & Gaudenzi, 2015).

Issues related to environmental risks can be roughly summarized to seven key principles of eco-efficiency listed by World Business Council for Sustainable Development (2000): reducing of material intensity, minimizing energy intensity, dispersing toxic substances, undertaking recycling, capitalizing the use of renewables, extending product durability and increasing service intensity. Acknowledging both endogenous and exogenous risks compels companies to consider such issues related to controlling, reducing and promoting recycling and utilization of natural resources in products, processes, services and operations. Incorporating environmental concerns include also the protection of water resources and soils. (Blackburn, 2007) Al Khdir and Zailani (2009) describe eco-efficiency and the possibilities of management philosophy as it promotes companies to find environmental improvements that also have economic benefits from reducing consumption.

It is recognized by Brent and Labuschagne (2007) that in comparison to the environmental and economic aspects, social aspects have been in minimal consideration in the business perspective. Considering the social risks throughout the supply chain will inevitably have a positive influence on performance, as Gouda and Saranga (2018) propose that employees are the key resource in achieving competitive advantage. By implementing best practices in human resource management in terms of health, safety and assuring work-life balance will prevent supply chain disruptions. Employment practises to promote social issues include security practices, employee contracting, promoting equity for employment and developing the use of labour sources. (Sarkis, Helms & Hervani, 2010) Gender, sex, minority, age and handicapped related harassment and discrimination must be addressed with non-discrimination programs and prohibitions for child exploitation and forced labour must be carried out. When establishing these policies, procedures and arrangements, open communication and honest dialogue between employees and management is desirable. Also, employee surveys are proposed to help ensuring that the actions address the sustainability concerns. (Blackburn, 2007). These endogenous risks differentiate themselves from

exogenous risks by deriving from the company's neglect towards the social issues, but the latter are posed by external threats to the company and its employees. Employment issues may surface from mass immigration and changes in population's growth and age. A pandemic affecting large number of people requires plans for remote work to ensure operation continuity and social unrest from protests and strikes which may pose disrupting risks to the company. (Giannakis & Papadopoulos, 2016)

Financial risks are connected to the negative impact that a company has to the environment. This impact can be calculated as external costs to the environment by calculating monetary value to physical damage inflicted to infrastructure by the transport and the damaging effects that emissions have to the environment and society. Placing external monetary value and calculating the effects of logistics activities on a macro level is rather difficult due to its less direct impact but the imposition of a higher environmental tax rate poses risk as it can place the transport industry in a weak commercial position. (Piecyk, McKinnon & Allen, 2010) It is possible that taxation can also have an impact on other areas of sustainability and risk areas. Companies may take a strategically proactive stance to mitigate the impact of governmental controls by adjusting and changing their supply chain policies to meet the expectations of changes in regulations and taxation in the future even though the changes are not certain (Harris, Rodrigues, Naim & Mumford, 2010).

Similarly, as this paper has addressed the connection between operational and sustainability risks, such correlation is found between the sustainability risk categories. Environmental and social issues such as strikes, customer outrage and catastrophes can raise distrust to the company's ability to perform. This distrust will reflect financially as a raised cost of capital and decreasing value of share price. (Blackburn, 2007) Mangla, Kumar and Barua (2015) conducted a risk analysis regarding a green supply chain, which indicated that operational risks have the highest priority in comparison to the other risk categories. Managers should prioritize adequate green supply chain design, a high level of technology and functioning machinery with skilled labour in enhancing the green supply chain's robustness and

ecological-economic benefits. This notion of skilled labour having a contribution to operational performance has strong a connection to social aspects.

3.3 Risk analysis

As the company has formulated a sustainability vision for risk management, the executives must organize and deploy means to weight the options and to quantify benefits and risks for different approaches. (Lubin & Esty, 2010) The purpose of a risk analysis is to provide more knowledge about the risks and their opportunities and to help managers to evaluate the variety of options that they have at their disposal (Vose, 2008). The efforts to mitigate risks require a basis of thorough assessment regarding the nature of the risks and the analysis of the probability and impact of the risks (Kern, Moser, Hartmann & Moder, 2012). The company can only be competent enough to decide appropriate responses for risks if it understands the root causes and potential consequences of a risk (Giannakis & Papadopoulos, 2016). This however is not an easy task, as it is a major challenge to demonstrate concrete results and contributions related to sustainable development due to the difficulties in measuring sustainability impacts (Lee & Saen, 2011).

The growing trend of sustainability is aligned with the thriving innovations that information technology is able offer in terms of business analysis, spotting new trends, scenario planning, risk modelling and cost accounting to meet the requirements of evaluating sustainability (Lubin & Esty, 2010). Lee and Wu (2012) emphasise also the importance of developing an appropriate and effective performance measurement system for implementing and measuring sustainability performance in a logistics supply chain. This is also found to be a difficult task as it is not easy apply performance outcomes to a specific function in a supply chain network. Hallikas, Karvonen, Pulkkinen, Virolainen and Tuominen (2004) introduced a semi-quantitative method for evaluating the overall weight of risks in a company's performance. This risk evaluation matrix is presented in below and the method is based on a scale from 1 to 5 where both impact and probability of the risk is evaluated. The fundamental idea of this analysis is that it provides a combination based on the values of the two factors which form a basis for deciding the proper approach for mitigating the specific risk.

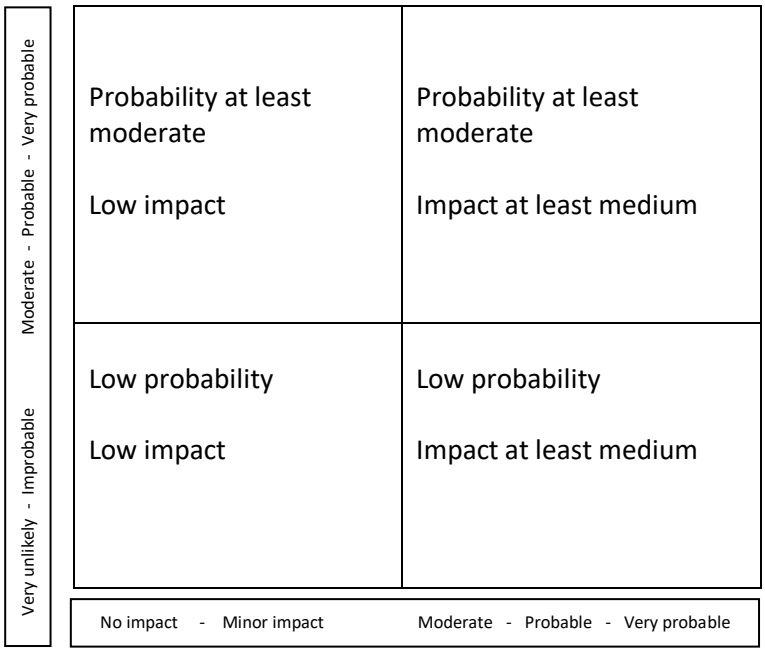

Figure 5. *Risk analysis matrix*

There are many challenges that are associated with the analysis, as probability of a risk has two different interpretations: frequency – interpretation and belief – interpretation. If the frequency view is chosen, the risk is viewed as "normal" and there is a history of occurrence in this risk and the company's analysis relies on historical data of probability. Instead of choosing the belief – interpretation, the risk is viewed as "abnormal" and there is no historical data of occurrence which brings an issue of whose belief should the company consent to. (Sodhi & Tang, 2012) This means that more elaborate means are required to evaluate the probability of the risk's occurrence or the analysis is based on a belief rather than concrete measures. Understanding the impact factor of a risk is often even more challenging due to the impact being more likely a multi-dimensional concept rather than a single number. The dimensions are associated with short - and long - term financial impacts, social issues and how the company's value is perceived by the public. (Sodhi & Tang, 2012) The multidimensional aspect of a risk's impact emphasizes the sustainability aspects of risk management and how stakeholder's reaction must be included and evaluated in the analysis. Being aware of company's surroundings is essential, as the environment of a company is not static. The status

of a risk varies in terms of probability and consequences, and monitoring the company's risk factors requires identification of changes in customer needs, networks, technologies and competitors to update risk assessment correspondingly. (Hallikas. et. al., 2004) The former findings of how risks analysis is associated with difficulties deriving from time, measurement and interpretation related issues pose a great challenge to formulate risk management strategies and to prioritize the risks to be mitigated. Dey et al. (2011) describe the risk analysis mindset for sustainability by stating that "if a decision is determined to have negative impacts at any point in the future, then it is not sustainable and not worth the risks associated". This rather strict statement could ease the decision – making of risk analysis, as management that has a sustainability focused risk strategy is initially proposed to take all sustainability related risks into account. Companies' limited resources and economic responsibilities are still likely to constrain companies to rule out some of the risks that are encountered during the analysis from the treatment portfolio, which this paper proceeds to examine with treatment methods for the risk analysis matrix.

3.4 Risk treatment

Starting with the risk treatment options, the amount of low probability and low impact risks found in the bottom left corner are normally vast for a company. These risks are not found to be in align with the costs that are required for controlling the risks which means that it is more advantageous to accept the existence of the risk and take no action towards it. (Vose, 2008) Acceptance or retaining a risk is a reactive method and an example of a treating such risks in a sustainability context is when managers do not make any changes to supplier relationships and do not initiate any type of arrangements regarding suppliers' facilities for improving environmental or economic issues. Basically, the adequate courtesy is to inform the supplier about the sustainability concerns and continue business without budgeting for damage control. (Hajmohammad & Vachon, 2016) If the acceptance strategy is chosen, contingency planning should be combined with the risk management. The idea is to identify the individuals that have the responsibility of monitoring the occurrence of the risk and the factors that have influence on the level of probability and impact of the risk. The identification allows the management to plan the actions for individuals to be carried out when the risk occurs. Such actions include preparations for public press and training employees for hazardous accidents.

(Vose, 2008) Insurance may also have a vital role in a company's risk management portfolio as there is a variety of sustainability practises to be insured. Insurance can be used against catastrophes and disasters, infringements from suppliers and customers, and to promote social issues with employee health insurances (Giannakis & Papadopoulos, 2016). Usually, insurance will come across as a favourable opinion if the company feels that the impact of the risk appears to be outside of the company's comfort zone and the insurance payment feels financially as an adequate decision (Vose, 2008). Using insurance resembles a proactive stance for managing risks and for gaining more insight to the strategic perspective of risk treatment, this paper focuses to examine further three other major risk treatment practises: control, avoidance and sharing and collaboration.

3.4.1 Control of the logistics chain

The control response considers the attempts and activities to prevent and reduce the possibility of a risk's occurrence. A key activity is the establishment of development programs as it also involves actions to mitigate the impact of a sustainability related risk. (Giannakis & Papadopoulos, 2016) As this research has identified the core functions of a logistics supply chain and its impact on sustainability matters, control and mitigation treatment are applied to assess the possibilities of lean production methods in supply chain management. Lean production has been found to have a contribution to three pillars of sustainability evidently by reducing waste and scrap and optimizing required transportation and inventory space (Järvenpää & Lanz, 2019). Some of the quantitative benefits that has been found from lean management are related to reduced time in production, processing and setup, effectiveness of inventory and decrease in defaults and defects (Bhamu & Sangwan, 2014). Reducing utilization of unnecessary resources across the supply chain leads to obvious environmental benefits, but according to studies of lean principals conducted by Hasle, Bojesen, Jensen & Bramming (2012), there is not a distinct causal relationship of lean management to certain social effects but primarily it has been found to have negative effects on working environment, health and well-being. Hasle et. al. (2012) continue that the method of implementation and introduction of lean principals and to which context of working environment the principals are carried out have great importance to the outcome and impact of lean production methods. There is a significant gap in research regarding social

sustainability in lean supply chain management and to find an agreement on what are the social impacts of lean supply management.

