

LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT

School of Business and Management

Master's Programme in Supply Management

Master's Thesis

SUSTAINABLE SUPPLY CHAIN MANAGEMENT

CHARACTERISTICS OF A SUSTAINABLE SUPPLY CHAIN

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2019

ABSTRACT

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Title:	Sustainable supply chain management: Characteristics of a sustainable supply chain
Faculty:	School of Business and Management
Major:	Master's Degree Programme in Supply Management
Year:	2019
Master's thesis:	87 pages, 23 figures, 1 appendix
Examiner:	Professor Veli Matti Virolainen
Keywords:	Sustainability, Sustainable development, Supply chain management, Strategy

This thesis discusses the role of supply chain management in promoting the overall sustainability of the company. Many companies have committed to the UN's sustainable development goals on the company level, however, the role and potential of supply chain management has traditionally been overlooked in these sustainability endeavors. This thesis introduces the concept of sustainable supply chain management which enables extending sustainability initiatives further along the supply network. This thesis utilizes a qualitative case study to identify sustainable supply chain characteristics from companies appearing on the Global 100 index.

The case study revealed that company level sustainability initiatives do not directly translate into sustainable supply chain activities. The sustainable supply chain management requires a holistic approach on value creation and inclusion of the upstream and downstream of the supply network into the value chain. The focus should be in engaging the actors on co-creating sustainable value to each actor of the network instead of focusing on generating profits on individual frames. A sustainable strategy plays a pivotal role on steering the focal company but network-wide KPI's enable steering the entire supply network towards the desired goal.

TIIVISTELMÄ

Tekijä:	Jani Lauri Inkilä
Opinnäytteen nimi:	Sustainable supply chain management: Characteristics of a sustainable supply chain
Tiedekunta:	Kauppätieteiden koulutusohjelma
Pääaine:	Supply Management
Valmistumisvuosi:	2019
Pro gradu -tutkielma:	87 sivua, 23 kuvaa, 1 liite
Tarkastajat:	Professori Veli Matti Virolainen
Avainsanat:	kestävyys, kestävä kehitys, hankintatoimi, strategia

Tämän tutkielman tarkoituksena on tutkia hankintatoimen roolia kestävästä yritystoiminnan luomisesta. Monet yritykset ovat osaltaan sitoutuneet YK:n kestävästä kehityksen tavoitteisiin, mutta hankintatoimen mahdollisuuksiin näiden tavoitteiden saavuttamisessa ja edistämiseksi ei ole annettu sille kuuluvaa painoarvoa. Tämä tutkielma esittelee kestävästä hankintatoimen konseptin, joka mahdollistaa yritystason kestävien ratkaisujen ja tavoitteiden levittämisen ja sitouttamisen laajemmalle hankintaverkoston. Laadullista tapaustutkimusta hyödyntäen tämä tutkielma pyrkii tunnistamaan kestävästä hankintatoimen piirteitä analysoimalla vuosikertomuksia Global 100 listalle sijoittuneilta yrityksiltä.

Vaikka yritys olisi omalta osaltaan sitoutunut kestävästä liiketoimintaan ei heidän hankintatoimensa välttämättä edistä tai sitouta näitä tavoitteita heidän toimittajaverkostoonsa. Kestävä hankintatoimi tarvitsee kokonaisvaltaisen lähestymisen arvonluomiseen sekä ala- ja ylävirtojen sisällyttämisen arvoketjuun. Pääpainon tulisi olla verkoston jäsenten sitouttaminen yhteiseen arvonluontiin sen sijaan, että jäsenet keskittyisivät voiton tavoittelemiseen itsenäisesti ja yksittäisillä osaluilla. Kestävällä strategialla on välttämätön rooli ohjata yritystason toimia, mutta koko verkoston laajuisia mittareita tarvitaan ohjaamaan verkostoa kohti haluttuja tavoitteita.

