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**Lappeenranta Lahti University of Technology LUT**

School of Business and Management

Master's Programme in Supply Management

**Influence of information sharing to supplier sustainability and  
the potential of blockchain to disrupt current information sharing practices**

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## TIIVISTELMÄ

|                         |   |
|-------------------------|---|
| <b>Otsikko:</b>         | Informaatiojakamisen vaikutus toimittajan vastuullisuuteen ja lohkoketjuteknologian mahdollisuudet muokata nykyisiä informaatiojakamisen käytäntöjä |
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Modernin yrityksen on kannettava yhteiskuntavastuunsa ja kehitettävä toimintaansa ottamalla huomioon taloudelliset, sosiaaliset ja ympäristövastuulliset toiminnan seuraamukset. Samaan aikaan globalisoituminen sekä lisääntynyt ulkoistaminen ovat laajentaneet yritysten toimitusketjuja ympäri maailmaa. Toimittajien vastuullisuus on suoraan linkitettävissä ostoyrityksen vastuullisuuteen, mikä tarkoittaa, että yritysten on pyrittävä vaikuttamaan informaatiojakamisen avulla toimittajien vastuullisuuden lisäämiseen.

Tämän pro gradu tutkimuksen tarkoitus on tutkia laadullisin menetelmin informaatiojakamisen vaikutusta toimittajien vastuullisuuteen, identifioida sen nykytila, sekä tutkia lohkoketjuteknologian tuomia mahdollisuuksia muokata nykyisiä käytäntöjä. Tutkimuksessa myös sivutaan mahdollisuutta jakaa vastuullisuusinformaatiota horisontaalisesti, muiden ostajien kesken. Tutkimus on tehty tapaustutkimuksena ja rajattu koskemaan vain palmuöljyn hankintaketjua.

Empiirisen tutkimuksen tuloksena voidaan todeta, että palmuöljyn hankintaketjussa informaatiojakamisen kulttuuri on kehittynyt huomattavasti viimeisen kymmenen vuoden aikana ja informaatiojakamisen menetelmät ovat siirtymässä pääosin erilaisin järjestelmien hallittaviksi. Lisääntynyt tiedonkeruu, sekä toisaalta sidosryhmiltä tuleva paine on osaltaan toiminut kehityksen motivaattoreina. Lohkoketjuteknologian tuomia mahdollisuuksia tutkitaan, mutta teknologia ei tällä hetkellä toimi ainoana mahdollisuutena, miten tiedonjakamista voitaisiin kehittää. Vastuullisuustiedon jakamista horisontaalisesti muiden ostajien kesken ei tällä hetkellä hyödynnetä, mutta kiinnostusta laajempaan tiedonhyödyntämiseen löytyy.

## ABSTRACT

|                         |  |
|-------------------------|--|
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A modern company must assume its social responsibility and develop its operations by taking into account the economic, social and environmental consequences of its actions. At the same time, globalization and increased outsourcing have expanded the supply chains of companies around the world. Sustainability of suppliers can be directly linked to the purchasing company, which means that companies must strive to increase the sustainability of suppliers by means of information sharing.

This master's thesis aims study, by qualitative methods, the influence of information sharing to supplier sustainability, to identify its current state, and to explore the opportunities brought by blockchain technology to disrupt current practices. This study also ponders the possibility of sharing responsibility information horizontally, among other buyers. The study has been conducted as a case study and is limited to the palm oil supply chain only.

As a result of empirical research, it can be stated that the culture of information sharing in palm oil supply chain has developed considerably during the last ten years and the methods of information sharing are shifting mainly to be handled through various systems. Increased data collection, as well as pressure from stakeholders, have contributed to the development. The potential of blockchain technology is being explored, but the technology is not currently the only option of how information sharing could be developed. The horizontal sharing of sustainability information among other buyers is not currently exploited, but there is interest in this sort of wider use of information.

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My time in Lappeenranta was short, but ever more enjoyable. This time reminded me of how interesting and fun studying and learning can be, and encouraged me to go towards my dreams, whatever they may be.

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Helsinki, 8<sup>th</sup> of November 2020

*Anuliina Karvinen*

## Table of Contents

|       |  |    |
|-------|--|----|
| 1     | INTRODUCTION .....   | 1  |
| 1.1   | Literature review and focus of the study.....                      | 3  |
| 1.1.1 | Current study on supplier visibility and information sharing ..... | 4  |
| 1.1.2 | Current study on technology enabling visibility .....              | 7  |
| 1.2   | Research questions.....  | 9  |
| 1.3   | Conceptual framework.....  | 12 |
| 1.4   | Limitations .....  | 13 |
| 1.5   | Structure of the thesis .....                                      | 14 |
| 2     | CORPORATE SOCIAL RESPONSIBILITY IN SUPPLY CHAIN .....              | 15 |
| 2.1   | Sustainable supply chain management .....                          | 17 |
| 2.2   | Information sharing enabling supplier visibility .....             | 19 |
| 2.2.1 | Drivers and restrains of information sharing.....                  | 21 |
| 2.2.2 | Supplier visibility as part of supplier development .....          | 24 |
| 2.3   | Measures of supplier sustainability in modern supply chains.....   | 25 |
| 2.4   | Sharing visibility among other buyers .....                        | 29 |
| 3     | BLOCKCHAIN TECHNOLOGY .....  | 30 |
| 3.1   | Security through decentralized systems.....                        | 32 |
| 3.2   | Blockchain in supply chains .....                                  | 34 |
| 3.3   | Limitations of blockchain based supply chain visibility .....      | 35 |
| 3.4   | Technology enabling value network creation.....                    | 36 |
| 4     | EMPIRICAL RESEARCH .....   | 38 |
| 4.1   | Research methodology.....  | 39 |
| 4.2   | Data collection.....   | 41 |

|     |  |    |
|-----|--|----|
| 4.3 | Reliability and validity.....                            | 41 |
| 4.4 | Introduction of case company.....                        | 43 |
| 5   | ANALYSIS .....   | 44 |
| 5.1 | Neste Oyj palm oil supply chain.....                     | 44 |
| 5.2 | Information sharing enabling supplier visibility .....   | 47 |
| 5.3 | Blockchain technology enabling supplier visibility ..... | 50 |
| 5.4 | Scaling visibility information among other players ..... | 53 |
| 6   | CONCLUSIONS .....  | 55 |
| 6.1 | Answers to research questions.....                       | 55 |
| 6.2 | Discussion .....   | 60 |
| 6.3 | Suggestions for future research .....                    | 63 |
|     | LIST OF REFERENCES .....                                 | 64 |
|     | APPENDIX 1 .....   | 75 |
|     | APPENDIX 2 .....   | 77 |

## **LIST OF FIGURES**

**Figure 1.** Distinction of terms

**Figure 2.** Conceptual framework.

**Figure 3.** Triple bottom line.

**Figure 4.** The concept of distinctive supply chain visibility

**Figure 5.** Non-compliance strategy

**Figure 6.** History of industrial revolution

**Figure 7.** Blockchain transaction

**Figure 8.** Possible barriers of adopting blockchain technology

**Figure 9.** The five-stage research process model

**Figure 10.** Nest Oyj palm oil PFAD supply chain illustration

## **LIST OF TABLES**

**Table 1.** Drivers and restraints of information sharing

**Table 2.** Neste supplier sustainability requirements

**Table 3.** SUSTAIN goals

**Table 4.** Information sharing drivers to serve CSR matters

# 1 INTRODUCTION

*“Unprecedented and simultaneous advances in artificial intelligence (AI), robotics, the internet of things, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage, quantum computing and others are redefining industries, blurring traditional boundaries, and creating new opportunities. We have dubbed this the Fourth Industrial Revolution, and it is fundamentally changing the way we live, work and relate to one another.”*

— Professor Klaus Schwab, 2016

Long gone are the days where pure profit maximation, at whatever cost, was the only goal of a company. As business has gone more complex, the solutions have to be more innovative and reply to the needs of complexity. One of the topics getting more attention in this setting, is the social and environmental effects of business. This is mostly because of increased understanding of science behind changes in the climate, and thus greater transparency demands for individuals and nations, but also organizations, regarding their environmental and social actions. (Carter & Easton, 2011, 46.)

These issues are relevant to managers, because their stakeholders – customers, stockholders and employees are increasingly demanding that organizations address and manage the environmental and social issues that are impacted by their operations (Carter & Easton, 2011, 46). One of the aspects that increases pressure to companies to act responsibly and include corporate social responsibility (CSR) themes in their strategies, is the rapid flow of information that ensures that any unethical behaviour can bring instant unwanted attention to a company, and cause severe damage to brand reputation (Werther & Chandler, 2011, 20-22). This only increases the demand to have up-to-the-minute reliable and accurate information, and emphasises the role of new technological solutions to provide improvements to the information flow.

Through the ever-increasing competitive environment that companies have to work and success, every sector of every process in the company infrastructure have to be thought of as strategically significant. In this thesis the focus is in the supply chain sector. One of the aspects in this environment that is impacting company supply chain performance, is how well companies can observe their outsourcing activities, especially at their supplier side. With the increased outsourcing, suppliers' activities can have big impact on how well company's sustainable sourcing activities are working. This means that sustainable and efficient supply chain management has become an important part in company's competitiveness (Park et al. 2010, 496) and visibility and transparency can be seen as one of the most significant building blocks in sustainable supply chain management (Carter & Rogers 2008, 367).

This study aims to contribute to see how information sharing influences supplier sustainability and whether new technology could help form new ways on how CSR information can be shared more effectively, securely and less costly. In recent decades the technological advances have taken a big leap forward and new technological solutions have brought relevant possibilities for companies to develop their operations. In this study the focus is on blockchain technology, which has been bringing opportunities for supply chain sector in recent years.

The main focus is to identify what is meant with supplier visibility and how information sharing currently contributes to that, and how blockchain technology could help with the information sharing to enable supplier visibility, in order for companies to comply both internal and external CSR demands and look for the possibility of scaling that information beyond traditional one-to-one supplier-buyer relationship, so that other buyers could utilize the same information. Increasingly, business is about working with the right partners, in order to utilize each other's resources, and learning and innovating together.

This study is conducted as single case study with Neste palm oil supply chain acting as the case environment. Neste has in recent years increased their sustainability communications and as palm oil as a raw material has received criticism in media, it has been forcing its supply chain to create heavy inputs on sustainability. As a

company that has heavily invested on supplier visibility, Neste palm oil supply chain is excellent source for this thesis about the impacts of information sharing. This research is conducted through a single case study approach. Semi-structured interviews serve as empiric material to study about the current state of information sharing in case company. Through both theoretical framework and empirical part this study aims to find where the current state of information sharing in supplier visibility is, and also ponder its future possibilities that could be achieved with technology.

## **1.1 Literature review and focus of the study**

Literature review aims to align this study to the existing knowledge. It is important to define where current study and research on the topic is at the moment so that clear theoretical framework can be defined to support the empirical part of the study, providing possibility to create conclusions. This chapter gives preunderstanding of the topic, but also supports the process of building the most relevant research questions that carry the study forward. Identifying a research gap on its own helps to sharpen the topic and limit the study. (Kähkönen, 2011, 32.)

Eskola and Suoranta (2000) define that research topic is on point when researcher finds the topic to be interesting, but not too familiar, so that enough distance can be taken to survey it extensively. This means that there has to be some open questions and curiosity when defining a good research topic. It cannot be argued that over the recent years both blockchain technology and CSR themes have been in much discussion in corporate world. Especially blockchain technology has received extensive hype, especially in the last couple of years, while at the same time environment friendly solutions and corporate worlds effect on nature has been raised as relevant issues inside companies. This brings interesting ground for a research, as it is intriguing to look beyond the hype and study what is behind all the marketing talks.

The literature review focuses on both current studies on supplier visibility and current usage cases of blockchain based solutions in the supply chain field. It also mentions possible studies on joint collaborative buyer coalitions where supplier related sustainable information is shared among multiple players. Because of the modern

nature of the topic, literature review is conducted by using peer-reviewed online-based journal publications from the previous decade, 2010s.

### 1.1.1 Current study on supplier visibility and information sharing

For the purpose of the study it is necessary first to clarify the terminology used. Many cases the terms, “visibility”, “traceability” and “transparency” are being used somewhat synonymously. Although there is no standardized terminology, for this study, distinction made by Sodhi & Tang (2019, 2946) is being used, as visualized in figure 1. Visibility refers to managers’ efforts to gather information about operations both in upstream and downstream of supply chains. Traceability is a particular aspect of visibility, being the capability of a company for tracing the origins. Transparency can be the end result or traceability and visibility, being dependent on whether or not company decides to disclose the gathered information to their chosen stakeholders in public. Thus, in order to have transparency, companies must invest to visibility and traceability. (Sodhi & Tang, 2019, 2946.)



**Figure 1.** Distinction of terms. Adapted from Sodhi & Tang, 2019, 2946.

In this study visibility is receiving the attention, as aim is to study how information sharing affects supplier sustainability and how blockchain technology could improve supplier visibility in terms of improving the information flow. Transparency is relevant to this study in the sense that the information regarding suppliers could be possible shared among network of buyers through blockchain technology, and this way allowing the supply chain to gain transparency. Also, the term transparency is mentioned in the

theory part of this study because many times current researcher use that as an umbrella term and thus more material is available under that concept.

Information sharing in supply chain have received somewhat attention in the research world, but mainly in different context of what is focused in this thesis. In various research it is recognized as leverage to improve supply chain performance but mainly looked at in context of sharing demand information (Ha et al. 2011, Shen & Chan, 2017, Williams et al. 2013, Park et al. 2010, Huang et al. 2017), its effect on the relationship between supplier and buyer e.g. issues such as trust building (Özalp et al. 2014, Park et al. 2010) or focusing on the risks of unwanted information leakage (Kim et al. 2016). In many studies' technology is raised as key for information sharing, but as for various technological solutions, development is slow and thus answers remain theoretical. This could be one of the reasons why, for example blockchain technology has not been covered in the theme of information sharing in recent research.

In terms of supplier sustainability, many times studies focus on ways on monitoring suppliers. Most companies use some sorts of internal set of policies as a starting point to interact with suppliers. For the majority of organizations various social and environmental issues such as labour practices and working conditions set a standard for what against supplier is monitored. (Leire & Mont, 2010, 32.) Van der Werffa et al. (2018, 1037) argue that codes of conduct, rules and audit procedures have a positive influence on the level of sustainable procurement and that the intensity of communication and willingness to share information, has a positive relationship with sustainable procurement performance.

Not all studies simply point out that current practices are working flawlessly. Sancha et al (2016, 1935) stated that auditing and monitoring suppliers on social issues (e.g., working conditions or child employment) does not lead to direct improvements as evaluating activities does not simply translate into improvements in suppliers' performance. This leads to emphasis on how improving supplier sustainability in the end is directly linked to supplier development, as it is not enough to simply collect the information, but to be able to further process it into knowledge and actions.