A profound definition of the purpose of reverse logistics provided by Rogers & Tibben-Lembke (1999) states that it is “The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal.” Firstly, the idea of reverse logistics is to create tangible and intangible value from returned or used products and materials instead of wasting resources in terms of labour and time. Secondly, value is created by promoting product life - cycle assessment. (Aitken & Harrison, 2013) Life - cycle assessment is defined as a “tool to assess the environmental impacts and resources used throughout a product’s life - cycle, from raw material acquisition via production and use phases to waste management” (Finnveden, Hauschild, Ekvall, Guineé, Heijungs, Hellweg, Koehler, Pennington & Suh, 2009) The third goal is to obtain customer satisfaction for showing commitment to handling the returns effortlessly and the fourth goal aims to gain more feedback from customers to improve product design (Aitken & Harrison, 2013).

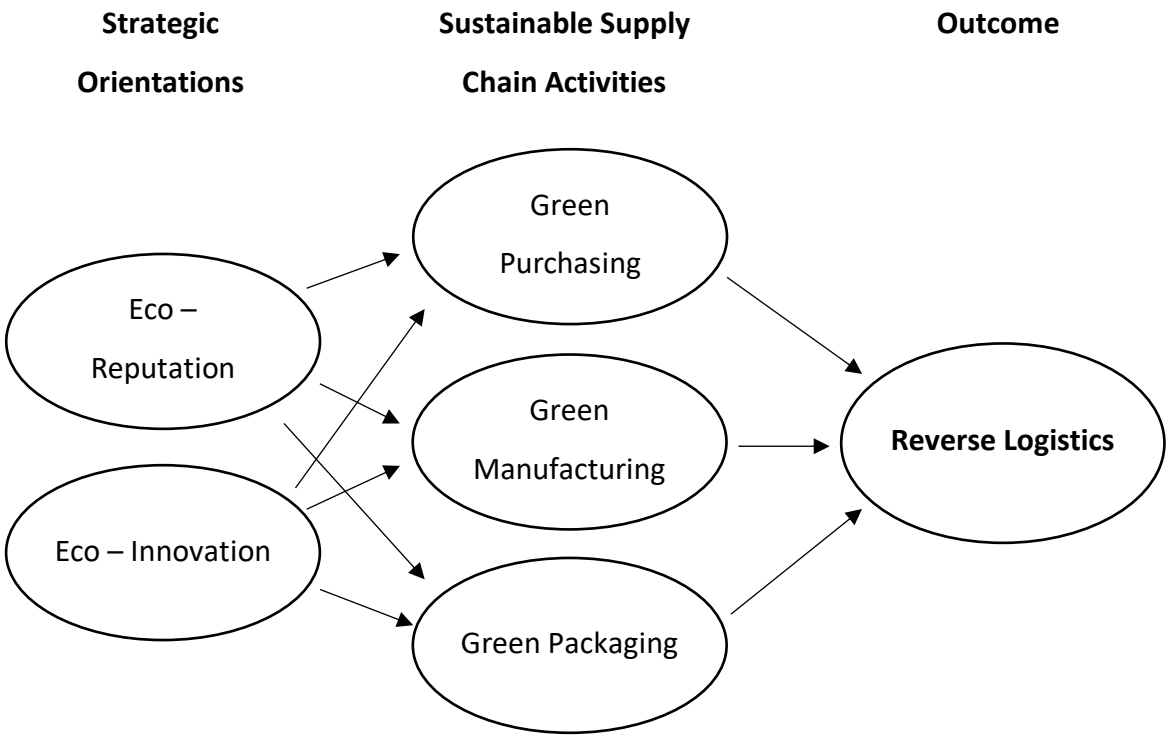

Figure 6. *Framework for reverse logistics*

The framework presented above regarding the strategical aspects of reverse logistics proposes a two - way scrutiny of the green supply management practices that are adopted by firms. The first one is associated with connection that this paper has made between sustainability risk management and stakeholder engagement. Eco - reputation strategic orientation aims to enhance the corporate image of a company by demonstrating eco-friendly systems to customers, suppliers and the society (Hsu, Tan & Zailani, 2016). The orientation to eco-reputation holds a high priority in a company's strategy which relates to a core business philosophy that is spread throughout the whole supply chain and its activities (Burgos-Jiménez, Vázquez-Brust, Plaza-Úbeda & Dijkshoorn, 2013). Eco – innovation strategy serves as a guideline for companies to thrive for differentiation among their competitors by developing eco-friendly processes and operations. The focus is on developing both new and existing activities and specifically in the supply chain context it serves as a guideline for applying more strict requirements for suppliers' conduct (Hsu et. al., 2016).

According to the model, the orientation for promoting company's reputation and innovation management contributes to supply chain activities. Associated with requiring sustainable conduct from the suppliers, green purchasing functions act as a gatekeeper for managing the flow of materials in an organization and promoting green products and sustainability in that context (Foo, Kanapathy, Zailani & Shaharudin, 2019). The second main activity is green manufacturing which considers the design and research of environmentally friendly products and how firms can re-organize their operations to rely more on utilizing recyclable materials. This activity is focused on diminishing environmental effects during the production and distribution phases by analysing the life - cycle of a product (Hsu et. al., 2016). The third activity is green packaging which is defined by Zhang and Zhao (2012) as a packaging that can be reused and recycled and it does not cause pollution for humans and the environment during the product life - cycle. This includes issues regarding size, shape and materials of packages with the assessment of environmental impacts on distribution terms of loading, handling efficiency and space utilization (Hsu et. al., 2016). An important notion regarding green design is that customers' demand is correlated with products that promote personal safety and environmental causes (Blackburn, 2007). Hence, this activity proposes a possibility for providing significant customer value.

Adopting reverse logistics functions and managing the reverse flow waste materials can promote social issues in terms of health and safety. Safety issues for employees are associated with the materials and products that are transported, and the hazard related to manually handling the material need to be considered. Often the technology and tools for handling these materials are not available for effective reverse logistics activities, which means that manual labour is required for completing the return process. Utilizing reusable containers can promote to safety issues by reducing possible injuries related to human involvement in box cutting and working in an unsafe environment filled with broken pallets and packaging scrap. (Sarkis et. al., 2010) Having a strategical focus on the reverse flow of the product has been found to have a significantly positive economic impact on the company's performance with increase in revenues and improvements in cost-efficiency. Managing the reverse flow of products efficiently can ultimately open a possibility for obtaining competitive advantage in

the market. It can also deliver strategical advantage as product returns are carried out effortlessly, which will reduce transaction risk when customer is selecting a supplier. (Rogers & Tibben-Lembke, 2001)

The issue of optimizing logistics functions to meet the sustainability requirements poses a great challenge for the management, as conventionally supply chains have being designed according to network optimisation principles. The network design was based on minimising costs and the analysis related to supply chain was conducted in a static manner, meaning that calculations relied on the costs prevailing at a single point in time. Consequently, companies need to revise former supply chain designs to drive changes and broaden the perspective to include sustainability aspects also in the making. (Christopher & Gaudenzi, 2015) There is great significance in how the transport is carried out considering the locations of activities, managing transport with minimum empty running and with driver's conserving driving habit. While logistics costs are rising due to anticipated oil price increases in the future, cargo optimization for enhanced capacity utilization can lead to both economic and environmental contributions to tackle this issue. (McKinnon & Edwards, 2010)

Primarily, the sustainability concern related to the logistics context is to simply reduce road transport, but the contribution to climate change and the environmental impact of a logistics function differs between the modes of transport. (Woodburn & Whiteing, 2010) Generally, electrically driven vehicles are regarded as more sustainable than the other but the economic and environmental impacts are also associated with the origin of how the electricity was produced. While nuclear generation for creating electricity reduces air pollution risks, it also poses other risks in terms of thermal pollution, radiation risks and terrorist threats. (Litman & Burwell, 2006) Another example of the multidimensional nature of optimizing sustainability is related to the generalized calculations of CO2 – emissions which indicate that water transport has five times lower and rail transport has even seven times lower rate of emissions per tonne-km than compared to road transport. Reflecting these statistics to the findings that rail transport has been found to have three times higher sulphur dioxide emissions in comparison to road transport, different modes of transports have different levels of distinct

emissions and it its therefore important to be clear on the environmental objectives and to which specific issue of sustainability in the supply chain the management wants to have an impact on. (Woodburn & Whiteing, 2010)

3.4.2 Risk avoidance & Supplier Selection

A major proactive response for mitigating risks is avoidance, which is associated with the notion that a certain risk is found to be unacceptable for business. This means that a company avoids involvement of an activity, product, geographical region or does not select suppliers that don not utilize unsustainable technologies or processes. (Miller, 1992) Regarding the probability/impact – matrix, risks with high probability and high impact for operations are most likely to be avoided my management (Vose, 2008). Goal of the avoidance strategy is to drive the probability of the risk down to zero by simply removing the risk source. (Hajmohammad & Vachon, 2016) Avoidance strategy extends to operating with governmental regulations, as Dey et. al. (2011) propose a proactive stance for anticipating changes in governmental regulations which may have a detrimental impact for supply chain operations. Sustainability must be implemented to supply chains prior to government intervention, as logistics regulations for emissions is not a matter of "if", but a matter of "when". Instead of a reactive stance upon government enforcements, a proactive implementation will provide competitive advantage by reducing time, resources and costs related to complying with the regulations. (Dey et. al. 2011) In financial terms, avoidance can be carried out by financial planning to avoid tax burden or not operating in countries with poor transparency record to avoid dishonesty and deliberate deception. Social risk avoidance can take place by avoiding investments to regions that have poor record for child labour and social care. Avoiding suppliers that neglect pollution management in their operations is one example of how environmental risks can be mitigated. (Giannakis & Papadopoulos, 2016) Firstly, managers should look for replacements for suppliers and imply to suppliers during negotiations that neglecting could possibly lead to a termination of business conduct. Supply managers can act by eliminating these risky suppliers by not renewing or terminating contracts and switching for suppliers with better sustainability record (Hajmohammad & Vachon, 2016).