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AKNOWLEDGEMENTS

I wish to express my gratitude to the LUT university for the possibility of participating in their story. I had been an advocate for sustainability before joining LUT, but the university provided me with the knowledge and tools to take my passion to the next level. I hope I can make the most of the teaching during my professional career within the industry.

I want to thank all the professors and lectures for the knowledge they had to share during the courses. I also want to thank my fellow students for their co-operation during the courses and group projects. Thanks for all the great discussions I had during my studies. Finally, a special thanks to Sini and Laura for all the laughs which helped through the studies.

1 INTRODUCTION

This chapter introduces the background for this research and defines the objectives, research question and limitations for the research. This chapter also introduces the key concepts used in this research and explains the conceptual framework used. Finally, it explains the structure of the thesis.

1.1 Background

The motivation for this thesis stems from personal interest towards sustainable development. The ever-growing concern for wellbeing of Earth and its inhabitants has increased public awareness for sustainability related themes which in turn has driven companies to incorporate sustainability in their actions to survive in this new market situation. The competition between individual companies has shifted more towards competition between supply chains thus this thesis aims to investigate the role of supply chain management in sustainable business practice.

The idea for this thesis began with an article by Frostenson & Prenkert (2015) studying sustainable supply chain management with the setting of the focal company being a network-entity rather than a single company. The authors concluded that managing sustainability with traditional supply chain management perspective is impossible since not all sustainability related resources are under hierarchical control within the network and so coordinating the network was deemed as more viable option. Frostenson & Prenkert (2015) further highlight that the coordination attempts may not succeed if the focal company does not acknowledge that all the actors in the network have their own network horizons thus no single network and single focal company exists but rather a plethora of focal companies and network horizons depending on the viewpoint.

The idea of networked networks steered this thesis to examine different structures for sustainable supply chains and tools to manage such entities. In order to engage the plethora of different actors in wide networks this thesis considers the concept of triple value creation (Kähkönen & Lintukangas, 2012). The triple value creation suggests that the role of supply management should be on co-creation of value to all partners. The triple value creation encompasses the idea of end-customer value and highlights that value should not be created solely for own company but for the partners as well. As sustainability is a value which benefits the entire Earth and its inhabitants, the triple value creation supports this ideology and works in the background on building the model for sustainable supply chain management.

Sustainable supply chain requires appropriate measurement tools and Chardine-Baumann & Botta-Genoulaz (2014) have introduced a model for measuring the sustainability performance of a supply chain. The suggested model utilizes a wide variety of sustainability factors on social, environmental, and economic levels. The model includes company-focused levels as well as stakeholder level on the economic, social, and environmental dimensions and provides very thorough and holistic evaluation on the sustainability performance of the entire supply chain. However, the sustainable performance model provides only tools to evaluate, not to integrate or improve sustainability. This article motivated on building a model with more active approach on sustainability evaluation and integration.

Bastas & Liyanage (2019) suggest an interesting idea of integrating sustainability with supply chain management and quality management approaches, which translates into sustainable supply chain quality management. The model utilizes the concepts of existing methods of both quality management and supply chain management with the measurements of sustainability. The model encompasses the entire value chain from the suppliers to the end-customer which indicates that companies should focus on holistic approach if they wish to achieve sustainable supply chain management. As the

model utilizes existing measurements and approaches it also motivated this thesis utilize existing tools in sustainability context to build an active model with tools for measuring, integrating and improving sustainability in the supply chain.

1.2 Objectives, research questions and limitations

This thesis studies sustainability within the supply chain management framework. One objective of this thesis is to build a model for sustainable supply chain using known tools and methods pre-existing in the supply chain and business management in order to create a practical approach to the issue. A supportive objective in the process is to identify sustainable supply chain factors from sustainable companies and their supply chains.

The research question, which this thesis aims to answer is “**What is sustainable supply chain management?** To answer the research question, this thesis will first build a theoretical framework for sustainable supply chain management and then analyze supply chain practices from five most sustainable companies in the world based on the Global 100 listing. The aim of the analysis is to identify what kind of supply chain practices the companies use and observe what kind of role the companies place on their supply chain management in their sustainability targets. The sub-question “**What are the characteristics of sustainable supply chain?**” is used to aid finding the answer to the research question.