Although widely used, the whole concept of auditing has also received some critique. Egels-Zandén (2017, 523, 527) argues that there is a risk that the scope of private regulatory systems is being developed to serve the interests of companies, activists, and consumers rather than those of the workers they claim to protect, based on limited resources and how firms define their responsibility boundaries. LeBaron et al. (2017, 972) even state that because of the underlying problems in current auditing procedures, it is creating more of an illusion of effective global supply chain governance rather than reality. Criticism towards auditing is also presenting Gonzales-Padron (2016, 22) with one of the identified problems being the management of information from the supply chain, thus supporting the topic on this research.

Similar outcome, although in slightly different context is presented by Akamp & Muller (2013) who studied buyer and supplier satisfaction and strongest buyer satisfaction did not come solely through supplier monitoring, but through supplier integration. Their study confirms assumptions that cooperative activities are helpful to overcome sustainability challenges that occur beyond company's corporate boundaries. This supports the question that combining companies' resources on supplier audits could benefit both buyers and suppliers by time saving, but also actual CSR related topics such as worker rights and environmental issues, when they are carved in the interest of multiple party, instead of being looked at from one perspective.

Recent studies of the supply chain information sharing in the context of multiple buyers tend to have focused more on the linear chain of dyadic relationships between one supplier and one buyer, rather than a network structure (Gonzales-Padron 2016, 25). There has been certain studies of a joint audit collaboratives, such as the European blood establishments, conducted by Nightingale et al. (2014, 96-97), where potential advantages of collaborative audit were i.e. the substantial savings in audit costs and auditors' time commitments and the ability to audit suppliers not previously visited owing to location and/ or cost, giving the point of view of benefits to the buyer side.

Article issued in MIT in 2012 recognized also the advantages on the supplier side, with discussing about initiatives to share supplier audit information between CMO's within common Chinese suppliers. A problem had been recognized where Chinese factory executives complained about each independent audit taking time and resources from

actual work and with multiple clients, time spend on writing corrective actions plans was tremendous (Plampeck, et al. 2011, 44). Carter & Rogers (2008, 367) sum up the benefits for both sides by saying that common auditing procedures adopted by an industry coalition could lower costs for both suppliers, and to multiple buying organizations resulting in win-win situation, while increasing transparency and supplier sustainability. Some concerns about the joint collaboration that were raised in the studies were the missed opportunity to see "first-hand" the supplier's processes and thus to better understand the quality issues. This only highlights the demand to have trusted information systems and protocols in place for such initiatives (Nightingale et al, 2014, 96-97).

### **1.1.2 Current study on technology enabling visibility**

Although technological development in recent decades have been rapid and fundamental, the expectations regarding this fundamental change is sometimes getting ahead of itself, as technological developments gets hyped without actual tested user cases in real-life context. This phenomenon is characterized in technologies such as big data, internet of things (IoT), artificial intelligence (AI), driverless vehicles, robotics and blockchain. In many cases, it is entrepreneurial interest to get investors to believe the profitability possibilities but overhype can come with negative effects than just empty economic promises, by eating company credibility. For example, IBM had to pull their AI based health care division called "Watson" from the market in 2019, after years of investing money and recourse to the development, after it was being accused of "overpromising and underdelivering" with it (Funk, 2019). This type of attention is not needed in any company and could impair its future endeavours in a negative way.

While getting real-time information about supply chains has becoming more crucial, there is an increasing demand for developing supportive tools to handle this. (Sodhi & Tang 2019, 2950). The growth of technological systems aimed for sharing information has increased access to information sourced from both customers and suppliers. Since supply chain information is both increased in volume, but also dispersed across people and departments within the organization, processing capability is an important factor in order to increase information usability. (Williams et al. 2013, 544.)

Information sharing through technology has received some attention in recent years, but mostly mentioned is inter-organizational information sharing systems. Electronic data interchange (EDI) has been quite prominent theme in the supply chain literature. The majority of the research on EDI proposes a positive link between EDI and buyer–supplier relations (Barrat & Oke, 2007, 1221).

In this thesis, the focus is in blockchain technology, which will be explained more detail in chapter three. In recent years, there are continuous issues with the excessive hype happening around blockchain as seen with Annalect (2017) enquiry, where 88% of surveyed marketers stated that they value the potential of blockchain technology to disrupt current practices, but only 15% of them could explain this technology to their customers. The hype has not yet slowed down, although some reasonable numbers have been presented, with most recent Gartner study stating that blockchain will be only scalable and support trusted private transactions by 2023 earliest (Cearley et al. 2019, 40).

Because cryptocurrencies are currently most used application of the technology, majority of current research of blockchain based technological solutions is conducted in financial institutional environment, rather than possibilities of using blockchain technology in other environments (Yli-Huumo et al. 2016, 21-22). This only highlights the unused potential to widen the spectrum across other industries as well, such as supply chain context. Morgan et al. (2017, 959) acknowledge that industry practices that may have previously gone unreported are no longer safe from scrutiny as technological advances have opened access to knowledge about supply chain activities. Their study combines blockchain technology and supply chain in the most obvious way, tracking goods.

Tracking has been the theme in most studies that combine blockchain and supply chains (Morkunas et al, 2019, Morgan et al, 2019, Marr, 2018), which when combined with for example RFID technology seems the readiest to roll business case for the technology. There are some real-life user cases already, as companies such as Walmart, Unilever, Nestle, Tyson and Dole have already implemented blockchain based solutions for tracking their products (Marr, 2018). Some of the studies that

combine blockchain technology and supply chain transparency, mention or go near to look more deeply into supplier visibility and information sharing (Saber et al, 2019), but do not solely focus on the topic, thus creating interesting base for this study.

In terms of added benefits, Hokey (2019, 36) states that blockchain technology could help with reducing transaction costs and time resulting from better preserved blockchain platforms that do not necessitate third-party involvement and improve the visibility across the supply chain, as a result of increased transparency gained via open ledgers that any approved person can see. This highlights the idea whether information regarding supplier reliability could be shared among companies in a decentralized platform between parties that do not necessarily know, and thus trust one another that well. Similar outcome is pondered by Takahashi (2017) who mentions improved connectivity among trading partners, including shared visibility of transactions and information flows across the supply chain as one of the key benefits of blockchain.

This study aims to study new ways of how technology can disrupt the information flow between supplier and buyer, and more closely, if information regarding supply chain visibility, what is traditionally been between two parties, can be securely and effectively scaled to be shared between multiple parties. Based on this it can be stated that clear study on how blockchain technology could enable supplier visibility has not been studied. This makes the study of the subject not only topical, but also necessary.

## **1.2 Research questions**

Good research questions are formed in a way where, by using empirical evidence they are researchable (White, 2009, 35). For this study, two main questions are formed based on identified research gap and the two main topics of this thesis. Four supportive sub-questions are formed to support the main questions and in order to deepen the topic and help to find more comprehensive answers to the main research questions.

In this study two main questions are formed to represent the two big themes of the study. First, how information sharing affects supplier sustainability and secondly, how blockchain technology could potentially improve current information sharing practices.

Both main research questions are followed by sub-questions, that help to deepen the main questions and help to form a more wholesome overview, and also acknowledge the potential of joint collaborative coalition in order to share supplier visibility information.

The main goal of this study how information sharing influences supplier sustainability, and to explore how information is currently shared. In order to examine or even propose improvements, it is crucial to understand the current state of information sharing in supplier visibility and the what practices currently is being used. Thus, the first main research question examines how currently information sharing enables supplier sustainability.

***RQ1:** How information sharing helps to facilitate supplier sustainability?*

Two following sub questions are formed to support the first main research question, in a way to explain and deepen the topic. As the need for supplier visibility and audited information is not new, it can be assumed that there are already practices in place to gather information, and this guides the formation of next sub-questions. As information is considered in general one of the most essential of business assets, sharing requires motives that support it, but there could be plenty of motives that hinder the motivation for information sharing. This is acknowledged in the first sub question. As mentioned in the previous chapter, currently it is common that sustainability information is gathered individually by each buyer and there has been quite limited efforts to try and change the information sharing culture to more shared direction, where for example various coalitions could be formed in order to support the sustainability cause and save resources. This is why the potential of sharing sustainability related information among other buyers in the field is considered relevant sub question. Two first sub-questions are:

***S-Q1:** What are the drivers and restricting forces for information sharing?*

*S-Q2: What are the drivers and restricting forces for sharing visibility information with multiple buyers.*

This study also aims to look how new technological solutions could provide improvements to the current ways of information sharing. More precisely, to provide an overview on whether blockchain technology could help businesses to achieve their CSR goals in terms of supplier visibility, and possible help with the information sharing among other buyers in the field, due to the trustworthy nature of the technology. Thus, the second main research question examines how blockchain technology could help to facilitate supplier visibility:

***RQ2:** How can blockchain technology help to facilitate supplier visibility?*

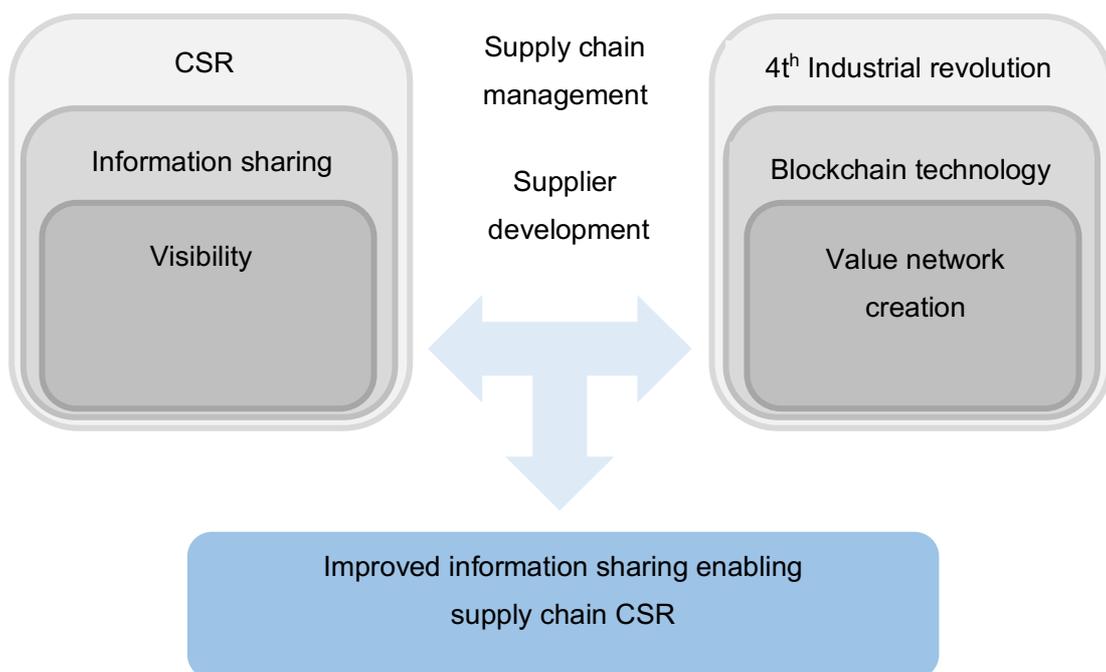
New ways of collecting and sharing information, although could bring added benefits, would most likely require some level of investments from companies' side, and this could potentially discourage companies of implement blockchain based solutions. Williams et al. (2013, 551) argue that organization must align its information processing capabilities with its information needs, highlighting the modern problem of large amount of data being produced every day. One of the clear benefits of having blockchain based system is that information could be theoretically shared in a trusted, tamper-proof way, thus this brings interesting questions to ponder if in case the culture for information sharing among other buyers would exist, would blockchain be useful tool to further the development. These reflections help to form two supportive sub-question to deepen the needs of companies, in order to invest to new technology, and identify the collective input blockchain technology could have. Thus, final supportive research questions are:

*S-Q3: What are the drivers and restricting forces of implementing blockchain based solution to help enable supplier visibility?*

*S-Q4: Could blockchain technology help to share sustainability information with other buyers?*

### 1.3 Conceptual framework

The conceptual framework of this study aims to present the key concepts of this study and the relationships between them. As per the research questions, there are two main concepts for this study, firstly, the initial motive that comes through the rise of CSR as a topic in supply chain, and the other one being technological revolution. Therefore, key concepts of CSR, together with supplier development and visibility is examined to gain information about information sharing. Other major theme is the blockchain technology, that will be studied in the context of supply chain and information sharing, as well as in value network creation through the possibility of shared supplier information with multiple buyers. These key concepts and relationships are presented in figure 2.



**Figure 2.** Conceptual framework.

#### **1.4 Limitations**

This study is limited to study information sharing in supply chain context, more precisely, information sharing in supply chain sustainability context. The case industry of palm oil supply chain helps to narrow the topic even more. Sustainability related information sharing is further restricted between buyer and supplier, so information sharing to company stakeholders such as customers or for example media is not studied, although the visibility information gathered from suppliers will eventually, at least in some level be shared among various stakeholders.

Although the concept of outsourcing serves as initial background of supplier-buyer relationships, the motivation behind it, nor the actual supplier-buyer relationship is not examined. Only brief introduction of supplier development is presented, as it serves as a backbone of modern buyer - supplier relationship. Company can have various kind of supplier relationship, but in this thesis the focus is on strategically significant suppliers, where buyer and supplier form a partnership and information sharing can be seen as relevant aspect to study.

Blockchain technology is examined in theory, but only narrowed to the scope of this study. This study will only focus blockchain technology and supplier visibility in the case company industry, even though blockchain technology is also applicable in other business functions, as well as in other industries. Traceability, sometimes synonymously used with the word visibility, is narrowed out from this study, although very promising area that could be improved with blockchain technology.

For the empirical part, only small number of interviews are conducted, mainly focusing on getting more insight from specific case industry. This limitation is justified in this study, as aim is not to get generalizable data, but more to understand the current state of case industry in a company that has already heavily invested to sustainability and information sharing, and the possibilities of new technology as a disruptive force behind supplier visibility and information sharing.

## **1.5 Structure of the thesis**

The research starts with introduction chapter, where the topic of the study is presented, with broad literature review that introduces the current state of the study. Literature review sums up where the current study is at the moment. This builds the way to find the research gap and identify correct research questions. In order to narrow down the topic, limitations are presented as in a way to sharpen the scope of the study.

The second part of the study consist the theoretical framework of the study. The initial motivation and back force for supplier visibility is in corporate social responsibility, thus the concept serves as the core for the theory for supplier visibility and helps to understand the idea behind it. After CSR concept is opened, sustainable supply chain, information sharing, and supplier visibility are presented, with brief introduction to supplier development. In chapter three, blockchain technology is presented, in order to fully understand the potential that it has to offer for supplier visibility and information sharing. The theory about blockchain technology is mainly looked through other possibilities than directly supplier visibility, as the current studies does not yet cover this aspect.

Fourth chapter presents the research methodology, together with data collection method. In this chapter also the reliability and validity of the study is presented. Case company is presented so that the comments can be better linked to this study. Fifth chapter consist the actual empirical research where the interview results are presented and examined. Last part of the study is the conclusions and results of the study. It will work as a concluding chapter and give recommendations for further study.