Being proactive and adopting the avoidance strategy with excellence should include a comprehensive supplier selection process for minimizing the unwanted repercussions that need to be handled from supplier's neglection towards sustainability issues. Supplier selection is considered strategically as the starting point for initiating sustainable partnerships and operations (Khan, Kusi-Sarpong & Arhin, 2018). Conventionally supplier selection criteria have focused on such factors as quality, capacity, finance, services, equipment, quantity, and responsiveness which represent the overall supply chain performance factors. The focal company's risen interest to respond in environmental trends related to business management and processes expose a modern green supplier selection criterion to be implemented in sustainable supply chain management. (Nielsen, Banaeian, Golinska, Mobli & Omid, 2014)

Table 4. *Sustainable Supplier Selection Criteria*

Cost/Price	The various sources of cost which mainly include purchase cost of products, transportation cost, inventory cost, maintenance cost, byer-supplier coordination and controlling cost.
Quality	Quality products provision, consistent conformance to required specifications settled by the buyer, and quality stability in long-term cooperation
Technological capabilities	The capability of suppliers to adjust themselves towards innovations, adopt advanced process technologies and react to technological turbulence promptly.
Green design	The design of products in which issues such as reuse, recycle, recovery, reduced consumption of material and energy and avoiding the use of hazardous materials are taken into consideration.
Environmental management systems	Environmental standards and certifications like ISO 14000, planning, performing, monitoring and control of environmental activities, and staff training for environmental objectives.
Environmental competencies	Using cleaner production systems; Ability to change and amend manufacturing process into green and environmentally friendly products.
Interests and rights of employees	This includes workers' pay, benefits and safe working condition, force labour, working hours, compensation and disciplinary practices
Rights of stakeholders	Stakeholder rights, including informing them about business activities, hearing them, identify and satisfy their requirements and respect them.
Social management commitment	The commitment to ensure compliance and continuous improvement in delivering important social aspects

Alikhani, Torabi and Altay (2019) have listed the strategic sustainability criteria in the figure above in which these criteria can be identified to have an impact on the three sustainability dimensions while focusing on the interaction with stakeholders. Zhu, Dou and Sarkis (2010) state that formerly supplier performance evaluation has been focused on organizational and strategical measures, which emphasized on financial aspects and the green supply chain management perspective has added an environmental factor analysis to the concept in terms of pollution controls and prevention, resource consumption and evaluation of environmental management systems. Environmental competencies and green design of the suppliers' operations becomes a key point of evaluation which are the prerequisites for sustainable collaboration. There is no doubt that still traditional financial measures are also included in the sustainability assessment, as the focal company has the responsibility to provide a product with the desired quality and costs in addition to environmental and social aspects (Tundys, 2016). Quality of the product can be highlighted as the desired outcome of the supplier selection process, as Sarkis and Dhavale (2015) state that the potential result of a successful supplier sustainability selection is the overall improvement of sustainability, once the raw materials and components comply with the sustainability standards and requirements. The supplier's capability to adjust into sustainable principles is evaluated according to technological criteria which ensures the potential for innovations and long - term commitment for improvement. Evaluating suppliers' approach for promoting rights of stakeholders is related to public orientation. Being aware of the expectations and having active communication with the public reflects to the manager acknowledging the negative impacts from neglecting social matters and orientation to protect the company from reputational damage (Reuter, Goebel & Foerstl, 2012). Lee and Saen (2012) specify measures for more concrete evaluation of sustainability, of which firstly social management can be evaluated with employee sustainability training hours, contributions to society and social related expenses in terms of donations and volunteering. Economic evaluation can be linked with any other financial criteria and multiple variations are possible, and environmental management can be evaluated with the number of green technology projects, investments for green innovations and expenses of environmental management.

Evaluation of a supplier's sustainability is essential for decision – making as the performance of the selected supplier contributes to whole organizational supply chain sustainability performance (Khan et. al., 2018). The nature of supplier selection is that is a multi-criteria decision issue, and the outcome is associated with the preferences and respect of the manager's towards sustainability criteria (Reuter et. al., 2012). Supplier Selection is found to be a challenging task due to the conflicting and abundance of criteria available for assessment which highlights the importance of adopting proper sustainability tools and frameworks for incorporating the criteria and their possible relations to sub-criteria in order to measure, analyze and evaluate the sustainability performance. (Khan et. al., 2018) Data envelopment analysis has become one of the most favoured tools for supplier selection due to its ability to handle adverse without the requirement of decision-maker's intuitive judgement and preferences for output and inputs for the system. (Alikhani et. al., 2019) A definition of supply chain management data science is: "SCM data science is the application of quantitative and qualitative methods from a variety of disciplines in combination with SCM theory to solve relevant SCM problems and predict outcomes, taking into account data quality and availability issues" (Waller & Fawcett, 2013).

3.4.3 Sharing and collaboration

Regarding the increasing amount of public scrutiny, regulations and customer expectations, companies need to establish functions of sustainability reporting that share information regarding the company's response to environmental standards (Lubin & Esty, 2010). Governments and communities can be described as enablers of business to which companies are required to comply with formal and informal means (Blackburn, 2007). The most important reason for a company to initiate reporting, is to protect the company's brand and reputation. Media plays a vital role in creating stakeholders' perception towards businesses and reporting acts as a tool for informing stakeholders about responsible performance. It is important for a company to identify the most important stakeholders in the industry and engage in an alliance to promote sustainability. To meet the distinct and varied sustainability expectations of stakeholders, companies need to receive feedback from sustainability reporting and performance for improving sustainability agenda for the future. (Amran & Ooi, 2014) Being transparent and having a dialogue with stakeholder enables proactive risk

management as it provides the company with early warnings of such upcoming issues as reputational damage, production delays, inefficiencies, stock decline deriving from boycotts, strikes and lawsuits (Blackburn, 2007).

Two – way dialogue should also be applied to supplier communications, which allows the mutual understanding on social and environmental issues (Hajmohammad & Vachon, 2016). Initiating sustainability related collaboration with suppliers can play a vital role in achieving the TBL - ambitions and for contributing to sustainable development (Govindan, Khodaverdi & Jafarian, 2012). Ensuring sustainability standards along the supply chain requires strong and flexible interaction between the companies as sustainability goals cannot be achieved with traditional means in terms of financial and operational management (Gold, Seuring & Beske, 2010). Increasing knowledge and extending the operations for investing in supplier sustainability development practices will reduce the focal company's overall supply chain risk by improving both internal and external processes (Gouda & Saranga, 2018) The means for improving processes are associated with offering training and education to suppliers' personnel regarding the sustainability issues. Sustainability performance is enhanced with joint investments, planning and decisions for working closely to find solutions for achieving the performance goals. (Hajmohammad & Vachon, 2016) These investments for collaborative initiatives are substantial and the question of whether to establish collaboration and to which issue of sustainability is the company aiming to contribute is becoming increasingly important (Gold, Seuring & Beske, 2010). Thriving towards sustainable development requires increasingly complex relationships and the most effective way to leverage in our interdependent world is through common endeavour with other parties (World Business Council for Sustainable Development, 2002).

Open innovation and technology agreements are rapidly becoming more common as companies are responding to the aggressive rate of change in both markets and technology to secure their access to knowledge for innovating new products or processes. (Christopher & Gaudenzi, 2015) The different types of innovations for sustainable supply chains are product, process, technological, organizational, marketing and resource allocation related

innovations (Gao, Xu, Ruan & Lu, 2016). The opportunities that sustainability innovations have is that they use compliance to induce partners to experiment in these different types of innovations to promote alternative energy sources and innovative uses for returned products. Innovations enable product development for compact and environmental packaging and new delivery technologies which enable development of significant value chains. Sustainability innovations establish models that combine physical and digital infrastructures and lastly the opportunity is to form new business platforms where customers and suppliers are enabled to manage energy in different ways. (Nidumolu, Prahalad & Rangaswami, 2009) The applications are therefore endless for improvement of sustainability in the supply chain, and three advantages are proposed by Hockerts and Morsing (2008) for integrating stakeholders into the innovation process with the first being the notion that having collaboration with stakeholders in the process allows the most accurate social effect assessment of the innovations. Second advantage is related to risk management, as having a collaborator in the process distributes the risk among the parties if any issues occur in the innovation. Third advantage is related to the distribution of knowledge with the stakeholders which can ultimately create new innovations.

The question for executives regarding investments for sustainable innovations is not about choosing to solely contribute in sustainable issues and enduring the financial costs of doing so. Findings by Carter & Rogers (2008) indicate that innovative companies with a strong vision will be more likely to be found in the Dow Jones Sustainability Indexes which is a global index for monitoring financial performance of the sustainability – driven companies, which demonstrates the apparent financial connection to sustainability. Sustainable innovations are found to have a positive effect on both bottom-line and top-line points, as the focus for implementing environmentally – friendly functions lowers the required inputs for processes and therefore reduces costs. The improved products create increased revenues and establish new markets for the company to endeavour. (Nidumolu et. al., 2009)

3.5 Monitoring and control

Integrating sustainability practices into business organizations requires development of suitable indicators and measurement models. The international sustainability standards persuade companies to demonstrate their performance in sustainability, but it is found to be a great challenge to find proper indicators to measure the overall sustainability performance. (Lee & Saen, 2012) This means that concrete metric results from sustainability performance are required to be presented for the public. Another important lesson to be learned is that while green designs and strategies offer great opportunities for companies, it also poses risks for business conduct itself. The emerging new strategies and increasing popularity of sustainability business models may pose business risks which can be controlled with market evaluations. (Blackburn, 2007) A model is proposed below by Petrin and Pozzebon (2009) for illustrating the potential of using business intelligence (BI) as a basis for aligning economic goals with sustainability integration and establishing indicators for monitoring the progress. The first concept titled organizational context considers the facilitation of sustainability into organizational structures and mechanisms from the initiative of top management. The second concept indicators in perspective basically supports the first concept by defining the information needs for systemized monitoring for performance. (Petrin & Pozzebon, 2009)

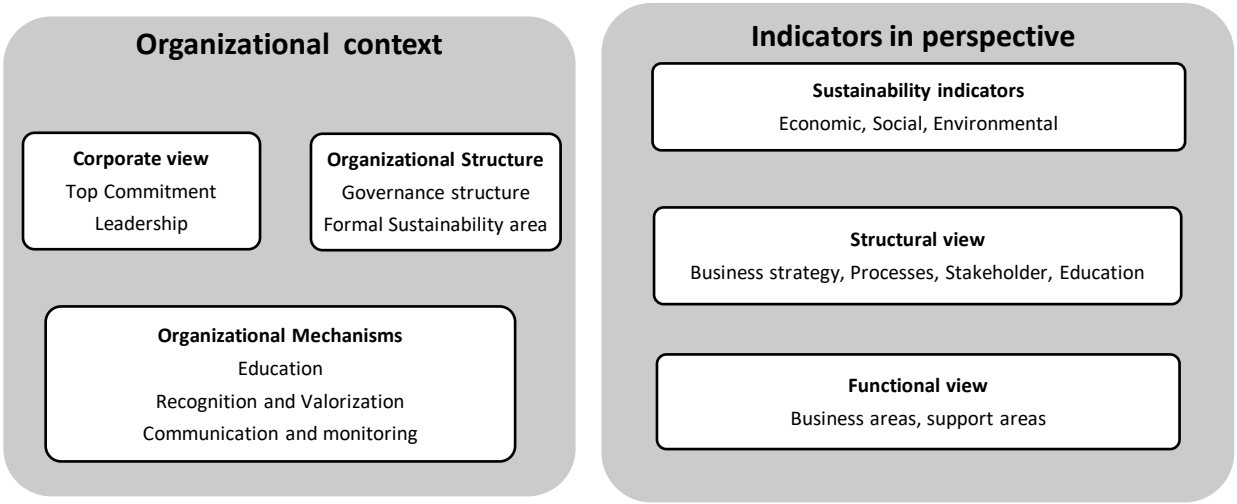

Figure 7. *Conceptual model for integrating sustainability indicators*

Examining the model by starting from the corporate view, the model emphasizes the importance of top management's commitment to implement sustainability. Making changes and forming new strategies for promoting sustainability requires complex technical knowledge any change in a process might affect the overall performance of the company. (Gouda & Saranga, 2018) A company may have different drivers for initiating sustainability which can be prioritized according to the initiative's: business or strategic importance, concern to management or to the public, value for company's culture, long lasting beneficial impact, and ease for implementation (Blackburn, 2007). Being committed and having the competence reflects to leadership in changing governance structure and creating a formal sustainability area for promoting sustainability in all other functions of the corporation. (Petrin & Pozzebon, 2009) Sustainability initiatives will not be successful if sustainability is not implemented into organizational culture. Sustainability efforts require a conscious effort for deploying the idea into existing processes, progresses, tools and values. (Blackburn, 2007)