This thesis is limited to research only the sustainable supply chain factors and does not consider sustainability actions focusing purely on the focal company. As the results are induced from qualitative analysis with the sample of five annual reports the results are not generalizable. Further research with bigger sample and quantitative method would

be required to confirm generalizable results. The research utilizes secondary data which might exclude some insight information that primary data could provide.

1.3 Definitions and key concepts

This chapter shortly defines the key concepts used in this thesis. All the concepts presented here are discussed more in-depth in their representative sections. It is good to note that some of these terms might be defined differently on other papers and thus these definitions only apply within this research and are based on the theoretical framework used in this research.

Sustainable supply chain management (SSCM) refers to the combined ideology of sustainability and supply chain management that promotes the concept of sustainable development with the supply chain management framework. No universally agreed model for SSCM exist and each research focuses on different aspect of SSCM, however, all the models highlight the holistic approach over traditional economic efficiency.

Lean Six Sigma combines the concepts of both Lean and Six Sigma under one methodology. This thesis uses the Lean Six Sigma as a basis to build a tool set to actively integrate, manage, and improve the sustainability in the supply chain context.

Sustainable turnaround strategy discusses the traditional turnaround strategy, that focuses on financial performance and declined growth, within sustainability setting. This results in an approach that utilizes a tested and proven model that is able to steer companies towards more viable path in the changed market environment and competition.

Supply chain structure is used to describe the different possible layouts and ways the supply chain can be organized. Instead of a single rigid shape, the structure should be elastic and allow different types of partnerships and transactions to emerge and dissipate. This thesis discusses the concept of virtual enterprise and business ecosystems as options for supply chain structure.

Supply chain orchestration refers to the management framework used in a networked environment. Hierarchical management methods do not provide adequate tools for companies to manage vast supply networks efficiently enough, thus this thesis uses the concept of supply chain orchestration. Orchestration means overseeing and steering rather than traditional commanding and ordering of partners. Orchestration encompasses the idea of cooperating with the existing network as well as shaping the consistency and structure of the network itself.

1.4 Conceptual framework

The conceptual framework of this thesis is presented on Figure 1. The main concepts are sustainability, strategy & tools, supply chain structure, and supply chain orchestration. The concept of sustainability is built upon the notion of sustainable development and then aligned it within the business context. The next concept discusses the importance of strategic approach on sustainability by utilizing the turnaround strategy in order to steer a traditional company on a more sustainable path. To supplement the strategic approach and to aid in implementation and measuring the process, this thesis discusses the concepts of lean six sigma and tolerance management.

The supply chain management topic is discussed with the concepts of supply chain structure and supply chain orchestration. The supply chain structure focuses on the

extent and shape of the supply network; meaning the elasticity and ability to respond to the changing environment. Whereas the supply chain orchestration focuses on the interaction between the actors of the supply network and discusses the importance of co-operation and identifying the right horizons for interaction.