## 2 CORPORATE SOCIAL RESPONSIBILITY IN SUPPLY CHAIN

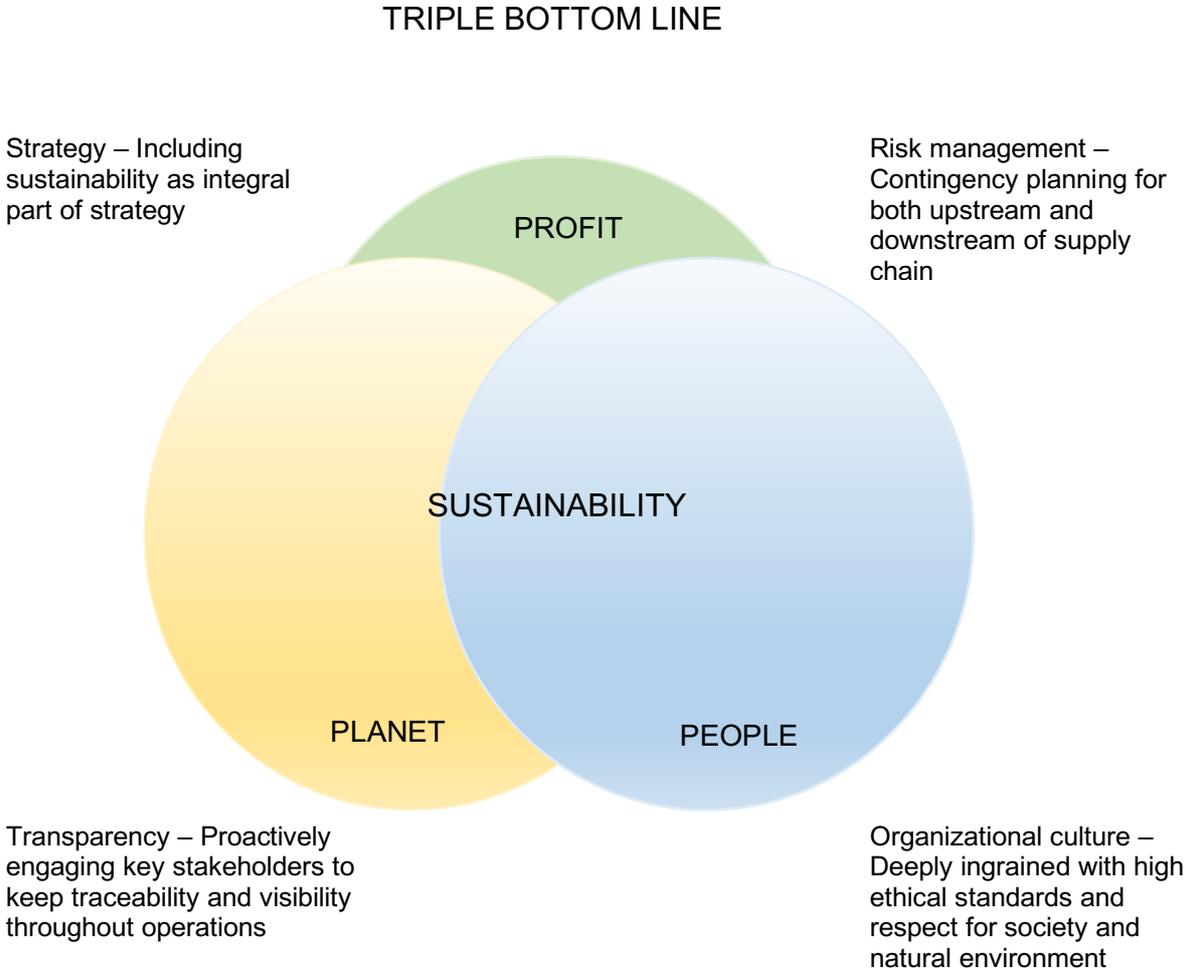
Corporate social responsibility is a form of corporate self-regulation (Fontaine, 2013, 111) that can be defined as a concept of integrating social and environmental issues in both business operations and interaction with various stakeholders, throughout company activities (Commission of the European Communities, 2001). Although the concept was first introduced in the 50's, it did not have a staple position in business environment until early 2000's, when CSR started moving from shallow observations, to an integral part of corporate strategic orientation. Companies started recognizing their responsibilities to integrate economic, social, and environmental concerns into their strategies, thus, the sole goal of a company progressed from pure profit maximization. (Russo & Perrini, 2010, 208.)

There hasn't have to be confrontation between CSR and profit though, as already argued by Porter & Kramer (2006, 80) who stated that CSR has potential to be more than a cost or charitable deed, meaning companies can gain actual competitive advantage through CSR opportunities and innovation. Similar conclusion is presented by Fontaine (2013, 114) with shared value idea, where corporate success and social welfare are interdependent, as society to thrive, profitable and competitive businesses must exist to create income, wealth and tax revenues.

Fontaine (2013, 112-114) argues that there are three managerial views on CSR; (1). Obligation, (2). Social Reaction or (3). Risk Management. In recent years CSR actions have taken more steps towards being part of the last two, as more anticipatory and preventative, rather than obligatory. This is especially highlighted in risk mitigation. Reputations and brands that take decades to build up, can be ruined in hours through environmental accidents. (Fontaine, 2013, 112-114.)

Over the years, what has been included to the concept of CSR has been somewhat debated and it has overlapped with such terms as "business ethics" and "sustainability" (Fassin et al. 2010, 426, Carter & Easton, 2011, 54), resulting in lack of clarity in terminology. There are several various concepts used, when defining corporate responsibilities in terms of social and environmental welfare, such as United Nations global compact classification, where various principles are divided in to four areas;

human rights, labour, environment and anticorruption. In 2010 International Organization for Standardization (ISO) launched ISO 26000 standard, that aims to global sustainable development with seven key areas; social responsibility, organizational governance, human rights, labour practices, environment, fair operating practices, consumer issues and community involvement and development. (Książak & Fischbach, 2017, 106-107.) Of course, nothing is stopping companies to carve their own CSR key areas, and many companies are presenting their own code of conducts (COC) representing the ethics of the company. What combines all of these, is that they many times take into account the three pillars of CSR, social, environmental and economical sides of business, that are well presented in a concept called triple bottom line (TBL) initially presented by Elkington in 1998. (Carter & Easton, 2011, 46).



**Figure 3.** Triple bottom line. Adapted from Carter & Easton, 2011, 48 & Carter and Rogers, 2008, 369.

With a simple outline, it gives clear structure and areas for any company or activity to start putting down relevant initiatives. The basic concept is divided to three key areas; People, planet and profit as seen in figure 3. It highlights the intersection of environmental, social, and economic performance and rather than suggesting that firms identify and engage only in social and environmental activities with least harm on economic performance, the triple bottom line explicitly directs managers to identify activities which improves economic performance, together with social and environmental issues. (Carter & Easton, 2011, 48).

One of the most used concepts on utilizing TBL in supply chain context comes from Carter and Rogers (2008, 369), who introduce four aspects to support triple bottom line; Risk management, transparency, strategy, and culture, as seen in figure 3. These days strategy and culture could be seen intervening, as an organization's sustainability initiatives and its corporate strategy must be seen as integrated in the company culture, rather than separate programs that are managed independently. Transparency is described as simply cheaper solution for a company to operate as with transparency risks concerning economic, social, and environmental issues can be lowered. (Carter & Rogers 2008, 366-367).

This chapter defines more clearly the CSR related context that this thesis aims to study and presents the concepts of information sharing and supply chain visibility, under the context of sustainable supply chain. Supplier development as a concept is introduced, as it is crucial part of modern buyer-supplier relationship. Current methods of measuring supplier sustainability and the possibilities of sharing supplier related information is presented at the end of chapter. This chapter aims to give good overview on what is the current theoretical state of sustainability related information sharing and visibility among suppliers.

## **2.1 Sustainable supply chain management**

Sustainable supply chain management (SSCM) inevitably combines supply chain to the concept presented by TBL. SSCM as a topic has been raised tremendously in recent years. It can be described as *“the management of material, information and*

*capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements.” (Seuring and Muller 2008).*

Supply chain activities have integral part of company’s ability to comply with TBL requirements. This is especially highlighted in today’s globalized world, where business operations are spreading out internationally. As it is easier for companies to fine-slice their value-chain activities across the globe, relationships are becoming more interdependent. (Jahncke & Lee 2016, Khan & Nicholson 2014, 1212.) Supply chain professionals are in excellent position to impact sustainability practices among suppliers with activities such as reducing packaging, improving working condition and requiring suppliers to undertake environmental and social programs. These are examples of actions that can reduce costs while improving corporate reputation. (Carter & Rogers 2008, 361.)

It is also competitive advantage for a company to develop ethical and responsible supply chains as consumers and public tend to hold a firm responsible for both of its own, but also its suppliers’ actions. Modern responsible businesses select and evaluate suppliers based on not only their products and pricing, but also on their social and environmental performance, and in this way help competent vendors become socially responsive and help socially responsive vendors become competent (Gonzales-Padron, 2016, 22).

Although companies mostly disclose information about their first-tier suppliers, regarding various standards of environmental norms and worker’s rights and safety compliance, it is possible that through collaboration across the supply chain, SSCM initiatives can spread more globally to various pieces in the chain (LeBaron et al. 2017, 968). In the best case, this knowledge can cascade environmentalism through the industrial ecosystem. These capabilities represent possible sources of competitive advantage due to their imperfect imitability and often the opportunity of gaining competitive advantage motivates companies to adopt environmental and sustainability strategies. (Gold et al. 2009, 232-237.) But as Krause, Vachon & Klassen (2009, 18)

states; company is only as sustainable as its supply chain and suppliers, thus, turning the focus on supplier side is necessary when ensuring supply chain sustainability.

It must be stated though that not all sourcing relationships are long-term or even collaborative. With the environment of increased outsourcing, companies these days are face to face with more and more suppliers. When forming a partnership, the idea beneath it is to create mutually beneficial opportunities for both parties, naturally, this type of relationship is not formed with all suppliers. (Park et al. 2010, 497.) CSR actions must still be introduced to the relationship in order to respect various demands. Collaboration is crucial when creating sustainable supply chain. Collaboration creates capabilities and assets which are difficult to imitate, by being historically grown, complex and ambiguous. This results knowledge that can advance social, economic and environmental performance. (Carter and Rogers 2008, 374.)

## **2.2 Information sharing enabling supplier visibility**

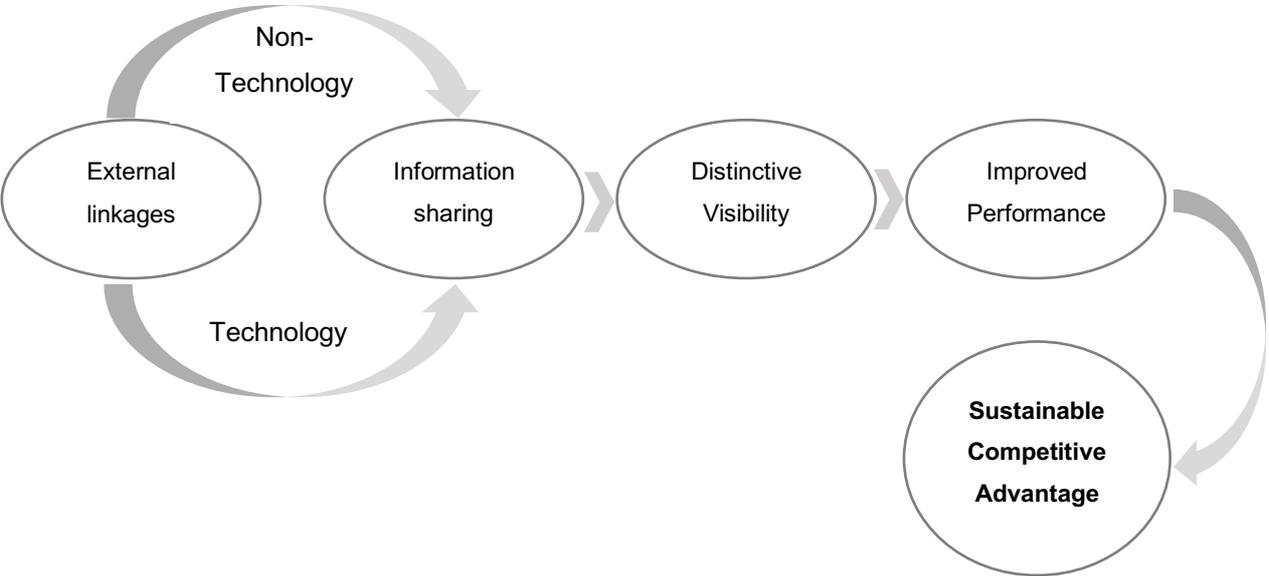
Information sharing among supply chain partners is recognized as a central component of effective supply chain management (Williams et al. 2013, 543). A growing number of companies are monitoring their suppliers to ensure adherence to social expectations (Awaysheh and Klassen, 2010, 1248). The prominent motivation for supplier monitoring is the globalization, which have facilitated geographically very dispersed global value chains, that is shown in the various ways of how social and environmental issues are handled throughout the world. (Egels-Zandén, 2017, 515). This has forced companies to fulfill their regulatory demands by hiring third party firms to perform auditing in developing countries where capacity to follow for example labor and environmental standards in their factories is lacking from general standards (LeBaron et al. 2017, 959).

In general, information can be shared vertically, horizontally, and completely. Vertical information sharing refers to situation where buyers and sellers in the supply chain form a partnership and share information in collaboration. Horizontal information sharing refers to information sharing between buyers and buyers, sellers and sellers, or competitors and competitors. Complete information sharing is a combination of

vertical and horizontal information sharing. In general, the more information is available, the more cooperation there is in the relationship. (Huang et al. 2017, 115.)

Not all information is necessary, and one crucial aspect of information is the quality of information. Relevant information can be characterized as being accurate, timely and complete (Williams et al. 2013, 544). This is especially important in the modern world where data collection has been rapidly increasing and resulting in enormous amount of data to be handled (Shrier et al. 2016).

Supply chain visibility (SCV) remains still quite ill-defined and poorly understood concept. It is sometimes interchangeably used with information sharing within the literature. But they must be distinguished clearly so that information sharing is an activity and visibility is a potential outcome of such activity. (Barrat and Oke 2007, 1217-1218.) Supply chain visibility as a term includes various information from supplier, but in this thesis the focus is on sustainability related information.



**Figure 4.** The concept of distinctive supply chain visibility. Adapted from Barrat and Oke 2007, 1219.

Supply chain visibility can be defined as *“the extent to which actors within a supply chain have access to or share information which they consider as key or useful to their operations and which they consider will be of mutual benefit”*. The main goal of visibility is primarily to improve internal decision making and operating performance and has been described that the capability to improve visibility is critical to improving supply chain performance. Main goal of supply chain visibility is to receive sustainable competitive advantage, as illustrated in figure 4.

As having the correct information and the correct time is such an important issue for modern supply chain, it evokes questions on whether current supply chain information systems can support this need, in a secure manner that is clear and robust enough to trust. (Sabeti et al. 2019, 2118.) Transparency and data sharing are the keys for supply chain sustainability. (Fritz, Schöggel & Baumgartner, 2017.)