The concrete drivers for sustainability are built with educational programs for promoting sustainability both internally and externally with also the creation of recognition and valorization systems for practices and initiatives. Developing key employees and tacit knowledge with continuous improvement methods demonstrate the dedication and vast resources that the sustainability - oriented firms are required to invest, for improving sustainable processes (Vachon & Klassen, 2008). In addition to promoting sustainable knowledge internally, reflecting corporate commitment to sustainability externally is found to ease the recruitment of suitable and competent workforce as the company becomes more attractive for the public. (Nidumolu, Prahalad & Rangaswami, 2009) Systems that measure and reward performance and encourage employees to pursue the company's sustainability goals are found by Epstein et. al (2010) to be critical for the impact of sustainability initiatives. The third function called communication and monitoring is the organizational mechanism that is directly related to the BI – projects and it transforms the sustainability practices into indicators. (Petrin & Pozzebon, 2009)

The process for achieving the sustainability goals is measured with a periodical review of indicators while utilizing other qualitative methods and applications that provide information and incentives for further actions and development (Saito, Managi, Kanie, Kauffman & Takeuchi, 2017). Indicators in perspective is an effective management tool that seeks to find equally sound importance of economic, social and environmental indicators at the same level of importance. Firstly, the sustainability indicators are formed to ensure equal weight on formerly identified TBL – dimensions. Secondly, the structural view is focused on the macro-level dimensions to measure business performance which are comparable to the measurable set of balance scorecard. (Petrin & Pozzebon, 2009) Balance scorecard is based on the study by Kaplan & Norton (1996) that in addition to financial information companies need intangible variables in terms of client knowledge, internal business processes, organizational learning and innovation to measure performance and drive for achieving long – term missions.

Environment, Health and safety balanced scorecard			
Employee objectives	**Financial objectives**	**Supply chain objectives**	**Citizenship Objectives**
Build a more effective program to better protect, develop and respect employees.	Improve EHS operational excellence through a risk-based, value-focused approach	Anticipate and align EHS initiatives with needs of external customers and suppliers to create better customer outcomes	Reduce the environmental impact of our operations and better engage our key stakeholders

Figure 8. *Environmental, health and safety balanced scorecard*

The environmental, health and safety balanced scorecard presented above and developed by Blackburn (2007) summarises the outcome of the process of aligning sustainability indicators in the structural view to form indicators that are sound with the business perspective. Each category can be tailored with company related indicators such as placing work-life balance and safety goals into employee objectives and to risk management programs and facility

integration goals into financial objectives. Supply chain related objectives can be related to strengthen compliance with legal frameworks and improving suppliers' sensitivity to EHS – issues and citizenship objectives are associated with enhancing communication with external stakeholders and improving systems for identifying community concerns (Blackburn, 2007) Finally, functional view aims to evaluate the different departments of the company with indicators based on following the strategic guidelines. Business area is related to the primary activity of the company and support relates to activities that enable success in business area. (Petrin & Pozzebon, 2009) In a logistics company an example of a business area would be function of the transporting parcels to the customer while an example of a supporting area represents the technology utilized in this process.

Monitoring includes the measurement of how performance meets the company's goals and other means of periodical oversight and performance evaluations which can be carried out in multiple ways (Blackburn, 2007). Audit is regarded as a powerful strategic tool when new supply chain designs are implemented. Observing suppliers' labour practices and operations may reveal many risks and issues related to safety and quality which require further assessment for improvement (Lee & Novac, 2014) Such ways are inspections, interviews, observations, measurements and monitoring which can be conducted with both qualitative and quantitative measures, as the process may rely on judgment or calculative results. Audits can be targeted to issues regarding compliance, internal standards and goals, management systems and risk, best practices and productivity assessments. Audits can be carried out separately or in combination with the others. (Blackburn, 2007). Associated with the sustainability risk management context, LeBaron, Lister & Dauvergne (2017) describe "ethical auditing" as a trend that has shifted the former focus from conducting audits internally inside the company to governing environmental and labour standards and endorsing legislation compliance. Blackburn (2007) recommends the use of environmental management system standards such as ISO 14001, ISO 9001, SA 8000 and OHSAS 18001 as a guideline for auditing of which ISO 14001 standard has become the most wide-spread administrative tool for corporations to respond to sustainability. The standard consists of five levels of requirements which begins with the constitutional level, describing the social and ecological principles. Objective level provides information regarding the favourable outcome of planning the

system and strategic level guides to reach this outcome. Action level describes concrete measures such as how to conduct recycling and switching to renewable energy sources.

Burritt (2005) studies Environmental Management Accounting (EMA) and its contribution to monitoring sustainable risk management, as the function is described as: “EMA is the part of accounting infrastructure that considers environmental and economic interrelationships. It is concerned with providing information about the organisation’s impact on the environment and the effect of the environment on the organisation”. The information must be collected for accounting in different manners and methods: orientation to past and future, routinely and ad-hoc and short and long term. One of the most useful aspects of applying this tool into a logistics supply chain is that it allows the management to make short and long-term decisions based on both physical (energy, materials and waste) and monetary (cost and finance) information. The EMA – approach helps to evaluate the effects of environmental sustainability in using green logistics. In addition, it includes the identification of sustainability aspects with measurement of which units are to be applied for sustainability. (Lee & Wu 2012) Implementing EMA provides an opportunity to claim competitive advantage and an increase in the overall value of the company related to value of corporate social responsibility (Pratiwi, Meutia & Syamsurijal, 2020)

		Monetary carbon accounting		Physical carbon accounting	
		Short term	Long term	Short term	Long term
Past oriented	Routine information	Carbon cost accounting	Carbon capital expenditure accounting	Carbon flow accounting	Carbon capital impact accounting
	Adhoc information	Ex post assessment of short - term carbon costing decisions	Ex post assessment of carbon reducing investments	Ex post assessment of short-term carbon impacts	Ex post assessment of physical carbon investment appraisal
Future Oriented	Routine information	Monetary carbon operational budgeting	Carbon long term financial planning	Physical carbon budgeting	Long term physical carbon planning
	Adhoc information	Relevant carbon costing	Monetary carbon project investment appraisal	Carbon impact budgeting	Carbon impact budgeting

Figure 9. *Carbon management accounting model*

An important application provided by Burrit, Schaltegger and Zvezdov (2010) is EMA is Carbon Management Accounting (CMA), which is depicted in the table above. Carbon related information is gathered from different places and parts of organizations for a variety of different occasions and purposes. Climate changes cause influences in costs and investments with short- and long-term relevance and information needs to be collected in routine and ad hoc methods. CMA distinguishes these factors according to decision situations. (Burrit, Schaltegger & Zvezdov, 2010) The challenge to managing carbon related activities vary derive from various interrelated reasons, such as how to decide which information is relevant to decision-making. The demand for redesigning information systems for adapting better the current and future short- and long-term requirements and the actual utilization of available information poses challenges for management. (Burritt, Hahn & Schaltegger, 2002)

4. Research methodology

In the following section, this paper provides the background of the empirical section regarding the company interviews, validity and reliability of the study and how the data was collected and analysed. The empirical part of the research is conducted with qualitative research method. Qualitative research is described to have a way of depicting phenomena from the point of view of the participating people. It seeks to contribute to a better understanding of social realities, processes and structural features. The idea is not solely to examine realities or abnormalities, but to rather make use of the unexpected phenomenon as a mirror for reflection to open possibilities for recognition. (Flick, von Kardoff & Steinke 2004) It allows the interviewer to perform flexible and open inquiries of situational meanings and motives for actions and collection of everyday theories and self – interpretations. (Hopf 2004) Wilson's (1970) findings support utilizing qualitative method in this research by describing qualitative methods as it allows a more open and involving investigation to the phenomena in comparison to other research methods that work with quantities and rather standardized concepts. Hence, qualitative method is an adequate method to pursue the objectives of this study as the aim is to gain understanding of a broad context of supply chain management and its relation with sustainability that includes a variety factors regarding company's strategic, risk and responsible management.

4.1 Validity & Reliability

Validity of the qualitative research can be divided into the analysis of four aspects of which the first one is construct validity. This is associated with the issue that the researcher fails to form adequate set of measures and subjective measures are made to collect the data. (Yin, 2003) The construct of this research is based on relevant and academic literature regarding the subject which is demonstrated in the context of logistics supply chain management and sustainability. Second aspect is internal validity which refers to the researcher making a false causal relationship between two factors without knowing a third factor which might have had an effect on the previous relationship. (Yin, 2003) In order to make adequate conclusions, the empirical part of this study aims to find factors that may have been disregarded via interviews and to make conclusions that are aligned with the interviews and theoretical background of the research. Third aspect is external validity which is associated with the issue of whether

the findings of the research are generalizable beyond the case study as criticism is presented that single case studies offer poor basis for generalizing. (Yin, 2003) This is an obvious issue regarding this research as the interviews are conducted within a single company. So that generalized results are achieved, the case company of the research is Finland's leading logistics company. Lastly, reliability test needs to be conducted which means that if the research would be carried out with the same procedures over again, the results would be exactly same. The goal of the reliability test is to eliminate errors and biases in the research (Yin, 2003).

Bias of the researcher is a factor that affects to the reliability and validity of the research, as "Bias refers to ways in which data collection or analysis are distorted by the researcher's theory, values, or preconceptions". It is generally impossible to rule out these problems pointed out previously nor appropriate to intentionally standardize the researcher to achieve reliability in the research. Therefore, the main concern is to rather understand how researcher's values influence the conduct and outcome of the research. (Maxwell, 2008) The researcher of the subject has had a preliminary discussion over the topic in a meeting and the main concerns have been presented from the company's perspective. Still, all the conclusions and the theoretical framework for the study is based on academic literature which is applied to interviews. Reactivity is another concern related to qualitative studies, which refers to the researcher's actual influence for the outcome and the goal is to prevent such research variability of being an unwanted cause for the outcome variables. Reactivity is not regarded as a serious validity threat for the outcome of the research and similarly as with bias, it is impossible to eliminate the reactivity factor entirely from the research and it is important to understand how the interviewer influences to the answers of interviewee and how to most productively and ethically utilize this influence to answer the research questions. (Maxwell, 2008)

4.2 Data collection and analysis

Case study is a is a broadly understood concept where in addition to persons and social communities, also organization and institutions could be the subject of a case analysis. This

regards to identifying the case that is significant for the research question and clarifying which methodological approaches are required for the research (Uwe, von Kardoff, Steinke, 2004). This research follows a single – case study design which is based on a rationale that it represents the critical case in testing of a well formulated theory, where a single case exists that meets the all the conditions for testing the theory and proportions that are believed to be true. (Yin, 2003) A single case study is justified, as this research aims to gain profound and deep knowledge regarding the subject. Managing sustainability risks was found to have a connection to such concepts as ensuring operational and financial performance of the supply chain while managing relationships with stakeholders and suppliers for promoting sustainability.

