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Assessing the Current State of Sustainability within Supply Management through Suppliers and Supplier Development

A Case Study

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ABSTRACT:
The increased global awareness of sustainability in business operations has necessitated organizations to re-evaluate their processes. A similar shift is evident in the supply management operations of the case company. This thesis studies the research gap in the intersectionality between supplier development, sourcing, and sustainability, traditionally researched as separate domains. This thesis aims to contribute to the literature on sustainability and supply chain management by addressing three research questions: factors and challenges impacting sustainability, current sustainability practices, and ways to improve sustainability in the supply network of the case company.

By using a qualitative research approach, semi-structured interviews were conducted with eight suppliers of the case company, which aimed to investigate the sustainable practices of the suppliers. The findings reveal that suppliers' perception of sustainability extends to environmental protection, social responsibility, and economic viability. Their sustainability practices are driven by customer needs, legal requirements, and communication, despite challenges related to technological adaptation, competition, pricing pressures, and consistency in sustainability performance measurement and reporting.

This study provides several managerial implications, recommending improvements in supplier development and sourcing programs, modifications to the supplier assessment and rating process, and the introduction of a supplier score matrix. These suggestions are intended to support businesses in incorporating sustainability into their supply management procedures, thus actively mitigating potential environmental, societal, or ethical hazards. In conclusion, this thesis underscores the criticality of an integrated approach to managing sustainability within supply management, highlighting the role of suppliers in this effort. However, organizations should consider their geographic scope, as locational bias presents limitations to the interpretation of the study. Furthermore, future research may benefit from exploring the impact of geographic variations as a significant dimension of the study. By bridging the research gap between supplier development, sourcing, and sustainability, this study provides insights into how these areas can mutually contribute to a more sustainable business landscape.

KEYWORDS: Supply Management, Sustainability, Supplier Development, Sourcing

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TIIVISTELMÄ:
Kasvava globaali tietoisuus kestävyydestä on pakottanut organisaatioita arvioimaan liikentoimintaprosessejaan uudelleen. Vastaavaa muutosta on havaittavissa myös tutkimuskohteena olevan yrityksen toimitusketjunhallinnassa. Tämä tutkimus tutkii toimittajakehityksen, hankinnan ja kestävyyden välisiä rajapintoja, joita on perinteisesti tutkittu erillisinä alueina. Tämän diplomityön tavoitteena on täydentää tieteellistä kirjallisuutta kestävyyden ja toimitusketjunhallinnan alalla vastaamalla kolmeen tutkimuskysymykseen: kestävyyteen vaikuttavat tekijät ja haasteet, nykyiset kestävät käytännöt ja kestävyyden parantamisen keinot toimittajakentässä.

Käyttämällä kvalitatiivista tutkimuslähestymistapaa, tutkimusyrityksen kahdeksan toimittajan kanssa tehtiin haastattelu, joilla pyrittiin selvittämään toimittajien kestäviä käytäntöjä. Tulokset osoittavat, että toimittajien käsitys kestävyydestä ulottuu ympäristönsuojeluun, sosiaaliseen vastuuseen ja taloudelliseen kannattavuuteen. Toimittajien kestävyyden käytännöt ovat asiakastarpeiden, lainsäädännöllisten vaatimusten ja viestinnän ohjaamia, huolimatta haasteista, jotka liittyvät teknologiseen sopeutumiseen, kilpailuun, hintapaineisiin sekä kestävyyden suorituskyvyn mittaamisen ja raportoinnin johdonmukaisuuteen.

Tämä tutkimus ehdottaa kolmea muutosta tapausyrityksen toimintaan, suositellen parannuksia toimittajakehitys- ja hankintaohjelmiin, muutoksia toimittajien arviointi- ja luokitusprosessiin sekä toimittajien pisteytysmatriisin käyttöönottoa. Nämä ehdotukset ovat tarkoitettu tukemaan yrityksiä kestävyyden sisällyttämisessä toimitusketjun hallintaan, joka aktiivisesti pienentää mahdollisia ympäristö-, yhteiskunnallisia tai eettisiä uhkia. Organisaatioiden tulisi kuitenkin ottaa huomioon maantieteellinen laajuus, koska sijaintipohjaiset vääristymät tuovat rajoituksia tutkimuksen tulkintaan. Lisäksi tulevaisuuden tutkimus voisi hyötyä maantieteellisten vaihteluiden tutkimisesta merkittävänä tutkimuksen ulottuvuutena. Tämä tutkimus esittelee, kuinka yhteistyö toimittajakehityksen, hankinnan ja kestävyyden välillä voi muovata kestävämpää liiketoimintaa ja sulkea aiemmin tunnistetun tutkimuksen aukon näiden kolmen alueen välillä. Yhteenvetona voidaan todeta, että tämä diplomityö korostaa toimittajien roolia tässä pyrkimyksessä.

AVAINSANAT: Toimittajakentän hallinta, Kestävyys, Toimittajien kehittäminen, Strateginen hankina

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Abbreviations

SSM	Sustainable Supply Management
SM	Supply Management
SD	Supplier Development
SSD	Sustainable Supplier Development
SCM	Supply Chain Management
SSCM	Sustainable Supply Chain Management
EU	European Union
SDGs	Sustainable Development Goals
TBL	Triple Bottom Line
LCM	Life Cycle Management
LCA	Life Cycle Assessment
CSR	Corporate Social Responsibility
SRM	Supplier Relationship Management
PSM	Purchasing and Supply Management
GSCI	Green Supply Chain Integration
CSDD	Corporate Sustainability Due Diligence
DJSI	Dow Jones Sustainability Indices
KPI	Key Performance Indicator

1 Introduction

As the world starts shifting towards more environmentally conscious operations due to climate change, corporations start to implement an increasing number of sustainable processes into their operation. Environmental calamities and industrial pollution have had an amplified effect to work on sustainable production and consumption in the field of manufacturing, and more explicitly, supply chain management (Rajeev et al., 2017). This highlights the importance of understanding the sustainability issues in supply chains and how they can affect the operations of a company. Furthermore, supply chains can cause significant losses for firms due to social, ecological, or ethical problems, but research on managing these sustainability issues as risks and their impact on losses is currently insufficient (Hofmann et al., 2014). Therefore, organizations make an effort to handle social, environmental, and ethical matters responsibly while maintaining their competitive position in the market (Balkau and Sonnemann, 2010). Accordingly, one of the most important industrial processes that can influence sustainability on a greater scale is Supply Management (SM).

1.1 Background

The increasing focus on sustainable and environmentally friendly operations is revolutionizing different businesses. Even though sustainability is a commonly known motive across all businesses, the drivers and barriers to sustainable practices within organizations are often disregarded (Giunipero, Hooker, & Denslow, 2012). The motivation behind sustainability can be divided into multiple different sectors. Firstly, as described by Eslami et al. (2019), environmental concerns, economic benefits, and social responsibility are all important contributors to sustainability. Moreover, climate change and pollution have both increased the awareness of environmental responsibility, whilst the economic benefits revolve around increasing efficiency and reducing costs. Likewise, consumers, investors, and other stakeholders are increasingly demanding that

organizations act in a socially responsible manner, which includes taking steps to reduce their environmental impact.

Governments around the world are implementing laws and regulations to encourage sustainable practices and reduce environmental impact. For instance, the European Union (EU) has implemented new legislation due to setting ambitious goals for reducing greenhouse gas emissions and overall energy usage (Johnson et al., 2021). Similarly, new technologies are making it easier and more cost-effective for organizations to implement sustainable practices, such as renewable energy, energy efficiency, and sustainable transportation. This is evident from the conclusions of Demartini et al. (2019), in which they examine digitalization technologies for sustainability.

Lastly, globalization and the interconnectivity of world economies have increased awareness of global issues, such as climate change and deforestation (Tang et al., 2020). Moreover, the concept of sustainable development has been included in the United Nations' agenda in the form of the Sustainable Development Goals (SDGs), which has increased the attention on sustainability in all sectors of the economy (United Nations, 2015).

All things considered, the motivation behind sustainable development can be constructed on a few factors; Technological advancement, a shift in social responsibility, a more environmentally conscious approach to operating, and a competitive advantage in the market (Smith & Sharicz, 2011; D'Eusanio et al., 2019; Purvis et al., 2019). Since the operations of supply chain management are interconnected with the practices of supply management and supplier development, the impact can also be seen in the realm of supply management.

1.2 The case company

In this thesis, the case company is used to investigate the current state of sustainability within supply management through suppliers and supplier development. The case company is a leading provider of innovative and sustainable technologies and services for the marine and energy markets. The company has a strong focus on sustainability and has implemented various initiatives to promote sustainable practices in its supply chain. By studying the practices and perceptions of the case company's suppliers and the effectiveness of its supply management and supplier development initiatives, this thesis aims to provide insight into the challenges and opportunities for improving sustainability in the field of supply management. The case company and its business processes are further described in Chapter 4.

1.3 Research gap, objectives, and research questions

This study aims to bridge the existing research gap that exists between supplier development, sourcing, and sustainability. Traditionally, these three areas have been researched as separate domains, each with its own theories and frameworks. However, in the current business environment, where sustainability is increasingly recognized as a critical aspect of business strategy, there's a need to understand how these areas intersect and influence each other. The aim of this study is to investigate how these domains can complement and reinforce each other to enhance overall organizational performance, efficiency, and responsibility towards sustainability. The research gap is illustrated in Figure 1.

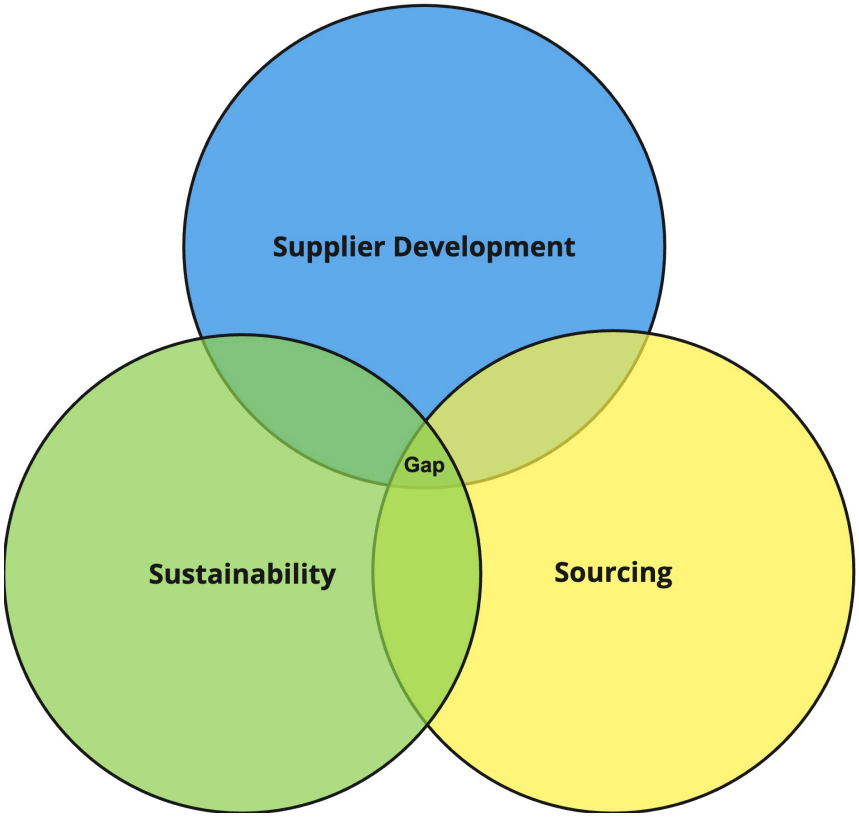

Figure 1. Venn diagram of the research gap.

This study concentrates on the sustainability practices of a case company. Furthermore, the objectives of the case company are increasingly leaning towards sustainability, hence the executive management of the case company has made commitments to conduct their operations in a sustainably responsible manner. Consequently, the case company needs to re-evaluate its current practices to establish a solid foundation for sustainable operation. One of the key areas within the company that requires reassessment is its supply chain management functions. Thus, the purpose of this thesis is to provide an investigation of the sustainability of the suppliers in the supply chain of the case company as well as to propose changes in their processes. This is accomplished by performing a comprehensive literature review with the objective of identifying the factors that promote sustainability by examining existing research in the areas of sustainability, sustainable supply management, and sustainable supplier development. After determining the key factors to operating sustainability, a conceptual framework is constructed, which

serves as the foundation for the development of the interview guide, and interpretation of the results. Following this, a study is carried out using semi-structured interviews to investigate supplier sustainability.

Furthermore, the framework is developed to assess supplier sustainability from the viewpoint of the focal organization. The purpose of the framework is to conceptualize the variables affecting the sustainability of the supplier by either sourcing or implementing a supplier development program. Eventually, this assessment is reflected in the supply management and supplier development processes of the case company. The research provides insight into the current challenges and opportunities for improving sustainability in the field of supply management in the form of a case study.

Additionally, this thesis recognizes other concepts associated with sustainability, such as quality certifications, governance mechanisms, KPIs, etc. The study aims to determine the status of suppliers with regard to sustainability and provide practical implications for management by linking the theoretical findings to the empirical research. Consequently, this is conducted through an analysis of the results gathered in the empirical section of the thesis. Furthermore, this thesis intends to identify opportunities for improvement and best practices for promoting sustainability within the supply chain. By addressing the research questions and objectives, this study aims to contribute to the advancement of knowledge in the field of sustainability and supply chain management.

Finally, it is important to assess the barriers and challenges faced by the suppliers in implementing sustainable practices and initiatives and to understand the role of the case company in supporting the sustainability efforts of its suppliers. By investigating these aspects, the study can provide recommendations on how the case company can improve its supply management and supplier development processes to promote sustainability and overcome barriers. Consequently, the research questions are:

RQ1: What factors and challenges impact the implementation of sustainability within a company's supply network?

RQ2: What are the current sustainability practices and initiatives being implemented in a company's supply network?

RQ3: In which ways, a company can support improving the sustainability of its supply networks?

1.4 The structure of the thesis

This thesis is comprised of seven chapters. The initial chapter serves as an introduction to the research, providing an overview of the study and outlining the aims and research questions that are addressed throughout the research. The second chapter presents a literature review, which is divided into four sections. The first section defines the scope of the literature, addresses the topic of climate change, and defines all relevant concepts related to the subject. The second section explores research on sustainable supply management. The third section examines research on sustainable supplier development, while the fourth section investigates how sustainable practices are incorporated into business operations, how quality standards contribute to the sustainability of an organization, and how sustainability performance is measured.

Chapter three provides details of the methodology used in the empirical section of the thesis and introduces a framework created to assess the sustainability of the supplier. The fourth chapter then introduces the case company and discusses the common processes within the organization. Furthermore, the findings from the interviews are presented in the fifth chapter. The sixth chapter discloses the practical implications for management and decision-makers based on the findings of the results. Lastly, the seventh chapter presents the conclusions of the study and suggests topics for future research on the subject.

2 Literature review

This chapter of the thesis aims to provide a comprehensive overview of the literature on sustainable supply management and supplier development. The first part of the chapter defines and scope of sustainable supply management, including its relationship to related concepts. Secondly, the chapter delves into the theoretical foundations of sustainable supply management, exploring key theories and frameworks such as the triple bottom line, and the sustainable value framework. Thirdly, the chapter examines the importance of sustainability in supplier selection and evaluation, including methods and tools used, such as sustainability rating systems, sustainability audits, and sustainability certifications.

In addition, this chapter also discusses the challenges and best practices for implementing sustainable practices in supply chain management, including stakeholder engagement, and governance mechanisms. Moreover, the chapter explores the role of corporate social responsibility and sustainability in supplier relationship management, including collaborative partnerships, co-creation, and supplier development programs.

Finally, the chapter reviews the methods and tools used to measure and evaluate the sustainability performance of supply chains, such as sustainability reporting, life cycle assessment, and multi-criteria decision-making. Overall, the literature review and theory section of this master's thesis plays a crucial role in providing the foundation for the research and is instrumental in shaping the subsequent analysis and discussion. This section of the master’s thesis provides an answer to the first research question: “What factors and challenges impact the implementation of sustainability within a company's supply network”.

2.1 Scope, definitions, and background

It is vital to examine the scope of the literature on sustainability within supply chain management to gain an understanding of the studied subject. D'Eusanio et al. (2019) present three illustrations of the sustainable supply chain literature they examined in their paper to provide a useful toolbox for decision-makers to systematically assess sustainability. These illustrations present the type of publications that they reviewed, the year of publication, and the distribution of the analyzed dimensions (D'Eusanio et al., 2019). The type of publication covering 172 papers, is presented in Figure 2.

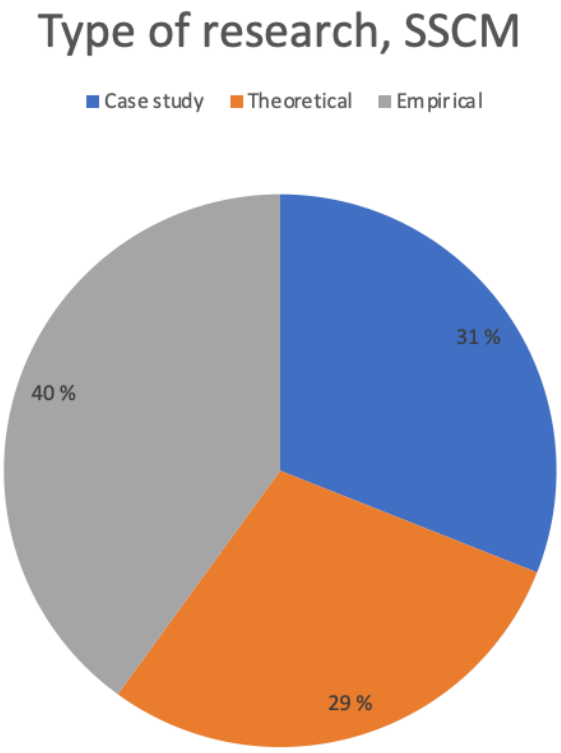

Figure 2. Type of research within the field of sustainable supply chain management (Adapted figure from D'Eusanio et al., 2019).

Publications in the field of sustainability and supply chain management have been increasing at a rapid rate in recent years (D'Eusanio et al., 2019). This trend highlights the growing interest and importance of addressing sustainability in the field of supply chain

management. The research illustrates that the number of publications has been rising consistently over time, indicating that sustainability is becoming a more prevalent concern among researchers, practitioners, and organizations in the field (D'Eusanio et al, 2019). Furthermore, the rising number of publications also indicates that there is a growing body of knowledge and resources available for organizations to draw from to improve the sustainability of their supply chain management practices. Likewise, Zimmer et al. (2015) make the equivalent conclusion about the literature on supply management.

One of the most essential characteristics of the research within the field of supply chain management, supply management, and supplier development is the dimensions that these articles cover. These dimensions are Social, Environmental, and Economic performance (Purvis et al, 2019). It is crucial to address the interconnectivity between these dimensions to establish a comprehensive understanding of sustainability. The definition and interconnectivity of the dimensions are further discussed in the definitions segment. The breakdown of the dimensions of sustainability investigated in the paper by D'Eusanio et al. (2019) reveals that most of the articles focused on the social dimension of sustainability. This suggests that there is a strong focus on addressing issues related to social sustainability in the field of SCM. In addition, it emphasizes that there is a growing awareness of the importance of addressing social issues in the supply chain, such as labor rights and fair trade. The second largest group of papers analyzed sustainability in its entirety, involving environmental, economic, and social perspectives, which shows that there is an increasing interest in understanding how the three dimensions of sustainability interact and how they can be integrated into supply chain management (D'Eusanio et al., 2019).

The smaller number of papers that discussed the social and environmental dimensions together, or the social and economic dimensions together, indicates that there is less research on how these specific dimensions of sustainability interact within the supply chain (D'Eusanio et al., 2019). This highlights an area for future research in the field. Eslami et al. (2019) have also conducted research on the topic of sustainability, with a

specific focus on the manufacturing industry. They have reached conclusions that align with previous research. However, the research suggests that the field of sustainability in the manufacturing industry often contains all three traditional sustainability dimensions, contrary to the conclusions about sustainable supply chain literature (D'Eusanio et al., 2019; Eslami et al., 2019). The coverage is presented in Figure 3, which is adapted from the study of Eslami et al. (2019).

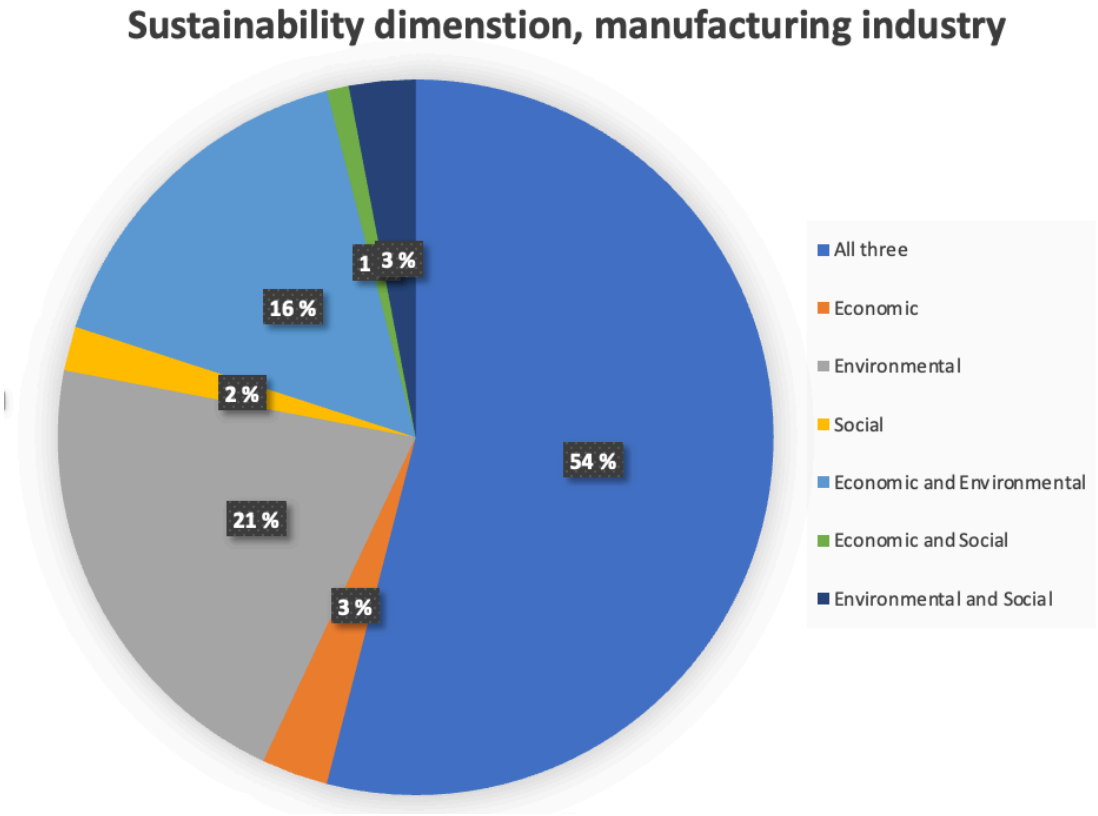

Figure 3. Sustainability dimensions in the literature of the manufacturing industry (Adapted figure from Eslami et al., 2019).