### **2.2.1 Drivers and restrains of information sharing**

Even though information about supply chains are disclosed more than ever, it is still an end result of pre-defined strategy. It is a result of weighing the pros and cons of what amount of information sharing to various stakeholders is seen as valuable and what should remain only visible inside the company management. Reporting information about the provenance of products, suppliers' compliance of labor practices with (western) consumer-expected norms and sustainability reports, is surely costly, complicated, and time-consuming so it is valid to study what is the actual value of such disclosure. (Sodhi & Tang 2019, 2946.)

The clear motivation behind sharing sustainable related information inform various stakeholders that company is operating in a responsible way in the sense it takes an interest in wider social issues, rather than just financial, which will attract customers who share the same values. This means companies need to extract this information from their suppliers. (Thorne et al. 2014, 689.)

Fluent information sharing can be seen as part of company's risk management. Risk can be defined as probability of variation when anticipating an outcome and thus risk

management must be included within the context of SSCM, as an organization must manage not only short-term financial results, but also risk factors such as harm resulting from its actions towards products, environmental waste, and worker and public safety. Risk management can also be seen as proactive, as in sustainability proactive actions can lower the risk of introduction of new and costly regulations, which in terms can be seen as financial risk management. (Carter & Rogers 2008, 366-367).

Current rapid flow of information is at the same time a tool for companies to stay on top of their game, but also a tool against companies if sustainability in supply chain is not handled appropriately (Werther & Chandler, 2011, 20-22). Maintaining the secrecy of corporate wrongdoings has become very difficult and extremely risky due to the rapid speed of communications, and actions of a supplier this morning in a remote part of the world can be read online by evening (Carter & Rogers 2008, 367). Thus, the main argument for companies' emphasis on sustainability is that CSR is a risk management tool to manage variety of risks, such as financial, reputation, environmental and supply chain risk (Fontaine, 2013, 115).

Disclosing information is not only risk management, but part of building company brand and promotion of its products and services. Consumers and investors are also more willing to support responsible business practice and are demanding more information on how companies are addressing risks related to CSR topics (Fontaine, 2013, 110). Much of today's consumerism and shopping has found a handy platform in web-based online sites, but consumers are not solely expected to make the purchasing decision based on pictures and price information. Potential customers learn quickly through different channels whether company and its products are meeting with environmental and social norms, and this is affecting their purchasing decisions. Phelon (2017) reported that 74% of young consumers turned to social networks for guidance on purchasing decisions. But this information is not solely for potential customers, as investors also seek this information to understand the company profile and potential sales growth. It is essential for the investor that the company discloses itself in detail and as clearly as possible (Sodhi & Tang 2019, 2950-2951.)

**Table 1.** Drivers and restraints of information sharing

| <b>DRIVERS</b>         | <b>RESTRAINTS</b>              |
|------------------------|--------------------------------|
| Stating Company Values | Value of transparency seen low |
| Risk Management        | Information sharing seen risky |
| Brand Building         | Fear of green washing          |

As mentioned previously, disclosing information is not just straight forward action of first gathering and then sharing information, but a strategy that needs to be defined and followed consistently. It is clear that companies disclose information at various degrees, as the value of transparency can be perceived differently (Sodhi & Tang 2019, 2947-2949).

Many companies mostly disclose information about their first-tier suppliers, regarding various standards of environmental norms and worker’s rights and safety compliance. (LeBaron et al. 2017, 968). There is a risk of even revealing the identity of 2<sup>nd</sup> or 3<sup>rd</sup> tier suppliers as visibility to them is usually lower, but in case of misdemeanor, buyer could be seen as directly linked and fully consent of their actions. There are also cases in the history where disclosing information about even the provenance of products have caused adverse reaction. Thus, it is understandable that companies think hard of what is shared publicly. Disclosing more information about the origins of goods or supplier’s performance on environmental and social sustainability, generally creates a risk of negative consumer response or brand reputation damage. In worst case this information is broadcasted around the globe in a heartbeat and gets picked up by search engines for a very long time. This can create an urge to provide only information that can be regarded solely positive, and even very limited amount of that. (Sodhi & Tang 2019, 2952.)

This was proven to be an issue that companies are pondering, as in recent poll made by Finnish sustainability design agency Infine, various business and marketing managers admitted that when it comes to sharing sustainability information, many feared that company’s sustainability messages were being taken as “green washing” if information was not fully “perfect” in sustainability standards. This is creating a

paradox, where companies hesitate to communicate about their sustainability related initiatives as the process is seen to be in progress, even though in sustainability related matters, process is almost always in progress. (Isoniemi, 2020.)

### **2.2.2 Supplier visibility as part of supplier development**

Supplier development (SD) initiatives play an important role in building buyer-supplier capacities to deal with social and economic performance. Studying the dialogue between buyer and supplier visibility correlates strongly towards supplier development. In their study Sancha et al (2016, 1943) found that supplier assessment and collaboration are positively associated in suppliers' social performance: while assessing suppliers helps to improve the buying firm's social reputation, collaborating with them contributes to improve the suppliers' social performance.

Krause and Ellram (1997, 21) define supplier development as *“Any effort of a buying firm with its supplier(s) to increase the performance and/or capabilities of the suppliers and meet the buying firm’s short- and/or long-term supply needs.”*. Supplier development as a concept has been developing due to the fact that suppliers can bring competitive advantage to companies. This creates a need to study more of the relationship between supplier and buyer, as moving on from power play means that collaboration is taking the next step towards dyadically beneficial relationship. (Krause and Ellram, 1997, 22).

In terms of supplier visibility and sustainability, supplier development could be discussed as being vital part of the combination. Krause and Ellram (1997, 22) acknowledge that by increasing supplier development buyer companies are able continue the relationship while elaborating the potential through collaboration. Supplier assessment enables firms to identify where suppliers need to be developed and thus guide the focus and resource to the right place. Such supplier assessment enables the implementation of supplier development initiatives such as training. (Sancha et al, 2016, 1936.)

Handfield et al (2000) identify three steps of continuous long-term development: (1) identifying where value is created in the supply chain. (2) positioning the buyer strategically in line with value creation, and (3) implementing an integrated supply-chain management strategy to maximize internal and external capabilities throughout the supply chain. The example is very straightforward and aims clearly for the value chain creation through supplier relationships from early on.

Continuous improvement could be seen as the most critical step. As stated by Krause and Ellram (1997, 30), only by communicating constantly with suppliers about the expectations and willing to participate on the development can the relationship evolve through time and not sink into the underachieving sector where the idea is just to stay alive instead of innovating for the unknown future. This could especially critical for companies operating in current global infrastructure where change is not only inevitable, but also happening in increasingly faster speed.

### **2.3 Measures of supplier sustainability in modern supply chains**

Modern supply chains are complex due to globalisation, diverse regulatory policies, and varied cultural and human behaviour. Inefficient transactions, fraud, pilferage, and create risk that lead to greater trust shortage, and therefore, a need for better information sharing, and verification. This amplifies the importance of visibility and how it is created. Relying on paper certificates and receipts can lead to human error and tampering and to the realization of the supply chain risks. (Saberi et al. 2019, 2117.)

Companies are facing various global supply chains and thus usage of various global certifications is common. To this day, companies have adapted several practises to increase awareness and monitor actions along the stream (Ciliberti et al. 2008. 1580). Values and sustainable performances must first be defined and gained before they can be communicated forward to relevant stakeholders. Ethical codes and nonfinancial reports are tools used by corporations to become accountable for their strategy. (Russo & Perrini, 2010, 215.)

Although each buying company is setting their own standards, increasingly firms with international supply chains have adopted common standards. Most commonly used standards are created globally by the International Organization for Standardization (ISO), although certifications are admitted always from third-party operator (ISO 2020). Commonly used ISO standards are for example SA8000 that sets basic requirements for workforce practices (Social Accountability International, 2008) and environmental management system ISO 14001 (International Organization for Standardization [ISO], 2020).

Common practice for a firm is also to issue their own codes of conduct (COC) that states their own or chosen industry specific requirements. These can be then reflected directly to supplier scorecards. Supplier scorecard serves firstly as helping to identify performance metrics that buying company has stated critical, and secondly it enables the evaluation of supplier against these pre-defined key metrics. Scorecards are popular as they help the buying company define their acceptable level, but also suppliers to link their performance to the strategic objectives. It is crucial that these metrics are based on objective and credible measures that cannot be manipulated and are shared on a regular basis. (Doolen, Traxler & McBride 2006.)

There are also so-called industry codes of conduct, but mainly companies are using assessments based on their own defined needs. Certifications such as the Global Reporting Initiative, Social Accountabilty 8000 (SA8000), and product eco-labels (e.g., Nordic Swan, the EU Flower, and Fairtrade) require verification of supplier compliance with global ethical standards. The wide spectrum of certification and monitoring results that suppliers often have to pay for multiple audits for various customers with differing criteria, creating tension in the buyer–supplier relationship. (Gonzales-Padron, 2016, 23).

Whatever assessment is used, usually some sorts of written requirements, monitoring, such as audits, surveys and factory inspections, and preventive actions such as previously mentioned awareness building is being implemented. Supplier audits are a common method of monitoring suppliers and typically include assessment questionnaires and on-site inspections. These actions are intervening and supporting

each other to build a holistic management and SSCM strategy. (Ciliberti et al 2008,1580.)

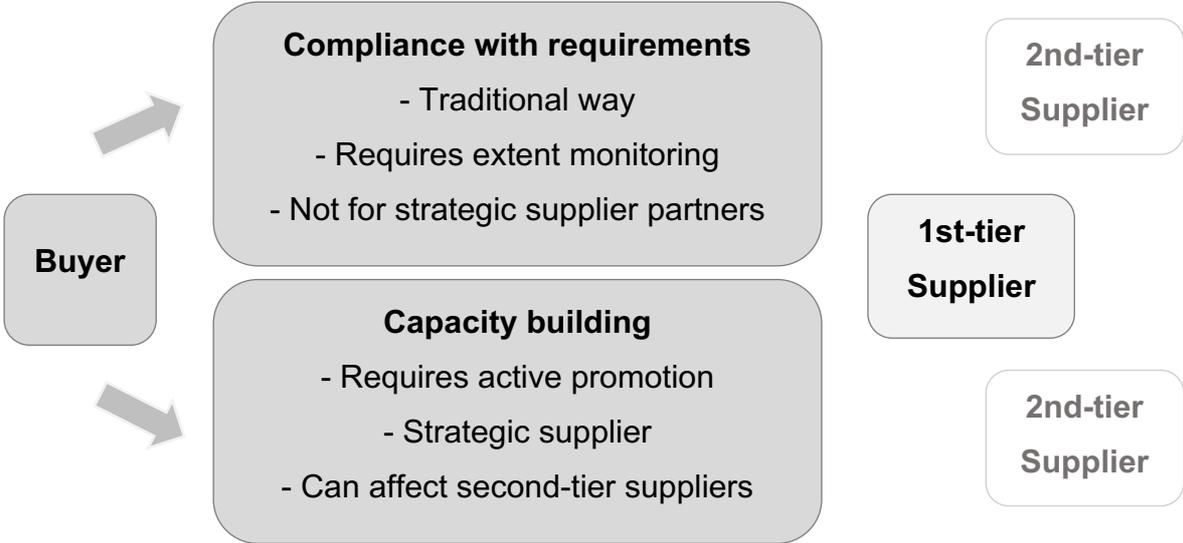
Audit procedure is quite commonly outsourced to an independent third party with on-country present. Audits generally include supplier surveys, visiting different sites, conducting on-the-ground interviews, and supporting independent audits (Sodhi & Tang 2019, 2950). Through an audit procedure, suppliers are for example granted a certification confirming sustainability-related principles, including safe working conditions for employees, payment of fair wages, and environmentally friendly cultivation techniques (Awaysheh and Klassen, 2010, 1248).

While it seems to be logical to audit new suppliers, the existing supplier base can be significant, and resources are guided with various techniques on how to avoid any misconduct on the supply chain. With a scattered supplier base around the globe, quite common way to guide audit resources is to prioritize suppliers based on various factors, such as to define key suppliers, determine high volume suppliers or audit based on suppliers' size. Quite common way to govern resources is also to determine high risk countries, based on rankings such UN and Amnesty International reports on human rights and corruption, as it can be more likely that suppliers located in these countries are more at risk to violate the firm's code of conduct. (Egels-Zandén, 2017, 520-521.)

Current habit of auditing is not completely without criticism. Gonzales-Padron (2016, 22) have identified four problems in current auditing procedures: (1) managing information from the supply chain, (2) motivating suppliers to pay for audits and complete questionnaires (3) responding to audit results uncovering ethical violations in the supply chain and (4) increasing awareness for a responsible supply chain among buyers. In the case of non-compliance to buyer company's CSR demands, traditionally three alternatives are thought of: (1) bring the outsourced item in-house and produce it internally, (2) change to a more capable supplier or, (3) help improve the existing supplier's capabilities (Handfield et al. 2000). Another problem stems from business value of auditing, as there are cases where vendors have devised strategies to falsify and misrepresent audit results and certifications. (LeBaron et al. 2017, 970).

Ciliberti et al (2008,1580) presented similar plan with simple outline, two strategies, as seen in figure 5, compliance with requirements and capacity building. With first one,

idea is present a level of standard to suppliers and in case of non-compliance, buyer terminates the contract or stops the business until the corrective changes are implemented. This has been seen as very traditional way of handling CSR responsibilities, but requires lot of monitoring. On the other hand, capacity building aims at building up the supplier’s own capacity of handling CSR issues. This requires active promotion of values to supplier to implement a socially responsible culture towards upstream. This usually also means building a long-term close relationship with suppliers. Added benefit with raised awareness is that it can affect also the second-tier suppliers, as in many cases it is the grey area of sustainable supply chain actions, that are mostly targeted on first-tier suppliers.



**Figure 5.** Non-compliance strategies. Adapted from Ciliberti et al 2008,1580.

Currently supply chains are quite heavily relying on centralised, sometimes disparate and stand-alone information management systems. Relying on single organization or broker for storing sensible information requires both immense trust on both systems and people. (Saber et al. 2019, 2117.) It is also criticized that there is a lack of tools implemented to supplier visibility and sustainable supply chain, and especially tools that can take in to account the specificities of developing countries (Fritz, Schöggel & Baumgartner, 2017, 589-590).