The data collection was designed to answer such wide concept by interviewing professionals from different departments inside a single company. The intention of qualitative interviews is to maintain an interactive and sensitive language while allowing a flexible approach for exploring the subject (Britten, 1995). The ability to look at such sub-units of a department within a large case is described by Baxter and Jack (2008) as powerful, as it enables rich data-analysis between, across and within the units. By conducting the interview, information is provided from a variety of perspectives inside the company to understand how a company forms a sound sustainable risk management strategy. Semi-structured interviews were carried out for data collection. Semi-structured interviews are based on a rather loose structure that consists of open-ended questions where initially either the interviewer or interviewee may diverge to pursue a subject or idea in more detail. (Britten, 1995) The advantage and why semi-structures are popular is that the flexibility translates to accessibility and intelligibility, which enables disclosure of essential and often hidden aspects of human and organizational behaviour. It helps to develop understanding of the ways in which the managers make sense or create meanings about their jobs and environment (Qu & Dumay, 2011). The basic framework with topics and themes was sent to the interviewees beforehand for enabling the interviewees to prepare their answer for excluding unnecessary information from the interviews and for gaining more insight on the research questions. Regarding the analysis and treatment of qualitative data, the purpose is not to analyse data separately and

independently. Baxter and Jack (2008) point out that the researcher must converge the data with an attempt to bring knowledge about the overall case.

4.3 Case company & interviewees

Posti Group is Finland's leading logistics and post service company measured with the total revenue 1,6 billion euros in 2019. Services consist of parcel, letter and paper distribution, e – commerce services, supply chain solutions such as warehousing and logistics, and a broad array of transportation services for businesses and communities. In addition, Posti Group offers a variety of digital services and global programming solutions. (Posti Group, 2019) Responsible business conduct and sustainability is a core function for Posti Group, which is led via active dialogue with stakeholders. This dialogue allows the company to understand stakeholders' expectations for developing its operations while the sustainability principals of Posti Group are expected to be followed by its partners. (Posti Group, 2017) The sustainability program is divided into four different parts: responsible services, sustainable business operations, trailblazer of green logistics and committed and skilled labour. An ambitious goal was set by Posti Group to have zero level of emissions by 2030. Currently Posti Group is carbon neutral in Finland due to the environmental program and voluntary emission compensations. (Posti Group, 2019) Posti Group has also claimed a high – level of recognition from its sustainability performance in the year 2017 from an international research unit Ecovadis. (Posti Group, 2017)

Table 5. *Interviewees for the empirical part.*

Interviewee	**Title**
Interviewee A	Head of Sustainability
Interviewee B	Category Manager
Interviewee C	Head of Line Haul
Interviewee D	Head of Quality and Environment

The table above enlists the interviewees for the empirical section. Interviewees were chosen not only on behalf of their expertise in aligning sustainability with business conduct but due to the different perspectives that they can provide from different departments of the

company. *Interviewee A* will provide an insight to sustainability management in a wide perspective regarding the strategy of risk management and what are the roles of stakeholder engagement and reporting in this process. *Interviewee B* describes the topic from the procurement perspective and how supplier management is a multidimensional mean for mitigating and evading risks and what are the possibilities of long - term relationships for developing sustainability. As the main operation for logistics is transportation, *Interviewee C* provides a sustainability outlook in this specific area about the main topics and decisions to be made for contributing to sustainability. Environmental aspects were found to be the most visible and concerning issues of sustainability, and *Interviewee D* describes how environmental goals are to be achieved and what are the challenges in forming sound coalition between the three sustainability aspects.

5. Findings

In the following section, this paper answers the sub-research questions by finding the relevant information and points of interest across the interviews.

5.1 *What kind of sustainability risks are associated with managing a logistics supply chain?*

The initiative for sustainability stems from the fact that Posti Group is a state-owned company which is initially required to implement sustainability in processes. *Interviewee A* points out with this requirement leads to the company having strong sustainability values and it is essential to consider the effects that the business has to the environment. The company's sustainability program is extended from the formerly identified triple bottom line – approach to corporate, economic, human resources and social responsibility which reflects to all the functions including suppliers, transport and services.

Nowadays, social risks are identified to be more commonly discussed in the logistics context (*Interviewee C*). Social responsibility is described by *Interviewee A* as an approach to produce safe and reliable services to the community while performing ethically and transparently with

the company's stakeholders. Social responsibility is managed by following the company's code of conduct which on a corporate level means the prevention of corruption in business operations (*Interviewee D*). *Interviewee A* describes the main social risks for Posti Group which are related to employment conditions and safety, promoting equality, following the legal framework of working hours and avoiding human trafficking and child labour. Child labour and forced labour are recognized by *Interviewee D* as major concerns but as Posti Group is functioning mainly in Finland, the occurring of these risks is unlikely due to the geographical location. The following statement by *Interviewee C* summarises how social responsibility is important in all the functions of the logistics chain and especially when the cargo considers chemicals or other material that is dangerous to the environment and for the employees:

"Every member of the logistics chain should understand their role in work safety. Certainly, they have a great legal responsibility to knowledge this fact. The second factor is that whether the sender of the parcel understand this responsibility, in terms how the parcel is packaged to meet our requirements. – when we are transporting cargo that is hazardous to the environment, these things come to even greater responsibility."

Responsibility is therefore considered as a concern to be managed with every member in the logistics chain. Environmental risks are identified as a key concern in the logistics industry and *Interviewee A* mentions that Posti Group has based the handling of these issues by the ISO 14000 environmental management system. *Interviewee D* points out that transportation is the company's key business which means that the vast amount of transport vehicles routing around the country translates to emissions and causes concerns in the environmental spectrum and *Interviewee D* regards climate change as the most concerning issue in the sustainability theme. *Interviewee C* points out that the impacts of transportation can be roughly evaluated with the assessment of driven kilometres. Posti Group also owns a wide array of properties, premises and warehouses which require development for reducing energy consumption and emissions. *Interviewee D and Interviewee B* also point out that logistics services require packaging and transport units which lead to unnecessary waste and

carbon of footprint in processes. *Interviewee D* describes the waste issue related to the logistics business:

"Regardless of the fact that we are a service - based business and we are not manufacturing products, our operations cause material waste which we need handle properly to consider the big picture. (Interviewee D)"

A given example of an economic risk is when the business performance of a partner or a supplier is not on a profitable ground which may lead eventually to bankruptcy and interruption in operations which highlights the consideration of the operational performance in the logistics chain. Regarding the sustainability issues and contributing to environmental matters, *Interviewee B* describes the importance of assessing their relation to profitability and economic benefits and whether the end customer is willing to purchase a service with higher price if the company invests financially to improve processes to consider sustainable issues and provide sustainable services. *Interviewee B* continues that it is important to find whether the transition to sustainable processes adds value to the end customer. The importance of sound business practices is described by *Interviewee A* as a prerequisite for promoting sustainability, and the statement also highlights the importance on being transparent with responsible business practices*:*

"Having profitable business performance is the basis for sustainability initiatives as without economic performance we are not able to consider the company's environmental impact in terms of carbon footprint or impact on the society. This considers long – term profitability, efficiency, customer - oriented innovations and transparency in reporting" (Interviewee A)

Reputational risks are identified as a concern which are linked to the sustainability aspects and *Interviewee A* emphasises the importance of following the company's sustainability program in all the company's operations. *Interviewee B* describes Posti Group as an attractive subject to the media and neglect towards sustainability matters may lead to a news story

which will lead to an unwanted reaction among stakeholders. This observation is supported by *Interviewee C* who also describes that if certain neglect towards safety measures leads to an accident which damages the transported parcel, both transport company and the customer who has chosen the company for transportation receive reputational damage. *Interviewee D* provides and insight about the connection between social risks and reputation:

"I find it to be really important for our reputation that we manage our social risks with excellence that accidents will not occur. A large share of our employees are mostly in transport which means that there may be unexpected risks in traffic, so it is important that we do our best in securing their safety." (Interviewee D)

Interviewee D continues to address this issue in the environmental aspect as customers are more likely to approach the company with a request for green services and customers are increasingly willing to also pay the extra cost in that sense. Not having an adequate sustainability risk management, places the company also in danger of losing competitive advantage.

5.2 *What are the means to manage sustainability risks?*

Controlling the logistics supply chain

Starting with the possibility of extreme catastrophes, *Interviewee D* describes the occurrence of these risks as minimal. The transportation of such chemicals, gases and paints are carried out by strict legal framework which ensures the safety of handling these materials. Regarding the identification of risks, Posti Group has implemented a mobile app which allows reporting of possible risks directly from the employees to management with ease and in real time. Similarly, digital innovations are utilized in evaluating energy consumption in warehousing as this matter is monitored via virtual control room. Economic driving habit is one of the basic means for reducing emissions and *Interviewee D* estimates that roughly 10-15% of the

emissions can be reduced by driving economically. *Interviewee D* describes the basic strategy behind sustainable risk management:

"We need to consider the hierarchy in that sense, as first we intent to eliminate the source of emission entirely. If we are not able to eliminate the emission, then we try to mitigate the source of emissions. – primarily we aim towards not having a source of emission" (Interviewee D)

Interviewee C describes the fundamental idea of sustainability in transport where the aim is to perform transportations with fewer vehicles which correlates directly to economic benefits, less consuming of resources and less harm to the environment. *Interviewee D* agrees with this notion and emphasizes the importance of strategic route optimization to gain more insight to choose the appropriate vehicle for the transportation task. *Interviewee C* continues by describing the importance of being proactive and having specific data about the quantity of cargo to optimize the volumes of transport:

"Bigger trucks are more beneficial when transporting cargo with high volume. Having the knowledge beforehand about the quantity of cargo allows us to the benefit the most by choosing the appropriate vehicle which is the most integral factor in that sense." (Interviewee C)

Continuing with the subject, *Interviewee C* reminds that formerly existed so called temporary storages where specific staff had the responsibility of loading the trucks to their full capacity limit. Nowadays, transportation is more fast - paced and these storages do not exist which in some cases leads to the whole capacity of trucks not being utilized as well as they should be to reduce the environmental impact and promote eco-efficiency. *Interviewee D* highlights the possibilities of transforming operations to utilize renewable fuels via gas and electric vehicles and also it is possible to purchase bio-diesel to the existing vehicles to reduce emissions. *Interviewee D* continues that electric scooters have also replaced automobiles for promoting

eco-efficiency and it is also important to consider new modes of transport for example railroad transportation which currently poses challenges as the network is not functioning with the desired level of logistics performance.