2.1.1 Definitions and background

Before examining the theories and frameworks on supply management and supplier development, it is important to define all key concepts associated with the subject. This includes defining the key terms related to sustainability, supply management, and supplier development, as well as any other relevant concepts that are used in the thesis.

Firstly, sustainability can be defined as the capacity to achieve economic prosperity while preserving natural systems and improving living conditions (Johnson et al., 2021). Purvis et al.(2019) describe that the three pillars of sustainability are social, economic, and environmental sustainability. It can be argued that the combination of these characteristics can be utilized to create a comprehensive understanding of sustainability. However, Salas-Zapata and Ortiz-Muñoz (2018) suggest that defining sustainability can be challenging because of the lack of consistency in its usage and the abundance of definitions that may have conflicting interpretations.

Similarly to the pillars of sustainability, Johnson et al. (2006) explain, that in order to operate sustainably, decision-makers must take into account four different financial perspectives when making assessments and decisions. These are financial capital (cash, investments), manufactured capital (infrastructure, machines), human capital (labor, intelligence), and natural capital (resources, ecosystems) (Johnson et al., 2021). This statement is aligned with the aforementioned dimensions of sustainability, although the characteristics are presented from a different perspective. Likewise, sustainable development can be defined as the process of meeting the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). Similarly, to previous suppositions, it can be stated that it is a holistic approach that considers the economic, social, and environmental dimensions of development, and aims to create a balance between these three pillars.

When examining the literature further on supply management, it becomes evident that the central terminology needs to be defined in order to establish an understanding of the subject. One of the most central concepts around supply management, supplier development, and several other supply processes is Supply Chain Management (SCM). Supply Chain Management can be defined as the structured and strategic synchronization of standard business operations, and the strategies used across these operations within a specific company and between companies in the supply chain

(Mentzer et al., 2001). Its aim is to boost the long-term efficiency of both individual organizations and the collective supply chain (Mentzer et al., 2001).

Moreover, the term supply chain is defined as a group of three or more parties that are directly connected to one another in the upstream or downstream flow of goods, services, finance, and information (Mentzer et al., 2001). Consequently, Sustainable Supply Chain Management (SSCM) involves overseeing the movement of goods, information, and finances while fostering collaboration between businesses along the supply chain (Seuring & Müller, 2008). It is informed by objectives from all three aspects of sustainable development: economic prosperity, environmental stewardship, and social responsibility, and the objectives are shaped by the needs and expectations of customers and stakeholders (Seuring & Müller, 2008).

To achieve a more accurate description of the supply management process, it is crucial to understand the interconnectivity to supply chain management within the context of the case company. The SCM of the case company contains a Supply Management (SM) process, which generally refers to the selection, assessment, and management of the supplier base. Moreover, Supply Management refers to the process of managing the procurement of goods and services for an organization. It is noteworthy to highlight that supply management and supply chain management are distinct concepts that are often used interchangeably. Supply management involves acquiring goods and services from external sources, focusing on activities such as sourcing, procurement, and vendor management, while supply chain management encompasses coordinating and managing all activities involved in the production and delivery of goods and services, including transportation, logistics, inventory management, and demand planning.

Furthermore, Supply Management can be defined as the design, initiation, control, and assessment of strategic, tactical, and operational processes within and between companies with the goal of obtaining goods and services at the most favorable terms. (Van Weele, 2015;Wynstra, 2006). In short, the goal of supply management is to ensure that

an organization has the materials it needs to operate efficiently while minimizing costs and maximizing value.

Consequently, incorporating sustainability into the supply management strategies creates a Sustainable Supply Management (SSM) process. Similarly, to the operations of supply management, SSM refers to the selection, assessment, and management of the supplier base to the degree to which supply management reflects the environmental, social, and economic value (Giunipero et al., 2012). One of the main functions within Supply Management is Supplier Development (SD) process. Supplier Development is characterized as any action initiated by a purchasing firm aimed at enhancing a supplier's performance or potential to fulfill the buyer's immediate or future supply demands (Handfield et al., 2006). To optimize supplier efficiency, purchasing firms may adopt several strategies, such as evaluating the supplier's operations, offering performance-based rewards, fostering competition among suppliers, and engaging directly with suppliers via training or other initiatives (Handfield et al., 2006).

Hence, it can be indicated, that Supplier Development is an essential operation within Supply Management. It establishes a more competitive environment for suppliers to better their operations and increase their efficiency on multiple platforms. Sustainable Supplier Development (SSD) strategies are also being incorporated within the operation of global businesses to manage and take responsibility for the environmental effect, that a business has. Traditional supplier development (SD) focuses on increasing the operational performance of suppliers; sustainability-oriented supplier development broadens that focus to include the sustainability (Yang & Xiongfei, 2017).

However, these terms are often used across several industries, although some research suggests that their usage may be slightly inaccurate because they all refer to the same business process and they frequently overlap. Moreover, according to Johnson et al. (2006), purchasing, supply management, and procurement are used interchangeably to

refer to the same process. Similarly, supply chain and supply chain management can be used to refer to the aforementioned processes.

2.1.2 Fundamental principles of sustainable operation

As described earlier, sustainability is often associated with three interrelated dimensions, known as the three pillars of sustainability, which are critical for achieving a sustainable future (Purvis et al., 2019). These pillars are social, environmental, and economic sustainability. These dimensions are constructed as the triple-bottom-line framework, which is often referred to as the practical framework of the sustainability (Rogers & Hudson, 2011). This framework essentially captures all characteristics of sustainability; however, the scope of sustainability can differ from altering the importance of each dimension in relationship to each other. The triple bottom line (TBL) framework is frequently utilized in sustainability literature, and it serves as the basis for multiple research articles. The three pillars of sustainability are illustrated in Figure 4.

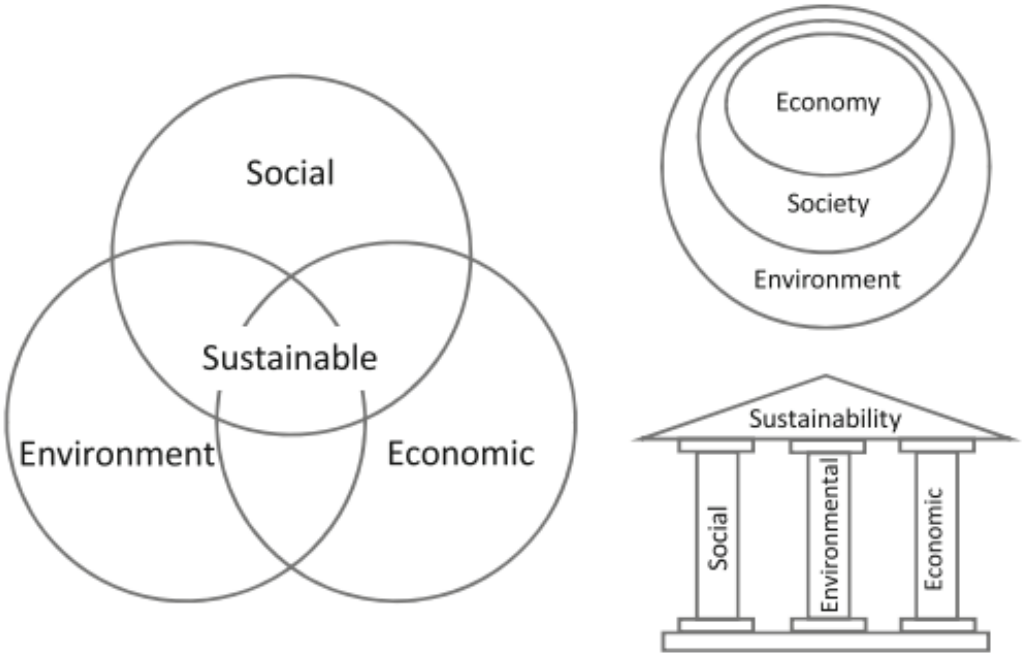

Figure 4. Three pillars of sustainability (Purvis, Mao, & Robinson, 2019).

Comprehending the fundamental elements that businesses need to function sustainably or support sustainable development is crucial. Stakeholder value, or sustainable value, are characteristics that provide a considerable source of competitive advantage (Laszlo, 2008). Moreover, Laszlo's (2008) research focused on a method for integrating stakeholder concerns into a company's strategy and operations in a systematic manner. It can be stated, that the sustainable value framework utilizes the triple-bottom-line approach to creating value in each stage of the business operation. Laszlo (2008) presents six levels of strategic focus, which can be divided into analyzing and assessing risks, integrating sustainability into the process, integrating sustainability into the product, entering new markets, developing a sustainable brand or culture, or changing the rules of the entire business by providing such competitive advantage through sustainability. By applying the aforementioned steps, businesses have the potential to generate enduring value.

The value chain principle is an essential part of sustainable operation. It focuses on the internal activities of a company that creates value for customers. Likewise in the scope of sustainability, organizations are utilizing a similar process to analyze the sustainability within the industry. There are primary activities and support activities within the value chains, and both activities present the company with new growth by building up the shared value (Yun & Yigitcanlar, 2017). The value chain principle is not a recent ground-breaking innovation, but a model that has been introduced as early as 1985. Cross-functional integration and marketing are crucial in achieving a successful value chain. Furthermore, supply chain management is a new way of managing businesses and relationships, and to achieve success, a shift from managing individual functions to integrating activities into key processes is necessary (Yun & Yigitcanlar, 2017). Hence, the interconnectivity of supply chain management and value chains enables us to consider the model from the scope of the thesis. The model of the value chain is illustrated in the adapted Figure 5, which is based on Porter’s value chain theory (Porter, 1985).

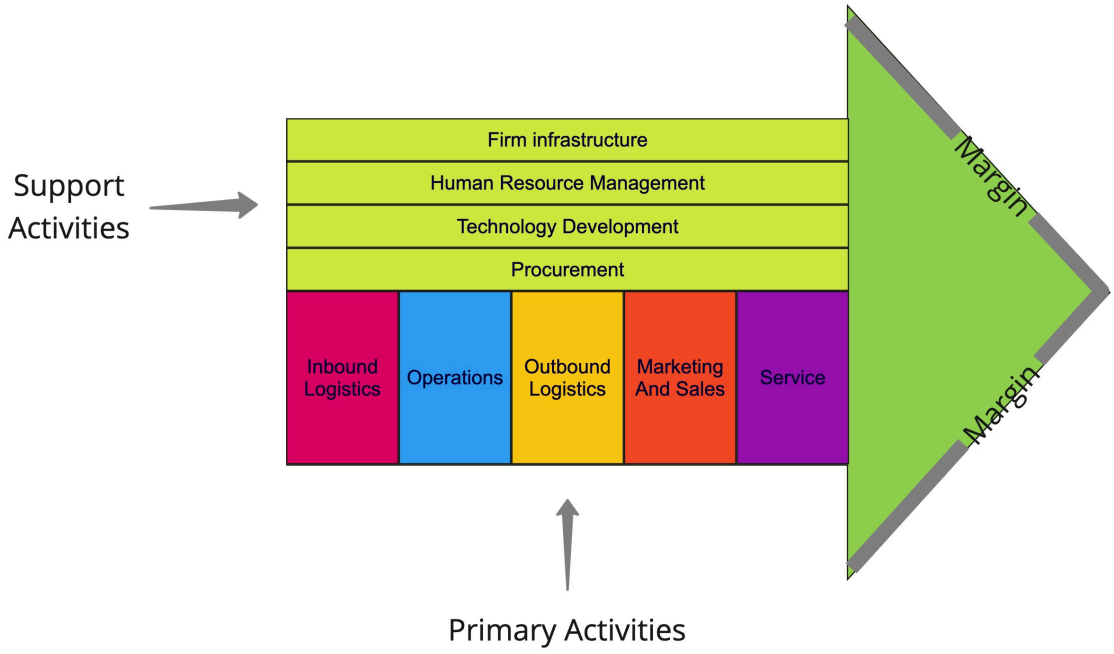

Figure 5. The value chain (Adapted from Porter, 1985).

Similarly, to the value chain principle, life-cycle management (LCM) can be an alternative approach to managing the sustainability (Balkau & Sonnemann, 2010). These principles are similar in nature, however, value chain analysis is typically performed from the perspective of the company, while LCM considers a broader perspective that includes the entire system of suppliers, customers, and other stakeholders. Thus, LCM could be argued to be more conscious of facing sustainability challenges and increasing responsibility within all dimensions of sustainability. Balkau and Sonnemann (2010) analyze case study models for LCM, and they find that businesses focus on supply-chain management to achieve their sustainability goals. They also suggest that communication is prioritized by governments over legislation (Balkau & Sonnemann, 2010). Likewise to LCM, the methodology of evaluating the environmental loud of processes and products is the life cycle assessment (LCA) (Ortiz et al., 2008).

Correspondingly, Corporate Social Responsibility (CSR) has been an increasing phenomenon within corporate entities to achieve the common good. It is a form of corporate self-regulation, which ultimately is integrated into the business model of the company (Fontaine, 2013). Furthermore, the policy of corporate social responsibility operates as an inherent, self-monitoring system in which businesses oversee and guarantee their compliance with the principles of the law, moral codes, and global standards (Fontaine, 2013). Strand et al. (2015) research CSR in the scope of sustainability in Scandinavia, and they state that Scandinavia is often cited as a global leader in CSR, as well as sustainability. This statement is comprehensively supported by the presented documentation; TBL performance by country cluster, Top 30 sustainability competitiveness, Top 20 transparency international corruption perceptions index, Scandinavian companies at the Global 100 vs. U.S.-based companies at the Global 100, and lastly, comparison between the Scandinavian and the U.S. on the Global 100 performance (Strand et al., 2015). Moreover, all aforementioned indexes list Scandinavian companies/countries as top performers within the corresponding index (Strand et al., 2015).

In today's world, with its economic crises, worker exploitation, and environmental destruction caused by corporate corruption, Corporate Social Responsibility (CSR) is a crucial component of the business world (Agan et al., 2018). Corporate Social Responsibility (CSR) refers to a company's responsibility to operate ethically and contribute positively to society and the environment. This process involves evaluating the consequences of a corporation's activities on its stakeholders, which include employees, customers, suppliers, communities, and the environment. It also entails making choices that are consistent with ethical norms, societal expectations, and environmental principles. Everyone involved in running a business, from owners to managers, must recognize the opportunities, and consequences of neglecting CSR (Agan et al., 2018). The collaborative approach of CSR is visible both in the supply chain management, supplier collaboration, and supplier development programs. It could be stated as one of the key foundations, that businesses base their sustainability initiatives on.

2.1.3 Climate change

It is important to consider climate change whenever examining topics related to sustainability. Climate change is often cited as a key reason to increase sustainability, as it is a major global challenge that is already having significant impacts on the planet and its inhabitants. Sustainability is defined as fulfilling current necessities without jeopardizing the capacity of upcoming generations to cater to their requirements. In relation to climate change, increasing sustainability means taking action to reduce greenhouse gas emissions, protect and restore natural systems, and build resilience to the impacts of a changing climate. These actions can help to slow the pace of climate change and minimize its negative consequence.

There are many ways that organizations and individuals can increase sustainability and mitigate the impacts of climate change. Some examples include reducing energy consumption and shifting to cleaner energy sources, conserving natural resources and protecting ecosystems, using environmentally friendly products and materials, promoting sustainable transportation options, and supporting policies and initiatives that address climate change. By taking these and other actions a more sustainable future can be created to be able to withstand the challenges of a changing climate.

One of the main contributors to sustainable development is the United Nations Sustainable Development Goals (SDGs). The 17 international objectives that the United Nations General Assembly endorsed in 2015 are a compilation of goals, which were integrated into the 2030 Agenda for Sustainable Development (United Nations, 2015). The objective of these goals is to eliminate poverty, safeguard the environment, and guarantee that every individual experience tranquillity and wealth. The SDGs are interconnected and address the economic, social, and environmental dimensions of sustainable development (United Nations, 2015). The SDGs are illustrated in Figure 6.

Figure 6. United Nations Sustainable Development Goals (United Nations, 2023).

These goals are intended to serve as a universal call to action to promote the well-being of all people and to ensure that no one is left behind in the pursuit of sustainable development. The SDGs aim to create a world where everyone can live in peace, and prosperity and with the protection of the planet. The SDGs aligned with their respective goal are illustrated in Table 1.

Goal	Goal Description according to SDGs
Goal 1: No Poverty	"End poverty in all its forms everywhere"
Goal 2: Zero Hunger	"Achieve a world free from hunger, ensure accessible nutrition, and encourage the practice of sustainable agriculture"
Goal 3: Good Health and Well-Being	"Promote universal health and wellness, catering to all individuals irrespective of age"
Goal 4: Quality Education	"Guarantee accessible, inclusive, and high-quality education and inspire continuous learning opportunities for everyone"
Goal 5: Gender Equality	"Achieve gender equality".
Goal 6: Clean Water and Sanitation	"Guarantee the availability and sustainable administration of water and sanitation for everyone"
Goal 7: Affordable and Clean Energy	"Ensure everyone's access to affordable, dependable, sustainable, and modern energy sources"
Goal 8: Decent Work and Economic Growth	"Promote sustainable economic growth, full and productive employment, and decent work for all."
Goal 9: Industry, Innovation, and Infrastructure	"Develop resilient infrastructure, promote inclusive sustainable industrialization, and inspire innovation"
Goal 10: Reduce Inequalities	"Mitigate inequality within and between nations"
Goal 11: Sustainable Cities and Communities	"Transform cities and human habitats to be inclusive, safe, resilient, and sustainable"
Goal 12: Responsible Consumption and Production	"Promote sustainable patterns of consumption and production"
Goal 13: Climate Action	"Urgently address the challenges of climate change and its repercussions."
Goal 14: Life Below Water	"Preserve and utilize the oceans, seas, and marine resources sustainably"
Goal 15: Life on Land	"Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, fight against desertification, and cease and reverse land degradation and biodiversity loss"
Goal 16: Peace, Justice, and strong institutions	"Encourage peaceful and inclusive societies, ensure justice for all, and establish efficient, accountable, and inclusive institutions at all levels"
Goal 17: Partnership for the Goals	"Enhance the mechanisms of implementation and rejuvenate the global partnership"

Table 1. SDGs aligned with their respective goal (Adapted from Ikram et al, 2021).

2.2 Sustainable Supply Management

There are several ways to increase sustainability within the field of supply management. Generally, these actions necessitate the suppliers to incorporate improved processes or require the central organization to evaluate and assess sustainability from the early stages of supply management –supplier evaluation. In addition, the selection, assessment, and management of the suppliers which consider the environmental, social, and economic value are all key characteristics of sustainable supply management (Giunipero et al., 2012). Some of the most common sustainability techniques that organizations utilize to achieve sustainable operation are new efficient technology, renewable energy source usage, logistics optimization, reducing waste, using recycled materials, improving human labor, and focusing on ethics. By implementing these practices, businesses can make a significant impact on their operation within the world of sustainability.

Supply management can influence the sustainability of an organization in several ways. First, it can help an organization reduce its environmental impact by sourcing materials and products from suppliers that have strong environmental practices. This may involve choosing suppliers that use environmentally friendly production processes, minimize waste, and reduce their carbon footprint. Second, supply management can help an organization improve the sustainability of its supply chain by identifying and mitigating risks that may impact the availability and quality of materials and products. This may involve working with suppliers to address potential issues such as natural disasters, supply chain disruptions, or changes in regulations. Finally, supply management can help an organization promote sustainability by working with suppliers to develop innovative products and materials that are more sustainable and environmentally friendly. This may involve collaborating on research and development efforts or leveraging the expertise of suppliers to identify and adopt new technologies or practices that can help reduce the organization's environmental impact.

2.2.1 Frameworks, models, and studies

Sustainable supply management can be constructed on a few different characteristics. According to Ageron et al. (2012), there are seven different ”building blocks” for sustainable supply management. Some of the building blocks include, for example, reasons and barriers for SSM, greening supply chains, managerial approaches, and characteristics of suppliers. The building blocks are presented in Figure 7. The interconnectivity and the involvement of these characteristics can be considered sustainable supply management.

Figure 7. Sustainable Supply Management building blocks (Adapted from Ageron et al., 2012).

The research by Zimmer et al. (2015) examines 143 publications made in the Supply Management industry. Similarly to the paper presented by Ageron et al. (2012), Zimmer, et al. (2015) present a framework for Sustainable Supply Management (SSM), however, Zimmer et al. (2015) examine the characteristics as functions within the business. The research indicates that these traits have traditionally been employed for evaluation in both the process of choosing suppliers and the procedure of supervising and evolving suppliers. According to the study, industry, focus of supply chain, SSM process, and sourcing are all contributing to sustainable supply management (Zimmer et al., 2015).

To understand the functionality of the supply-related concepts, Johnson et al. (2021) present a process chart of a supply process. According to Johnson et al. (2021), the supply process from strategic acquisition involves identifying key resources or businesses

that add value to your existing operations. It starts with strategic planning to discern needs, followed by sourcing suppliers that align with your objectives. The process includes negotiations, contract establishment, procurement, and integration of acquired resources or businesses into the current operations (Johnson et al, 2021). Finally, it involves monitoring and evaluating supplier performance to ensure continuous improvement and value maximization (Johnson et al, 2021).