## **2.4 Sharing visibility among other buyers**

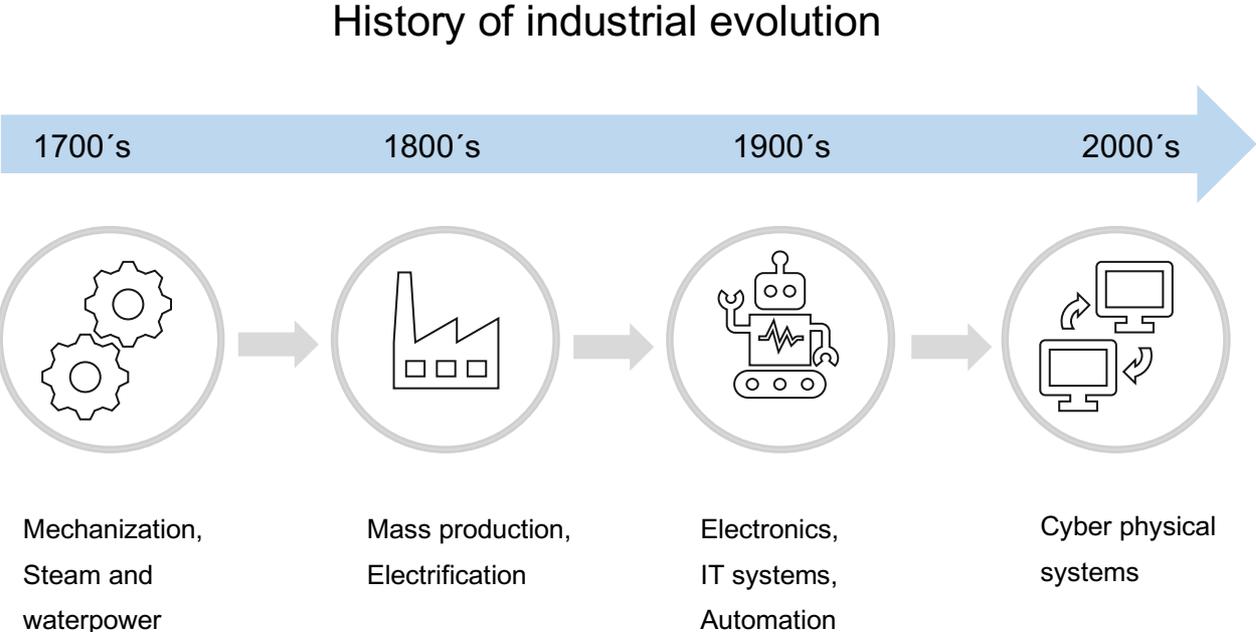
One future possible development for auditing suppliers could be that information is shared among other buyers more frequently than now. A single company can have hundreds, if not thousands of suppliers, and although companies like IKEA have stated that they audit all of their 1300 suppliers at least once a year, this is not possibility for all buyers due to limited resources. Other companies tend to only focus on critical suppliers, but this can be risky due to previously mentioned fact that customers tend to hold company responsible for all their supplier's behaviour, as usually it is not public knowledge, nor interest, for company to broadcast whether suppliers are classified as critical or not. This results in the fact that many companies tend to rely on the information provided by their suppliers. (Leire & Mont, 2010, 33.)

Barrat and Oke (2007, 1218) highlight one of the key attributes of visibility; mutual benefit. This mutual benefit will be one of the interests in this study as it is pondered whether supplier related sustainability information could be shared more completely, with other buyers as well. One solution that is studied in this thesis is the introduction of blockchain technology, to see if it could, in the best-case scenario improve the information sharing for both between a buyer and supplier, but also be scalable further from that, to be used among buyer coalition and thus lower the interactions of traditional supplier vs audit scenario of suppliers everyday life. This would create and require a horizontal, and more complete information sharing strategy (Huang et al. 2017, 115.)

It must be acknowledged though, that even if the technological side of such information sharing would be already available, there are still other issues that could prevent various parties to enter such coalition, as for example unwanted information leakage is in general, one of the main risks companies are dealing with and this could hinder the enthusiasm to enter such collaboration with parties that could be described as representatives of competition (Kim et al. 2016, 623).

### 3 BLOCKCHAIN TECHNOLOGY

Through its history, technological development has provided way to overcome limitations of human skillset and it has been paving the way to fundamental changes on societal infrastructures. The change has been continuous and only accelerated though centuries. This change has been referred as the industrial revolution, as seen in figure 6, and it describes the various transformations that have witnessed the rise of global population and GBD wealth through the past centuries. Recently it has reached its 4<sup>th</sup> step, that has characterized the 21<sup>st</sup> century with its cyper-physical systems that have the potential to revolutionize the information sharing concepts. (Skilton & Hovsepian 2018, 3-6).



**Figure 6.** History of industrial revolution. Adapted from Skilton & Hovsepian 2018, 3-6

The enormous amount of data that each individual, company and society is collecting is becoming the accelerator of the fundamental technological change that is happening. This change does not only affect the economies of systems, but it affects the traditional boundaries between customer and company, citizen and government, as everyone has wider access to data, thus creating a demand for visibility. (Shrier et al. 2016.)

In recent years technology has taken a leap in terms of disruption of current practices. Various strategic technology trends have significant potential to create disruption and to power transformation of physical environments to move towards “smart spaces” within which people will interact through multiple touchpoints and sensory channels for an increasingly ambient experience (Cearley et al, 2019).

New innovations are the key for companies in order to survive in ever more demanding environment. One of the, still relatively new, innovative technologies is blockchain technology. Blockchain – or distributed ledger technology – was first recognized as the foundation technology of cryptocurrency bitcoin in 2008 (Underwood, 2016, 15). It is an open and global infrastructure that aims to create a decentralized environment where only two parties are responsible for the data (Yli-Huumo et al. 2016, 67). Although cryptocurrencies are the most famous application of blockchain technology, due to allowing payments to be finished without any bank or intermediary, blockchain technology has become one of the promising technologies for the next generation of internet interaction systems, such as smart contracts, internet of things (IoT) and security services, thus widening the spectrum of possibilities how this technology could be utilized (Zheng et al. 2019, 354).

Blockchain network can be either public or private. Cryptocurrencies are good examples of open networks, but private networks could be the more used in corporate world. In that scenario, the entities that create the private blockchain would define how entries can be added and verified and in only specific authorized participants are given access and are known within the network. (Mckinlay, 2018.) There are yet many actual examples of how companies could utilize the private, permissioned blockchain loops for their advantage, and thus more experiments is needed (Underwood, 2016, 16).

This chapter aims to present the possibilities that blockchain technology could bring to supplier sustainability related information sharing, and thus to supplier visibility. In order to evaluate the technology, its basic principles are introduced before studying it in supply chain context. Possible driver and restrictive forces for implementing such new technology is presented before studying the possibility of sharing the information through blockchain technology among multiple buyers.

### **3.1 Security through decentralized systems**

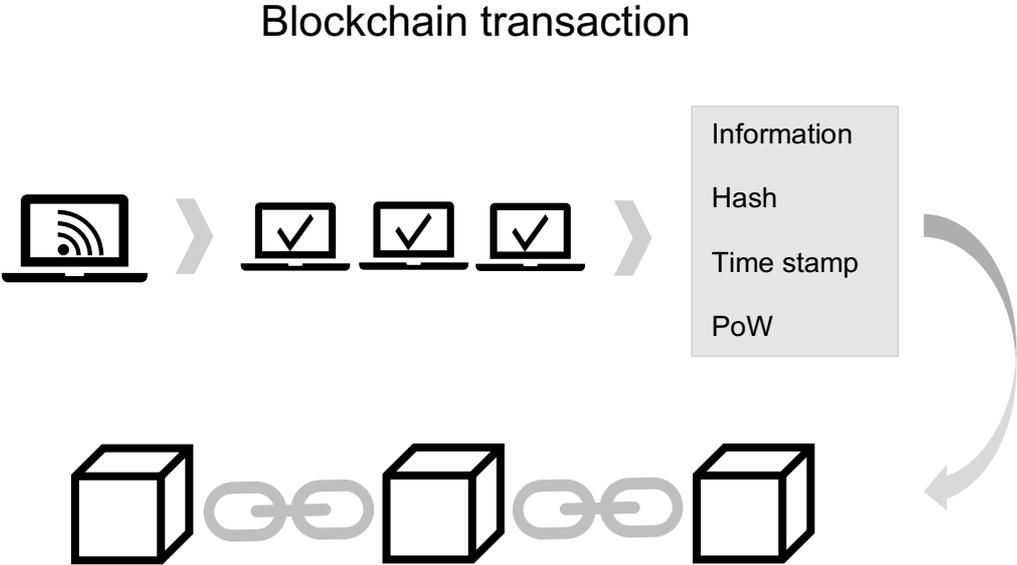
Blockchain technology is based on a distributed ledger structure where transactions can be created and shared between the network. The ledger itself is not owned by any middleman, but can be viewed by anyone in the network, this being the core idea of blockchain and why in theory it should increase trust and cut costs. Data is added as so called “blocks” to the ledger and then encrypted and verified by other computers on the network, by using cryptographic algorithms. In case there is consensus among majority of computers that the transaction is valid, a new block of data is added to the chain and shared in the network. (Underwood, 2016, 15.)

The core idea of blockchain is the validity it brings to the data. First, blockchain can record transactions between parties without central coordination. Second, it is able to keep transactions permanently in a verifiable way guaranteeing the integrity and non-repudiation of the transactions and thirdly, blockchains can use changeable public keys as users’ identities to preserve anonymity and privacy. (Wang et al, 2019, 11). These value drivers theoretically enable parties that do not know, or inherently trust each other to create and exchange value using a diverse range of assets (Cearley et al. 2019, 40.)

Blockchain technology combines several core technologies, such as cryptographic hash, digital signature (based on asymmetric cryptography) and distributed consensus mechanism. The actual blockchain is a sequence of blocks, that holds a complete list of transaction records. Each block holds a hash value of the previous block, called parent block, so that blocks can be linked together in a sequence. The first block of a blockchain is called a genesis block, as it does not have a parent block. (Zheng et al. 2019, 354). Actual transaction works in a simple way, as seen in figure 7. The request of transaction is broadcasted to the blockchain network. Every computer in the network must check the transaction against pre-settled validation rules that are created by the network. After validation, the block is created and added to the chain with information stored in a tamper proof way. (Hokey, 2019)

Generally, a single block includes four pieces, for it to be secure; a) a summary of the included transaction, b) the ‘hash’ of the previous block, c) a time stamp and d) so

called “proof-of-work”, meaning proof that the block is ‘valid’ by solving a highly complex algorithm. (Mckinlay, 2018.)



**Figure 7.** Blockchain transaction. Adapted from Hokey, 2019 & Mckinlay, 2018.

The security of blockchain comes from its decentralized idea. As blockchain is a peer-to-peer (P2P) network that keeps records of all transactions by using its distributed ledgers, blockchains decentralized, open and cryptographic way brings security benefits. The currently common problem of hacking that puts centralized systems such as banks, governments and credit agencies at constant risk of attack, seems to be impossible threat for blockchain based systems. Blocks are linked together by each block having a piece of information of another, creating a chain that makes modifying impossible. In case of wanting information from one particular block, hacker needs to enter to all the blocks in the entire history of that blockchain to get the information, as change in one block invalidates every block after it. (Hokey, 2019, 36.)

### **3.2 Blockchain in supply chains**

Blockchain technology has the potential to commit to supply chain sustainability by making information durable and immutable. As information cannot be modified without consent by authorized actors, blockchains are able prevent corrupt individuals, governments or organizations from altering information regarding human rights, and fair and safe work practices. This in turns helps consumers for knowing that that goods being purchased are from ethical sources. (Saber et al. 2019, 2122-2123.)

How exactly will blockchain finds its place in the scope of supply chains is still open for interpretation and development. Unlike more development financial blockchain applications, which can be public; blockchain-based supply chain networks most likely will need a closed, private, permissioned blockchain with multiple, limited players, thus level of privacy will be one of the critical decisions. (Saber et al. 2019, 2120.)

Saber et al (2019, 2127) argue that blockchain technology-based supply chain could mitigate potentially opportunistic behavior, based on its decentralized idea. In a transparent supply chain, where information is accessible to the related participants, opportunistic behavior like subtle violation of agreements and concealing critical information is more difficult in compare with traditional supply chain management systems. Blockchain could affect trust-building between buyer and supplier, as it creates a theoretically trust-free environment for trading.

One key issue to solve privacy issues could be smart contracts. Smart contracts, as written rules stored in the blockchain, can help to define network actor interaction amongst each other and within the system. Through smart contracts, data sharing between supply chain participants could be improved as certifiers and standards organizations digitally verify actor profiles which have their own digital profile on the network. This enables tracking and controlling sustainable terms and regulatory policy autonomously and enforcing or governing appropriate corrections. (Saber et al. 2019, 2120, 2122.)

**3.3 Limitations of blockchain based supply chain visibility**

Blockchain technology is not yet widely in use, and there are many reasons why companies might be hesitant to adopt such new technology. Saberi et al. (2019, 2124) divide limitations on blockchain based solution to sustainable supply chain in to four main categories; Intra-organizational, inter-organizational, systems related and external, as seen in figure 8.

|   |   |
|---|---|
| <p style="text-align: center;"><b>INTER-ORGANIZATIONAL</b></p> <ul style="list-style-type: none"> <li>-Lack of awareness and tendency of sustainability and blockchain technology</li> <li>-Problems in collaboration, communication and coordination</li> <li>-Information disclosure policy challenge between partners in supply chain</li> <li>-Challenges in integrating sustainable practices and blockchain technology through SCM</li> <li>-Cultural differences of supply partners</li> </ul> | <p style="text-align: center;"><b>INTRA-ORGANIZATIONAL</b></p> <ul style="list-style-type: none"> <li>-Financial constraints</li> <li>-Lack of management commitment and support</li> <li>-Lack of new organizational policies for using technology</li> <li>-Lack of knowledge and expertise</li> <li>-Difficulty in changing organizational culture</li> <li>-Hesitation to convert to new systems</li> <li>-Lack of tools for blockchain technology implementation in sustainable supply chains</li> </ul> |
| <p style="text-align: center;"><b>EXTERNAL</b></p> <ul style="list-style-type: none"> <li>-Lack of governmental policies</li> <li>-Market competition and uncertainty</li> <li>-Lack of external stakeholders' involvement</li> <li>-Lack of industry involvement in ethical and safe practices</li> <li>-Lack of rewards and encouragements programs</li> </ul>  | <p style="text-align: center;"><b>SYSTEMS RELATED</b></p> <ul style="list-style-type: none"> <li>-Security challenge</li> <li>-Access to technology</li> <li>-Hesitation to adopt blockchain technology due to negative public perception</li> <li>-Immutability challenge of blockchain technology</li> <li>-immaturity of technology</li> </ul>   |

**Figure 8.** Possible barriers of adopting blockchain technology. Adapted from Saberi et al. 2019, 2124.

Initial motivation to implement blockchain based system comes from company itself, thus it is clear that there are issues to be solved there first. Lack of management support or just simply lack of tools for implementation could be clear hesitation points that prevent this technology to be used. Careful consideration is needed as this sort of implementation would clearly include resource allocations and financial decisions. (Saberi et al. 2019, 2124.)

Other issues come when deciding to implement technology among partners and include inter organizational actors into the picture. Principally, supply chain management is aiming to create value for stakeholders by managing relationships among partners, this can bring challenges especially when integrating information technology and sustainability practices. Cultural differences, lack of rules and/or implementation problems could all hinder the enthusiasm for moving to a new information sharing system. (Saberri et al. 2019, 2125.) As there are intellectual property involved, there will be a need to find a balance of privacy versus transparency. This will be highlighted when defining who can join the private blockchain. The allocation and attribution of risk and liability in relation to a malfunctioning blockchain service must be thought through between all relevant participants, including counterparties affected by the issues. (Mckinlay, 2018).