The first and easiest factor for optimising resource consumption and cargo space is to decide which type of materials will be used during the transportation of the parcel. This will have an immediate impact on sustainability when the parcel is distributed to the customer during the logistics chain with least amount of material and the amount of waste is also minimized. Collaboration enables tailored solutions for improving packaging for the logistics chain, and *interviewee B* describes an example called ”Green tech – tightener”, as a win-win outcome of a successful innovation project with a supplier that promotes eco-efficiency by eliminating waste and material consumption:

“When we are able to transport goods with less material, we are left with less waste. In that sense, this tightener which we have accomplished in collaboration with our supplier is a comprehensive improvement for the carbon footprint and efficiency. – it has truly been a win-win situation for the environment, our company, the supplier and the market” (Interviewee B)

Considering optimization of reverse logistics, *Interviewee B* describes Posti Group’s latest innovation called “BOX” which reduces unnecessary resources from returning the parcel by allowing the customer to try and inspect the received parcel instantly in the premises. If the product is not satisfactory, the customer can instantly return the product to the sender which eventually reduces unnecessary transportation. Excess movement of parcels is a source of emissions which is required to be eliminated, and *Interviewee A* points out an example of how reactively sustainability risks can be reduced, as the company withdrew an express service from offering to customers as it was identified to lead to unnecessary transport and emissions.

Information sharing and reporting

Interviewee A mentions annual reporting for International Post Corporation (IPC) as a key function for promoting sustainable reporting, which considers a comprehensive sustainability questionnaire including issues from social, environment and economic aspects. This includes the assessment of policies and strategies with evaluation and measurement in the sustainability area. Reporting to the IPC regards to the performance assessment with promoting health, safety, learning and development among the employees. Environmental aspects include the assessment of preserving energy, contribution to climate change and promoting circular economy. These issues are questioned in the context of logistics and the assessment includes reporting of sustainable procurement performance, processes and means by which sustainability is implemented and developed with the suppliers. *Interviewee B* provides an insight to the subject of how the information must certified and validated when reported to the public.

"When the suppliers communicate or reports with us, we have a contractual code guiding in the background. The information is validated according to certifications which we are able to demonstrate both internally and externally with the supplier" (Interviewee B)

Similarly, annual reporting is also conducted with the framework of Global Reporting Initiative (GRI) which is applied to Posti Group's sustainability report. This is a comprehensive sustainability report to be demonstrated for the public which presents the concrete indicators for measuring triple bottom line – performance. Indicators include for example progress in reducing carbon footprint and emissions and improving the wellbeing and development of employees. The information is detailed with assessment of sustainability issues in specific business areas and operations and future goals and challenges are also demonstrated to the public. In the economic area, Posti Group reports its tax footprint to its stakeholders which demonstrates the compliance of sound business practices towards regulations and legislations.

Interviewee D describes Posti Group's operations as being carbon neutral, which is carried out by investing into certified sustainability projects across the globe. Investing into these projects compensates emissions from the company's transport and logistics functions as they ensure that production and emissions are decreased in other locations around the globe. This is performed in a voluntarily fashion and some examples of these projects are eco-efficient cooking stove project in Ghana and windmill development projects in India and China.

"We basically buy offsets, which means that somewhere around the globe has been reduced the amount of carbon emissions equivalent to our purchases. – we started to buy these offsets from the year 2014 and we have compensated all of the carbon emissions from Finland's operations via these offsets." (Interviewee D)

Supplier selection and auditing

An important factor when deciding partnerships and performing supplier selection is to promote transparency and sustainability in that process. Posti Group's supplier code of conduct acts as a guideline for decision making, which has been established on top of the ten principles of United Nations Global Compact. *Interviewee A* highlights the importance of utilizing these globally recognized principles, as it creates a framework for assessing the potential risks that may occur in the supply chain. Sustainability is recognized as an enormous concept in this industry, and this framework enables limitation of this concept to smaller principles that can be evaluated and measured for future goals. This framework translates to Posti Group's Supplier Code of Conduct, which is the basis for selecting such suppliers that are evaluated as having the required level of environment and human resources management for assessing their carbon footprint and work safety *(Interviewee A*). Sustainability questionnaire is one of the tools for monitoring sustainability and keeping track of the progression and Posti Group is also assessed by stakeholders regarding its sustainability performance:

"We send self-assessment questionnaires to our suppliers inquiring about the established sustainability goals, what are the results for achieving these goals and whether these results are reported to the public. We also receive these questionnaires from our clients and the response is based on the performance of our code of conduct" (Interviewee A)

The basis for sustainability reporting extends to supplier selection and suppliers are required to promote transparency in their operations to enable certified sustainability reporting. Sustainability questionnaires are performed on multiple levels and they can be also carried out by interviewing the supplier. Regarding the social issues in transportation, *Interviewee C* identifies a certain issue in monitoring, even though instructions and requirements for safety measures are informed to own staff and transport companies:

"We inform about the requirements of how different type of cargo should be loaded, handled and fastened, the whole chain has a great role in this area. – another factor is that how our partners inform their drivers about these requirements. – there is no other way than to conduct random checks that these measures are followed. We have also requested photographs of the cargo on a regular basis for gaining more control over the actions of a partner." (Interviewee C)

Auditing is one of the main functions for ensuring that the packaging materials, tools, instruments and supplies that are required in logistics production to meet the safety and environment standards of the company. *Interviewee B* provides an example and describes the severe social affects that the global pandemic COVID-19 has posed to the operations. The pandemic has compelled the company to procure necessary sanitation, hygienic and protective gear for safeguarding the employees and even though the company is required to take quick and reactive actions, the supplier code of conduct is not be compromised:

"Regardless of the fact that we are in a hurry to make decisions, we need to always carry out a checklist for our suppliers and we will never compromise in this matter. If we do not confirm

our suppliers and we neglect this step, we face a risk of endangering our business." (Interviewee B)

The same principles of being transparent apply to the control of environmental risks but *Interviewee B* points out that a visible green or environmentally friend stamp in a procured packaging material is not yet satisfactory. The factors of where it is produced, how it is produced, and the overall sustainability impacts of the procured item needs to be assessed. Simultaneously, it is required to assess the implementation and the actual using of the product by our workers and its relation to reducing consumption in our operations. *Interviewee B* summarizes also how social issues hold high importance and how safety is confirmed with a product used by the employees:

"Firstly, the product and the working itself has to be safe for our employees. The tool or appliance is required to be certificated in terms of its origin of production, structure and material to ensure safety." (Interviewee B)

Interviewee B describes the auditing process which starts with sending a such questionnaire to the supplier to be filled in advance. After this, an appointment is arranged for further review of the answers and if corrections are not provided by the supplier during the meeting, a time frame is given to the supplier for sending corrective answers or documentation afterwards. A conclusive report is sent to the supplier for approval when the audit is conducted. The audit process itself is tailored according to the supplier and some of the suppliers are required for further scrutiny about sustainability issues. *Interviewee C* points out that there is a resource allocation related concern which also limits the amount of audits:

"We conduct supplier visits for checking but we have a vast amount of suppliers which requires plenty of resources if we audit the whole supplier portfolio." (Interviewee C)

Posti Group evaluates and gives points to its suppliers according to their performance which makes the suppliers' evaluation more convenient. One of the innovations is a digital platform called EcoVadis which is used for evaluating sustainability and the advantage of this platform is that it functions as a network where service providers' sustainability management is evaluated in advance by this trusted ratings provider (*Interviewee A*).

Monitoring

Monitoring is conducted in a systematic manner for confirming that the transportation sector is performing by the company's sustainability values. Indicators for monitoring performance can be evaluated according to *Interviewee D* with the utilization rate of biofuels and renewable energy. *Interviewee D* continues that carbon emissions are a key indicator for monitoring the progress towards sustainability goals which is also analysed in relation to company's revenue. These emissions are monitored and divided to company's own emissions and partners' emissions which allows monitoring of the subcontractors' performance in the sustainability area. *Interviewee C* provides more insight about the specifics of monitoring and how the partners take initiative in this matter as it is found to have economic benefits:

"Our devices monitor driving habits for example speeding, braking, economical driving and at the same time we measure idle of transport vehicles. When we started to monitor and manage these factors, we realized that this had a major impact for the environment and consumption of fuels. Majority of our partners also monitor these factors as it realized to be a major factor economically." (Interviewee C)

Interviewee A addresses the issue of also analysing the social performance and how this factor affects in reducing emissions of transportation. *Interviewee C* continues to complete this finding by specifying the main points of monitoring for the drivers and what is the reason for monitoring:

"Regarding transport, we monitor the capacity rate of our vehicles and economic driving habit. Safety aspects are more increasingly taken into consideration when we plan the routes of our vehicles. – to all of our areas of focus we have indicators which we monitor for development" (Interviewee C)

Collaboration and partnerships

Having subcontractors and the ability to supply transport services from an external provider, enables the company to benefit both financially while also reducing emissions via collaboration and *Interviewee C* explains this application in the reverse logistics context. When the company already knows that a truck that is sent to a location does not have any deliveries to bring back, it is more convenient to procure this transportation from a subcontractor. It is more likely that the subcontractor has cargo to bring from that location back and therefore environmental benefits are achieved by assuring that there are no empty trucks transported across the logistics chain. *Interviewee C* continues to describe collaboration with subcontractors and how they are almost considered as own employees which emphasizes the importance of considering partner's sustainability aspects:

"We need to be as close and considerate towards our partners in similar way as we consider our own employees. --Nowadays we make decisions together. For example, we inform that a certain route is no longer profitable and we make solutions together for finding compensatory work for the subcontractor." (Interviewee C)

Posti Group has committed to reporting for IPC and its sustainability principles. This union consists of other total amount of twenty logistics companies, and *interviewee A* describes the potential for collaboration as this opens up a variety of possible joint ventures for contributing to sustainability. Sustainability is seen as a responsibility to collaboratively engage stakeholders, employees and suppliers to learn more about sustainability and finding solutions to tackle the challenges that future poses to sustainable development:

"We arrange a variety of seminars regarding sustainability. For example, last year we held a suppliers' seminar with sustainability theme. The primary focus for this seminar was sustainable packaging and e-commerce from the environmental perspective. We were able to find a few great ideas to proceed for further development. We also had a circular economy expert speaking in that seminar (Interviewee A).