The focus of supply management is limited to specific processes, but by incorporating the principles of sustainable supply management, a comprehensive overview can be drawn that encompasses these processes within the context of sustainability. The process of choosing a supplier generally begins with determining the needs and requirements and extends with the development of the criteria (Zimmer et al., 2015). Following a preliminary review and qualifying stage using the provided supplier information, a thorough examination and selection of the qualified suppliers take place, after which the supplier is continuously monitored and evaluated through a sustainable supplier development process (Zimmer et al., 2015). The illustration of the SSM framework is presented in Figure 8 below.

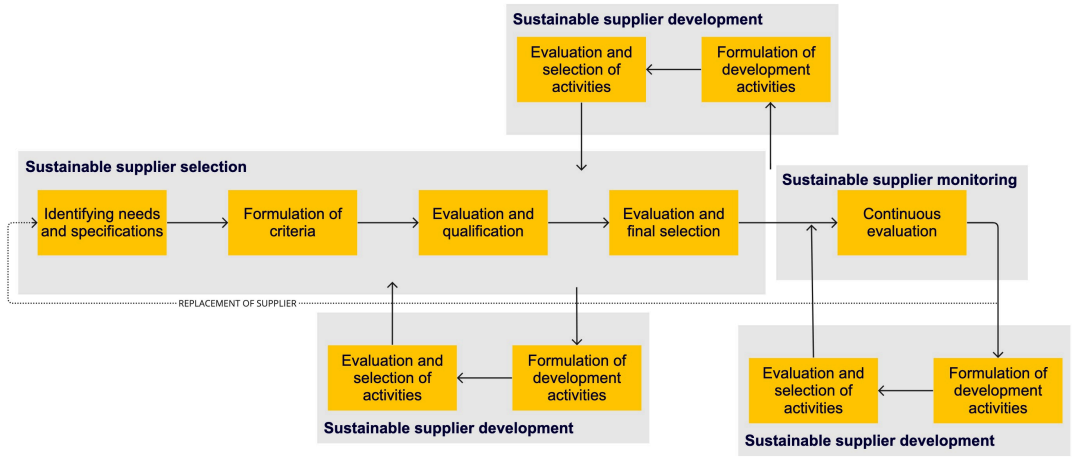

Figure 8. Framework on SSM (Adapted from Zimmer et al., 2015; Originally adopted from Hahn et al., 1990; Krause et al., 1998; de Boer et al., 2001; Wu and Barnes 2011; Igarashi et al., 2013).

Nevertheless, Zimmer et al. (2015) further state, that the content and criteria analysis could be criticized for not taking into account the specific requirements of environmental and social issues as well as the potential impact of climate change. It is crucial to take into account every link in the upstream supply chain. Moreover, it is anticipated that the tiers above the first-tier suppliers would be the source of the majority of the significant social and environmental problems (Zimmer et al., 2015). In addition, the focused topics of SSM literature demonstrate that there is an increased focus on supplier evaluation and final selection, which consequently signifies the importance to conduct research in the other sectors of the SSM (Zimmer et al., 2015).

Likewise, due to sustainability-conscious motives, organizations have been prompted to review their corporate, business, and functional strategies (Ageron et al., 2012). It is further stated by Ageron et al. (2012), that more emphasis has been put on virtual enterprises, supply chain management, and global markets. Nevertheless, sustainability in supply management is still essential for competitive enterprises. The paper by Ageron et al. (2012) presents a questionnaire, which is based on a series of interviews that aim to examine the current suppositions and practices within the world of supply chain management. It can be stated, that the majority of the respondents were from the supply chain or purchasing background. The respondents are necessary to state to effectively interpret the article results, which is further analyzed in the subsequent section of this chapter.

Most of the businesses, that took part in the questionnaire, were from the manufacturing industry (Ageron et al., 2012). Hence, the nature of the respondents illustrates the situation within the world of the manufacturing industry and supply chain accurately. This study underscores the findings of government regulations, the specific industry landscape, and the inherent characteristics of a business all conspire to shape and sometimes constrain a company's decision-making process when it comes to implementing SSM (Ageron et al., 2012).

Furthermore, businesses often choose their suppliers based on certain criteria. According to the questionnaire, the most important criteria are quality, price, reliability, service rate, and delivery (Ageron et al., 2012). Ageron et al. (2012) further explain that environmental issues are valued approximately as high as economic dependency, personal relationships, and geographic proximity. These findings can be linked with the current beliefs within the world of supply management, however, the increased global awareness to act sustainable has only increased the value that sustainable operation has amongst other supplier selection criteria. The selection criteria are illustrated in Table 2. Consequently, Johnson et al. (2021) state that businesses might harm the sustainability of the process by prioritizing strong economic capital expenditures. They continue, that this is a common issue in the weak economy (Johnson et al., 2021).

Supplier selection criteria	Mean	STD
Quality	2.30	1.857
Price	2.62	2.317
Reliability	4.09	3.113
Service	5.01	3.452
Delivery	5.23	3.003
Flexibility	7.09	3.511
Size	7.32	3.961
Certification	8.14	4.508
Confidence	8.68	4.448
Associated services	8.71	4.941
Long Term Relationships	9.09	4.123
Geographic proximity	9.32	5.203
Environmental issues	9.70	4.767
Economic dependency	10.05	5.150
Personal relationships	10.82	6.938
IT and IS	10.21	4.280
Social responsibility	10.62	5.636

Table 2. Selection criteria (Ageron et al., 2012).

In alignment with the suppositions and previous studies, a study performed by Sugandini et al. (2020) reveals that small and medium enterprises have adopted green supply

management practices through the selection of environmentally conscious suppliers, environmental audits of suppliers' partners, and the use of suppliers that provide raw materials that are environmentally healthy.

One of the most important features of supply management is sourcing. Sustainable sourcing enables corporations to transform their supply management into greener operations since the responsibility is shared between all market players. In short – the sustainability of the suppliers correlates with the sustainability of the central organization. Akhavan & Beckmann (2017) study sustainable sourcing and supply management strategies in their research, and they aim to identify typical sustainability practices, that corporations tend to employ when utilizing these strategies in their operation. The study demonstrates, that there is no one optimum method to do sustainable sourcing and supply management (Akhavan & Beckmann, 2017). They further state that corporate environments, stakeholder or institutional pressure, resources, and capabilities all play a role in sustainable sourcing and supply management operations. Hence, the strategies should be designed for a specific set of corporate framework (Akhavan & Beckmann, 2017).

2.2.2 Barriers to Sustainable Supply Management

Businesses prioritize sustainability but often overlook factors that impact sustainable practices (Giunipero et al., 2012). Giunipero et al. (2012) further state, that purchasing, and supply management sustainability efforts are now driven by top management initiatives and governmental mandates, whereas investments in sustainability and economic instability constitute a barrier to these programs. Moreover, the economic dimension is controlling SSM initiatives heavily, and the SSM requires government compliance and economic reliability & value to achieve its full potential (Giunipero et al., 2012).

Likewise, the study done by Ageron et al. (2012) examines the barriers to sustainable supply management. The questionnaire shows, that financial costs, green investments,

and return on investment were the most highly agreed characteristics that could affect the growth and utilization of the SSM (Ageron et al., 2012). Interestingly, top management commitment, location, and previous experience are all features that were least likely to be the barriers to sustainable supply management (Ageron et al., 2012). Similarly, Giunipero et al. (2012), and Walker et al. (2008) find, that investments and costs are the biggest barriers to SSM. The barriers to SSM are presented in Table 3.

Barriers to Sustainable Supply Management		
(Ageron et al., 2012)	(Giunipero et al., 2012)	(Walker et al., 2008)
Financial costs	Investments	Costs
Green investments	Economic uncertainty	Cost concern hinders
Return on investment	Short vs long-term goals	Lack of understanding of how to incorporate green into buying
Supplier's facilities	Lack of regulations	Focus on cost reductions at expense of green practices
Suppliers' human skills	Lack of standards	Lack of management commitment
Green induced changes	Additional burden to suppliers	Lack of buyer awareness
Product price	Little top management support	Lack of training and commitment
Supplier's top management commitment	Suppliers lack resources	Accounting methods limit green reporting
Suppliers' firm culture	External awareness	Costs especially for SMEs
Product characteristics	Policy change difficulties	Pressure for lower prices
Focal company's facilities		Lack of legitimacy
Supply chain configuration		PR exercise as greenwash
Suppliers' firm size		Regulation
Company human skills		Inhibits innovation
Supplier's location		Poor supplier commitment
Previous sustainability experiences		Unwilling to exchange information
Top management commitment		Industry specific barriers

Table 3. Barriers to sustainable supply management (Adapted from Ageron et al., 2012; Giunipero et al., 2012; Walker et al., 2008).

2.2.3 Competencies within Supply Management

An important feature of the supply management and purchasing process is to identify the current and future competencies in the business. Bals et al. (2019) examine the aforementioned requirements, and they perform qualitative research based on 46 interviews with 16 different companies. They explain, that the current most important competencies required by purchasing and supply management (PSM) professionals are negotiation, communication, relationship management, strategy, and analytics (Bals et al., 2019). Similarly, Johnson et al.(2021) propose, that effective supply management requires strong coordination and communication within an organization, as well as with external suppliers. Other key elements of effective supply management include risk management, quality control, and sustainability (Johnson et al., 2021).

Similarly, a study by (Bals et al., 2019) concludes that in the future, digital transformation, sustainability, analytics, and innovative sourcing will be increasingly vital competencies to establish a competitive supply management process (Bals et al., 2019). According to Delte et al. (2021), several future supply management competencies are crucial for success in the business. They agree that skills related to data analytics, digital contract management and legal knowledge, digital leadership, digital negotiation, and digital partnership management are essential for the future of supply management (Delke et al., 2021). These competencies are expected to become increasingly important as technology continues to advance and play a more significant role in business operations. By developing and enhancing these competencies, supply management professionals can stay competitive and ensure that their organizations are well-equipped to succeed in the future. The future competencies are illustrated in Table 4.

Future competencies by Bals et al. (2019)	Future competencies Delke et al. (2021)
Analytical skills	Data Analytics skills
Automation	Digital Contract Management and Legal skills
Big Data Analytics	Digital Leadership skills
Computer Literacy	Digital Negotiation skills
eProcurement Technology	Digital Partnership Management skills
Holistic Supply Chain Thinking	E-Procurement Technology skills
Process Optimization	Robotic Process Automation (RPA) skills
Strategic Sourcing	Strategic Management skills
Strategic Thinking	Supply Network Management skills
Sustainability	

Table 4. Future competencies (Adapted from Bals et al. 2019; Delke et al. 2021).

D'Eusanio et al. (2019) suggest that in addition to the competencies mentioned earlier, organizations should also be aware of the various tools and methods available to help them achieve their goals. These may include software and technology solutions, such as supply chain management software, data analytics tools, and contract management platforms. They may also include methodologies and frameworks, such as agile project management, lean methodology, and Six Sigma. By leveraging these tools and methods, organizations can optimize their supply management processes, improve efficiency, and enhance their overall performance. It is important for organizations to stay up-to-date with the latest advancements in technology and methodology to remain competitive and achieve success in the ever-evolving business landscape.

2.3 Sustainable Supplier Development

Suppliers are important partners in achieving sustainability in supply management. They can help focal businesses to minimize the environmental effect by providing products that are produced sustainably. By encouraging suppliers to improve their production processes with new technology, increase efficiency through recycling and reuse, and reduce

waste, they can make a significant impact on their operations and the environment. Consequently, Supplier Development is an crucial part of the Supply Management process.

2.3.1 Foundations for Sustainable Supplier Development

As described earlier in Chapter 2.2, Corporate Social Responsibility presents a collaborative approach to achieving sustainability through its framework. Moreover, CSR can be utilized in a way that enables the focal business to apply Supplier Development programs to increase the performance of the suppliers.

Understanding the opportunities of the supplier relationship is an important part of the activities between the focal organization and the supplier. Consequently, Supplier Relationship Management involves establishing long-term, mutually beneficial relationships with suppliers and creating a collaborative environment where both parties work towards common goals. The enduring sustainability of the whole supply chain and the final product relies on the sustainability practices upheld by each stakeholder involved in the chain (Kumar & Rahman, 2015). It is further stated in the research by Kumar and Rahman (2015) that enhancing sustainability within the supply chain requires the buyer and supplier to work together to establish a sustainable partnership. This is a comparable and parallel motive with supplier development programs, and it is noteworthy to mention, that studies within CSR, SRM, and Supplier Development programs all contribute to the common cause of collaborating with the customer/buyer. The model of the Buyer-Supplier Relationship in connection to different dimensions of sustainability, which is modeled by Kumar and Rahman (2015), is presented in Figure 9.

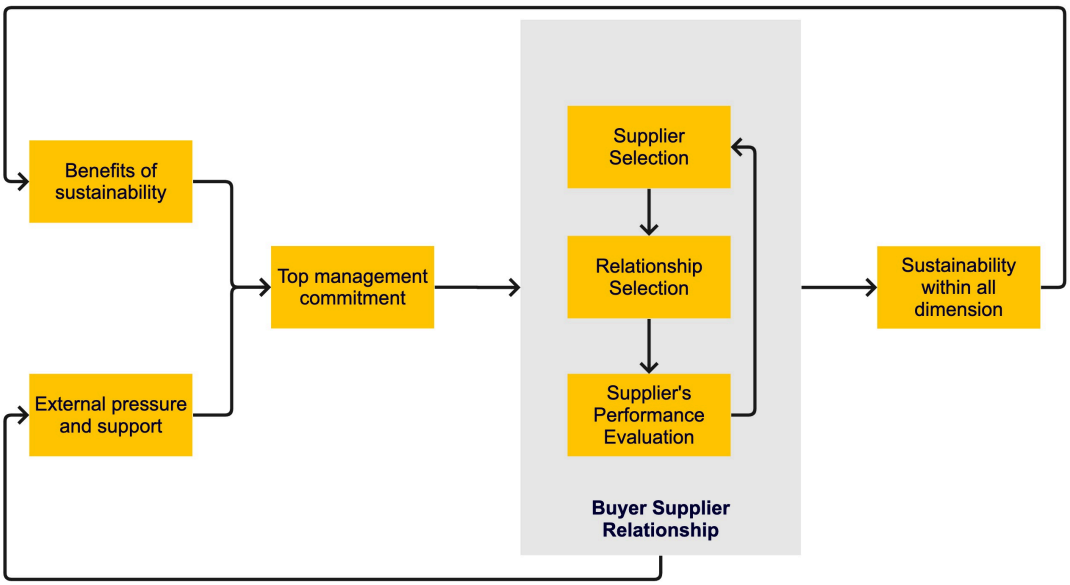

Figure 9. Buyer-Supplier Relationship model (Adapted from Kumar & Rahman, 2015)

Moreover, Supplier Development is the process of collaborating with current or potential suppliers to improve their performance and capabilities. By definition, Watts and Hahn (1993) state that it is a long-term cooperative effort between the focal organization and the supplier to improve the operation and skills of the supplier. This may involve providing training and resources to help suppliers improve their quality, efficiency, and sustainability. As anticipated, Bai & Sarkis (2010) highlight the fact that supplier development is a critical component within sustainable supply chain management in their study concerning different sustainable supplier development theories.

The concept of supplier development itself is complex and involves various aspects such as supplier evaluation, incentives, and direct involvement (Agan et al., 2018). The optimal approach may vary depending on the circumstances and resources available, nonetheless, supplier development remains an important factor for achieving sustainability in supply chain management (Agan et al., 2018).

2.3.2 Frameworks, models, and studies

Early studies on supplier development have classified it into four main categories: competitive pressure, evaluation and certification, incentives, and direct involvement (Krause et al., 2000). These categories represent different approaches that organizations can take to develop their suppliers and improve their overall supply chain performance. Competitive pressure refers to the use of market pressures and competition to encourage suppliers to improve their processes and sustainability practices. Evaluation and certification involve assessing suppliers' performance and providing them with certification or recognition for meeting specific standards. Incentives refer to the use of rewards or benefits to motivate suppliers to improve their performance, while direct involvement involves working closely with suppliers to provide training, support, and guidance to enhance their capabilities and sustainability practices. These categories provide a framework for organizations to develop a comprehensive supplier development strategy that aligns with their goals and resources.

According to Liu et al. (2017), supplier development is necessary for multi-stakeholder cooperation in managing the supply chain. They further explain, that it is necessary to develop a study, that establishes a conceptual framework for supplier development practices. Likewise, based on the 63 interviews they conduct, three groups of contributors are defined in the research (Liu et al., 2017). The drivers, facilitators, and inspectors are all contributors, that should be examined upon establishing sustainable supplier development since these characteristics accommodate suppliers and purchasing organizations to design, implement, and evaluate sustainable supplier development (Liu et al., 2017).

Furthermore, Liu et al. (2017) present a conceptual cycle for sustainable supplier development. In this model, the prevailing strategies are competitive pressure (CP), incentives (IC), evaluation and assessment (EA), management involvement (MI), and lastly KT (knowledge transfer). Moreover, the model Liu et al. (2017) utilize in this research is adapted from previous concepts of Hahn et al. (1990), Giannakis (2008), and

Dou et al. (2015). The model presents a continuous development cycle by presenting designing, recruiting & engaging, implementation, and conclusions as individual phases of the progression. This model is presented in Figure 10.

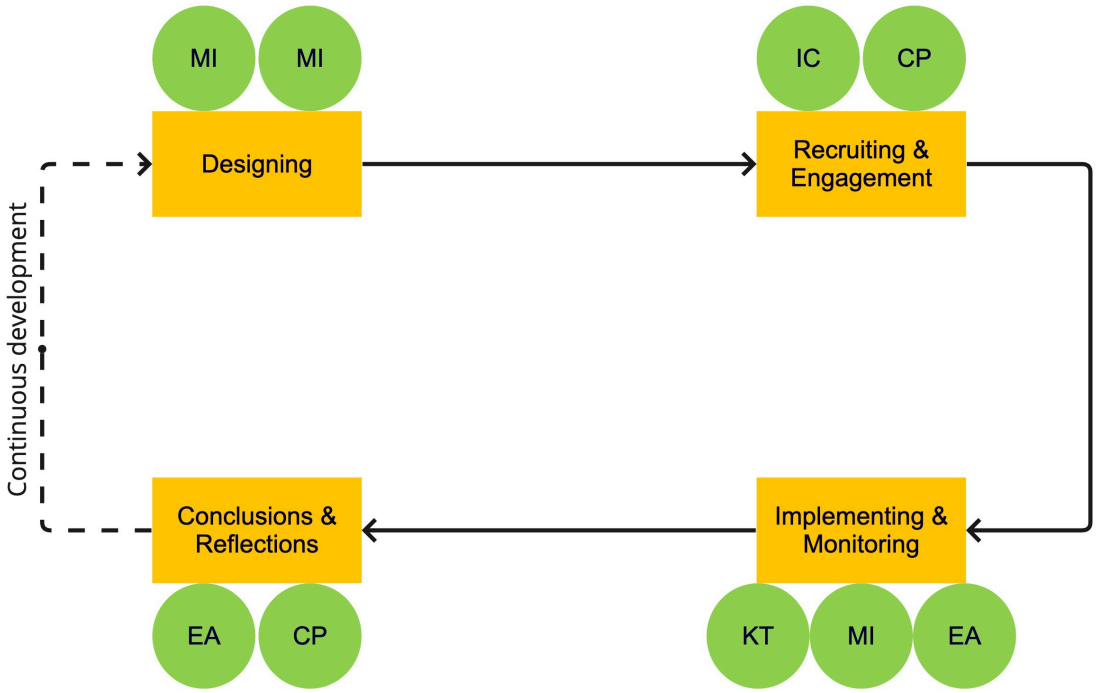

Figure 10. A conceptual cycle of supplier development (Adapted from Liu et al., 2017).

Since sustainability is an emerging industry in the global manufacturing business, there has been an increasing amount of research within the field of sustainability (Zimmer et al., 2015). Moreover, a sudden need for research on a global scale implies that there is an increasing amount of research gaps in the academic literature. However, it is further described, that businesses do not want their supply networks to become more environmentally conscious at the expense of their decreasing financial performance (e.g. poorer delivery, quality, and costs) (Bai & Sarkis, 2010). They further state, that there is a considerable synergistic interaction between organizational characteristics, green management, and organizational practices, or knowledge transfer and communication, for the high environmental performance (Bai & Sarkis, 2010).

Some sustainable supplier development practices may have an effect on their business performance as well (Bai & Sarkis, 2010). According to Bai & Sarkis (2010) green supplier development programs, if found not to be contributing to environmental or economic performance, can be restructured to enhance their effectiveness. This suggests that, despite the focus being on improving sustainability, there may be a positive impact on the business.

Relatedly, Akman (2015) concludes in his research that supplier development programs should involve low- and medium-performing suppliers to help them improve their performance. Sustainability should be a secondary objective, since the low performance of the supplier could affect the relationship between the central organization, excluding further cooperation (Akman, 2015). Medium to high-performance suppliers should be included in supplier development, and the objective should be to increase their rank to preferred suppliers so that the central organization can choose to build a long-term relationship (Akman, 2015).

M. Lo et al. (2018) study how upstream Green Supply Chain Integration (GSCI) is influenced by top management support and relational governance through supplier development. The data and conclusions of the study have been gathered from an international survey focused on high-performance manufacturing (M. Lo et al., 2018). The findings demonstrate that relational governance and upstream GSCI are only slightly influenced by supplier development, while top management support and upstream GSCI are completely influenced by supplier development (M. Lo et al., 2018).

Ultimately, several studies underscore the notion that assessing suppliers can significantly improve the environmental practices of the focal organization (Agan et al., 2018). This process is achieved by fostering cooperative relationships with suppliers, which subsequently leads to a constructive influence on environmental sustainability (Agan et al., 2018). In addition, Blome et al. (2014) indicate that there is a positive

relationship between green supplier development and supplier performance. This ultimately leads to more innovations, declined lead time, improvements to quality, and better awareness.