As blockchain nodes can be located anywhere in the world, it poses some jurisdictional issues as in a decentralized environment it may be difficult to identify the appropriate set of rules to apply (Mckinlay, 2018). Decision-makers must consider both the value proposition and the cost structures for the new and old ways in order to see the actual possibility that new technology has to offer (Funk, 2019). The barriers of blockchain adoption in supply chain are quite multi-faceted issues, affecting various stakeholders in the supply chain, many of them simply stemming from immaturity of blockchain technology (Saberri et al. 2019, 2130). Even in the case of handling organizational barriers, there are various external and system related issues that must be handled through multiple parties. This could explain the lack of user cases of this technology outside of cryptocurrencies, as the technology has to mature together with the whole industry.

### **3.4 Technology enabling value network creation**

One of the supportive research questions in this study is to see whether supplier information could potentially be shared among other buyers among the field. This could create value network that can benefit both buyers' parties, but also supplier party that could potentially handle multiple audit's at once. As mentioned before, blockchain technology brings trust among users through its decentralized concept. This brings

interesting point of view to look blockchain technology as enabler of value creation among buyer network. Joint initiatives and shared information to increase supplier visibility and other demands regarding CSR related topics.

Value creation is undoubtedly core of any business. Traditionally value has been seen as presented in value chain model (Porter, 1985), where the chain of activities gives the produced product or service more added value than the sum of added values of all activities. This theory has been expanded to value system, where suppliers input is included, but it does not include links and relationships between companies. As mentioned before, CSR initiatives are not aiming to strain value away from business, but to create value in a sustainable way. What has traditionally seen as value extraction, supplier audits, could be seen as co-creation of value, when shared among several buyer and stakeholder in the value net.

This of course is not so straight forward, as organizations could have different idea of what information is needed and what is classified as competitive advantage. The hesitation to reveal information from some partners may limit the full benefits of adopting blockchain technology and hinder successful implementation of this technology. (Saber et al. 2019, 2125.)

## **4 EMPIRICAL RESEARCH**

The empirical part of this study presents information gained through empirical data collection. The data used in this study comes from case company theme interviews. This thesis has been limited to study the topic only in palm oil industry and thus interviews are conducted from a case company Neste that is working in the field with incentive to heavily focus on visibility and sustainability in their supply chain. Although Neste works in larger scale of oil business, focus in this thesis is on the palm oil supply chain, as it has received lot of press in terms of CSR related issues. This creates an interesting base to look at the supply chain from sustainability perspective and collect data from company that has already put decisively resources into the palm oil supply chain sustainability.

Another point what makes Neste palm oil sourcing interesting case company for this thesis is that they are members of blockchain based information sharing initiative, where aim is to create allegiance together with various actors in the palm oil supply chain in order to improve data collection and communication. As this study is aiming to see how blockchain technology could enable supplier visibility on a larger scale, company that is already part of blockchain based information sharing system is a natural choice as a case company and can bring insight of the possibilities of the technology.

In this chapter the research methodology is presented to explain how this study aims to answer previously defined research questions. As data is conducted through qualitative methods, data collection method is explained more thoroughly. After presenting research methodology and data collection, reliability and validity of this thesis is examined. Reliability and validity bring trustworthiness, rigor and quality in qualitative study (Golafshani, 2003, 602), thus determining them is important. Finally, case company is briefly presented in order to give more holistic overview on the case industry.

#### **4.1 Research methodology**

Defining research methodology essentially describes how the study will answer the defined research questions. Best method depends on research questions, but also from study objectives and what kind, and how much of existing data and previously done research is already available. (Saunders et al. 2009 136-137.)

As mentioned before, the CSR related matters have gained tremendously more attention in recent years, and especially when discussing the topic in the case industry, palm oil sourcing, it has been in the midst of lot of debate. Also, the topic of blockchain technology has been hyped for couple of years, but still actual realization of the possibilities has been much less than anticipated. Cryptocurrencies are the most successful example of the technology in use, and even those have been around for a decade and only used as a payment method in very limited places with small circle of people that prefer them. (Halaburda, 2018).

These facts guide the study method towards qualitative method, as it aims to generate textual data. Qualitative research seeks to understand phenomena in a context-specific setting and thus uses a naturalistic approach, and research produces findings arrived from real world settings. Unlike in quantitative studies where aim is to find causal relationships, prediction and generalization of findings, qualitative researchers seeks instead illumination, understanding, and extrapolation to similar situations. (Golafshani, 2003, 600)

More specifically, this study is conducted as an exploratory case study where the main goal is to understand how information sharing influences supplier sustainability and how new technology could help to disrupt current practices. Exploratory case research methodology is appropriate when theory exists, but the environmental context is different (Stuart et al. 2002, 423), such as sustainability information sharing in palm oil supply chain or new technology adoption in the same setting. Case study is usually conducted when researcher is asking “how” and “why” questions, and when the focus is in contemporary real-life context. More specifically, exploratory case study is used when the study is focusing on exploring rather than explaining the issue. (Yin 2003, 6).



**Figure 9.** The five-stage research process model (Stuart et al. 2002, 420)

This research follows five critical steps as defined by Stuart et al. (2002, 420), illustrated in figure 9. The first stage of the process is to define the research questions by building the theory and gaining knowledge of the topic. In this study motivation behind the research and research questions are explained in chapter one.

The second step in conducting case research is the development and selection of relevant measurement instrument to capture the data. Qualitative data is usually gathered through observations and interviews. Information for this study is gathered through semi-structured interviews. A semi-structured interview is simple and popular way of conducting qualitative data as it enables interviewer to set a frame around the theme, but permits the interviewee to freely answer to the topic in the best way he/she sees possible (Koskinen et.al, 2005.) and, if necessary include questions that are outside of the original scope (Saunders et al. 2009, 322). This is especially important in a topic where not much direct research has been conducted and thus clear preset assumptions cannot be made.

Third stage is the actual data gathering through interviews, which is more explained in the next part. The fourth stage is the analyzing part where researcher is interpreting the data. Interpreting qualitative data is time consuming and crucial part of the study. Analyzing process for qualitative study can be either inductive or deductive, and in this study, inductive approach was seen more fit, mainly due to lack of theory that directly can be linked to this research. An inductive approach starts with the observations and theories are proposed towards the end of the research process, whereas in deductive approach the analysis of the study is based on some specific model or theory and the collected data is used to test and verify existing theory. (Tuomi and Sarajärvi 2018, 107-112). Final stage of research includes communicating the findings to a wider audience.

## **4.2 Data collection**

Data for this study was collected through semi-structured interviews. Semi-structured interviews are often used in exploratory studies, as it sets up theme and structure for the interview through list of prepared questions but leaves room for expansion in case more questions arise during the interview (Saunders et al. 2009, 322). All interviews were conducted through skype, due to geographic distance, but also due to the pandemic situation of 2020, so that safe distances could be followed. The interviews were conducted both in English and Finnish based on what was the common language between the interviewer and the interviewees.

Interviews were conducted between September and October 2020. Each interview started with a brief introduction about the thesis topic, before starting with the questions that each person had already received beforehand. All interviews included also some additional refining questions in situation where it seemed appropriate, in order to deepen the understanding of the topic. For analysis part, recorded interviews were transcribed from the audio file. Saunders et al (2009) considers this the first part of the analysis process, as in this step the data is listened carefully several times.

In this study, three people from Neste were interviewed, a senior manager of Asia sustainability, and sustainability specialist, both located in Singapore and head of supply chain sustainability, located in Finland. All interviews lasted for 45 min to an hour and questions 1-10 were same for each interviewee. Questions related to possibilities of blockchain technology were only asked in the first interview as interviewee was expert in that field.

## **4.3 Reliability and validity**

Reliability and validity of the study must be acknowledged in order to evaluate the quality of research. Reliability of a research refers to the consistency and replicability of the study. In case of repeating the study using same research procedures, same findings and results would be achieved. Reliability is not often directly applicable to

qualitative research as in general it is not meant to be repeated. Validity evaluates the ability of the research to measure what it is intended to measure. (Saunders et al. 2009.) This research is done through qualitative methodology and data is gathered through semi-structured interviews, thus it is not likely that this study could be repeated as it is, even though same questions would be used. The topic revolves around both sustainability issues and technological solutions where development is known to be fast, thus repetition of the study would most likely bring different results, representing always the period of time when study is conducted.

There could be a concern of generalizability when conducting a qualitative research with semi-structured interviews, especially when using a small number of interviews, as in this study. Saunders et al. (2009, 335) argue that it is up to the researcher to establish the relations between existing theory in order to be able to demonstrate the broader significance of the cases and study. There has been some criticism about the single case study that it does not offer good basis for generalizing (Yin, 2003). This obviously affects this study and must be stated that no larger causal relationships can be generated from this study as it only represents one industry, with one case company, with very limited number of interviews.

When conducting only limited number of interviews, for validity it is important to carefully choose the interviewees, to justify the small number of participants and to verify that enough and good quality data can be gathered. All the interviewees were supply chain professionals and experts in the field to explain the topic of the thesis. All interviewees represented quite high position in the company and were good representatives for the topic. For the blockchain related questions, as the case company initiative was in piloting stage, it is understandable that not many people are able to explain the issue, thus this part of the study remains quite exploratory, as it is merely looking into to current stage of blockchain based initiative. It must be stated though that answers received through the interviews regarding the information sharing in sustainability context were very similar with each other's and thus validated the interviews.

In order to assure trustworthiness in the interviews, the research was conducted anonymously. Anonymity was highlighted for the participants in order to create an

environment where interviewees can be open in their answers, but at the same time assuring that topics were to be discussed without trying to get company critical information. This is why also it was decided to give questions to participants beforehand, in order to highlight the openness.

#### **4.4 Introduction of case company**

Neste corporation is a producer of renewable diesel and jet fuels and refiner of high-quality oil products, founded in Finland in 1948. Neste is now known for its transformation from a traditional oil refining company to the world's leading renewable products company. They conduct research on the development of renewable solutions for the plastics and chemical industries and the possibilities of using waste plastic as a raw material for new plastic products. In 2019, Neste's revenue stood at EUR 15.8 billion. (Neste 2020a.)

Neste has been emphasizing its sustainability as part of strategy for a long time and company was in 2020 placed again on 3rd position on the Corporate Knights' Global 100 list of the world's most sustainable corporations. This marks company's 14th consecutive inclusion on the Global 100 list and third time being on the top three. Neste has been included on the list continuously for longer than any other energy company in the world. (Neste 2020b)

Neste states (Neste 2020c) that knowing the origin of products is a strict requirement and sustainability requirements are annually verified by independent expert parties. Cooperation with long-term partners through training and communication is highlighted as a tool. Regarding sourcing of palm oil, it is sourced directly from certified producer companies, enabling direct engagement and collaboration, as well as better visibility into their operations. Neste has strongly emphasised the importance of transparency of supply chain as a tool to improve sustainability and like many non-governmental organizations (NGO), recently emphasized the importance of involvement, cooperation and support for palm oil suppliers rather than boycotting them. (Neste 2020d.)

## **5 ANALYSIS**

In this chapter, the analysis and results of the study are presented based on the theme interviews. Interview results are presented according to the three main themes of the study; information sharing, blockchain technology as an information sharing enabler and the possibility to share supplier information among other players in the field. Direct quoting is used when it is seemed appropriate. Interviews were started with background questions about Neste Oyj's palm oil supply base to create clear background for the sourcing of the raw material, before interview focused on the information sharing and blockchain technology and this topic is presented in the beginning.

### **5.1 Neste Oyj palm oil supply chain**

Neste uses palm oil as a raw material for renewable diesel, and currently the material represents less than 20% company's annual renewable raw material inputs. Neste supplies it's palm oil only from Southeast Asia and utilizing both refined palm oil and a side product of palm oil processing called palm fatty acid distillate (PFAD). Their supplier base is considered quite large as the supply chain of palm oil includes refineries, mills and plantations that must be all recognized as crucial part of the sourcing. Basic supply chain of palm oil starts from palm oil plantations, goes to palm oils mills, to refineries before being sold downstream buyers such as Neste.

Neste sources refined palm oil with direct supply from approximately 15 palm oil refineries, who themselves source their raw material from approximately 1400 mills. In South-East Asia there are roughly 1800 mills, which means that Neste supply chain influences almost 80% of the local palm oil mills. To widen the spectrum, one mill can purchase from several palm plantations, thus the actual palm oil supply chain field is large. The basic concept of palm oil supply chain from plantation level onwards is illustrated in figure 10. Neste aims for full rigorization of their supply base to the plantation level.

In recent years Neste has focused on usage of waste and residue materials as their raw material. PFAD can be considered as part of this category as it is a side product of palm oil processed for food. PFAD is a processing residue derived from the refining of food-grade palm oil for the food and chemical industry uses, as illustrated in figure 10. About 3-5% of processed palm oil is resulting in PFAD, so naturally this also influences why Neste has such a large supply base.

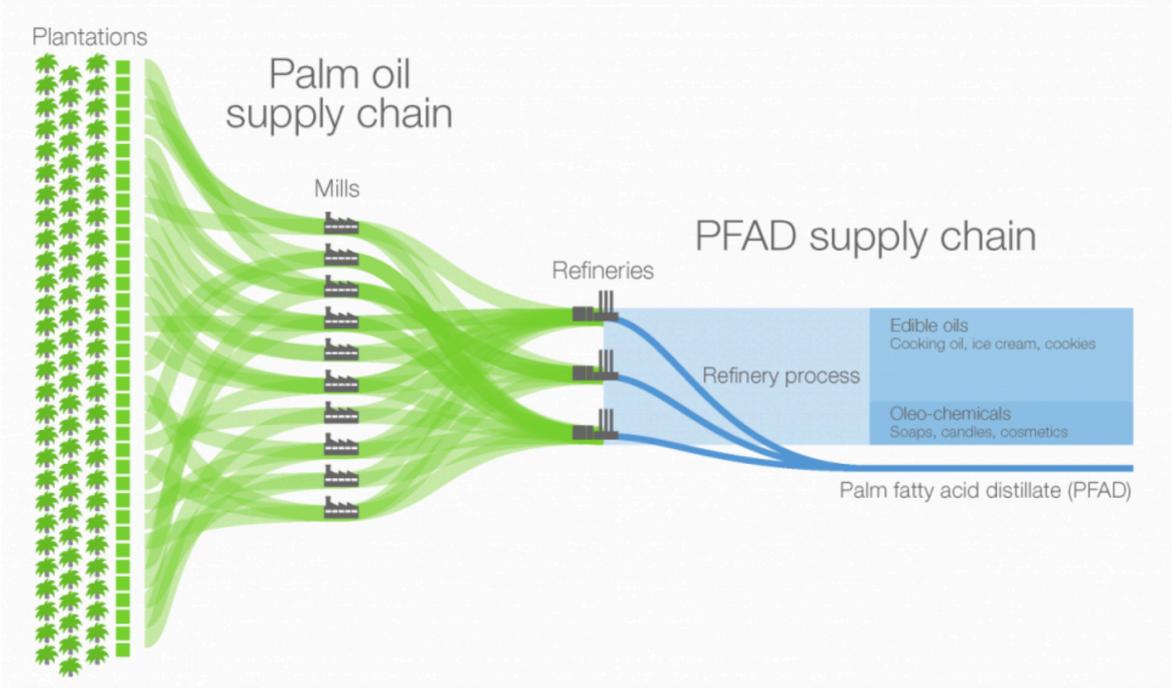


Figure 10. Nest Oyj Palm oil PFAD supply chain illustration (Neste, 2020)

Sustainability as a topic is perceived as important in their supply chain. Palm oil must be 100% ISCC-certified and 100% traceable all the way to the oil palm plantations. This means that there is better opportunity for direct engagement and collaboration, as well as better visibility into their operations. Sourcing is done only from suppliers who fully comply both with industry-specific regulatory requirements and sustainability requirements set by Neste. Every new supplier goes through the process of validity checks before accepted as a supplier. Sourcing is done based on following requirements formed by local authorities, EU and US legislation depending on the sales market and also own sustainability requirements formed in the company, as illustrated in table 3.