In the sustainable development perspective, long term collaboration is essential and selection criteria rely on the assessment of the financial resources of the supplier as the risk for disruption due to suppliers' bankruptcy is perceived as a risk according to *interviewee A*. However, the sustainability aspirations of the supplier and how does the company perceive the future for collaboration are important, and *Interviewee B* continues to describe how sustainability and being innovative requires long term commitment and mutual business performance goals:

"When I assess our current and prospective partnerships, it is not to be taken for granted that they are our suppliers. To me, sustainability is also the assessment of whether they are able to adapt to the changing markets and global aspects and the ability to be two steps ahead with the sustainability trend and the willingness to be involved with development and innovations. – these suppliers that are actively involved with consideration to cost efficiency, will remain." (Interviewee B)

Interviewee C also agrees on the former description and highlights the key issue in economic sustainability of finding mutually beneficial relationships. The idea is to take suppliers' issues in consideration and *Interviewee B* also finds that both parties in the supply chain are required to gain benefits from sustainable business operations:

"When we think about partnerships, there has to be continuity for both of us. Then we are making progress together. – we need take care of our partners as a big company and consider

their issues. We do not just dictate initiatives and in that way collaboration is more productive." (Interviewee C)

"— it has to be a win-win situation, where both parties realize the benefits" (Interviewee B)

Sustainability is more increasingly also perceived as an opportunity on the suppliers' behalf and Posti Group has even encountered partnerships where the initiative stems from the supplier itself:

"We have sustainable suppliers that have been with us regarding this matter right from the start which have informed us that they have procured more sustainable gas – fueled vehicles for their transport." (Interviewee C)

5.3 *What are the challenges related to sustainability risk management?*

Proceeding to establish knowledge about the challenges that are related to managing sustainability, *Interviewee A* begins the conversation by stating that sustainability risk management must be done by considering sustainability aspects in every process of decision - making. Balancing between being sustainable and ensuring business continuity requires company's departments to be aware of the risks and consequences of business actions to be made and an example of pushing towards profitability is perceived as a risk that endangers operational performance of the company:

"The primary goal for managing sustainability is that sustainability aspects are integrated in the decision-making of all the processes. This means that no matter what decision is to be made, risks need to be evaluated as an entity. – it is a matter of how comprehensively we evaluate the consequences. If we only look at the price aspect, this may lead to occurrence of safety risks if we push the time limits of transports too strictly. (Interviewee A)."

An answer to finding balance in this context is described by *interviewee D, as* the company has encountered interest to sustainable initiatives from the suppliers' side and so have Posti Group's customers also expressed their interest towards green services. However, transforming business to meet sustainable principals requires financial investments and the green service offering is likely to have a higher price. *Interviewee D* tackles this challenge by describing the importance of taking initiative and finding a way to engage customers in contributing to these costs:

"At the moment, still little options exist regarding green services and we need to take initiative in bringing more options even though it might take a few years to start properly. A positive thing is that we have encountered interest from our customers to sustainability, and we need to find a way to jointly carry the costs regarding green services." (Interviewee D)

The economic challenge extends to the supplier's side, as the company needs to evaluate the functionality of the supply chain as an entity. Leaving partners out of the equation and solely dictating the sustainability initiatives from the customer's side to transform the supply chain leads to an economic burden to the partners in the supply chain and *Interviewee D* addresses this issue of managing the whole supply chain as follows:

"—ideal is that we could have the whole network contributing to this cause together, which means that we would not act solely upon demands and pressure of our customers and then transfer this pressure to our partners." (Interviewee D)

Interviewee D acknowledges the risks of implementing sustainability initiatives into the supply chain that without profoundly considering the consequences if partners are not being prepared or are not willing to co–operate according to the sustainability framework. *Interviewee B* reminds about the importance of ensuring operational performance and how logistics chain functions acts as a seamless process and implementing sustainability requires improvement of the entire production:

"When we want improve something, we need to improve the whole production of the logistics chain." (Interviewee B)

The logistics sector has encountered growth and meeting customers' increasing demand poses challenges itself as increase in transportation results to rise in emission. The transformation has to be done in a controlled manner, and according to *interviewee D* sustainability goals must be achieved with adequate analysis of how what are the results when resources are put in sustainability:

"We need to manage our cost/emissions – ratio in a controlled manner and we do not have infinite financial resources as we need to constantly optimize sustainability as an entity. --We have encountered growth in the parcel business and logistics services and in the economic spectrum it is important to consider the big picture of simultaneously being profitable and securing the transformation with responsibility" (Interviewee D)

Interviewee A agrees to this former notion by stating that being profitable is the foundation of business performance and finds that the prerequisites of identifying the key points of emissions have been conducted successfully to improve sustainability. The results indicate a challenge related to finding an incentive for the suppliers to improve sustainability as the financial aspects are considered a priority on their behalf:

"We have done a lot of work for improving environmental sustainability to identify the main points that are causing emissions, but a big issue is that moreover the carbon footprint is increased from the operations of suppliers and subcontractors. We can always ask them to use renewable fuels and try to encourage and commit them to sustainability programs, but the focus is more on the cost-efficiency and financial aspects." (Interviewee A)

According to *Interviewee D,* roughly 90% of the company's total amount of emissions are caused in the transportation sector and a majority share for the amount of two thirds stems from the subcontractors, which emphasizes the importance of involving partners to the sustainability cause. The company has a strong code of conduct which extends to requiring the suppliers to act upon these principals, but still the lack of visibility is present:

"We utilize more increasingly our suppliers and subcontractors and social issues need to be handled as well. --The fact that we do not have the same level of visibility to our subcontractors in comparison to our own employees poses challenges, especially when there is a high number of subcontractors and suppliers." (Interviewee D)

There are many different possibilities and options to apply when improving sustainability and especially the choice of fuel makes a significant impact in the logistics industry, where the majority of the emissions stems from transportation. Transforming the vehicles to utilize renewable fuels poses a price risk for the sustainability initiative which in the worst case puts the company's financial continuity in jeopardy. *Interviewee D* highlights this issue while also acknowledging the fact that there are infrastructural barriers that are required to overcome for properly implementing renewable fuels into transport:

"Regarding the utilization of biofuels, we have a variety of choices, but also a high level of price risk in terms of what kind of fluctuation in prices in these fuels will we face in the future. -- We also face an infrastructural risk in both gas and electric fuels. Technology choices are clear for 50% of our sources of emissions, which means that lightweight vans will transfer to utilize electricity and heavy trucks will transfer to utilize gas. In the middle we have heavy delivery vans and lightweight trucks, where a clear choice of technology does not exist." (Interviewee D)

Regarding the former infrastructural barrier, benefiting the most out of electric is not possible in the logistics sector as there is not an adequate solution for the issue of how to establish

infrastructure for charging the vast amount of vehicles that the company is using in transport. Heavier trucks require significant amount of electric capacity and *interviewee D* proposes a possibility that the company may take initiative for building the infrastructure that is required:

"We have set our goals to be achieved during the next ten years and the price of renewable energy is not necessarily the same during this period. This means that we need to take into account our self-sufficiency regarding this matter. We have moreover considered the possibility of producing our own energy resources." (Interviewee D)

5.4 ***How does a logistics company manage sustainability risks in the supply chain?***

As this paper as addressed the sub-questions that form the basis to answer for the main research question, the following model is formed to gather the results into a visual presentation of how sustainability risks are managed in the supply chain. The specific parts of this model are further described by findings of the interviews.

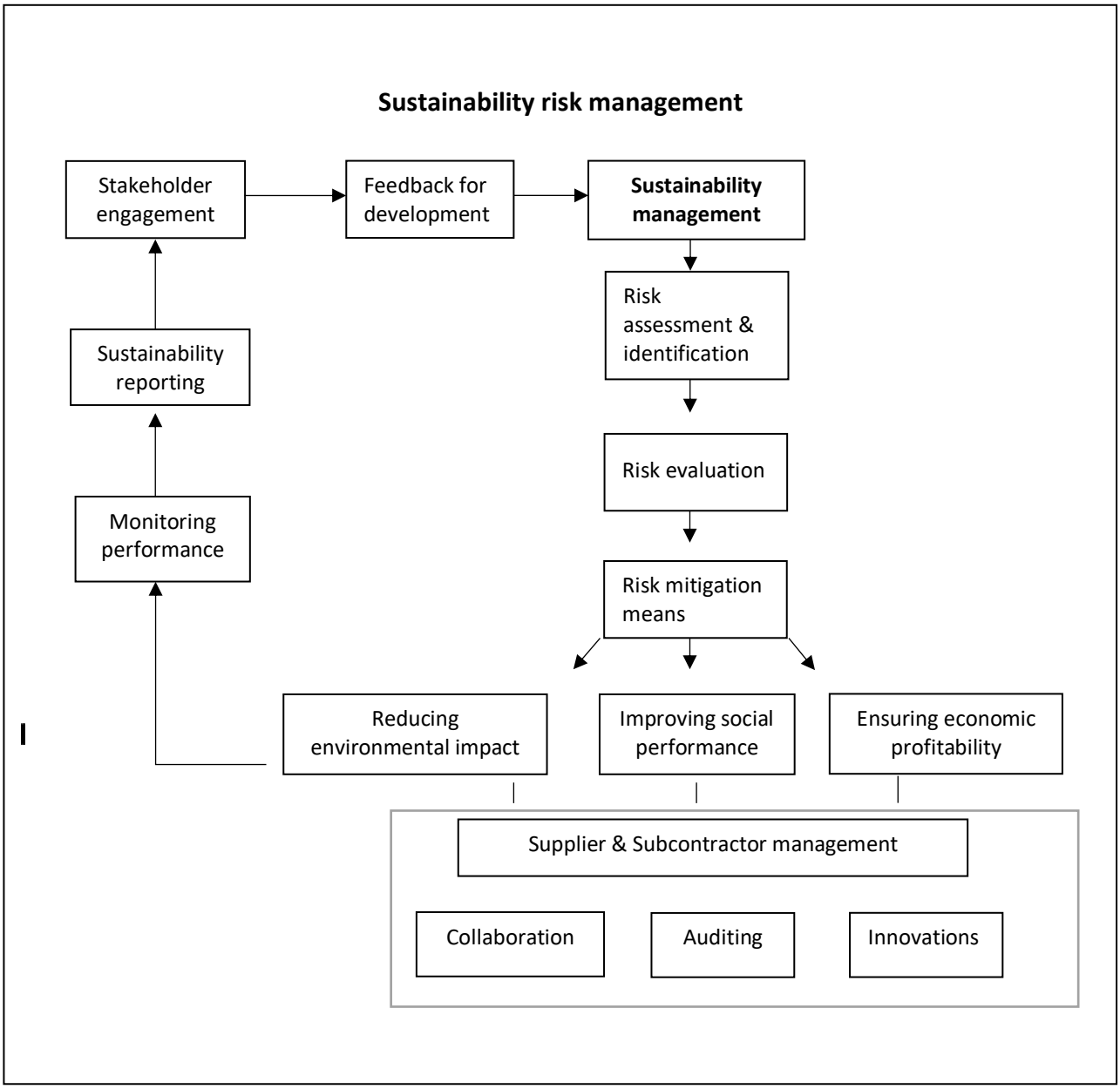

Figure 10. *Overview of sustainability risk management process*

Starting from the top right of the model, the assessment of the risks serves as foundation for detecting sources of sustainability risks where the responsibility is partly transferred to the employees and partners to communicate risks for the managers to further the evaluate risks. Especially, employees have the responsibility to inform safety risks that may cause accidents or disruptions in the supply chain and innovations play a role in communicating risks, as mobile applications allow risk observations to be directed for the management. Employees and partners are educated about sustainability issues and an integral part of evaluating these risks is the gathering of transportation related data from vehicles and formulating a profound carbon footprint evaluation of operations. The management itself is responsible of conducting audits, for identifying risks deriving from suppliers and subcontractors. Economic aspects emphasize the evaluation of customers' demand, as being aware of the sustainability initiatives that customers appreciate in the service spectrum allows the company to find eco-efficient solutions that ensure financial profitability while reducing the environmental impact.