2.4 Implementation of sustainable practices to business operations

Implementation strategies are essential for successfully integrating sustainability into an industrial process. A systematic approach is required to manage the risks and opportunities involved in sustainability, and provide value for customers. There are a few characteristics that need to be examined when integrating sustainability into a process. Contextual factors, stakeholder engagement, performance metrics, integration with business strategy, and continuous improvement are all crucial features in the implementation of sustainable practices. In addition, governance mechanisms, and enforcing codes of conduct and ethical standards can help ensure that the company and its employees are following sustainable practices.

Due to the emerging interest in social and sustainable manners, has governing entities such as the EU started to address the questions of sustainability within its legislation. On In February 2022, the European Commission introduced a directive proposal centered around corporate sustainability due diligence (Mak, 2022). Mak (2022) further summarizes that the directive addresses green transition, and protects human rights in Europe and beyond. Corporate Sustainability Due Diligence (CSDD) would affect corporate behavior, and it would be visible throughout the global value chains (European Commission, 2022). This directive would primarily affect large organizations, with a turnover of 150 million euros or more, and secondly, medium-sized organizations with 40 million euros turnovers or more (European Commission, 2022). However, this wouldn’t affect medium-sized organizations instantly, but after two years the regulations had been set on large organizations (European Commission, 2022). CSDD has the potential to affect greatly the sustainability of global value chains, and it is required to take the directive into account when examining the future prospects of global businesses.

As described earlier, Corporate Social Responsibility (CSR) is a framework for integrating successful practices into business operations (Agan et al., 2018). CSR is compatible with sustainability initiatives, thus it can be reviewed as an influential tool to manage the sustainability of an organization. Another framework in the evaluation of sustainability is the environmental, social, and governance (ESG) principle. According to Li et al. (2021), the ESG principle, which has been developed since its creation in 2004, stems from responsible investment. They further explain that ESG is a strategic practice to incorporate sustainable environmental, social, and governance factors into the business of the focal organization (Li et al., 2021). Furthermore, it is used by evaluating the sustainable development of enterprises (Li et al., 2021). The ESG principle in its dimensions, factors, and definitions are illustrated in Table 5. By considering these factors, organizations are able to understand and manage the impact on the environment, society, and economy. Overall, ESG factors help in the promotion of sustainable business practices.

Dimension	**Factors**
Environmental (E)	GHG emissions
	Energy consumption and efficiency
	Air pollutants
	Water usage and recycling
	Waste production and management (water, solid, hazardous))
	Impact and dependence on biodiversity
	Impact and dependence on ecosystems
	Innovation in environmentally friendly products and services

Social (S)	Workforce freedom of association
	Child labor
	Forced and compulsory labor
	Workplace health and safety
	Customer health and safety
	Discrimination, diversity, and equal
	Opportunity
	Poverty and community impact
	Supply chain management
	Training and education
	Customer privacy
	Community impacts
Governance (G)	Codes of conduct and business principles
	Accountability
	Transparency and disclosure
	Executive pay
	Board diversity and structure
	Bribery and corruption
	Stakeholder engagement
	Shareholder rights

Table 5. ESG Principle (Adapted from Li et al., 2021).

On an individual characteristic importance, one of the most important characteristics of utilizing environmentally friendly operations is the timeframe. Wang & Chan (2013) study the hierarchical fuzzy TOPSIS approach to assess different improvement areas within supply chain management. Their objective is to measure the different green initiatives within SCM while establishing the timescale, which the variable ought to be completed within. They find that using green raw materials in six months has the highest relative closeness index and is thus the time frame that should be suggested among the three alternatives (Wang & Chan, 2013). Wang and Chan (2013) suggest that supply chain constraints prevent the successful implementation of green raw materials, but adopting such materials can enhance a company's brand reputation and environmental performance. They further explain that manufacturing operations currently support the standard way of manufacturing, so green initiatives should be implemented within six months to strike a balance between time and capacity (Wang & Chan, 2013).

2.4.1 Management standards for sustainability

Management standards play a crucial role in achieving sustainability. Standards provide guidelines and frameworks for organizations to manage their environmental, social, and economic impacts. With the utilization of management standards, organizations are able to identify and prioritize sustainability risks and opportunities, set targets, and implement strategies to achieve them. In addition, standards establish a common collaboration framework for organizations to cooperate with.

Qi et al. (2013) examine the effect of ISO and OHSAS certifications on corporate decisions. By utilizing a survey that involved 1268 industrial enterprises in China they were able to analyze the corporate decision differences between different management standards (Qi et al., 2013). They find that the effect of environmental and social management practices is not significant in ISO 9001 and OHSAS certifications, but ISO 14001 shows a substantial influence on the dimensions of sustainability (Qi et al., 2013). In addition, their findings demonstrate that investment can enhance the environmental performance of a developing country (Qi et al., 2013).

Likewise to the previous study, Ikram et al. (2021) study the contribution of certification bodies with regard to sustainability and SDGs. Based on the SDGs presented by the UN (United Nations, 2015), they present the alignment with the correlating management standard to help achieve each goal (Ikram et al., 2021). The sustainability goals with regard to the standards are presented in the adapted Table 6. These standards provide understanding in using standards and certifications as guidelines when assessing supplier sustainability on a focal company's supply chain. Many organizations, such as the case company, use standards to evaluate their suppliers in the supplier assessment process.

Goal	Corresponding Standards
Goal 1: No Poverty	ISO 20400, ISO 37001, GRI 207
Goal 2: Zero Hunger	ISO 22000 family, ISO 26000, ISO 20400, ISO 34101 series, GRI 411
Goal 3: Good Health and Well-Being	ISO 11137 series, ISO 7153, ISO 37101, GRI 403
Goal 4: Quality Education	ISO 21001, ISO 29993, GRI 404
Goal 5: Gender Equality	ISO 26000, SA8000, GRI 404
Goal 6: Clean Water and Sanitation	ISO 24518, ISO 24521, ISO 30500, GRI 303
Goal 7: Affordable and Clean Energy	ISO 50001, EU Ecolabel, GRI 302
Goal 8: Decent Work and Economic Growth	ISO 45001, SA8000, GRI 201
Goal 9: Industry, Innovation, and Infrastructure	ISO 56002, ISO 44001, GRI 203
Goal 10: Reduce Inequalities	ISO 26000, SA8000, SMETA, GRI 405
Goal 11: Sustainable Cities and Communities	ISO 37101, GRI 203
Goal 12: Responsible Consumption and Production	ISO 20400, ISO 15392, ISO 20245, GRI 302
Goal 13: Climate Action	ISO 14001, EMAS, EU Ecolabel, GRI 302
Goal 14: Life Below Water	ISO/TC 234, ISO/TC 8, GRI 305
Goal 15: Life on Land	ISO 14055, ISO 14001, EMAS, EU Ecolabel, ISO 38200, GRI 306
Goal 16: Peace, Justice, and strong institutions	ISO 19600, ISO/DIS 37000, ISO/TC 309, GRI 403
Goal 17: Partnership for the Goals	GRI 207, ISO

Table 6. Sustainability standards in alignment with SDGs (Adapted from Ikram et al, 2021).

2.4.2 Sustainability performance measurement

Organizations must have the ability to evaluate and enhance their sustainability practices. It is crucial for companies to recognize the impact their operations have on sustainability, therefore, sustainability performance measurement is an essential component of sustainable deployment. Accordingly, Akman (2015) attempts to assess each supplier's green and environmental performance. Moreover, the performance standards and criteria for evaluating green suppliers were largely created through a survey (Akman, 2015). Johnson et al. (2021) state, that effective supply management involves using data and

analytics to track and forecast demand, as well as to evaluate and optimize the performance of suppliers. Other key elements of supply management include risk management, quality control, and sustainability.

2.4.3 Rating systems, evaluation, and selection

The Life Cycle Assessment (LCA) is a tool that evaluates the sustainability performance of a supply chain (Heijungs et al., 2010). It does this by measuring the environmental footprint of every stage in a product's life cycle, which encompasses the extraction of raw materials, manufacturing, transportation, utilization, and eventual disposal (Heijungs et al., 2010). Heijungs et al. (2010) further explain that the evaluation considers issues such as energy usage, emissions, waste generation, and resource depletion. Companies can identify supply chain hotspots and adopt solutions to mitigate the environmental impact by adopting an LCA. The description of LCA methodology is based on ISO 14040, and the four analytical steps of LCA consist of defining the goal, creating the inventory, assessing the impact, and interpreting the results (ISO, 2006). In conclusion, LCA provides the focal organizations to assess and evaluate the suppliers through an ISO-collaborative process.

As described earlier, environmental management systems, standards, and certifications enable businesses to assure and help their business operations to achieve sustainability (Ikram et al., 2021). They provide a common framework for organizations to measure and improve their sustainability performance. Examples of these are, for example, ISO 14001, and SA8000. Hence, their contribution to supplier evaluation and selection is evident. In addition, organizations may use ESG principles to evaluate and select suppliers through a similar process flow. By increasing attention to ESG factors, organizations are able to affect the behavior and future financial performance of the organization (Li et al., 2021).

Similar to ESG, Dow Jones Sustainability Indices (DJSI) provide a framework for measuring the sustainability performance of companies. Moreover, according to López et al. (2007), the DJSI index uses issues that are relevant to measuring CSR. DJSI is widely used in the financial markets to index the sustainability configuration into investment portfolios, and it has been developed by organizations with recognized prestige (López et al., 2007). The DJSI methodology systematically covers company assessment, industry comparison, and index selection in order to identify organizations that demonstrate leadership in sustainability.

Lastly, an important characteristic of a sustainability performance measurement process is sustainability reporting. It involves disclosing information about an organization's sustainability performance to stakeholders. Reporting frameworks, such as the GRI, provide guidance on what information to include in sustainability reports (Orazalin & Mahmood, 2019).

2.4.4 Key performance indicators

Bai & Sarkis continue their research in the field of sustainable supplier development by researching sustainable supplier key performance indicators. Generally, key performance indicators (KPIs) are metrics used to measure and evaluate the performance of an organization or process. In the context of supplier development, KPIs can be used to assess the sustainability of supplier relationships and the impact of supplier development activities on the organization's overall sustainability performance. Bai and Sarkis (2014) state, that the creation and use of performance measurements are necessary for supply chain management assessment and monitoring. In agreement with Bai and Sarkis (2014), Manning (2013), it might be necessary to create KPIs to produce a meaningful impact on corporate environmental responsibility and operation.

Bai and Sarkis (2014) further describe that sustainability performance can be easily assessed and compared by using KPIs. They can achieve these results from a two-staged

approach that uses the neighborhood rough set theory, and data envelopment analysis (Bai & Sarkis, 2014). The proposed two-stage method enables the model to minimize the amount of data needed to make accurate results (Bai & Sarkis, 2014). Moreover, Bai and Sarkis (2014) describe that the less extensive method is important to organizations that potentially have hundreds or thousands of suppliers.

In conclusion, the KPIs that may be relevant to the sustainability of supplier development include greenhouse gas emissions, waste reduction, energy consumption, water consumption, and sustainability certifications. Finally, using KPIs to track and evaluate the sustainability of supplier development can help organizations identify areas for improvement, set goals and targets, and monitor progress toward more sustainable supplier relationships.

2.5 Summary

The literature review explores various aspects related to the research gap between supplier development, sourcing, and sustainability. It begins by providing the scope, definitions, and background of sustainable operations, including fundamental principles and the impact of climate change. The review then delves into sustainable supply management, discussing frameworks, models, studies, barriers, and competencies within supply management. Next, it explores sustainable supplier development, covering its foundations and examining frameworks, models, and studies. The review further investigates the implementation of sustainable practices in business operations, focusing on management standards, sustainability performance measurement, rating systems, evaluation, selection, and key performance indicators.

To bridge the research gap, several relevant literature works are identified. These include influential theories such as the Three Pillars of Sustainability (Purvis et al., 2019), the Value Chain Model (Porter, 1985), and the Sustainable Development Goals (United Nations, 2015). Additionally, various models and frameworks are highlighted, such as the

Sustainable Supply Management Model (Ageron et al., 2012), Framework for Sustainable Supply Management (Zimmer et al., 2015), Competencies for Supply Management (Bals et al., 2019;Delke et al., 2021), Buyer-Supplier Relationship Model (Kumar & Rahman, 2015), Conceptual Cycle of Supplier Development (Liu et al., 2017), ESG Principle (Li et al., 2021), and Standards Influencing Sustainability (Ikram et al., 2021). These identified works directly contribute to bridging the research gap and provide valuable insights into the integration and interdependencies among supplier development, sourcing, and sustainability.

3 Methodology

The objective of this section in the thesis is to provide an overview of the research methodology and outline the research design. This chapter outlines the approach and techniques that the thesis utilizes to collect and analyze the data, thereby ensuring that the research objectives are met. Moreover, this chapter of the thesis provides a detailed and clear description of the research approach, which includes the research design, methods of data collection, sampling strategies, and data analysis. The aim is to ensure that the research methodology is both comprehensive and transparent, allowing readers to understand how the research was conducted, and how the findings were generated.

3.1 Research design

The goal of the study is to gain insights into the sustainability practices of the suppliers and provide guidance to the case company to enhance the sustainability of its suppliers. Considering that sustainability is not currently integrated into the supply management process of the case company, the research methodology adopted for this study involves using an exploratory case study approach by conducting semi-structured interviews. A case study is a research method that examines a current phenomenon in its actual context through empirical investigation (Yin, 2009). Generally, semi-structured interviews can be defined as social research that intends to examine how individuals interpret and understand their thoughts and experiences (Savin-Baden & Major, 2013). This approach was chosen to provide an open and comprehensive assessment of the various perspectives and approaches employed by suppliers to promote sustainability.

The interviews are conducted using a standardized interview guide that covers the main topics of interest, such as the suppliers' perceptions of sustainability, and their current practices and initiatives. In addition, the interview questions were developed collaboratively with the managers of the case company, to ensure that all pertinent topics were covered in the interviews. To understand the problems of the interviewees, the

qualitative researcher needs to comprehend the viewpoint of the research participants regarding the issue and form a conclusion by merging their perspectives (Hennink, Hutter, & Bailey, 2020).

Consequently, this thesis proposes the case company use the findings of this study to implement a sustainability framework that guides its suppliers toward more sustainable practices. This is done through the content analysis of all relevant documents provided by the case company. This approach involves examining the content of documents such as reports, process flow charts, and other materials to identify patterns, themes, and common practices. The purpose of the content analysis is to gain insights and understanding of the company's practices, processes, and policies. Furthermore, the research aims to identify the barriers and challenges that suppliers face in implementing sustainable practices and propose strategies to overcome these obstacles.

3.2 Data collection

Since the chosen research approach was a case study that utilized semi-structured interviews, it was necessary to select the population of participants who would be interviewed. Utilizing multiple sources of information is desired when implementing a case study (Yin, 2009). The thesis employed purposive sampling as a sampling strategy to select the most appropriate and high-quality suppliers that reflect the case company's use of suppliers. This included involving strategic purchasers in the decision-making process to select “preferred suppliers” from the case company's supplier base. Moreover, strategic purchasers have a comprehensive understanding of the organization's supply chain requirements and can identify suppliers that can meet those needs efficiently and effectively. Eight suppliers associated with the case company were included in this study, as it was decided that 8-12 suppliers should be included to cover the principle of data saturation. These suppliers were decided from a population of 150 suppliers, which consist of “preferred suppliers”. Lastly, practical considerations of time, resources, and the accessibility of suppliers also played a crucial role in determining the sample size.

The semi-structured interviews were conducted through Microsoft Teams meetings, which allowed for remote data collection to suppliers located in different places. Prior to the interviews, participants were provided with the specification of the interviews, informed about their anonymity, and given the opportunity to ask any questions they had about the study. The semi-structured interviews were conducted using an interview guide as a framework for the conversation. The interview guide, which is disclosed in Appendix 1, contained a set of open-ended questions that were designed to explore the research questions and topics of interest, which provided some structure to the interviews while still allowing for flexibility and the opportunity for participants to elaborate on their responses. Furthermore, the interview questions were organized into categories that corresponded to the relevant topics of interest.

All interviews were audio-recorded with the participant's consent and transcribed by the researcher. The transcriptions were created by converting the spoken sentences to text while excluding unnecessary pauses, and filler expressions. The use of audio recording and transcription allowed for a more thorough and accurate analysis of the data, as it provided a written record of the interviews to review and analyze in detail. Table 7 displays a record of the interview information, including the duration of the interviews, the supplier's turnover rate, and the number of employees.

Supplier	Interview length	Turnover of the supplier	Employees
Supplier 1	29min 2sec	2-10 million €	50-99
Supplier 2	35min 52sec	100 million €	270
Supplier 3	49min 3sec	16 million €	50-99
Supplier 4	30min 4sec	2-10 million €	50-99
Supplier 5	26min 35sec	20 million €	50-99
Supplier 6	24min 14sec	20 million €	50-99
Supplier 7	28min 43sec	50 million €	50-99
Supplier 8	51min 27sec	2-10 million €	1-50

Table 7. Interviewed suppliers.

Table 8 presents the techniques used for collecting research data along with their corresponding data analysis methods. The table shows a variety of methods that have been employed to gather information, ranging from interviews to case company documentation to establish the case study. The table serves as a comprehensive guide for the data collection and analysis methods for the study, based on their research objectives and data types.

Data collection	**Data format**	**Analysis**	**Note**
Literature review	Qualitative	Content analysis	Theory on sustainable supply management; Sourcing and Supplier Development
Semi-structured interviews	Qualitative	Thematic analysis	Interviews from the globally operating suppliers of the case company
Data provided by the case company	Qualitative	Content analysis	Reports, documents, and process-flow charts that outline the common processes of the case company

Table 8. Data collection methods with their respective analysis methods.

3.3 Data analysis

The data analysis of the thesis primarily uses thematic analysis, which involves identifying patterns and themes in the data. However, some of the themes were pre-determined by incorporating the emerging concepts and themes from the literature review into the analysis process. This approach allows for a more focused analysis of the data and ensures that the research questions and objectives are addressed. By incorporating

relevant themes from the literature review, the analysis process becomes more systematic and helps to establish connections between the data and existing theories or concepts in the field. Overall, this approach combines both inductive and deductive reasoning in the data analysis process.

3.4 Data validity and reliability

To ensure the validity of the data collected in this master's thesis, a comprehensive approach was adopted. A case study design was chosen to provide an in-depth understanding of the research phenomenon. Semi-structured interviews were conducted using a carefully designed interview guide that addressed the research questions and captured relevant information. The selection of participants was based on their expertise and relevance to the case study context, ensuring that the data collected were from knowledgeable sources. Throughout the interview process, ethical considerations were prioritized, including obtaining informed consent and maintaining participant confidentiality. These measures enhance the validity of the data by ensuring that it accurately reflects the perspectives and experiences of the participants. Furthermore, the use of Microsoft Teams for the interviews provided a convenient and reliable platform for data collection, enabling effective communication and interaction between the researcher and participants.

The reliability of the data collected in this master's thesis was endorsed through consistent procedures. The interviews were conducted following a semi-structured format, ensuring a standardized approach across all participants. The use of a interview guide, developed in collaboration with the case company managers, facilitated consistency in the data collection process, as it provided a framework for the discussion while allowing flexibility for participants to express their unique perspectives. To maintain reliability, all interviews were recorded and transcribed accurately, minimizing the risk of information loss or misinterpretation. The transparency of the data collection procedures allows for the reproducibility of the study, as other researchers can potentially replicate the process and obtain similar findings. By maintaining these practices, the reliability of the data

obtained from the case study interviews is established, enhancing the credibility of the analysis and research findings.

3.5 Conceptual framework

To create a plan for improving supplier sustainability, it is essential to construct a framework that outlines the variables in the field of study. A conceptual framework is a useful instrument that guides the research process by establishing a framework to define essential concepts and variables and conceptualizing the connections between them.

The problem in this study is to understand the sustainability of the suppliers through sustainable supply management practices, and how the focal organization may affect the sustainability of its suppliers. The problem can be divided into two different variables: Sustainable sourcing, and sustainable supplier development. By identifying the key concepts related to the subject, we find that the size, the industry, and the geographic location of the supplier all contribute towards the sourcing or supplier development strategy required to affect the focal organization’s sustainability. The sustainability of suppliers cannot be pursued without taking into account the supplier's financial stability, environmental policies, and social policies. These factors may have an impact on the outcome of sustainability initiatives, even if the focal organization has little or no control over them.

In addition, categorizing interview questions based on similar topics can help to make the interconnectivity between questions clearer and easier to interpret. When questions are grouped by theme, it becomes easier to see how they relate to one another, and how they collectively address the topic being investigated. This can be particularly helpful during the analysis phase of the research, as it can facilitate the identification of patterns and themes in the data. Hence, as visible in Appendix 1, the interview question has been categorized into three different topics.

The first category of interview questions focuses on knowledge and strategies. The purpose of this category is to evaluate the supplier's understanding of sustainability, which can help to frame and interpret their responses to subsequent questions. For instance, if the supplier representative lacks knowledge about sustainability, it may limit their ability to provide relevant information during the interview, as they may not fully comprehend the context and importance of the questions being asked. The purpose of the second category is to collectively examine the collaborative methods and preferences and investigate the reporting methods utilized by the suppliers. Finally, the aim of the third category is to inspect the supplier's risk assessment process and explore the evaluation process of the sub-suppliers from the supplier's perspective.

The conceptual framework is established to evaluate Supply Management and Sustainability within the context of the suppliers of the case company by combining relevant studies and methods from the field. By assessing the sustainability of the suppliers, the case company can identify areas where improvements can be made in their supply chain operations to promote sustainability. The conceptual framework provides a systematic approach to evaluating suppliers in terms of their environmental, social, and economic performance. This approach allows the case company to identify the strengths and weaknesses of its suppliers, and work collaboratively with them to achieve sustainable outcomes. Furthermore, this framework can be used as a benchmarking tool to compare the performance of different suppliers and to monitor progress over time. Table 9 summarizes the most relevant studies and their respective fields of influence, providing a comprehensive overview of the literature used to develop the conceptual framework for assessing supply management and sustainability in the case company's supplier context. However, the conceptual framework may be influenced by the researcher's perceptions, other studies, and past knowledge.