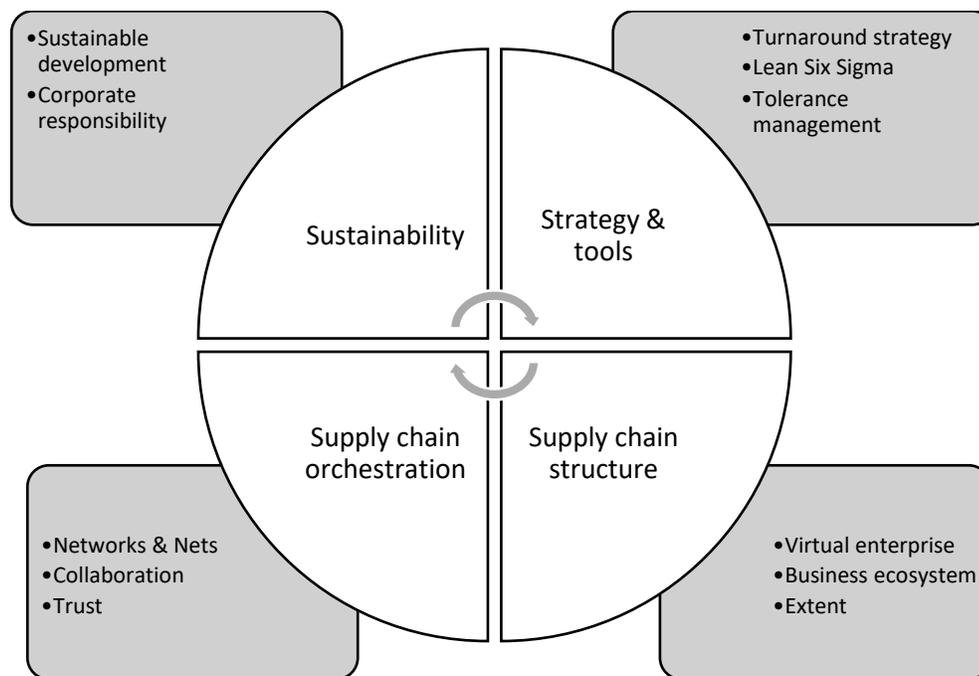


Figure 1 Conceptual framework

The presented concepts are used as basis on building the model for sustainable supply chain management. These concepts are considered and discussed as circular and interlinked. The reasoning behind this approach is that companies need to have sustainability as an underlying motive to operate. In order to transform the idea of sustainability into concrete actions, company needs to build a sustainable strategy with proper tools for implementation and measuring. The strategy defines what kind of structure and shape the supply chain will take. Supply chain orchestration is needed in managing and steering the networks towards the strategical goals. At this point the

cycle returns to consider sustainability of the network and what are the future directions of the network.

1.5 Structure of thesis

This thesis consists of five sections: introduction, methodology, theoretical framework, empirical part, and discussion & conclusions. Introduction chapter begins by discussing the concepts and themes which inspired this thesis and which ideas were used as background to build the utilized framework. Next the chapter will state the objectives, limitations, and the research questions this research aims to answer. Then the chapter will present the key definitions and concepts used in the research as well as illustrate the conceptual framework utilized in this thesis. The chapter will end by shortly presenting the structure of this thesis.

Methodology chapter focuses on presetting arguments for the selected research approach, methodology, and methods. The chapter will also discuss the validity and the reliability of the research. The theoretical framework discusses the topic of sustainable supply chain management. The discussion is divided into five sub chapters starting with the sustainability framework. The second subchapter discusses the strategical approach suggested for the SSCM. Third subchapter presents a toolset for measuring and tracking the progress. Fourth subchapter considers the different options for the flexible supply chain structure. The fifth and final subchapter illustrates viewpoints on how to steer and manage the supply networks.

The empirical part will introduce the analysis used in this thesis. The chapter will first discuss how the data for the analysis was collected and what kind of material was analyzed. Second the chapter will explain the phases and steps of the analysis. Then the chapter will go through the findings of each case. The chapter will then summarize

the main findings from the cases. Final part will draw conclusions on the sustainable supply chain characterizes based on the findings from the analyzed cases.

The discussion & conclusions chapter draws together conclusions from the theoretical framework and the conducted analysis. The chapter will also present the answer to the research question. Finally, the chapter will discuss the overall process and aspects of the research, provide future research possibilities, and state faced limitations.

2 METHODOLOGY

This chapter will explain the methodology used in this study, justify the chosen method and data collection, and the analysis. This chapter will also analyze the validity and reliability of the research.