Table 3. Neste palm oil supplier sustainability requirements

| <b>Supplier sustainability requirements</b>                 | <b>Introduction</b>  |
|---|--|
| Neste Sustainability Policy                                 | Sets down Neste sustainability standards   |
| Neste Supplier Code of Conduct                              | Ensures correspondence with existing norms and regulations, as well as stakeholder expectations and needs. |
| Neste Responsible Sourcing Principle                        | Set's down principles for Neste sourcing   |
| Neste's Sustainability Principles for Biofuels              | Set's down principles for the industry specific sourcing   |
| Member of Roundtable on Sustainable Palm Oil (RSPO)         | Requires its members to commit themselves to respecting human rights and protecting rainforests            |
| Neste Supplier Self-Service Portal                          | Digital sustainability platform for Neste's renewable raw material suppliers and compliance processes      |
| Country specific laws                                       | Laws and legislations based on supplier location   |
| EU/USA level legislation (based on selling market location) | EU RED directive (Renewable energy directive), US EPA legislation (Environmental Protection Agency)        |

Sustainability work continues with existing suppliers, as they are checked continuously through the co-operation in order to make sure that the requirement level stays optimal. It was also seen important to recognize the different levels of sustainability per supplier. The interactions with supplier regarding sustainability related issues is seen as a journey, where various supplier might be in different states and thus each case needs

to be identified in order to give support that benefits each individual supplier and is best fitted to their needs.

This perspective also acknowledges the difference in the awareness levels in various locations, as CSR matters in general might be in different condition. In a collaborative way of doing business information sharing becomes more relevant. It is stated that collaboration with suppliers is seen important and close engagement and dialogue can be seen as providing most opportunities to support development of sustainability related matters.

Interviewees highlight that CSR related issues are implemented to the core of their business, and the sustainability related discussion is not just reserved to those whose job is directly linked to sustainability related matters but is something that is implemented across the company culture and extended to all its stakeholders.

## **5.2 Information sharing enabling supplier visibility**

Sustainability discussion in general has been evolving a lot in supply chains, and this has also affected palm oil sourcing. One of the reasons why sustainability of palm oil supply chain was described as currently in advanced state compared to many other agricultural accommodates was due to increased attention it has received in the last decade. This itself has helped to push CSR related matters in the field tremendously.

As Neste is interacting with such a huge base of palm oil players in south east Asia, with focus being on the sustainability side of the business, it can be stated that they are spreading the sustainability related awareness. This has been noted in supplier side as well, as it was mentioned that sometimes sustainability related questioning can be seen as somewhat annoying, although the reasoning is still understood. Various legal requirements, together with focus on environmental and social side of business and how companies are managing them has become more relevant and this relevance is recognized by suppliers as well. Neste has various standards, both company and legislation related that each supplier must comply with. Based on legal requirements, Neste could only trace back the palm oil to the refiners but Neste is tracing the raw material to plant level.

It was acknowledged that information sharing as a concept is contradictory. Information in general is one of the biggest assets of any company, thus information sharing strategy must be distinguished. Especially in palm oil industry, competitiveness is seen as a big challenge, so information sharing in this setup can be seen as a threat as well. Through the development of CSR awareness, information sharing as a concept has been developing continuously. There has been a big change in the last decade where information sharing has developed more due to increase pressure to gather and release data about the supplier operations. It was stated that it was not long ago when for example, traceability information, which in modern sustainability discussion can be seen quite pivotal, could be even seen as risky information leakage in terms of competition.

*“five or ten years ago people were really reluctant to share any information at all, because everyone is competing with each other and everyone is fighting for the same piece of business”*

Even though information sharing has developed a lot in recent years, there might be still hesitation inside suppliers' minds. A very intense competition situation can hinder the motivation to share any information regarding the supplier base as this information is seen as company critical. A lot of work has been done in terms of supplier engagement and information sharing in palm oil supply chain, thus this topic is not categorized as a concern anymore. Thus, aligning goals and objectives clearly with suppliers has been one tool how information sharing has been encouraged with suppliers. Collaborative strategy is used to encourage suppliers for information sharing, as jointly set goals and objectives create similar mindset so that information sharing can be seen as beneficial for all parties involved. Neste recognizes the power of collaboration.

*“one company cannot really do it [sustainability] alone, so you really need to partner and collaborate with each other's and to do that properly you need to share lot of information for that partnership to be effective.”*

Currently the actual action data collection has become more system based and there is less and less relying on paper documents. Due-Diligence process is implemented with more focus on creating system based follow up. Supplier sustainability portal is one of the biggest tools utilized in information gathering. It is a system where each suppliers sustainability information is gathered in one place, in order to evaluate it and also to utilize it, in order to recognize the level of sustainability of each supplier. Although in general there are several systems created for sustainability information sharing already available, Neste has focused on developing their own system, mainly because palm oil supply chain is large and naturally goes to smaller tiers. This sets lot of requirements for the information system as it has to recognize the different supplier levels in the chain. Recognizing only the first tiers would not be working strategy for palm oil supply chain.

Currently palm oil suppliers in general react to sustainability related information sharing in a positive way, but there are differences in the awareness levels. As mentioned before, Neste aims to spread awareness and support their suppliers in their sustainability journey instead of simply putting down demands. They have found that collaborative strategy is benefitting the cause the most. Similar motives and alignment to the same goal can be seen as important factors when discussing the motivation behind the information sharing.

*“Because that’s really what you want to tackle, the actual sustainability issues that is happening in the ground and try to do that together, so I think information sharing is a major part of being able to collaborate together as well.”*

Even though the general view for information sharing in modern supply chain is positive, there are still some challenges that could be roughly divided based on the sizes of the supplier company. For bigger companies the awareness level could be in advance stage, so that they already have invested resources into sustainability in their business. Thus, interest to their sustainability related actions are seen as positive because it validates the resources invested into the sustainability and gathered information is worth its value.

A challenge that could affect bigger entities is the current situation where buyer companies are not organized with each other in terms of sustainability demands. Bigger suppliers are faced with more customers causing the fact that they receive hundreds of various questionnaires, face different systems and in order to respect various actors demands, more resources are required, or there is a risk of information sharing related bottleneck to be formed, hindering the effective data gathering and sharing. For smaller companies' challenges might be different. It could be that the sustainability journey is at the very beginning and there might be the lack of more profound understanding of, for example terminology. As mentioned before, Neste aims to recognize the different state of each supplier in order to both support the supplier, but also guide their resources in to correct place.

Interviewees see current information sharing culture in palm oil supply chain in a very advance stage, due to years of active work towards sustainable supply chain. There is an existing culture and practise that have been recognised and found to be useful for the sustainability cause. It has been found that bollaboration towards joint goals is the most beneficial way to improve supply chain sustainability and information sharing is seen as pivotal in the way where it enables the actual cause.

### **5.3 Blockchain technology enabling supplier visibility**

Neste serves as a steering committee member in SUSTAIN initiative. SUSTAIN brings together palm growers, processors, users, sustainability experts, and technology partners to collaborate in region-specific sustainability issues. The initiative aims to develop a blockchain-based sustainability assurance platform to facilitate the collection and sharing of sustainability and traceability information. (Neste 2019.) SUSTAIN aims to improve data collection and sharing and avoid misuse of resources by implementing blockchain based collaborative system. Three major pillars that has been set as goals of SUSTAIN initiative can be seen in table 4.

Table 3. SUSTAIN goals, adapted from Sustain 2020.

*SUSTAIN Initiative goals*

*Improve data collection and communicate progress on NDPE (no deforestation, no peat, no exploitation) policy compliance.*

*Work towards greater smallholder inclusion in the supply chain of sustainable palm oil*

*Avoid duplication of efforts and resources through an integrated collaborative system built on blockchain.*

SUSTAIN stands for sustainability assurance and innovation alliance. Aim is to find and create better system for data collection and analysing to provide assurance for the information. One of the major suppliers for Neste, Apical, has been an initiative force behind SUSTAIN. Initiative is still on early development and piloting stage, as it still needs a strong proof of concept.

Blockchain technology serves as one of the methods how information can be shared in the best possible way, but this initiative aims to utilise other options as well. Blockchain offers that wanted assurance as it verifies the accuracy for the information and helps to summarize the information before passing on in the supply chain. This itself could help to guide the resources into the correct place. The possibility that companies could put resources directly to the most needed cause would be a major benefit instead of focusing on a larger scale to areas that maybe do not need such focus and are possible verified by other parties.

In the best scenario, blockchain could potentially fine tune the current process as currently it still requires some manual input. Another major area is data verification in

terms of verifying correct and accurate data and possible automation of the process. Providing automation to the verification is helping to guide resources to the correct places. Aim is to create more visibility online and create a platform of cloud services where new members can sign in relatively easily.

SUSTAIN wants to also acknowledge the different stages where companies might be in terms of technological implementation. This is affecting already the pilot stage where there are options offered for those companies that don't already have that technological partnering established and thus needs quite initial, early level deployment of support. Another solution would recognize the existing technology solutions and would aim to find way where various ways where different systems can input information to be jointly utilized.

*“knowing that there is so many different technology solutions out there already, and different suppliers are using different partners, and then there are those that do not have any partners, so we need to figure both side of things”*

One of the main benefits of blockchain system would be saved time, as data would be collected and stored in a safe way, ready to be assorted and shared whenever needed. Another big motivator for SUSTAIN is also the fact that currently there are lot of various technological solutions providers all working for different parts of supply chain actors, but not really one solution that could bring everything and everybody together. This is something that could be sorted with the help of blockchain based system.

One barrier that has been seen for this has been the worry about the risk of such information sharing system in terms of business or profit risks. True understanding of blockchain is still quite limited and even though in the case where understanding has increased, the technology is in many ways in early development and in so called dummy phase. It must be acknowledged that technology is still new, and this effects the awareness and technology adoption. As awareness of the possibility of technology is seen as low, this could lower the user cases. Many could see this still out of reach and not see the industry specific potential. This can be seen as main challenge, as the

true understanding in the field is missing and this can hinder the implementation of the technology.

#### **5.4 Scaling visibility information among other players**

One of the research sub questions pondered the possibility to share supplier related CSR information with other buyers in the field. Interviewees stated that this possibility itself sound interesting but would require development both from supplier and buyers' side in order to be functioning.

*“In the ideal situation there would be a global system where each company can input and share their own sustainability information to avoid situations where multiple companies ask the same questions in a slightly different form.”*

A similar joint audit system as currently being offered by BSCI, mainly used to retails business, would be ideal. But in a global context this brings question about antitrust and competition laws that need to be applied. A challenge that was mentioned was the various rules and regulations that would need to be standardised, as well as the fact that the emphasis on sustainability related matters can vary from company to another. Although lot of aspects in the industry specific CSR matters are regulated, there are still areas that are not, for example traceability to mill, meaning that some aspects on sustainability related information sharing is still based on volunteering, and this puts companies in different position.

The biggest drivers for sharing information within the field was seen as time saving from both buyer and supplier side and the power of collective efforts to increase sustainability in the supply chain. All interviewees mention that more collaborative grip on sustainability related matters could only benefit the actual cause. As Neste recognizes that various suppliers need different level of support in their sustainability journey, it is obvious that this support requires resources from buyer side. Resources is required from supplier side as well, as multiple buyers have their own sustainability systems to be filled and updated.

Blockchain technology is seen as enabler of information sharing among other players in the field as well, it could have the possibility to revolutionize the information sharing in general. In this case the adolescence of the technology could be seen as benefit as the rules have not been set up yet and in that way the culture is still a white canvas in that sense.

*“so it could be good that everyone jumps on the same board (..) and it is easier to gross collaborate and you don’t have to purposely seek more information, sometimes you can just do a quick search and you know that perhaps you and your peer are buying from the same regions and maybe you can already look in to something together, you fast track some discussion and meetings.”*

One of the possible challenges mentioned was needed approval from suppliers. It is mentioned that although Neste collects sustainability related information from supplier, it is still supplier related information that requires consensus from their side to be shared among other players. There could be motivation from supplier side to allow larger scale information sharing, but initial set up would require development of ground rules.

## **6 CONCLUSIONS**

The aim of this study was to understand how information sharing influences supplier sustainability and whether new technology could help form new ways on how CSR information can be shared more effectively, securely and less costly. The main focus was to identify what is meant with supplier visibility and how information sharing currently contributes to that, and how blockchain technology could help with the information sharing to enable supplier visibility, in order for companies to comply both internal and external CSR demands and look for the possibility of scaling that information beyond traditional one-to-one supplier-buyer relationship.

The study utilized qualitative research method and the analysis and results are based on the data collected through theme interviews. There were two main research question as well as five supporting sub-questions that were set at the beginning of the research process according to the research objectives. Research questions are gone through according to the main research questions and supportive questions bring added insight to the discussion.

This chapter answers the research questions and studies the relationship between interviews and theory by drawing conclusions from both the theoretical framework and the empirical research. After this there is a discussion part evaluates the results of this study. Finally, this chapter also presents suggestions for future research.

### **6.1 Answers to research questions**

Research questions for this thesis were formed by studying the current status of the topic and refining the possible existing research gap. Previously information sharing has been looked on multiple studies in supply chain related researches, but the main focus has been mainly in demand planning, relationship between buyer and supplier, or for example purely order related information sharing. This study aimed to combine information sharing to supplier sustainability and both examine its current state and also ponder it's future. Next the main research questions are examined through the help of the defined sub-questions.

### *RQ1 How information sharing helps to facilitate supplier sustainability?*

Information sharing can be stated to be integral part of developing supplier sustainability. It has become crucial part of collaboration between supplier and buyer and has been developing tremendously in the recent decade. In second chapter two non-compliance strategies were presented by Ciliberti et al (2008), and Neste were seeing as aiming more towards capacity building to increase supplier's own capacity of handling CSR issues. Capacity building requires active participation and information sharing but can be seen as more modern clasp on sustainable supply chain, opposite to immediately terminate the contract in case of misdemeanor. Sancha et al (2016, 1943) found that supplier assessment and collaboration are positively associated in suppliers' social performance and collaboration was seen as crucial in case company as well.

Neste presented various due diligence aspects that they have committed in their actions and combine both legal requirements and their own pre-defined criteria that suppliers must commit to. As mentioned in chapter two, sustainable supply chain aims to create a system that to builds a holistic management and SSCM strategy (Ciliberti et al 2008). It was stated that information sharing has changed tremendously in recent years, and more and more moves towards utilizing systems instead of paper reviews. This was seen as positive change, as when more data is collected, it is crucial that this data is then easily accessible and sortable.