Influencing theory	Authors
Three pillars of sustainability	(Purvis et al., 2019)
Value Chain Model	(Porter, 1985)
Sustainable Development Goals	(United Nations, 2015)
Sustainable Supply Management Model	(Ageron et al., 2012)
Framework for Sustainable Supply Management	(Zimmer et al., 2015)
Competencies for Supply Management	(Bals et al., 2019)
Competencies for Supply Management	(Delke et al., 2021)
Buyer-Supplier Relationship Model	(Kumar & Rahman, 2015)
Conceptual Cycle of Supplier Development	(Liu et al., 2017)
Factors from ESG Principle	(Li et al., 2021)
Standards Influencing Sustainability	(Ikram et al., 2021)
LCA Framework	(Heijungs et al., 2010)
Importance of KPI's	(Bai & Sarkis, 2014)

Table 9. Studies directly influencing the conceptual framework.

By using the aforementioned features, a conceptual framework can be developed with the focal organization's sustainable supply management initiatives as the independent variable and sustainable suppliers as the dependent variable. The mediating variables can be identified as sustainable supplier development and sustainable sourcing, which can be further subdivided into specific fields for a more detailed assessment. Similarly, the size of the supplier, the industry type, and geographic location can be considered as moderator variables, as they directly impact the sourcing or supplier development activities of the focal organization. The control variables can be identified as the supplier's financial stability, environmental policies, and social policies, which may not directly affect the sourcing or supplier development activities but should be considered as they could impact the sustainability of the supplier. Thus, the visualization of the conceptual framework is illustrated in Figure 11.

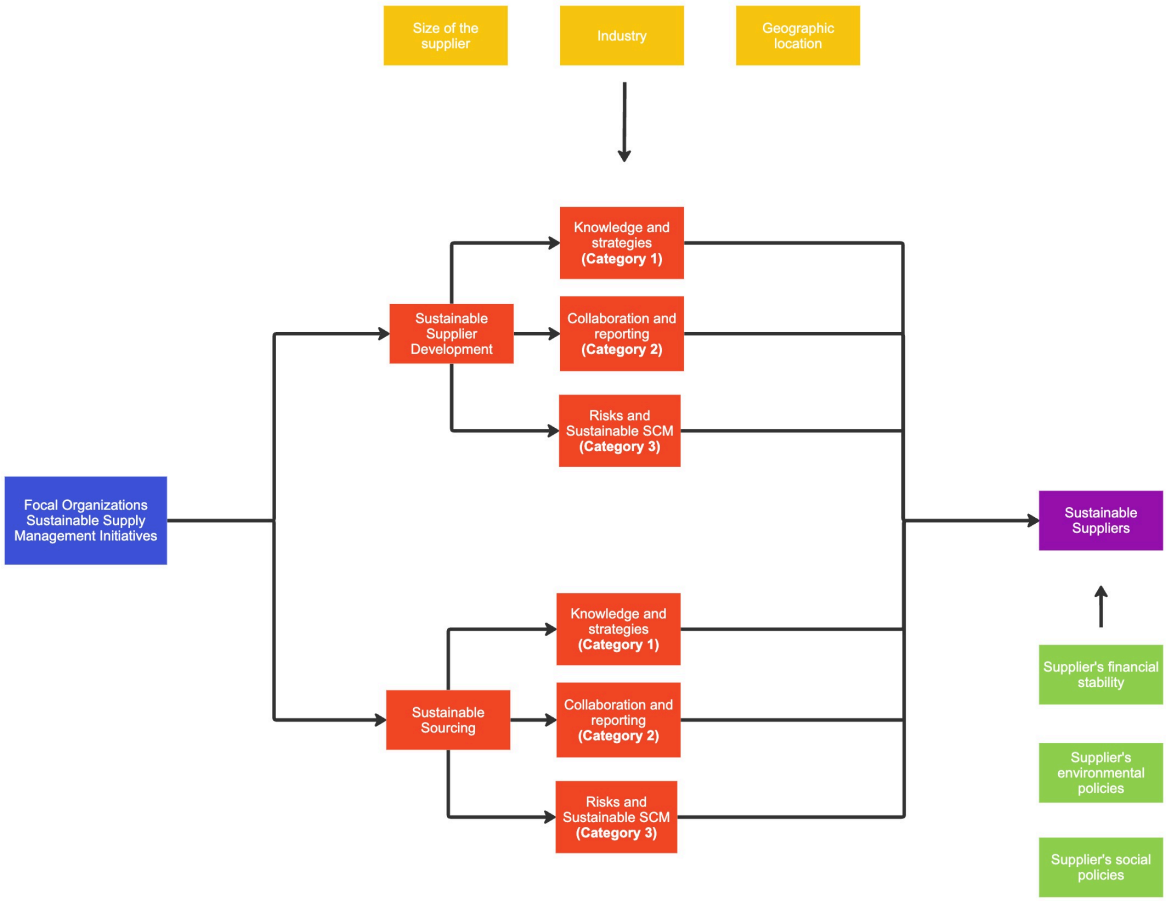

Figure 11. Conceptual framework.

3.6 Research process

A systematic approach is employed in formulating the managerial implications. The process begins with the theoretical context provided by the literature review, which informs the establishment of a conceptual framework that identifies critical factors in sustainable supply management operations. This framework guides the development of the interview guide, ensuring that the semi-structured interviews are grounded in insights from the existing literature. The semi-structured interviews yield practical data on the suppliers' perceptions and practices. The results of these interviews are then analyzed, with a gap analysis conducted to identify areas of improvement. From these identified gaps, managerial implications are derived and presented, offering recommendations for changes to supplier development and sourcing strategies, vendor ratings, and the

creation of a supplier sustainability scoring matrix. The iterative process of finding the managerial implications is presented in Figure 12.

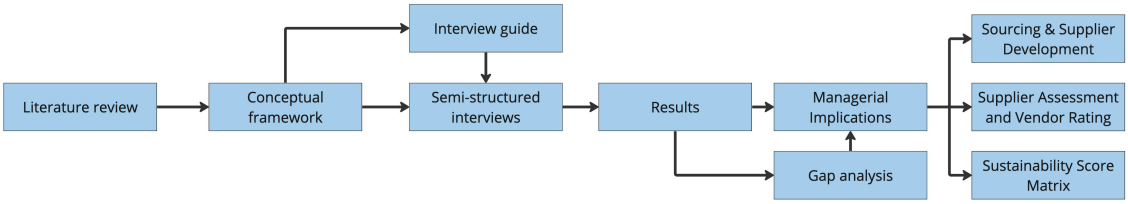

Figure 12. Iterative process for finding managerial implications.

4 The case company

The case company operates on multiple platforms with its business operation focusing on sustainability, and the different divisions are gradually following the sustainable goals of the corporation. The division that this thesis focuses on, has a specific unit responsible for all supply chain management activities, including procurement, sourcing, quality assurance, inventory management, and logistics. Within the supply chain unit, there is a supply management component responsible for sourcing suppliers, conducting supplier assessments, evaluations, contracts, quality inspections, and supplier development programs. The main objective of this research is to examine how sourcing and supplier development contribute to advancing sustainability practices within the organization. An outline of the case company's organizational chart is illustrated in Figure 13. As visualized in the organizational chart, the path and focus of the thesis are indicated with green tiles.

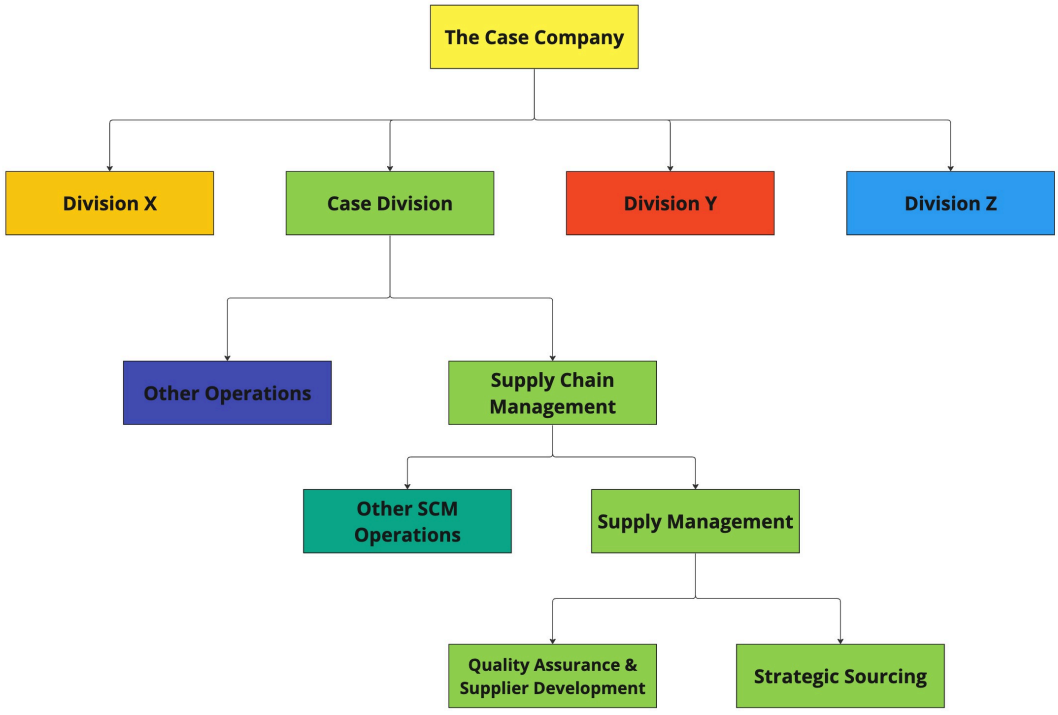

Figure 13. The organization chart of the case company.

4.1.1 Common processes

To gain a deeper insight and understanding into the supply management operations of the case company, it is crucial to examine and visualize the related process charts and common practices. The general process flow resembles the supplier value chain process, which can be seen in Figure 14. Furthermore, the value chain process is a series of activities that are involved in producing and delivering the products or services for the customer. From the scope of the thesis, the most important stages of the value chain process are material acquisition, quality control and assurance, and distribution.

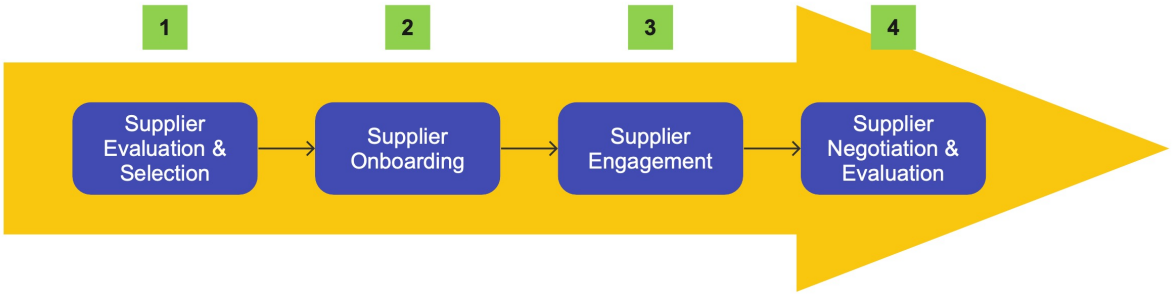

Figure 14. Supplier Value Chain Process (Adapted from Porter, 1985).

Figure 15 visualizes the common processes involved in the supplier onboarding process, which is a critical component of effective supply management. The supplier onboarding process typically begins with a new design, which requires a new supplier. This initiative requires action from various stakeholders within the case company. Furthermore, the authorized purchaser needs to create new purchase orders for the supplier, the category or supply manager needs to scan potential suppliers, and the strategic purchaser or category manager inspects the internal supplier portal, where the supplier is preferably registered. These actions ultimately lead to the supplier compliance assurance process. This evaluation may involve a detailed analysis of the supplier's financial stability, technical expertise, quality control procedures, and overall suitability for the organization's needs.

If the supplier meets the case company's requirements, the process moves on to vendor management or other necessary actions to be taken.

In addition to these core components, effective supplier onboarding may also involve ongoing monitoring and evaluation of the supplier's performance, as well as periodic renegotiation of the supplier agreement to ensure continued alignment with the organization's needs and goals.

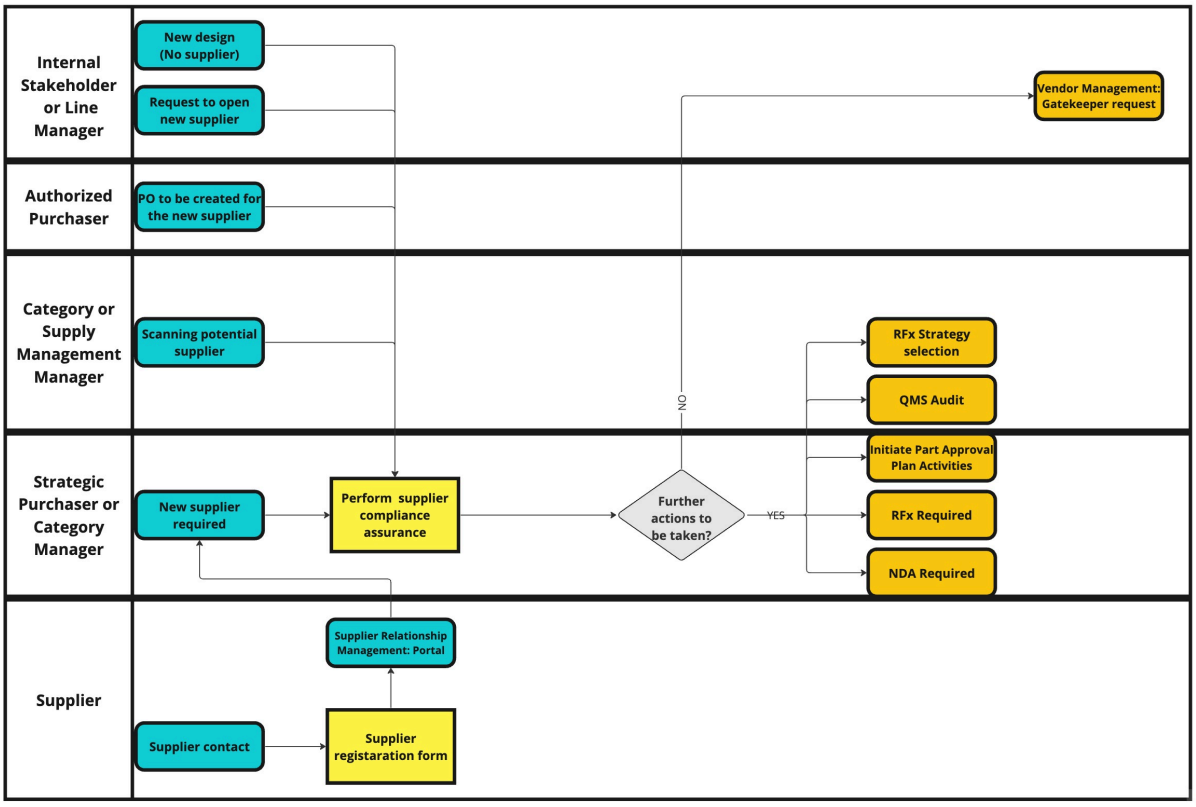

Figure 15. Common processes in Supply Management, Supplier Onboarding

The sourcing-specific actions begin from the need for a source of supply. The different phases follow the common project stage-gate model, whereby the process is divided into several consecutive stages, and only proceeds to the next stage if the gate requirements for that gate have been fulfilled. The sourcing process itself starts with initiation and planning on gate 1, which requires the case company to do case planning. Consequently,

the case plan is either given a go or no-go decision based on the identified specifications. If a no-go decision is given, the business case is rejected. Upon accepting the case plan, the process continues to the supplier compliance assurance on gate 2, which is further illustrated in Figure 16. If the compliance of the supplier is assured, the process continues to part quality assurance and sample inspection on gates 2b and 2d, which enables the case company to comprehensively guarantee the part quality. Subsequently, the process advances towards gates 3 and 4, which involve ensuring the functionality of the components. Furthermore, the completion of the sourcing process indicates that the quality of both the supplier and the parts has been verified as complete. This as a whole process is visible in Figure 16.

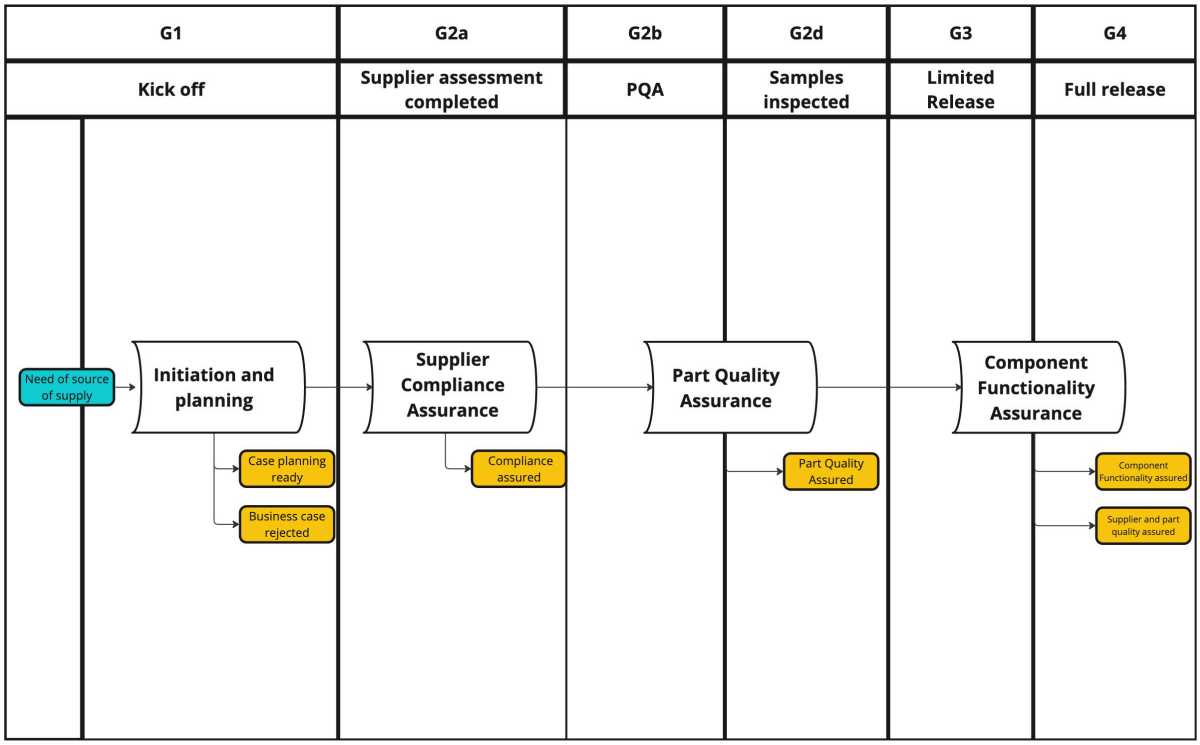

Figure 16. Common processes in Sourcing, Part Approval Process

4.1.2 Supplier assessment

The supplier assessment process is a crucial aspect of supply chain management, as it helps organizations identify and evaluate potential suppliers based on their performance, risk profile, and alignment with the focal organization's strategic objectives. The different stages involved in the supplier assessment process are information gathering, risk assessment, and finally, the assignment of a vendor rating value.

The first step in the supplier assessment process involves gathering comprehensive information about the supplier. This information is collected from a variety of sources, including supplier disclosures. This is information provided by the supplier, such as financial statements, quality certifications, and sustainability reports. Moreover, the case company has an assessment document, which is directly forwarded to the supplier when requested as a potential vendor. Through this document, suppliers can submit and verify all essential information about their processes and products. If completed accurately, it establishes a thorough understanding of the supplier's operations. Consequently, the supplier may be approved for use based on the assessment document and the associated information, which is disclosed in the following paragraph.

Then, the focal organization's previous interactions and dealings with the supplier are investigated. The supplier's participation in trade fairs and conferences has provided direct observation and networking opportunities. This can offer useful insights into the supplier's reputation and capabilities. In addition, information is being gathered from other suppliers in the industry who may have insights into the supplier's performance and reputation. Accordingly, the supplier is being investigated through online research, including supplier websites, social media, and news articles. Lastly, the supplier is searched from Nexis Diligence, a platform that provides access to a wealth of company data, including legal, regulatory, and financial information.

The supplier assessment is based on 15 different areas of business, with each area assigned a qualitative grade. These grades are categorized as either not compliant,

compliant with remarks, or compliant. Each grade has certain criteria that the supplier needs to establish to receive the respective grade. Furthermore, to minimize risk within the organization's supply chain, only suppliers that receive an approved or approved with remarks grade are considered for use. If the supplier receives a "non-compliant" grade in any of the 15 investigated topics of interest, they are held non-compliant overall, and as a result, are not used. However, supplier development engineers are engaged to audit and evaluate the supplier further, providing feedback on their processes to improve their status and increase their grade, if necessary. The process overall enables the case company to ensure that it selects suppliers that meet its quality, risk, and strategic requirements, fostering strong partnerships and minimizing supply chain disruptions. The following table (Table 10) presents the questions and topics that encompass sustainability or facilitate the objective of a sustainable supply chain.

Assessment criteria
What is the maximum level of sub-tier suppliers you have?
Does your supply comply with the case company's Black and Grey list of restricted substances
Do you supply materials within the European Union
Do your supplies comply with the European Union Directive of Registration, Evaluation, Authorization and Restriction of Chemicals (REACH 1907/2006)?
Are substances of very high concern (SVHC) present in a concentration above 0,1% (w/w) in any of the articles in your offering?
Do you comply with the requirements of Classification, Labeling and Packaging (CLP) regulations?
Do your supplies comply with the European Directive of Restriction of Hazardous Substances (RoHS 2011/65/EU)?
Is your supply asbestos-free and do not contain any radioactive material or substances?
Do your supply comply with the conflict mineral regulations?
Do you have a certified environmental management system (e.g. ISO 14001)?
Are you reporting your packing materials on an annual basis?
Do you have evidence on proven performance improvements within environmental management?
Describe your performance improvements within environmental management.
Are you aware of the case company's objectives in environmental management and able to support them?
Do you have a certified health and safety management system (e.g. OHSAS 18001, ISO 45001)?
Do you have evidence of proven performance improvements in occupational health and safety management?
Do you have a Code of Conduct or Code of Ethics in place in your company?
Does your Code of Conduct or Ethics include a statement according to which your company is committed to carry out all its activities in compliance with all applicable laws?
Do you monitor that the Code of Conduct is compiled by the stakeholders related to it?