Research methodology describes what kind of approach the research has on the studied issue or problem and the method describes the research technique (Metsämuuronen, 2008). The qualitative and quantitative methodologies are supporting rather than opposing methodologies thus utilizing both on appropriate levels provides more insightful results. Quantitative methodology focuses on statistics and mathematical relationships; however, the data is drawn from source(s) with meaningful concepts and non-numerical aspects, which is the focus of the qualitative methodology. In other words, the numerical values can be explained by qualitative concepts and the qualitative concepts and relationships can be expressed as numbers (with certain degrees). (Hirsjärvi, Remes & Sajavaara, 2009)

This the research utilizes case study -method, which is used to gain understanding over a certain phenomenon on a more detailed level and find new information rather than to test hypotheses (Hirsjärvi et al., 2009). Metäsmuuronen (2009) suggest that the sample in case study should be justified with statistical or other means in order to provide good analysis and identify connections between cases. Vilkka (2005) highlights that even though the case study focuses on a certain time period, the context and history of the case should be visible and understood when selecting the sample.

This research falls under descriptive type since the aim is to observe how the analyzed companies are executing sustainability in their supply chain. In descriptive type of research, the researcher has no control over the variables and the aim is to simply

describe what has happened and report the findings (Kothari, 2004). Qualitative method was selected since the aim is to observe how companies integrate sustainability in their supply chain and how they see the role of supply chain management in sustainable development instead of studying quantitative data. Additionally, this is a cross-sectional case study focusing on annual reports from 2018. Figure 2 summarizes the aspect of research methodology used in this thesis.

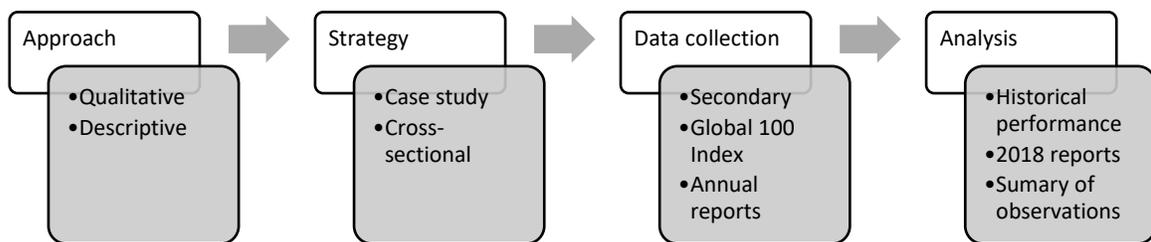


Figure 2 Research methodology

This study utilizes secondary data. The analyzed data consists of annual reports from the five selected companies. The reports vary from 2018 and 2018/2019 depending whether the companies report solely their past year activities or also incorporate plans into their reports. Quantitative and longitudinal analysis was used to map historical rankings of the Global 100 companies from 2005 to 2019. The purpose was to identify companies with the most rankings during the history of the Global 100 listings and to identify companies that have been incorporating/reporting sustainability related activities for a longer time frame; this shows more strategic approach rather than a one-time effort on sustainable practice.

2.1. Validity and reliability of the research

Research reliability and validity refers to how well the study can be repeated, how credible is the analyzed data, and how generalized are the results. Validity refers whether the findings describe what they are meant to describe. Reliability is concerned on the quality of data collection, processing, and analysis. (Saunders, Lewis & Thornhill 2009; Hirsjärvi et al. 2009) The data is collected from public company reports which are aimed to professional audiences. The data content in the reports can be viewed as valid and these annual reports are generally used in business research and analyses. The companies are selected based on their historical appearance on the Global 100 index which is generally accepted listing for sustainability ranking.

Reliability refers to how well the research could be repeated with the given instructions. Qualitative research lacks the internal mechanisms for data consistency, which are built into the quantitative research (Metsämuuronen, 2009). Vilkkä (2005) highlights the difference between theoretical and practical repeatability in the qualitative research. Theoretical repeatability means that the reader should be able to reach the same conclusion with the given instructions, structure of the analysis, and the logic used in the interpretations. Practical repeatability means that the reader cannot achieve the same results despite identical instructions since interpretations vary depending on the knowledge-horizon of the person making the interpretation.