Having the information regarding the processes that require sustainable development, adequate means are carried out with concrete and measurable goals to be achieved. Thriving towards sustainable development must be carried out with precaution, as allocating resources to sustainability goals and ambitions cannot endanger company's profitability. Communications between departments and partners enhance risk management, as this allows the consideration of different perspectives inside the company for not initiating sustainability actions without evaluating the supply chain as an entity. These findings translate to risk management being mainly proactive, but such actions as choosing a suitable vehicle, utilizing environmental friendly fuels and improving packaging mitigate risks that have already occurred which demonstrates a reactive aspect in risk management. Innovations have a major role, as alternatives are explored for transportation vehicles and suppliers are committed to long-term relationships for finding innovative solutions via mutually beneficial goals.

Supplier code of conduct is the basis for ensuring that in addition to own employees and staff, also partners are operating in accordance to the determined sustainability guidelines. This is

important due to the factor that visibility is lower to the operations of suppliers and subcontractors, even though they are regarded almost as own employees. Supplier code of conduct is utilized as a proactive method for assessing suppliers in the selection phase, to avoid risks from occuring and to evaluate partners that have prospects to develop these new sustainability solutions and the willingness to contribute in long term relationships. Audits are performed to monitor performance, but also via collaborative actions and initiatives for innovations suppliers enable a wide array of tailored logistics solutions for packaging and route optimization that promote sustainability.

The whole sustainability risk management process is monitored with metrics that provide concrete and measurable information of how the sustainability performance is improving and how this reflects to the company's financial status. Having a high standard of sustainability information forms a basis for reporting which serves as one of the major principles of transparency, where stakeholders are informed about the updated sustainability issues, points of development and where the company currently stands on the progress of achieving its sustainability goals. Engaging with stakeholders is key part for development, as the company receives industry specific feedback for improvement. Combined with knowledge from customers' demand and their insight to sustainability, this feedback enables the company to allocate their resources adequately and to design their processes to meet the customers' requirements of both developing sustainability and ensuring business continuity.

6. Discussion

In the discussion section of this study, the theory part is reflected to the findings in the empirical part. The aim is to find the key points regarding the logistics supply chain risk management process proposed by the academic literature and link them to the findings of the empirical part. In addition to finding similarities and conclusive discoveries, it is necessary to debate whether these discoveries can be confirmed to be valid and to discuss about the differences that occur between the two parts of this study. The discussion part is guided by the research questions and aims to bring analysis to answering these questions.

Starting with the sustainability issues in the logistics industry and the framework provided by Litman T and Burwell (2006), the same issues surfaced in the empirical part. Environmental issues were found to the most concerning theme in the interviews which remained to be the main point of development, as transforming logistics operations to offer environmentally friendly services was found to have significant customer and business value. Main issues were found to be excess consumption, emissions and waste that can be reduced in the operations. The interviews confirmed that transport and packaging in the logistics chain had a link with environmental risks as the company's core business is associated with these factors. Findings by Carter and Rogers (2008) demonstrated four aspects of sustainable supply chain management: risk management, communication with stakeholders and promoting traceability, identifying and aligning sustainability initiatives and following high ethical sustainability standards. These aspects were found to be a guideline when assuring via audits and inspections that the environmental guidelines were followed in operations. Similarly, social risks are in high consideration and examples from neglect towards this issue were found to be detrimental in the worst scenario. Accidents and hazardous incidents affect the whole logistics operations and the partners involved, which poses a significant reputation risk to the parties that are involved in the supply chain. As these issues are monitored and improved systematically in the company, it seems that logistics industry has made progress from the findings of Brent and Labuschagne (2007) which formerly indicated that social issues have been in low consideration in the business perspective. Economic issues, in terms of productivity and sustainable business activities were found to have a connection to the findings by Christopher and Gaudenzi (2015) that indicate that formerly supply chains were designed to optimize cost-efficiency and the transformation to sustainability required eco-efficient solutions that promote sustainability and financial benefits.

This study followed the sustainable risk management process established by Giannakis and Papadopoulos (2016) and identifying the risks and how the sustainability risks differ from the ordinary risks was evident as Posti Group conducts a variety of reporting for its stakeholders and systematically ensures that the information is correct. Reputational risks surfaced in the interviews and the managing them was held in great importance as contribution from all the departments was required to enable reporting of sound and sustainable economic, social and

environment management. Conduct of risk analysis differed in the empirical part as a systematic model proposed by Hallikas et.al. (2004) was not identified. This is due to the fact the risk was decentralized across the departments and managing these risks was rather based on co-operation inside the company where everybody played a role in analysing these risks and identifying their impact and probability.

Reverse logistics was found to have a great contribution for sustainability, and analysing the framework of reverse logistics activities provided by Hsu, Tan and Zailani (2016) are especially important in the packaging procurement. As Posti Group's services are focused on delivering parcels, reduction and optimization of the use of materials is essential in this subject. This extends to optimizing the size of packaging for improving the capacity level of trucks. Performance in this area was found to have a mutual benefit for economic and environmental issues by reducing costs and waste simultaneously. This notion is aligned with the findings by Sbhisi and Eglese (2007) that vehicle routing can also serve mutual benefits in this area, and so did the interviews demonstrate that idle of vehicles and unnecessary traffic with transport vehicles is required to be decreased for reducing emissions and gaining savings with less resource consumption.

Collaboration was found to have a high level of importance which is aligned with supplier selection criteria formed by Alikhani, Torabi and Altay (2019). Embracing these criteria enables a proactive stance for sustainable development, as the suppliers are assessed also according to the qualities that allow long term relationships for innovative solutions. This was also supported by findings of Christopher and Gaudenzi (2015), which emphasized the importance of answering to the rapidly changing markets by initiating open innovation and technology development agreements. Prerequisite for developing sustainable operations was to also find solutions that provide business value, where company's profitability is ensured by evaluating customers' willingness to purchase the sustainable services.

The whole performance of this process was monitored with indicators that provide information about sustainability's improvement. One of the key indicators related to green logistics was carbon emissions, which was similarly assessed as by Burrit, Schaltegger and Zvezdov (2010) who proposed a carbon management accounting model for assessing these emissions. As transportation had a direct environmental impact via causing carbon emissions, it was essential to perform carbon compensations to reduce the environmental impact. Similarly, Blackburn (2007) demonstrated an environmental, health and safety balanced scorecard, and social wellbeing and environmental performance metrics were aligned in the company, with indicators that take into consideration business value proposition with supply chain objectives and with stakeholder engagement.

6.1 Managerial implications

Combining the academic literature with empirical analysis, this paper provides managerial implications to be considered for sustainability risk management in the logistics industry. The concept of sustainability was identified to be a rather new phenomena and it has a significant impact to the future of logistics operations as this industry had a direct impact to sustainability with its core business. The paper proposes a management guideline which provides more systematic approach to managing sustainability risks. Especially if the given company does not have an assigned sustainability risk manager, following this guideline will bring more clarity and comprehensive knowledge to be considered when managing these risks. Sustainability risks were found initially to be a difficult subject to comprehend and to extract from the traditional risks. Implementing a risk assessment and evaluation model will allow identification of risks with knowledge regarding the level of concern of the risks. Regarding the subject, importance of stakeholders' engagement and means for acting upon are presented as a necessity for sustaining business conduct in the future. This study provides a new approach for perceiving sustainability risks as possibilities. Possibilities are presented as a new form of supplier selection criteria which emphasizes a new array of factors to be considered. These criteria serve as a prerequisite for initiating sustainably oriented relationships, as sustainable development is highly associated with innovations which further require a new set of qualities in a supplier.

6.2 Propositions for future research

For future research, this study raised a significant issue regarding the alignment of ensuring financial performance and sustainable development. Regarding the basis of risks management, this study found that the impact of sustainability risks can be rather to evaluate in financial terms and finding a connection between the two could serve as a key for the management to effectively allocate its resources to find eco-efficient solutions. Implementing sustainable initiatives requires consideration of the whole logistics processes and parts of it that need to be involved. Assessing the implementation of sustainable initiatives would serve as a major improvement when considering its effect on operational and financial performance. This study found that suppliers pose sustainability risks while also providing a mean to open further possibilities for long term partnerships. Allowing the company to form these partnerships, mutually beneficial aspirations must be established. Focusing a study to assess the qualities of this relationship would contribute to companies finding the management approach that enables joint ventures and technology improvement projects for breaking sustainable development barriers via innovations. Fluctuation of renewable fuels and energy resources was also found to be great risk for sustainable development and analysing the variance of fluctuations and what would be the tolerable amount of variance could serve as a guideline when assessing the risk of a sustainable investment. Regarding the same subject, a quantitative analysis regarding sustainability initiatives or sustainably oriented companies and their relation to financial performance could serve either as a confirm or an opponent for the findings of this study.

7. Conclusions

It is evident that sustainable development is a significant issue in the logistics industry. As logistics companies' core business is directly involved with transportation, the environmental impact is inevitable. Neglecting environmental risks in operations places companies' business continuity at great danger and excluding social issues from business operations is a conduct that is not tolerated in modern business environment. Logistics companies are required to establish transparency in their business to demonstrate that they are contributing to sustainable development rather than solely focusing on the bottom line being the guideline

of business. This pressure deriving from stakeholders places the company to a such challenge that requires systematic risk management.

The concept can be described as rather contradicting, as while the requirement is to perform in a sustainable fashion, logistics companies need to provide a service with a cost that pleases the customer. This compels companies to balance between being sustainable and ensuring business continuity, and engaging especially with customers provides the insight for finding business value in that sense. Sustainable risk management presents the reputational risk that acts as a driver for transforming the supply chain from the former operational performance focused strategy to taking more consideration on sustainability aspects. One of the prerequisites for business conduct is to ensure social performance in the company, as not only does social risks expose companies for unwanted stakeholder reactions, but also taking care of employees correlates to operational performance and adequate use of resources for improving environmental performance. Sustainability risk management can be considered as a mindset where all the triple bottom line – aspects need to be in balance as they compensate each other. In the logistics industry environmental aspects are the most visible and noted risks, and therefore tackling this issue with a strategy that also seeks to find business value is important.

Eco-efficiency is the key for understanding how sustainable development can be carried out in a way that business continuity is not in danger. Exploring means that reduce consumption and environmental burden can simultaneously have financial benefits. Logistics chain needs profound assessment, so that the sources of consumption can be revealed for implementing alternative ways to reduce the environmental impact. This regards to a reactive method of taking action at the time when risks have been observed, but rather being proactive and finding innovative ways to manage these risks is proposed as a strategy by this study. Supplier selection and collaboration was found to be a key mean for avoiding and being proactive towards sustainability risks. Engaging with partners that have the competence and desired level of innovativeness opens a variety of possibilities to develop new solutions for sustainability. The key concept in collaboration is to find such win-win situations where both

parties perceive the benefits of the relationship. Suppliers and subcontractors are regarded as partners that are in the same level as own employees and by neglecting the aspirations of partners, there is little possibility for development.

Luckily, the perception towards sustainability is changing as partners take initiative for sustainability and stakeholders provide constant feedback for improvement as company's sustainability reporting reveals the overall process in this context. Having the precise evaluation of these risks and monitoring of the whole process creates a basis for managing these risks and reporting them to the public. Therefore, sustainable risk management must be carried out in a systematic manner and so the guideline for sustainability is communicated to every part of the organization via code of conduct. It is the mindset of gaining competitive advantage by engaging company's partners and stakeholders to find innovative ways to break the barriers of sustainable development and to find solutions for aligning operational performance with business value for performing sustainable risk management.

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