Do you have policies which support the Code of Conduct?
Do you have a certified social accountability management system (e.g., SA 8000)?
Do you have a training program in place for employees on ethical business conduct?
Do you have your own social accountability management system or are you planning to develop one?
Do you commit to complying with the case company's supplier requirements for Human rights?
Do you commit to comply with the case company's supplier requirements for No child labor?
Do you commit to comply with the case company's supplier requirements for No forced labor?
Do you commit to comply with the case company's supplier requirements for Anti-corruption and anti-bribery?

Table 10. Assessment criteria in the supplier assessment document that encompasses sustainability.

4.1.3 Vendor rating

After collecting the necessary information, the focal organization proceeds with a risk assessment using specialized software. This software evaluates the potential risks associated with the supplier by analyzing the gathered information. If the software cannot provide a reliable risk assessment based on the available data, a supplier development engineer visits and audits the supplier to gather additional information and complete the risk evaluation. Once the risk assessment is complete, the supplier is assigned a vendor rating value, which reflects their suitability and alignment with the focal organization's needs. Although not always expressed numerically, numerical methods can be employed to quantify this evaluation. Furthermore, the vendor rating criteria are based on the processes or procedures of the supplier. The rating is given through the supplier assessment result, with the qualitative grades, i.e., as either not compliant, compliant with remarks, or compliant. The following tables present the criteria that directly encompass sustainability (Table 11, Table 12, Table 13).

Environmental Management		
Not compliant	**Compliant with remarks**	**Compliant**
The supplier has no environmental management system (e.g. management of special waste and recycling). The supplier has no intention to implement one and there is a risk for non-compliance with the local environmental legislations.	The supplier has policies/procedures for environmental management, but no environmental management system. Alternatively, the supplier has an action plan for implementing an environmental management system which meets the ISO 14001 or Eco-Management and Audit Scheme (EMAS) requirements and is fully complying with local environmental legislations. The supplier is reporting the packing materials on annual basis.	The supplier has a certified environmental management system (ISO 14001) or clear schedule to apply for the certification. Alternatively, the supplier has Environmental Management System which is not certified, but meets the ISO 14001 or Eco-Management and Audit Scheme (EMAS) requirements. The supplier has recognised and is willing to support the case company's objectives and targets in this area.
Guiding questions: • Are there any local regulations related to Environmental Management? • If supplier does not have certified Environmental Management System, are there any policies that relate to it? • Is supplier aware of the case company's objectives and targets in this area?		

Table 11. VMS Criteria, Environmental Management.

Occupational Health & Safety Management		
Not compliant	**Compliant with remarks**	**Compliant**
The supplier has no Occupational Health and Safety (OHSAS) management system and has no intention to implement one, or the working environment has dangerous places with high risk of serious hazards.	The supplier has policies/procedures for OHS management, including safety plan, but no OHS management system. Alternatively, the supplier has an action plan for implementing an OHS management system which meets the ISO 45001 requirements, and is fully complying with the local legislations. Adequate and fully operational safety equipment for the protection of the personnel and facilities is in place.	The supplier has a certified OHS management system (ISO 45001) or clear schedule to apply for the certification. Alternatively, the supplier has OHS management system which is not certified, but meets the ISO 45001 requirements. The supplier has recognised and is willing to support the case company's objectives and targets in this area.
Guiding questions: • Are there any local regulations related to Occupational Health & Safety Management? • If supplier does not have certified Occupational Health & Safety Management System, are there any policies that relate to it? • Is supplier aware of the case company's objectives and targets in this area?		

Table 12. VMS Criteria, Occupational Health & Safety Management.

Social Accountability Management		
Not compliant	**Compliant with remarks**	**Compliant**
The supplier does not comply with the case company's requirements for human rights, child or forced labour.	The supplier complies with the case company's requirements for human rights, child or forced labour. The supplier is willing to develop, or already has an action plan for the other requirements.	The supplier has a certified management system covering the social issues e.g. SA8000 or complies with the case company's defined social requirements. The supplier actively promotes social performance in its own supply chain.

Guiding questions:

- Does supplier have respect for human & labour rights?
- Does supplier have fair employment practises?
- How are above performed in practise?

Table 13. VMS Criteria, Social Accountability Management adapted from confidential internal documents).

5 Results

This chapter presents the results of the research conducted and provides a detailed analysis of the data collected. The aim of this chapter is to present the findings in a clear and structured manner, allowing the reader to understand the results obtained and their significance to the researched topic. The chapter showcases the results through their respective categories, discussing the topic theme by theme. To ensure clear interpretation, some findings from the semi-structured interviews, which provided an extensive amount of comparable data, are presented in a table format. In addition, this chapter answers the second research question “What are the current sustainability practices and initiatives being implemented in a company’s supply network?”.

5.1 Knowledge and strategies

5.1.1 Suppliers’ definition of sustainability

The interviewees emphasized the importance of minimizing environmental impact through measures like reducing emissions, waste materials, and resource depletion. Supplier 4 described that sustainability is about ensuring "the operations should not cause much harm to the environment, nature, people, and all stakeholders involved". Likewise, Supplier 3 explained:

> I would define sustainability from the perspective that it means taking into account the environment and other people in our business operations so that we do not deplete resources on Earth but instead strive to leave good conditions for the future. We strongly emphasize the environmental aspect, aiming to minimize emissions and waste materials, so that we do not harm future generations.

This answer seems to provide a broad understanding of sustainability for three reasons. First, the ability to understand the importance of environmental action, second, understanding the importance of other people within the concept of sustainability, and lastly, comprehending that resources on Earth are not limitless, and businesses should

recognize this within their operation. These characteristics are supported by the definition of Eslami et al. (2019), the three pillars of sustainability of Purvis et al. (2019), and the practical framework of sustainability (Rogers & Hudson, 2011). However, as examined, the definition often reflected the business actions that reflect sustainable operation within the supplier. This is visible from the description of Supplier 2:

The suppliers highlighted the need to consider the well-being of employees and society as a whole. Supplier 6 mentioned the importance of a sustainable factory environment: "It means considering that the factory environment is sustainable for both people and products – not using slave labor, for instance – and that the whole product is designed to be sustainable in itself while also considering environmental aspects." Supplier 7 emphasized the role of social perspectives in sustainability: "I would define sustainability as the consideration of environmental and social perspectives and how the company's operations are aligned with them. It's indeed a broad question."

The interviewees discussed the balance between profitability and sustainability in business operations. Supplier 1 noted the importance of considering financial aspects when making sustainable investments: "We go by the euros, and investments are made based on savings and subsidies." Supplier 5 provided a dual perspective on sustainability: "You have to make a certain profit for the company to continue its operations, but at the same time, you must bear in mind that we should leave a good future for the coming generations and not use up all the resources during our lifetime”. However, as examined, the definition often reflected the business actions that reflect sustainable operation within the supplier. This is visible from the description of Supplier 2:

> Well, that's just the product lifecycle, and then on a smaller scale, it's about how the product is packaged, what components are chosen, and what kind of subcontractors and partners you have around it. It'll start from there.

The response outlines the various elements that contribute to sustainability, including the entire lifecycle of a product, the use of sustainable packaging, the incorporation of

sustainably produced components, and the selection of sustainable suppliers and subcontractors (Balkau & Sonnemann, 2010; Zimmer et al., 2015). It is evident that achieving sustainability involves considering several aspects, and the answer highlights the importance of each of them.

In conclusion, the interviewed suppliers offered various definitions of sustainability that can be categorized into three main themes: environmental protection, social responsibility, and economic viability. They acknowledged the need for a holistic approach, addressing various aspects such as waste management, product development, and supplier relationships. This collective understanding of sustainability underscores the crucial role that suppliers and supplier development play in ensuring supply management practices align with sustainable values and principles (Zimmer et al., 2015; Yang & Xiongfei, 2017; Akhavan & Beckmann, 2017).

5.1.2 Suppliers' approach to sustainability

It is evident that suppliers pursue different approaches to meet the needs of their organizations regarding sustainability. These range from focusing on product quality and cost-effectiveness to ensuring on-time delivery and fostering sustainable practices. Some suppliers have mixed these strategies to better adapt to market changes. The different methods have helped suppliers gain a competitive edge, remain financially feasible, and collaborate with their customers better. The different approaches are presented in Table 14.

Supplier	Approach to Sustainability
1	They focus on being active in developing sustainable operations and are trying to stay on top of sustainable fuel innovations. They invest and plan based on the strategy of staying at the forefront of development and being involved in environmentally friendly fuels. They also strive to find environmentally friendly solutions in their manufacturing processes. They refer to ISO 14040 for environmental policy guidance.
2	Their sustainability themes revolve around all their investment programs. Anywhere money is spent, sustainability needs to be considered.

	This includes investments in factories or equipment where sustainability needs to be accounted for.
3	Operation according to the strategic sustainability goals set by their parent company. They have a dedicated sustainability team that created frames and targets for the upcoming years, aiming to be carbon-neutral by 2030 for scope 1 and 2 emissions, and by 2050 for scope 3 emissions. They are starting to research their own value chain to assess emissions from production or raw material manufacturing and transport.
4	They are striving for sustainable operations, although specific numerical targets have not yet been set. The supplier is waiting for short- and long-term targets from the group's owner side. They are trying to keep in mind that their solutions should be as environmentally friendly as possible.
5	Sustainability is part of their strategy, considering options such as installing solar panels and utilizing green steel developed by SSAB.
6	They are certified under ISO 9001, and 14001, and focus on providing a more sustainable world for future generations as part of their vision and strategy. They measure the life cycle of their products and how much goes into renewable energy and a more sustainable world.
7	They are changing packaging materials to better options, using solar panels on factory roofs, reducing travel, and transitioning to fully electric company cars. They have significant systems overall and aim to be a leading company in sustainability on a global scale.
8	Sustainability has long been a high priority. Environmental goals and social responsibility have been part of their strategy for a long time. The supplier designs products with environmental considerations and lifecycle in mind. They have computed the carbon footprint from their operations and products but have not publicly released them due to non-standardized calculation methods. They use solar panels, geothermal pumps, and wind energy.

Table 14. Suppliers' approaches to sustainability.

In summary, the interviewed suppliers demonstrated a strong commitment to sustainability, incorporating it into their investment programs, value chains, production processes, and supplier relationships (Qi et al., 2013; Porter, 1985; Kumar & Rahman, 2015). They have adopted various strategies, including setting specific targets, exploring renewable energy sources, and focusing on eco-friendly and socially responsible practices (Bai & Sarkis, 2014; Bals et al., 2019; Delke et al., 2021). While some suppliers have not set numerical targets, their overall approach emphasizes continuous improvement and

collaboration with customers and other stakeholders to contribute to a more sustainable world.

5.1.3 Influence of sustainability on decision-making and business operations

Supplier 1 highlights the role of customers' needs and legal requirements in shaping their approach to sustainability, stating that these factors guide their exploration of sustainable solutions: "Our focus on sustainability comes from our customers' needs and the requirements that come from them, as well as from the law that guides us in finding solutions." Furthermore, Supplier 2 emphasizes the importance of daily monitoring and evaluation of sustainability metrics. They mention a daily meeting at their office where they review energy consumption, waste management, and recycling rates:

> We have a daily meeting at 9:30 with representatives from all departments, where we specifically discuss these issues, plus safety. We monitor electricity consumption, waste recycling, and the further processing of waste fractions with our recycling partner. These issues are either in the red or green daily monitoring to see if we are on target or not, and they are monitored quarterly throughout the year.

Similarly, Supplier 3 discusses their waste management and recycling efforts, as well as their work on a roadmap for carbon neutrality. They have been monitoring the waste generated in their warehouse for many years, focusing on how much can be recycled and how much goes to landfills. Their quality department sets targets for recycling rates. Additionally, they maintain a blacklist of chemicals and hazardous substances that cannot be used in their products. Currently, they are working on determining their emissions throughout the value chain and developing a roadmap for reducing them annually. Supplier 4 shares its efforts in energy conservation, transitioning to green electricity and district heating, and considering the recyclability of its products at the end of its life cycle. They have achieved energy savings at their factory and have switched to green electricity and district heating. Furthermore, they also think about transportation optimization and the recyclability of their products when they reach the end of their life cycle. These

factors contribute to sustainability through their respective factors, mainly through the environmental dimension (Li et al., 2021). In addition, the life cycle assessment is important to consider when evaluating the sustainability of a product, and the supplier seems to have a broad understanding of the influence that it has (Ortiz et al, 2008).

Supplier 5 discusses their efforts to reuse surplus materials, such as selling leftover steel for reuse and repurposing valuable raw materials from their machining workshop: "For example, surplus steel is sold back to be used again, and we sell valuable raw materials from our machining workshop for reuse, so the waste is practically zero." Supplier 6 mentions their commitment to using only green electricity in their factory and monitoring their CO2 emissions annually:

> We made a decision several years ago that our entire factory would use only green electricity. We measure our CO2 emissions every year, including travel, company cars, and more, and our parent company collects this information.

Supplier 7 talks about their goals for 2030, emphasizing energy efficiency and sustainable materials in their products, and optimizing logistics to reduce waste. Likewise, Supplier 8 elaborates on their waste management practices and their efforts to communicate their sustainability code of conduct to suppliers:

> We try to minimize waste and work with our suppliers to optimize packaging and transportation. We also collect different types of packaging waste for recycling. We have provided our suppliers with our code of conduct, and they have signed it, but we have not asked for any specific numbers about their carbon footprint reduction.

In summary, the suppliers emphasized the importance of sustainability in their business operations and decision-making processes. Common themes include the influence of customer needs and legal requirements, monitoring and evaluation of sustainability metrics, energy conservation, waste management, recycling efforts, and communication.

The awareness that these elements contribute to sustainable functioning underscores a foundational insight into sustainable practices (Zimmer et al., 2015; Igarashi et al., 2013; Bai & Sarkis, 2014; Seuring & Müller, 2008).

5.1.4 Sustainable practices

When discussing sustainable practices within the suppliers, six different themes emerged. Firstly, several suppliers emphasized energy efficiency and renewable energy use by mentioning efforts in increasing energy efficiency and adopting renewable energy sources. Supplier 1 mentioned that they have transitioned to LED lamps and solar panels to save energy. Supplier 2 shared that they have a project underway to capture and recycle waste heat generated by their factory, which has been implemented in the last two years. Supplier 3 talked about their production facility in China, which uses renewable energy for electricity and heat production. They also mentioned the possibility of switching their office space's electricity contract to wind or solar power.

In addition, several suppliers highlighted the waste management and recycling practices that have been implemented. Supplier 1 shared that they have become more diligent in waste segregation and have a partnership with Lassila & Tikanoja to monitor and manage their waste. Supplier 4 mentioned that waste sorting and energy efficiency are priorities for their company, with efforts being made continuously. Likewise, Supplier 5 discussed how they optimize the use of raw materials by decreasing the waste by using their own plasma cutter to maximize the use of steel.

Furthermore, suppliers highlighted their efforts in adopting more sustainable transportation methods. Supplier 3 mentioned that they primarily use sea and land transport instead of air freight and have requested quotes for transport services using biofuels. Supplier 5 discussed how they try to minimize transportation by organizing multiple projects to be transported together. Supplier 5 discusses this: “We optimize the use of raw materials and try to minimize transportation by organizing multiple projects to be

transported together". Some suppliers emphasized the importance of sustainable production processes and equipment. Supplier 5 shared that they have invested in a plasma cutter to optimize the use of metal sheets and minimize waste. Supplier 6 talked about their focus on producing high-quality, long-lasting products, which indirectly contribute to environmental sustainability. They also mentioned the use of a special welding gas that produces fewer harmful emissions. It is evident that these findings contribute to sustainable practices through their respective technological innovations (Demartini et al., 2019).

Several suppliers have chosen to collaborate with local partners and source materials locally to reduce their environmental impact. Supplier 7 mentioned that they source components from local manufacturers and prioritize local suppliers whenever possible. Lastly, some suppliers have implemented sustainable employee benefits and practices. Supplier 1 mentioned that they have an incentive system where the better their waste management performance, the larger the budget for their annual leisure activities. Supplier 7 stated that they offer fully electric or hybrid company cars as employee benefits. These findings indicate that the suppliers understand a collaborative approach to increase their sustainability (Kumar & Rahman, 2015).

In conclusion, the interviewed suppliers demonstrate a range of sustainable practices within their organizations. These practices revolve around themes such as energy efficiency, waste management, sustainable transportation, sustainable production processes and equipment, local sourcing and collaboration, and sustainable employee benefits and practices. Additionally, the suppliers' practices and criteria are addressed as a whole in Table 15.

Practices and criteria
Green values
Stakeholders 'attention to sustainability
Sustainable parts
Geographic location of the supplier
Communication

Transportation methods
Packaging
Lifecycle
Minimizing waste
LED lighting within manufacturing
Solar panels
Sustainability within decision making
Limited resources
Environment and labor
Ethical labor
Certifications and standards
Conflict minerals
Recycling
Carbon footprint
Responsibility
Green supply chains
Selling unused materials
KPI
Measuring values related to sustainability

Table 15. Practices and criteria addressed by the suppliers.

5.1.5 Integration of practices

The responses have been analyzed according to three primary themes: Employee involvement and awareness, environmental policies and certifications, and integration of sustainability into processes and operations. The interviews revealed the importance of engaging employees in sustainability initiatives and raising their awareness of sustainable practices. Supplier 1 mentioned that they receive various suggestions from employees, some of which may be related to sustainability. Supplier 5 highlighted that their organization follows a common-sense approach, relying on employees' awareness and desire to act sustainably. Supplier 6 emphasized regular communication of their vision, fostering a culture of sustainability within the organization through waste segregation, recycling facilities, and electric vehicle charging stations. This highlights the synergistic interaction between communication and the sustainability (Bai & Sarkis, 2010).

Several suppliers highlighted the significance of having environmental policies and certifications in place. Supplier 3 discussed their written environmental policy, signed by their CEO, and the consideration of implementing software to monitor their progress. Supplier 5 mentioned their ISO 14001 certification, which they have maintained for many years and plan to continue upholding. Management standards play a crucial role in achieving sustainability, and the framework that it provides can be a good guideline for organizations attempting to incorporate sustainability into their operation (Ikram et al, 2021).

The extent to which sustainability is integrated into organizational processes and operations varied among the suppliers interviewed. Supplier 2 admitted that sustainability is not yet fully integrated into their processes, while Supplier 4 revealed that detailed processes related to sustainability are lacking in their organization. In contrast, Supplier 8 emphasized that sustainability is one of the pillars of their processes, integrated alongside safety and quality. They discussed how decision-making factors such as price differences and customer preferences are considered when evaluating low-emission and high-emission options. Furthermore, the interviews demonstrated the importance of employee involvement and awareness, environmental policies and certifications, and the integration of sustainability into processes and operations within supply management (Agan et al., 2018;Ikram et al., 2021). The findings suggest that fostering a culture of sustainability within organizations, establishing clear environmental policies, and implementing monitoring systems are crucial to ensuring that sustainability remains a priority in supply management.

5.2 Collaboration and reporting

5.2.1 Monitoring the sustainability, trends, and regulations

The findings of the interviews unveiled distinct themes concerning tracking sustainability, trends, and regulations. The practices of the supplier are presented in Table 16.

Supplier	Practices for staying Informed about sustainability
1	Monitoring global developments, proactive market activity, information sharing within the company, product development collaborations, and internal planning.
2	Partnerships with other companies, networked information sharing, tracking developments in sustainable technology, and incorporating sustainability into annual objectives.
3	Corporate-level channels (Sharepoint), tracking advancements and trends in the industry, individual interest, proactive product development for sustainability, and membership in a local chamber of commerce.
4	Regularly attends expos with their R&D, production, and sales departments, actively seeks information from subcontractors, and stays updated through market monitoring and customer feedback.
5	Organizes and attends sustainability-themed webinars that their own employees and external stakeholders can participate in. They monitor industry news and take note of new developments and emerging trends. They also conduct customer surveys to identify areas where they could improve in terms of sustainability.
6	The dedicated sustainability department monitors industry practices and regulations. Internal meetings and newsletters. Collaborate with external stakeholders, such as research institutions and sustainability consultants, to keep alongside of new developments and trends.
7	Regularly reviews industry research to stay informed about new sustainability practices. They also attend industry conferences and trade shows, where they can learn about new trends and practices. They use social media and other online platforms to follow sustainability experts and organizations.
8	Engages in regular discussion with their suppliers and customers to understand their sustainability goals and practices. They also monitor industry news and trends, and participate in relevant industry forums and events. They have integrated sustainability into their strategic planning and decision-making processes.

Table 16. Suppliers' practices for monitoring sustainability, trends, and regulations.

In summary, the suppliers employed different practices, with strategies ranging from internal team collaborations and customer surveys to active participation in industry events and comprehensive market monitoring. These findings emphasize the importance of a collaborative approach (Agan et al., 2018). Moreover, the suppliers rely on internal communication and collaboration, participation in industry events and networks,

monitoring relevant information sources, learning from their suppliers and customers, and adapting their business models to meet the evolving demands of the market.

5.2.2 Communication and collaboration regarding sustainability

It is clear that suppliers place a high value on both internal and external communication. Several suppliers emphasized the importance of clear and effective communication between themselves and their own employees, as well as with their customers and other stakeholders in the supply chain. This communication was seen as critical to building and maintaining trust, as well as ensuring that sustainability goals and initiatives were properly understood and implemented throughout the organization. Direct communication with customers, either through meetings or various events, was a prevalent theme in the interviews as well. These practices are presented in Table 17.