Sustainability information is gathered based on various regulations set by various local authorities or for example EU based legislations. Together from rules coming from outside, companies, such as the case company is using their own pre-defined standards were information gathering is then aligned with those company and industry specific goals. As mentioned in chapter two, crucial aspect of information is the quality of information. Relevant information can be characterized as being accurate, timely and complete (Williams et al. 2013). Creating a system-based tools for data gathering and utilizing various technological solutions in order to gather, summarize and distribute information whenever necessary is crucial part of modern information exchange.

*SQ2: What are the drivers and restricting forces for information sharing?*

It could be stated that information sharing itself works as a driver for information sharing. Aligning sustainability goals together with suppliers requires collaboration and partnering and sharing information from buyers' side, but this can be seen as beneficial as it helps suppliers understand the motivation to share details that could have been previously seen sensitive in terms of competition. Aligning goals together with suppliers requires active information sharing between all parties. Part of aligning goals together with suppliers is also to identify the key areas where each supplier requires help in order to correctly guide limited resources. As argued also by Sancha et al (2016, 1936) supplier assessment enables firms to identify where suppliers need to be developed and thus guide the focus and resource to the right place.

Part of the communications between buyer and supplier is also the use of various measures and metrics of sustainability that have been implemented. COC's and dashboards are examples of measures actions that have been taken, but they can also be viewed as stating company values and ways of both collecting information and sharing them. It is crucial that relevant metrics are based on objective and credible measures that cannot be manipulated and are shared on a regular basis. (Doolen, Traxler & McBride 2006.) Aim is to gather information that in the best possible way raises the CSR related issues in the palm oil supply chain.

What can also be seen as driver is the raised value of sustainability information. As the value of CSR related information has increased (Thorne et al. 2014, 689), supplier companies want to utilize the value they have invested to the information gathering and extract it through sharing the information, that can then raise the value of their product. Buyer company can actively work on raising the value of sustainability information. As a bigger player in the field, company such as Neste have higher leverage in the supply chain, and thus can utilize their sustainability strategy and the fact that it is stated as a core in their business. This can mean that their demands are being heard in the chain more loudly. It can be stated as highly important that bigger

players in the field are invested in sustainability as they help to deepen the topic and raise the value of sustainability with their stakeholders.

Sensitivity of information in general could be seen as restrictive force behind information sharing, as intense competition increases the motivation to share information as it can be stated as valuable. Although relevant, this is no longer such a big threat to sustainability related information sharing in palm oil supply chain, as value of sustainability information is recognized and thus this works as incentive for it. As stated by Krause and Ellram (1997), only by communicating constantly with suppliers about the expectations and willing to participate on the development can the relationship evolve through time and innovate for the unknown future.

*SQ3: What are the drivers and restricting forces for sharing visibility information with multiple buyers.*

In general interviewees saw the possibility to share more visibility information with other buyers as positive possible development and could see it beneficial from both supplier and buyer side. The biggest drivers for sharing information with other buyers was seen as time saving from both buyer and supplier side and the power of collective efforts to increase sustainability in the supply chain. This would benefit the actual cause as resources could be guided to the needed areas, instead of verify something that has perhaps already been verified by other parties.

The challenges or restrictive forces for wider information sharing were seen mainly in legislations and also the current culture where information is not so much shared from one buyer to another. This means that the initial start would require lot of resources as the rules and set up is brought up. Possible challenges of such coalition were the effects of various legislations and regulations, or more precisely, the current lack of them. Defining joint rules and regulation and being able to get other parties to join in it, or the implementation of existing laws such as competition law that could bring own challenges to the mix.

Another challenge that would require refinement would be to clarify the use of information. Although sustainability information is collected by buyers, it is still information that is belonging to suppliers, thus it would be crucial to define the limits of information sharing and align the goals of all parties, each supplier and each buyer. This kind of complete information sharing would bring so many players together that some level of collaboration would be needed.

*RQ2 How can blockchain technology help to facilitate supplier visibility?*

Blockchain technology was seen as enabler of verified and validated data sharing. As mentioned previously, collaboration together with suppliers means increased information sharing in order to benefit the sustainability cause. This increased data collection creates needs for having tools that are able to fine tune the process and create automation for information handling, such as data sorting, and thus resources can be directed accordingly. Blockchain technology were seen as one, but not the only possibility as a technological solution to serve as an aide in information sharing. It was still seen as early development stage and in need for proof of concept. Blockchain technology could be seen as accelerator to share information widely with other players in the field as well, with the added trust the technology brings to the information sharing in general.

SUSTAIN initiative works as an interesting base for supplier visibility as it aims to share sustainability related data, and thus truly aims to find a way of utilizing blockchain technology in increasing supplier visibility. It was acknowledged though, that blockchain would only bring one part of added value to the technological side of information sharing, and cloud services, apps and other solutions are needed in order to develop a working information system. Piloting of SUSTAIN initiative continues and aims to find solutions to serve CSR matter in the most fluent way.

*SQ4: What are the drivers and restricting forces of blockchain based solution to supplier visibility?*

In chapter three, there were four barriers presented by Saberi et al. (2019), which represented obstacles that could prevent companies to invest in blockchain technology. The case company interviewed where already putting resources into blockchain technology, thus intra-organizational constraints where not applicable directly to them. They have also tackled many inter-organizational barriers by acknowledging for example the possible differences in technological levels in their supply base. The most relevant barrier for Neste and SUSTAIN initiative seemed to be external and system-based barriers. It was mentioned that due to the immatured nature of technology, there's is still lack of policies developed for the technology. There still seems to be quite marginal group that understands the technology and it is hindering its development. This would be relevant to any new technology that has relevantly low user cases.

Drivers to implement blockchain based information sharing system where definitely the verifications and storage of data it would provide. Cearley et al. (2019) argues that the value drivers of blockchain, meaning validation of data, enables parties that do not know each other that well create and exchange value through blockchain technology and this data validation was one important advantage also in SUSTAIN initiative and why blockchain technology is part of that. Principally, supply chain management is about managing relationships among partners to create value for stakeholders, this can bring challenges especially when integrating information technology and sustainability practices. Cultural differences, lack of rules and/or implementation problems could all hinder the enthusiasm for moving to a new information sharing system. (Saberi et al. 2019, 2125.)

## **6.2 Discussion**

The theoretical framework for this study presented the basis of modern CSR and its development especially in the recent years where it has clearly been elevated as relevant topic in company strategies (Russo & Perrini, 2010, 208). This point was validated also in the interviews as it was mentioned that the sustainability culture can be seen as implemented to company in a way where sustainability discussion is not only reserved to those that work directly with the issue, but also implemented to every

stakeholder across the company. The raise of CSR issues to an integral part of corporate strategic orientation (Russo & Perrini, 2010, 208.) is truly illustrated well in the case company, as Neste was highlighting true power of collaboration to serve the sustainability cause.

Fontaine (2013, 112-114) argued that modern CSR actions are preventative rather than obligatory for companies and this can be seen in palm oil supply chain as well. Due to the pressure that palm oil industry has received, this development has been ongoing for some time longer than for example other agricultural industries. This brings interesting point of view to evaluate the effects of media pressure that companies are dealing with, as that pressure can both further the CSR cause causing positive change, but the discussion can easily become black and white and focus only on the negativity, skewing the reality of the issue. In the case industry, this pressure has helped to carve company CSR strategies to more open and transparent direction and this change highlights the need of fluent information sharing between buyer and supplier.

Information sharing in general was seen as important and has been developing along with the development of both CSR topics and with the increased data gathering, enabling fluent exchange of valuable information. As awareness of the effects of businesses to environment and social wellbeing have increased (Awaysheh and Klassen, 2010, 1248), it can be assumed that more data and thus more information must be gathered and shared. These cannot be stated as the only motivators for sustainability related information sharing. The disperse global supply chains (Egels-Zandén, 2017, 515) create a need to develop information sharing as a concept as visibility is needed in order to handle financial risk, reputation risk, environmental risk, and supply chain risk (Fontaine, 2013, 115). Sustainable supply chain can also act as stating company values not only to customers and investors, but directly to suppliers.

In case company, collaborative strategy was mentioned to be one of the keys of achieving the sustainability related goals as efforts done together can truly be more than their sum together. Suppliers must share information regarding their actions and buyers must support this by sharing their demands and linking them together to create joint goals. Sustainable supply chain can be seen as big value creator of business and it can be achieved through persistent collaboration and ongoing discussions.

Collaboration was mentioned as one of the biggest motivators for furthering CSR matter, but not only through dyadic relationship between one buyer and supplier. The interviews mentioned that one company cannot do everything alone, meaning that it is necessary that other buying entities invest into the matter as well, creating similar message to all supplier tiers, even in the case where information is not shared horizontally. Collaboration between buyers was not excluded as an option, although mentioned that it would require plenty of process development and resources to create interfaces and thus regulations.

One of the discussions in this thesis was the possible implementation of blockchain technology to improve the information flow. The core idea of blockchain is the validity it brings to the data, theoretically enabling parties that do not know to exchange information (Cearley et al. 2019, 40). In chapter three, four barriers of companies adopting blockchain based system was presented; inter-organizational, intra-organizational, external and systems related (Saberri et al. 2019, 2124.). As the case company in this thesis was already at the stage where such possibility of implementation was considered, for such company, challenges are mainly outside the company. This highlights the immaturity of the technology, as it can be stated to be in its pilot stage, not only in the case company, but most likely in other companies as well, as clear regulatory system seemed to be missing.

When it comes to the blockchain technology, as mentioned, technology is still in early stages. Initiatives such as SUSTAIN in the case company gives hope for the future that companies are more willing to test the technology and give it the needed proof of concept. The immaturity of overall technological adoption must be taken into account in general, as done in case company, as they were recognizing the different levels supplier companies can be in their technological development. Thus, one of the key takeaways would be tailoring the offers to the needs of each company. As mentioned in theory, and verified by the interviews, resource for any company are always limited and thus acknowledging this from early on helps to minimize the friction in the business. The main takeaways about information sharing and technological development are presented in table 4. It highlights well the themes that Neste has proven to serve the CSR matters best, when deciding information sharing strategy.

**Table 4.** Information sharing drivers to serve CSR matters

| <b>DRIVERS</b>  |
|---|
| Collaborative strategy  |
| Aligning goals together with suppliers to create similar mindset so that information sharing can be seen as beneficial for all parties involved |
| Recognise individual suppliers CSR awareness level and state  |
| Utilising technology to guide resources to correct place  |

Using information as a tool for tailoring seems to be one of the key takeaways whether talking about sharing CSR related information or new technology adoption. With the increased information sharing, it can be stated as crucial step to evaluate each supplier to assess the stage in where each supplier is at the moment. Information sharing requires always company resources and guiding them to the correct place is both economical and serves the purpose.

**6.3 Suggestions for future research**

This study provided a brief examination of current situation of information sharing and CSR in palm oil supply chain. As this study was done with only one case company, a wider selection of companies in the palm oil supply chain would be interesting base for a research. As seen in the study, the basic supply chain of palm oil includes thousands of players from the plantation to mills and refineries and thus more deep analysis of how sustainability issues affect the supply chain would be interesting.

One of the findings from this study was the fact that although palm oil supply chain was seen as advanced in sustainability, the level of knowledge and awareness in sustainability related matters in different actors can vary a lot. These variations could provide interesting base for a research as to study further were these variations come from. In the case where inside one geographical location there are multiple point of views, emphasis and interest to invest in sustainability among one industry, the motivation behind actions could provide more insight on what is seen as a motivator to invest in the topic and what not.

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## **APPENDIX 1**

### **Interview**

### **Background question**

- Position in the company?

### **Suppliers and Sustainability**

- 1) How would you describe your palm oil supplier base at the moment?
- 2) How much sustainability issues are influencing cooperation with suppliers?
- 3) What kind of sustainability criterias are set for suppliers and how is it validated?  
(eg auditing, standards, certificates)
- 4) Are sustainability requirements based more on legislations or on the company's own strategy?

### **Information sharing**

- 5) How would you describe the importance of information sharing from a sustainability perspective, e.g. what effect does the increase / decrease in information sharing have to sustainability?
- 6) How do suppliers view the sharing of sustainability information?
- 7) What do you think encourages the information sharing?
- 8) What do you think does not encourage the information sharing?
- 9) How is sustainability related information currently distributed from supplier to buyer?
- 10) Is there anything you would change in the current information sharing?
  - a. On the system side
  - b. In the culture of information sharing?
- 11) Would you be willing to share supplier-related responsibility information with other buyers?
  - a. If yes, why?
  - b. If not, why not?

## **Blockchain based information sharing system**

- 12) In terms of supply chain visibility, how do you see blockchain technology can disrupt current information sharing practices?
- 13) What are the benefits and challenges of blockchain based information sharing system?
- 14) What do companies need to do to implement blockchain based information sharing system?
  - a. In company resources?
  - b. In company culture?
- 15) Could blockchain based system help to share supplier related sustainability information with other buyers as well?
- 16) Is there something else that comes to your mind that could be useful information regarding the topic?

## APPENDIX 2

### Haastattelurunko 1

### Taustakysymys

- asema / rooli yrityksessä

### Toimittajat ja vastuullisuus

1. Miten kuvailisitte palmuöljyn toimittajakantaanne tällä hetkellä?
2. Kuinka isossa osassa vastuullisuus näkyy toimittajayhteistyössä?
3. Minkälaisia kriteerejä toimittajille asetetaan ja kuinka toimittajien vastuullisuus varmistetaan? (esim. auditointi, standardit, sertifikaatit)
4. Perustuvatko vastuullisuusvaatimukset enemmän lainsäädäntöön vai yrityksen omaan strategiaan?

### Tiedon jakaminen

5. Minkälaisessa osassa vastuullisuustiedon jakaminen on tällä hetkellä palmuöljyn hankintaketjussa?
6. Minkälaista vastuullisuustietoa pääasiassa jaetaan?
7. Miten kuvailisitte tiedon jakamisen merkitystä vastuullisuuden näkökulmasta, ts. minkälaista vaikutusta tiedon lisääntymisellä/vähenemisellä on?
8. Miten vastuullisuuteen liittyvää tietoa jaetaan tällä hetkellä toimittajalta ostajalle?
9. Miten toimittajat suhtautuvat vastuullisuustiedon jakamiseen?
  - a. Mikä mielestänne kannustaa vastuullisuustiedon jakamista?
  - b. Mikä mielestänne ei kannusta vastuullisuustiedon jakamiseen?
10. Onko jotain mitä muuttaisitte nykyisessä tiedonjakamisessa
  - a. Järjestelmäpuolella
  - b. Tiedonjakamisen kulttuurissa?
11. Olisitteko valmis jakamaan tavarantoimittajiin liittyvää vastuullisuustietoa muiden ostajien kesken?
  - a. Jos kyllä, niin miksi?
  - b. Jos ei, niin miksi?
12. Tuleeko mieleen jotain muuta oleellista, jota mielestänne olisi hyvä lisätä?