Supplier	Practices
1	Communications are constrained by strict contractual agreements, making it challenging to publicly present or market collaborations.
2	Collaboration through town hall meetings, quarterly reviews, and supplier development programs. They also highlight the importance of enhancing their engagement in sustainability with customers.
3	Incorporate sustainability metrics into their proposals, estimating potential CO2 savings if customers implement their solutions. They foresee a future need for sustainability reporting, especially as more customers and financial institutions are beginning to require it.
4	Sustainability information is provided to customers in manuals or during business negotiations.
5	Compliance with ISO 14001 certification is common, as most customers require it. However, there has been minimal conversation on sustainability thus far and there is no sustainability report.
6	Conduct customer satisfaction surveys and promote their vision of sustainability during new customer onboarding. Feedback on sustainability is received via audits and development projects with customers.
7	Communicate new ideas and sustainable alternatives, such as packing materials. Customer discussions and supplier days are part of the collaborative efforts.

8	Engage in sustainability discussions during audits and bid phases, respond to customer queries about sustainability, and maintain a web page dedicated to sustainability. A responsibility report has been prepared but not published due to comparability concerns.

Table 17. Supplier practices regarding collaboration and communication.

The importance of supplier development programs is evident from the responses of the suppliers. This highlights the importance of studies within supplier development (Akman, 2015; M. Lo et al., 2018; Blome et al., 2014). Furthermore, emphasizing the importance of direct communication is an essential part of achieving sustainability (Bai & Sarkis, 2010). Reporting was a theme that emerged from the interviews, with several suppliers discussing the importance of sharing sustainability information through reports. However, the need for more consistent reporting in the future is discussed, as environmental and sustainability concerns become increasingly important for obtaining loans and other financial support. These challenges could be resolved by including reporting frameworks, such as GRI, on what information to include in the sustainability reports (Orazalin & Mahmood, 2019).

In conclusion, the interviews revealed that suppliers communicate and collaborate with their customers on sustainability issues through various means, including the use of certifications and standards, direct communication, collaboration on specific projects, reporting, and continuously developing their sustainability efforts. These findings highlight the importance of fostering strong relationships and open communication channels between suppliers and customers in order to achieve shared sustainability goals.

5.2.3 Preferred methods of collaboration

The interviewees' responses were grouped into key themes: long-term partnerships, open communication, and sharing knowledge and experiences. One of the primary themes that emerged was the importance of long-term partnerships for effective

collaboration on sustainability issues. Supplier 1 highlighted the need for a consistent point of contact within the customer's organization, stating, "There isn't anyone who takes responsibility… We don't know who takes charge of future fuels. We've only talked about them, but we need to start planning and making prototypes." Supplier 4 echoed the value of long-term partnerships, saying, "It's more about a partnership relationship where we work together for the long term, focusing on development and selecting those aspects that are both cost-effective and environmentally friendly". This underlines the fact that buyers and suppliers need to work together to establish a partnership that results in sustainability (Kumar & Rahman, 2015).

Open communication and mutual feedback were also emphasized by the interviewees. Supplier 2 suggested that integrating end-user experiences into the product development process would lead to better results, explaining, "If we could get feedback from end-users and bring it into our product development process, it would guide us in the right direction." Supplier 6 also highlighted the importance of open communication in the partnership, stating, "We always look for a long partnership… We discuss and think about things together, either we propose something new to them, or they come to us with their interests and ideas."

Sharing knowledge and experiences emerged as a crucial aspect of successful collaboration on sustainability. Supplier 5 noted that supplier development had mostly focused on quality and production processes, rather than sustainability, but suggested that a more targeted approach could be beneficial: "We could arrange a 'walkthrough' with suppliers, focusing specifically on these issues." Supplier 7 emphasized the value of learning from each other, stating, "At this stage, when we're all learning about these issues, sharing knowledge and ideas is a good thing. A good and informed customer is the best teacher". Sharing knowledge is a fundamental aspect of SSCM, and thus it contributes towards sustainable objectives (Seuring & Müller, 2008). The general preferred collaboration practices are presented in Table 18.

Supplier	Collaboration Practices
1	Favors participating in customer-led projects focused on multi-fuel research, though better management and designated responsibilities from the customer are preferred.
2	Advocates for gathering customer/user experiences and incorporating them into product development. Real-life case studies of projects can aid in demonstrating the impacts and promoting sustainability.
3	Suggests long-term partnerships to develop right solutions for customer products. Considers customer requirements like emissions limits and noise levels in the context of sustainability.
4	Emphasizes on customizing solutions based on project-specific requirements. Discussion during negotiation stages to improve sustainability of end products.
5	Encourages customers, particularly large organizations, to share market and competitors' practices. Proposes "walk-throughs" with suppliers to focus on sustainability aspects.
6	Prefers long-term partnership for continuous improvements. Chooses cost-effective yet environmentally friendly solutions. Works on replacing harmful substances like SF6 gas in production.
7	Values long-term partnership and open discussions about new solutions or customer directions. Open to trying new practices based on customer needs or industry trends.
8	Advocates for knowledge sharing and collective learning. Welcomes customer experiences and is willing to share their own practices for greater sustainability.

Table 18. Preferred methods of collaboration.

In conclusion, the suppliers interviewed for this study highlighted the importance of long-term partnerships, open communication, and sharing knowledge and experiences in collaborating with their customers on sustainability issues. As the field of sustainability continues to evolve, these themes play a critical role in shaping effective supplier-customer relationships and fostering sustainable supply chain management practices.

5.2.4 Measuring and reporting

When analyzing the interviews, three distinct themes emerged from the transcribed results. One of the most prevailing themes was the use of Key Performance Indicators. Most of the interviewees mentioned the use of KPIs to measure and report on their sustainability performance. Supplier 1 indicated that they do not have a specific indicator for measuring their sustainability performance with their customers but mentioned their involvement in biofuel projects: "We've done a lot with biofuels...but there isn't really any indicator that is followed...it's not really measurable in any way." Supplier 3 explained that they currently report mainly on recycling rates at their warehouse and the potential emission savings for their customers: "We have KPIs, or whatever you want to call them...we report mainly on recycling rates at our warehouse and the potential emission savings for our customers with the products we sell." This finding emphasizes the importance of KPIs, which can help organizations to produce a meaningful impact on the environmental operation (Manning, 2013).

Furthermore, several suppliers mentioned the role of external audits in measuring and reporting on their sustainability performance. Supplier 4 stated that their company is audited by DNV (Det Norske Veritas), a global risk management company: "We have, of course, external audits; DNV audits our management and environmental systems." The same supplier also mentioned monthly status review meetings where they report on sustainability-related activities.

Some suppliers mentioned the use of ESG criteria in measuring and reporting their sustainability performance. However, most of them were not familiar with the term. Supplier 5 stated that they do not measure their sustainability performance using ESG criteria: "ESG is not really familiar to us, so we do not measure it that way...we do not have an indicator that shows how much we got back this year; we do not follow it that way at the moment." Supplier 6, who was not familiar with the term ESG either, mentioned that their company measures CO2 emissions, electricity consumption, and product efficiency ratios: "We report more to the parent company, which then reports forward...Waste

management is, of course, mandatory to report, and we report that to Finland, but other emissions are reported to the location of the parent company". These results indicate that while suppliers employ some ESG criteria, they do not recognize this in principle (Li et al., 2021). Therefore, it would be advised for the supplier to familiarize themselves with ESG since it establishes a framework for assessment criteria (Li et al., 2021). Lastly, an overview of the interview answers is presented in Table 19.

Supplier	Primary practices
1	Mainly uses consumption reports for internal operations. They have introduced biofuel-based solutions, but do not have specific metrics for this. Customer decisions regarding fuel type are often unpredictable and thus challenging to measure.
2	Reports to a global team using KPIs, possibly on a weekly or monthly basis, but the exact process is unknown.
3	Has established quality-based KPIs. Mainly reports on recycling rates at their warehouses and estimates of emissions savings for customers. Aims to establish more KPIs once a sustainability roadmap is in place.
4	Has an external audit by DNV for their management-environment system. Reports numerical data annually to owners and holds monthly meetings to discuss progress.
5	Does not have an explicit ESG approach. They note excess material residue but do not have a specific measure for tracking it year-over-year.
6	Measures CO2 emissions, electricity usage, product efficiency, and reports waste management domestically, while other emissions are reported to the parent company in the Netherlands. However, they do not directly engage with ESG.
7	Acknowledges the existence of various metrics, but personally does not use them. The specifics of the metrics used in the company are not detailed.
8	Uses energy usage and waste monitoring as KPIs. Numerically measures the carbon footprint based on the current methods in use.

Table 19. Supplier practices on measuring and reporting sustainability.

In conclusion, the suppliers interviewed for this study mentioned various methods for measuring and reporting on their sustainability performance, including the use of KPIs, external audits, and ESG criteria. Generally, suppliers had some sort of measurement system for metrics that are related to sustainability but lack the understanding of a more

objective analysis of sustainability measurement. The term ESG was unknown to customers, however, ESG provides a useful framework for measuring and reporting the sustainability of the organization. It must be stated, that without a proper measurement system and a thorough investigation of the sustainability of the organization, a phenomenon called “greenwashing” may become a problem. According to Delmas and Burbano (2011), greenwashing is characterized by two overlapping corporate behaviors, which are subpar environmental outcomes coupled with favorable messaging about these environmental results. Finally, as the field of sustainability continues to evolve, it is crucial for suppliers to adopt and refine these measurement and reporting practices to ensure continuous improvement and alignment with their customers' sustainability goals.

5.3 Risks, challenges, and supply chain management

5.3.1 Managing and mitigating sustainability-related risks

The importance of communication and collaboration to mitigate sustainability-related risks in the supply chain is highlighted by the suppliers. The interviews revealed that suppliers recognize the critical role of effective communication and collaboration in identifying and addressing sustainability risks throughout the supply chain. This includes communication both within their own organizations and with external stakeholders. By working together and sharing information, suppliers can better understand the sustainability risks and opportunities associated with their operations and supply chains and take action to mitigate these risks and improve overall sustainability performance (Bai & Sarkis, 2010). This highlights not only the importance of communication but the importance of communication in mitigating risks in the supply chain of the supplier. The Supplier 2 discusses the matter by stating:

> We are a manufacturing plant. We discuss with our suppliers about the components, how they are manufactured, where they are manufactured, and how sustainably they are produced. We also discuss the type of freight we use and how we can make it as sustainable as possible.

One of the prevailing themes that emerged in the interviews was risk assessment. Supplier 1 mentioned the challenge of anticipating and planning for risks: "It is quite challenging when there are so many variables, and we can't plan and assess risks much in advance." They also discussed a specific case where a particular oil was no longer being manufactured, forcing them to adapt and find an environmentally friendly alternative while ensuring equipment protection. Supplier 5 described their process of conducting risk analyses for larger projects, including identifying dangerous materials: "We hold a risk analysis of it and list all our risks, and in that, if we see risks such as dangerous materials, they are also included and how it is managed so that no accidents occur." Lastly, Supplier 6 explained how sustainability has become a general aspect of their risk assessments: "We do a SWOT analysis once a year, and from that, we identify risks and take necessary actions." These findings highlight the importance of managerial approaches to seeking sustainability (Ageron et al., 2012).

Supplier 2 emphasized the importance of considering the overall impact of their actions on sustainability. They said, "We try to take into account the overall effect, for example, by choosing suppliers located nearby to reduce freight time and storage time." They also mentioned that their company has a dedicated procurement team responsible for supplier monitoring and development. Supplier 8 shared their approach to business risk assessment, considering potential environmental risks: "We have evaluated the possibility of fires and environmental damage for a long time and ensured that the chance of fire is as small as possible with automatic fire alarm systems." They also mentioned that they have implemented a code of conduct for suppliers but have not yet conducted audits or requested calculations from suppliers. Sustainable sourcing can be a powerful method in making supply chains more sustainable (Zimmer et al., 2015;Akhavan & Beckmann, 2017).

Supplier 6 highlighted the importance of communication with suppliers in addressing sustainability and risk-related issues: "We always communicate any issues related to

responsibility, sustainable development, or any other problem to our suppliers". On a similar note, Supplier 7 highlighted the importance of continuous improvement and collaboration with suppliers: "We maintain contact with suppliers, make joint decisions, and engage in problem-solving, trying to optimize the entire chain so that things work smarter". In addition, the general practices that suppliers utilized to manage and mitigate sustainability-related risks are presented in Table 20.

Supplier	Practices to manage and mitigate sustainability related risks
1	Conducts risk assessments, especially in energy and heat sectors. Focuses on managing the use of different liquids or gases and how these impact operations. Open to suggestions and collaboration with stakeholders to find solutions to risks and potential shortages.
2	Strives to optimize the whole supply chain with a holistic view, taking into account the total impact. Tries to minimize transport and storage time, and maintain yearly shipments. Holds weekly, and monthly meetings, and face-to-face follow-ups with suppliers.
3	Practices strict compliance with prohibited substances list.
4	Selects some suppliers based on their sustainability performance. Aims to use components made in Europe or the West in general, with the understanding that these are more likely to be sustainably produced. Provides certifications for non-use of hazardous materials like asbestos.
5	Conducts risk analysis for larger projects, considering potential hazardous materials and the necessary steps to avoid accidents.
6	Conducts annual SWOT analysis to identify sustainability risks and necessary actions. Primarily works with global, large-scale suppliers who assert their sustainability. Communicates any issues or problems identified up the supply chain.
7	Engages in continuous improvement and frequent communication with suppliers. Works collaboratively on problem-solving and supply chain optimization. Keeps a list of risk materials and monitors changes.
8	Conducts regular business risk assessments, including potential sustainability risks such as fires and environmental damage. Ensures that hazardous chemicals are not used. Considers the risk of sustainability performance being inadequate for customers, which could lead to loss of clientele. Requires suppliers to sign a code of conduct, but has not yet conducted sustainability audits or requested sustainability calculations.

Table 20. Practices to manage and mitigate sustainability-related risks.

In conclusion, managing and mitigating sustainability-related risks within an organization involves a diverse range of practices. These include conducting regular risk assessments, optimizing the supply chain, ensuring compliance with environmental standards, and choosing suppliers based on their sustainability performance. In addition, crucial factors are continuous improvement, open communication, close collaboration with suppliers, and the implementation of prohibitions on hazardous substances.

5.3.2 Evaluation of sub-supplier in the SCM of the supplier

The analysis of the interview data revealed several key themes, such as quality, cost, supplier selection criteria, and sustainability. Quality was consistently emphasized by the suppliers as a primary factor in the selection process. For instance, Supplier 1 mentioned, "Cost pressure is so high that we go with whoever is good in terms of quality, that is like the number one". Similarly, Supplier 4 noted the importance of prioritizing quality and durability in the selection process, stating that "we try to prioritize them". Supplier 2 explained that "Commercial aspects are always involved, and their terms and conditions must be approved". Supplier 7 echoed this sentiment, pointing out the importance of cost in the evaluation process: "So, we prefer to support local suppliers if possible. We have many local suppliers nearby, and we focus more on quality, cost, and delivery times". These results indicate that the barriers still lay within the financial costs of the operation (Ageron et al., 2012).

The interviews also revealed specific criteria and standards used in the supplier selection process. Supplier 3 mentioned the use of ISO standards, stating, "They define quite a lot, and we require a larger number of our subcontractors to have ISO standards in use". Supplier 8 also highlighted the importance of assessing suppliers' social responsibility, stating, "The supplier's social responsibility and other aspects are certainly important". Sustainability, while not always the top priority, was recognized as an important factor in supplier selection. Supplier 6 acknowledged that sustainability is one of the many criteria in their evaluation process: "Yes, it is one of the many criteria and competitions,

and it is a long process”. Supplier 7, however, admitted that sustainability was not their primary concern, stating, "It is not our number one criterion, to be honest”.

In summary, the interviews reveal that while quality, cost, and commercial aspects are the primary concerns in supplier selection, sustainability is increasingly recognized as an important factor. Suppliers are aware of the need to incorporate sustainability in their selection criteria, and they are using ISO standards, social responsibility assessments, and other approaches to ensure this is taken into consideration. These criteria show moderate understanding and capability in incorporating sustainability as a supplier selection criterion in the suppliers’ supply chains (Ikram et al., 2021; Li et al., 2021).

5.3.3 Challenges now and in the future

The results emphasize the challenges and concerns encountered by different suppliers in the arena of sustainability. Given the rapidly evolving landscape, the companies are opposing with a variety of difficulties to maintain an sustainable approach to business while remaining economically feasible. These challenges encompass areas such as new energy solutions, internal and external communication, data tracking, cost and competitiveness, high-energy consumption, ethical sourcing and sustainability of materials, availability of supplies, customer expectations, and standardized sustainability metrics. Table 21 provides a concise overview of these challenges as stated by each supplier.

Supplier	Challenges
1	Risk and opportunity with new fuels. Staying up-to-date with development. Maintaining a competitive edge.
2	Communication between all parties. Regular meetings and discussions. Documentation of sustainability practices.Time management. Effective internal communication.
3	Reliable data acquisition from their own operations. Regular updates instead of infrequent data dumps. Collaboration with third parties.

4	Cost competitiveness affecting sustainability choices. Customer willingness to pay more for sustainability. Minimal inherent environmental risks.
5	High electricity consumption in manufacturing processes. Source and transport distance of steel supplies. Cost of 'green' steel affecting competitiveness. Customer willingness to pay for greener products.
6	Sustainable technology development. Ethical sourcing of materials. Durability of products to prevent waste.
7	Availability of sustainably produced supplies. Global challenges affecting local operations.
8	Balancing customer cost expectations with sustainable production. Lack of customer interest in carbon footprint. Standardization of sustainability metrics. Continuous improvement in sustainability practices.

Table 21. Challenges as seen by the suppliers.

In conclusion, the various challenges identified in the pursuit of sustainability encompass managing the risks and opportunities associated with new fuel technologies, ensuring effective internal and external communication and documentation of sustainability practices, and the reliable gathering and regular updating of data from their operations. Some of the challenges stem from grappling with cost competitiveness and its impact on sustainability choices, dealing with high energy consumption in manufacturing processes, and the sourcing and cost of sustainable materials. Furthermore, other issues include the development of sustainable technology and ethical sourcing of materials, ensuring the availability of sustainably produced supplies, and balancing customer cost expectations with the desire to produce in a more sustainable way, including the lack of standardized sustainability measurements. Overcoming these challenges is crucial for organizations aiming to achieve a sustainable supply chain in the future (Bai & Sarkis, 2010; Li et al., 2021; Orazalin & Mahmood, 2019).

6 Managerial implications

This chapter aims to translate the theoretical insights and empirical results of the study into actionable guidance for managers and decision-makers. By focusing on the real-world implications of the research, this section provides valuable information that can help organizations improve their practices, overcome challenges, and capitalize on opportunities for growth and innovation. In this chapter, the key findings of the research are summarized, emphasizing their relevance to management practice.l After summarizing the key findings, a gap analysis is established to rationalize the recommendations of the study. Consequently, specific recommendations are provided based on the findings, offering practical guidance in addressing the issues identified in the study.

Furthermore, these recommendations have been separated into three sectors: Addressing these recommendations through sourcing and supplier development, improving the supplier assessment and vendor rating process to include sustainability, and lastly, creating a new system for the focal organization to review the sustainability of the suppliers. The challenges, barriers, and opportunities section delve into potential obstacles that may arise during the implementation of the recommendations, as well as strategies to address them and capitalize on opportunities for growth. Lastly, the of the findings generalization is discussed, exploring the extent to which the results can be applied across different organizational contexts and industries. This chapter ultimately answers the third research question: “In which ways, a company can support improving the sustainability of its supply networks?”.

6.1 Summary of key findings

The empirical study reveals that suppliers provided a range of definitions for sustainability, which can be grouped into three primary themes: environmental protection, social responsibility, and economic viability. Most of the suppliers showed a strong dedication to sustainability, incorporating it into numerous areas of their businesses, such as

investment programs, value chains, and production processes. The key elements of sustainable practices encompass energy efficiency, waste management, sustainable transportation, local sourcing and collaboration, and sustainable employee benefits. Furthermore, the suppliers stated that to foster a culture of sustainability within organizations, employee involvement and awareness, environmental policies, certifications, and the integration of sustainability into processes and operations are vital.

Suppliers stressed the significance of customer needs, legal requirements, monitoring and evaluating sustainability metrics, energy conservation, waste management, and communication in their decision-making processes. They use various methods to stay updated on sustainability trends, regulations, and market demands, including internal communication, industry events, and learning from suppliers and customers. Effective communication and collaboration with customers on sustainability matters are crucial, which includes using certifications and standards, direct communication, and ongoing development of sustainability initiatives. Suppliers also emphasize that establishing long-lasting relationships, maintaining transparent communication, and exchanging information and experiences are crucial for working together with customers to address sustainability issues.

Suppliers employed different techniques to measure and report their sustainability performance, such as KPIs, external audits, and some ESG criteria. However, there is still room for improvement to prevent greenwashing. Risk assessment, supplier selection and management, and communication with suppliers are important aspects of achieving sustainability within supply chain management. In addition, there were some challenges in incorporating sustainability into business operations including adapting to new technologies, effective communication and information sharing, competition, pricing pressures, and consistently measuring and reporting sustainability performance. These findings ultimately present an answer to two of the objectives of this study, which were: “What is the current situation of sustainability in the supplier field of the case company”, and “How do our suppliers operate in a sustainable manner”.

6.2 Recommendations

Based on the literature and empirical research findings, we can formulate actionable recommendations for managers, particularly those in charge of supply chain and procurement operations, or within the context of the case company, supply management. By conducting a gap analysis, we can pinpoint specific areas where improvements can be made. The recommendations are applied to three distinct approaches: supplier development and sourcing programs, modifications to vendor ratings and supplier assessments, and the implementation of a supplier sustainability-weighted scoring matrix.

6.2.1 Gap analysis

By utilizing gap analysis in the results of the interviews, we can identify the differences or "gaps" between existing practices and potential actions to make. By examining these gaps, it is possible to pinpoint the topics that would benefit from further exploration. This process can be used as a strategic tool to develop well-informed and relevant recommendations, ensuring that the work contributes valuable insights to the supply management of the case company, and to other organizations relevant to the industry. The current state, the desired state, and the specific gap is illustrated in Table 21.

Current state	Future state	Gap
Suppliers have various definitions of sustainability categorized into environmental protection, social responsibility, and economic viability	Suppliers have a unified understanding of sustainability, encompassing environmental protection, social responsibility, and economic viability.	Lack of a unified understanding of sustainability among suppliers.
Sustainability is incorporated into some aspects of suppliers' businesses, such as investment programs, value chains, and production processes.	Sustainability is fully integrated into all aspects of suppliers' businesses, with clear strategies and goals that align with customer expectations.	Inconsistency in the integration of sustainability into all aspects of suppliers' businesses
Suppliers emphasize the importance of customer needs, legal requirements, monitoring and evaluation of sustainability metrics, energy conservation, waste management, and communication.	Suppliers consistently prioritize sustainability in decision-making processes and proactively monitor and evaluate sustainability metrics.	Inadequate prioritization of sustainability in decision-making processes.
Suppliers utilize different methods to stay informed about sustainability trends, regulations, and market demands.	Suppliers have effective systems in place to stay informed and adapt to sustainability trends, regulations, and market demands.	Inefficient systems for staying informed about and adapting to sustainability trends,

		regulations, and market demands.
Suppliers collaborate with customers on sustainability issues through certifications and standards, direct communication, and continuous development of sustainability efforts.	Suppliers and customers have strong partnerships, open communication channels, and shared goals to drive sustainability efforts.	Insufficient partnerships, communication channels, and shared goals between suppliers and customers on sustainability issues.
Suppliers measure and report sustainability performance using KPIs, external audits, and ESG criteria, but may lack a more objective analysis.	Suppliers use robust measurement and reporting systems for sustainability performance, such as ESG criteria, to prevent greenwashing and ensure continuous improvement.	Incomplete measurement and reporting systems for sustainability performance, leading to potential greenwashing.
Challenges in incorporating sustainability into business operations include adapting to new technologies, effective communication, competition, pricing pressures, and consistent measurement and reporting of sustainability performance.	Suppliers effectively address and overcome challenges in incorporating sustainability into their business operations.	Difficulty addressing and overcoming challenges in incorporating sustainability into business operations.

Table 22. Gap analysis.

6.2.2 Supplier development and sourcing strategies

Firstly, when assessing supplier sustainability through sourcing and supplier development, it is essential to establish clear sustainability goals and objectives for suppliers. This can be achieved by developing a standardized supplier sustainability assessment framework based on the discovered criteria and factors. It is important to communicate the expectations and requirements to the suppliers while providing necessary support for improvements. Regular data collection, analysis, and reporting of supplier sustainability performance are crucial for tracking progress. This can be supplemented by conducting supplier audits and site visits to verify the accuracy of the reported data and evaluate actual practices. In addition, recognizing and rewarding high-performing suppliers can help encourage continuous improvement and foster a culture of sustainability throughout the supply chain.

In addition to the steps mentioned earlier, the gap analysis can be more thoroughly examined to determine the actions needed to close the identified gaps. This deeper investigation involves not only recognizing the inconsistencies between the current state and

desired outcomes but also formulating targeted strategies to address these shortcomings effectively. The gaps and their respective actions are illustrated in Table 23. These actions can be further included in the sourcing and supplier development programs of the case company. Furthermore, these actions partly answer to one of the objectives of the thesis, which is “What can the case company do to improve the sustainability of its suppliers”, and “How do the current sustainability initiatives that the case company has, perform?”.

Gap	Actions to close the gap
Lack of a unified understanding of sustainability among suppliers.	Develop and communicate a clear, comprehensive definition of sustainability that involves environmental protection, social responsibility, and economic viability. Provide training and workshops for suppliers to ensure a consistent understanding of sustainability concepts and goals.
Inconsistency in the integration of sustainability into all aspects of suppliers' businesses	Develop a comprehensive sustainability strategy for suppliers, including specific targets, goals, and action plans. Conduct regular assessments of suppliers' sustainability performance to ensure alignment with the case company's sustainability goals.
Inadequate prioritization of sustainability in decision-making processes.	Encourage suppliers to establish sustainability-focused decision-making frameworks and guidelines. Monitor and evaluate suppliers' adherence to these frameworks, providing feedback and recommendations for improvement.
Inefficient systems for staying informed about and adapting to sustainability trends, regulations, and market demands.	Facilitate access to relevant information sources, such as industry reports, webinars, and conferences, to keep suppliers informed about sustainability trends and regulations. Promote collaboration and knowledge-sharing among suppliers to foster a culture of continuous learning and improvement in sustainability practices.
Insufficient partnerships, communication channels, and shared goals between suppliers and customers on sustainability issues.	Strengthen supplier-customer relationships by establishing regular communication channels and fostering long-term partnerships focused on sustainability. Collaborate on specific sustainability projects and initiatives to align goals and drive continuous improvement.
Incomplete measurement and reporting systems for sustainability performance, leading to potential greenwashing.	Implement robust measurement and reporting systems, such as ESG criteria, to ensure transparency and accuracy in sustainability performance. Provide guidance and support for suppliers in adopting these systems, as well as regularly reviewing and updating them to stay current with best practices.
Difficulty addressing and overcoming challenges in incorporating sustainability into business operations.	Assist suppliers in identifying and addressing the root causes of sustainability challenges through targeted support, such as technology adoption, process improvement, and capacity building. Encourage suppliers to share best practices and lessons learned with each other to promote a culture of continuous improvement and problem-solving in the face of sustainability challenges

Table 23. Actions to close the gap.

6.2.3 Vendor rating and supplier assessment changes

While the case company currently has a process in place to assess suppliers, it doesn't address sustainability as an individual topic. This could potentially compromise the case company's efforts to ensure a sustainable supply chain, as it may overlook suppliers who are not following sustainability. To effectively promote sustainability throughout the supply chain, it would be beneficial for the case company to expand its supplier assessment process to include sustainability as its own category. This should be combined with a set of questions designed for the supplier assessment process. Moreover, the vendor rating system should include sustainability as a separate element that can be scored, with defined criteria for each rating level and related guiding questions. The supplier assessment and vendor rating criteria modification are illustrated in Table 24 and Table 25.

Sustainability Management
What is your level of commitment to sustainability in your operations and supply chain?
Does your company have a sustainability policy or a comprehensive sustainability management system in place?
Do your products or services align with the case company's sustainability standards?
Does your supply comply with local and international environmental regulations?
Do you have any certifications related to sustainability management (e.g., ISO 14001)?
Are you actively working towards reducing your carbon footprint and environmental impact?
Do you have a strategy for resource efficiency and waste reduction in your operations?
Are you transparent and accountable in reporting your sustainability performance?
Can you provide evidence of improvements in your sustainability performance?
Are you aware of the case company's sustainability objectives and targets, and are you willing to support them?
Do you provide sustainability training and education to your employees?
Are you willing to cooperate with the case company in efforts to improve sustainability in the supply chain?
Do you have a plan for managing sustainability risks and opportunities?
Are you committed to continuously improving your sustainability performance?
Do you have a system for stakeholder engagement on sustainability issues?

Table 24. Supplier Assessment Criteria, Sustainability Management.

Sustainability Management		
Not compliant	**Compliant with remarks**	**Compliant**
The supplier does not have a sustainability management system or practices in place, nor any intention to implement one. The company does not consider sustainability factors in its operations or supply chain.	The supplier has basic sustainability policies or procedures in place, but no comprehensive sustainability management system. Alternatively, the supplier has a plan for implementing a sustainability management system that meets recognized standards and is fully complying with local sustainability legislation.	Environmentally friendly practices and sustainable resource management are in place. The supplier has a certified sustainability management system or a clear schedule to apply for certification. Alternatively, the supplier's sustainability management system is not certified but meets recognized sustainability standards. The supplier acknowledges and is willing to support the case company's sustainability objectives and targets.
Guiding questions: • Does the supplier report its sustainability achievements? • Does the supplier have a measurement system for sustainability? • Is the supplier aware of the case company's sustainability objectives and targets?		

Table 25. Vendor Rating Criteria, Sustainability Management.

This approach contributes to addressing the main question of the thesis, which is "What can the case company do to improve the sustainability of its suppliers?" By incorporating sustainability as a key element in its supplier assessment and vendor rating processes, the case company can actively better their sustainability practices amongst its suppliers.

6.2.4 Supplier sustainability weighted scoring matrix

To measure the progress and ensure continuous improvement, it is essential to have a comprehensive model to measure the sustainability performance of the supplier. This model should encompass various dimensions of sustainability, including environmental, social, and economic aspects. Based on the literature review, key findings, and gap analysis, it is possible to pinpoint the most relevant factors contributing to sustainability from their respective dimensions of sustainability. From the field of environmental sustainability, carbon footprint, resources, energy, and waste should be included. Similarly, from

social sustainability, labor practices, human rights, and community should be included in the model. Lastly, economic sustainability should encompass financial performance, innovation & adaptability, and ethical governance should be used.

It is important to include weights to address the problem of comparing supplier scores with each other, since certain control variables may affect the feasibility of the factors for the suppliers differently. Therefore, there should be a clear rationale behind the weight assigned to each criterion. The weights should be assigned through three scopes: Organization's strategic objectives, the industry standards, and stakeholder expectations. An example of giving weights is presented in Appendix 2. However, there is still a limitation to the weighted scores. If supplier B has lower weights on each of their criteria, it would result in a lower overall score, even if their actual sustainability situation is similar to supplier A. This is an inherent limitation of the weighted scoring matrix approach when comparing suppliers with different weights on the criteria. To address this issue, the weights should be normalized for each supplier so that the sum of the weights is equal for all suppliers. This would ensure that the overall impact of the weights is consistent across both suppliers, allowing for a more accurate comparison of their sustainability performance.

By normalizing the weights, it is possible to minimize the distortion caused by different weightings for each supplier and provide a more fair and accurate comparison of their sustainability performance. This is done with the following: First, calculate the sum of the weights of the supplier by adding up their individual weights. Next, divide the weight of the individual criteraia by the sum of weights to obtain the normalized weight. Then, multiply the normalized weight by the score for each criterion to compute the normalized weighted score. Afterward, sum up the normalized weighted scores for each criterion to determine the overall score for each supplier. Finally, it is possible to compare the total scores of various suppliers to evaluate their relative sustainability performance. The Supplier Sustainability Scoring Matrix is illustrated in Table 26. Likewise, the filled matrix is presented in Appendix 3.

Criteria	**Weight (1-5)**	**Normalized Weight (Weight/Sum of Weights)**	**Supplier score (1-10)**	**Normalized Weighted score**
Environmental sustainability				
Carbon footprint				
Waste management				
Energy efficiency				
Sustainable materials				
Biodiversity impact				
Social sustainability				
Labor rights				
Human rights				
Employee health and safety				
Community engagement				
Economic sustainability				
Financial stability				
Cost efficiency				
Innovation				
Ethical governance				
Compliance with regulations				
Sum:				

Table 26. Supplier Sustainability Scoring Matrix.

This model could be further improved by defining specific criteria for determining the weights, such as financial stability, geographic location, or industry. These factors could automatically establish certain weights in the model. This approach could lead to a more

standardized model, facilitating easier comparisons across specific industries and other parameters. In addition, it is important to regularly review and update the scoring model, considering emerging trends, best practices, and stakeholder feedback. This ensures the model remains relevant and effective in driving sustainable practices across the entire supplier base. Finally, this model conclusively addresses the objective of the thesis, which seeks to answer the question “What can the case company do to improve the sustainability of its suppliers”.

6.3 Limitations in implementing the recommendations

Implementing the proposed recommendations may present several challenges and barriers. One significant challenge is the allocation of resources, such as time, money, and personnel. Organizations may find it difficult to allocate the necessary resources for effectively incorporating sustainability in their processes. Furthermore, suppliers may resist changes that they perceive as costly, time-consuming, or disruptive to their existing operations. Overcoming this resistance may require open communication, collaboration, and ongoing support from the case company.

In terms of barriers, the case company might face a lack of expertise in assessing sustainability performance or in implementing sustainable sourcing and supplier development practices. This could necessitate investment in training or the hiring of additional experts in the field. Furthermore, complex or geographically dispersed supply chains could pose difficulties in monitoring and enforcing sustainability standards effectively. Finally, legal, or regulatory hurdles might arise, particularly as the case company operates in multiple jurisdictions. Overcoming these obstacles would need a deep knowledge of the laws and regulations, and potentially hiring legal professionals to ensure compliance.

6.4 Generalization

While the findings of this study are in the context of the case company, they offer valuable insights that could be applicable to other organizations as well. The methodologies and strategies recommended for enhancing sustainability in supplier relationships and incorporating sustainability in vendor rating and supplier assessment processes can be generally applied across organizations and industries.

However, it's important to remember that each organization has its unique set of dynamics, industry norms, and operational context. Thus, while the overall strategies and principles are transferable, specific tactics and approaches may need adjustment to align with the individual circumstances of different companies. Consequently, decision-makers should be mindful of these variations when applying the findings to their environment. Overall, this research offers a comprehensive framework that can help not only the case company but also other similar organizations in enhancing their sustainability practices within the supplier relationships and sourcing processes.

7 Conclusions

The purpose of this chapter is to highlight the central focus of the study - supplier sustainability. This thesis aimed to identify the factors that influence sustainability and find what actions suppliers are currently taking to improve their sustainability. Moreover, the processes within the case company were analyzed, assessing their effectiveness in increasing supplier sustainability. The analysis of the processes in relation to the findings from semi-structured interviews revealed gaps in these processes, which led to the managerial implications, and recommendation of changes. Furthermore, the recommendations were designed to fit the needs of the case company. If implemented, these changes could significantly improve the case company's ability to promote sustainability among its suppliers, leading to a more sustainable supply chain. Essentially, this chapter provides a summary of the research objectives, limitations, and suggests potential topics for future investigation.

7.1 Summary of the study objectives

The study encompassed three research questions that collectively aimed to assess supplier sustainability from multiple perspectives. By addressing these questions, the research attempted to provide a holistic understanding of the factors, challenges, practices, and initiatives pertaining to sustainability within a company's supply network. The first research question of the thesis attempted to identify the factors and obstacles that influence the incorporation of sustainability within a company's supply chain. This research question was answered through a comprehensive literature review, which presented the dimensions, factors, and criteria that were recognized to promote sustainability. As a result of the literature review, a conceptual framework was developed to encapsulate the factors that must be considered when addressing supply management issues within an organization. Essentially, this provides a summarized response to the research question. The studies that directly influenced the conceptual framework were presented in Table 9, and the conceptual framework was presented in Figure 11.

The second research question aimed to identify the existing sustainability practices and initiatives that are currently being implemented within a company's supply network. This question was answered by conducting semi-structured interviews with the suppliers of the case company. In evaluating the results of the study, various practices and initiatives related to sustainability were identified within the case company's supply networks. Essentially, the practices were presented in Tables 14,15, 16, 17, and 18. In addition, the semi-structured interviews highlighted that suppliers define sustainability through environmental protection, social responsibility, and economic viability. Suppliers are incorporating sustainability into various business areas, underlining the importance of customer needs, legal requirements, and effective communication in decision-making processes. They stay updated on sustainability trends and regulations using several methods and emphasize the significance of communication and collaboration with customers on sustainability. Despite these practices, challenges arose in integrating sustainability into business operations, including the adaptation to new technologies, effective information sharing, competition, pricing pressures, and consistent sustainability performance measurement and reporting.

Finally, the third research question attempted to uncover how a company can contribute to enhancing the sustainability of its supply networks. Answering this research question required conducting a literature review, building a conceptual framework, carrying out and analyzing interviews, and examining the processes of the case company. Furthermore, the conceptual framework offers the case company a structured approach to understanding and managing complex supply management issues. It provides strategic guidance, simplifies decision-making, and promotes consistency across the organization. As a result of these investigations, recommendations were formulated to improve the case company's processes and procedures. These recommendations focused on supplier development and sourcing, modifications to the supplier assessment and rating process, and the creation of a supplier score matrix.

7.2 Limitations

This research has a few limitations that should be considered in interpreting the study. Firstly, it must be recognized that the research might be biased due to the limited sample size. The semi-structured interviews enable the research to incorporate only a reasonable number of suppliers, therefore, it should not be assumed that the results would accurately represent the status within the entire supplier field. Likewise, while the organization operates globally, the focus of the thesis is on its division in Finland. As such, the findings might more accurately reflect the situation in Finland, the Nordic countries, or Europe, rather than other regions. Moreover, given the current trends in emphasizing sustainability in Nordic countries, the results may be influenced by this geographical scope. Differing sustainability definitions among suppliers complicate the objective evaluation of interview responses, as interviewees might only acknowledge certain sustainability aspects, potentially misrepresenting their organization's broader operations.

7.3 Recommendations for future research

The findings from this thesis open several paths for further exploration and investigation. Future research could extend this study's geographic scope by replicating similar research in an organization operating in a different country or continent. This could offer valuable insights into how geographical factors influence supplier sustainability and potentially highlight regional differences in sustainability practices and perceptions. Furthermore, the implementation of robust measurement and reporting systems for sustainability performance represents a vital area for future exploration. More research is needed to understand the most effective ways to prevent greenwashing and ensure transparency in sustainability performance. This could involve studying the implementation of various sustainability criteria and developing new sustainability reporting systems. The examination of these topics would make a significant contribution to the field by improving the understanding of quantifying and communicating sustainability, as well as recognizing the influence of geographical and cultural variations.

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Appendices

Appendix 1. Interview guide

Category 1: Definition, strategies, operation

1. How would you define sustainability?
    - Try to seek out the dimensions (environmental, labor & human rights, ethics, sustainable procurement)
2. Can you describe your company's approach to sustainability?
    - Do you have sustainability in your organization's strategy, do you have sustainability targets, or have you adapted any certifications?
3. How does sustainability impact your business operations and decision-making processes?
    - Any commitments to decrease emissions, waste reduction, energy usage, renewables, and reuse of materials, how do they affect the business operation/decision-making processes?
4. Can you describe any sustainable practices currently in place within your organization?
    - Energy efficiency, waste reduction, renewable energy, sustainable supply chain, employee engagement, community engagement?
5. How does your organization integrate sustainability into its operation?
    - Do you have a process that includes new strategies or initiatives and assures their credibility?

Category 2: Communication, collaboration, supplier development, reporting

6. How does your organization stay informed about sustainability, trends, and regulations?
    - Do you actively monitor industry trends, engage with stakeholders, conduct R&D, attend conferences, or monitor regulations? How?
7. How do you communicate and collaborate with your customers on sustainability issues?

- Do you publish sustainability reports, and customer surveys, attend workshops, sustainable product development, attend to supplier development programs?

8. How would you prefer to collaborate with your customers on sustainability issues?
    - What is your preferred method to collaborate? Open communication, problem-solving, long-term partnerships, supplier development programs, shared value creation?
9. How do you measure and report on your sustainability performance?
    - KPIs, ESG, metrics, reporting, third-party assurance, stakeholder engagement?

Category 3: Risks, supply chain management, and challenges

10. How do you manage and mitigate any sustainability-related risks within your organization?
    - What sustainability-related risks are there in your organization, and how do you minimize them? Risk assessment, mitigation plans, stakeholder engagement, continuous monitoring or improvement, collaboration?
11. How do you evaluate and select (sub)suppliers with regard to sustainability?
    - Any sustainability criteria (environmental, labor, human rights, ethics, etc.), supplier assessment, or stakeholder impact?
12. What challenges do you see your organization facing in terms of sustainability now and in the future?

Appendix 2. Example of giving weights to the factors in the supplier scoring matrix

Organizations strategic objectives:
Focus on reducing carbon emissions and improving energy efficiency.
Prioritize labor rights and employee health & safety.
Ensure innovation and adaptability to stay competitive in the market.
Industry standards:
Electronics manufacturing is energy-intensive and has a significant carbon footprint, hence, energy efficiency and carbon footprint reduction are crucial.
Labor rights and employee health & safety are essential due to the nature of the work in this industry.
Stakeholder Expectations:
Customers are increasingly concerned about the environmental impact of electronics manufacturing and expect suppliers to adhere to environmental regulations.
Employees and investors expect organizations to prioritize labor rights, human rights, and employee health & safety.

Hence, the following weights can be set for the supplier scoring matrix:

Criteria	**Weight (1-5)**	**Rationale**
Environmental sustainability		
Carbon footprint	4	High organizational focus on reducing carbon emissions
Waste management	3	Moderate focus on waste management in the organization
Energy efficiency	5	Top priority as per strategic objectives and industry standards

Sustainable materials	3	Moderate importance due to stakeholder expectations and organizational goals
Biodiversity impact	1	Lowest priority due to limited direct impact on biodiversity in Supplier's operations
Social sustainability		
Labor rights	4	High importance due to industry requirements, stakeholder concerns, and organizational goals
Human rights	4	High importance due to stakeholder expectations, industry requirements, and organizational goals
Employee health and safety	5	Top priority due to industry requirements, stakeholder expectations, and organizational goals
Community engagement	3	Moderate importance due to stakeholder expectations and organizational goals
Economic sustainability		
Financial stability	4	High importance for long-term business viability, investor concerns, and organizational goals
Cost efficiency	5	Top priority for competitiveness, profitability, and organizational goals
Innovation	4	High importance for staying competitive, addressing stakeholder expectations, and meeting organizational goals
Ethical governance	3	Moderate importance due to stakeholder expectations, industry requirements, and organizational goals
Compliance with regulations	5	Top priority due to legal requirements, stakeholder expectations, and organizational goals

Appendix 3. Example of the use of sustainability score matrix

Criteria	**Weight (1-5)**	**Normalized Weight (Weight/Sum of Weights)**	**Supplier score (1-10)**	**Normalized Weighted score**
Environmental sustainability				
Carbon footprint	5	0,092592593	10	0,925925926
Waste management	4	0,074074074	8	0,592592593
Energy efficiency	4	0,074074074	6	0,444444444
Sustainable materials	3	0,055555556	8	0,444444444
Biodiversity impact	2	0,037037037	8	0,296296296
Social sustainability				
Labor rights	4	0,074074074	8	0,592592593
Human rights	5	0,092592593	6	0,555555556
Employee health and safety	5	0,092592593	7	0,648148148
Community engagement	3	0,055555556	4	0,222222222
Economic sustainability				
Financial stability	5	0,092592593	10	0,925925926
Cost efficiency	3	0,055555556	5	0,277777778
Innovation	3	0,055555556	8	0,444444444
Ethical governance	4	0,074074074	4	0,296296296
Compliance with regulations	4	0,074074074	8	0,592592593
Sum:	54	1	100	**7,259259259**