This thesis uses inductive logic on building the conclusions. Inductive logic means that conclusion is drawn based on the individual cases. Induction can provide new information since there are no existing conclusions which the premises would prove, but the premises create the basis for the conclusion. Although the conclusions from inductive logic rarely hold statistical meaning, the results might reveal something that was not originally thought to be investigated. (Haaparanta & Niiniluoto, 2016) Kakkuri-Knuutila & Heinlahti (2006) emphasize the process of scientific argumentation. The

arguments should be supported with enough information to prove the truthfulness of the argument. This is vital especially with inductive logic since the conclusion is drawn from the presented information and additional information can either support or disapprove the previously presented information.

Validity of the research relates to how well the used research methods measure the things they are supposed to measure. In qualitative research the validity refers to how consistent and linked the given descriptions and interpretations drawn from them are. In other words, this means whether the given results are logical and believable. (Hirsjärvi et al., 2009). As the aim is to gain a better understanding of the sustainable supply chain as a phenomenon the case study provides a good approach for adding to our information.

3 SUSTAINABLE SUPPLY CHAIN MANAGEMENT

The concept of supply chain management originates from the increased importance of logistics in business practices. The original focus of supply chain management was on improving functions on individual firm level by demolishing internal barriers, whereas, later the focus developed to seek improvements on the inter-organizational level. In addition to logistics, the view began to encompass outside knowhow, sharing resources with other companies and, utilizing third-party actors in operations. The paradigm shifted to companies focusing on their core competencies and sourcing additional knowhow and resources via collaboration. (Smart, 2008)

The concept of sustainable supply chain management (SSCM) is usually defined by integrating components of both supply chain management (SCM) and sustainability. Despite the widely accepted generic definitions of SSCM, the practical implications vary greatly depending on the nature of the supply network they are applied to. (Turke & Altuntas, 2014). The role of sustainable supply chain management is to achieve a holistic picture of actors and their capabilities within the network, and the aim is to find the optimal configuration for the supply net so that it promotes sustainability instead of merely lessening its unsustainability.

Gold & Schleper (2017) criticize the SSCM research for placing too much emphasis on profits and investigating whether it pays off to be environmental or social instead of focusing on how to achieve true sustainability. According to Frostenson & Prenekert (2015) it is common to view sustainable supply chain management as a task for the focal company at the end of the chain instead of co-operative mission. For sustainable supply chain all actors should be aware of their own capabilities and what kind of impact their operations have on their stakeholders.

3.1 Sustainability framework

Sustainability is a complex concept with many overlapping concepts and definitions, therefore, there is a plethora of definitions and models utilized in the literature and in studies. Opinion on defining the concept and how to achieve sustainability differ depending on the source. There are many different views on what it is and how it can be achieved. However, it is generally accepted by academics and industry commentators that the concept of sustainability stems from World's first Earth Summit in Rio in 1992 where the concept of sustainable development was introduced.

The most often quoted definition of sustainable development comes from the UN Brundtland commission: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Since then there have been many variations and extensions on this basic definition which include those of the World Commission on Environment and Development who describe sustainability as “process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations” (United Nations WCED, 1992); and that of the Forum of the Future who describe sustainable development as “a dynamic process which enables people to realize their potential and improve their quality of life in ways which simultaneously protect and enhance the earth's life support systems” (Forum for the Future, 2008). In simple terms, sustainability can be summarized to focus on our future generations, and what kind of world we will leave them, whilst meeting our own demands.

Also known as the “triple bottom line,” there are three interrelated dimensions of sustainability: ecology, society, and economics. The three are conceived of and labeled in various ways: (i) Economy, equity, ecology (ii) Profit, people, planet (iii) Economic

security, social justice, ecological health (iv) Economic well-being, social harmony, ecological integrity (University of Wisconsin, 2016). There are three generally acknowledged models on grasping the idea of sustainability: the three dimensions, the three pillars, and the nested sustainability. In the literature and in business life, these three models are generally used interchangeably as different sides of the same coin. However, there are pivotal differences on how each model displays the aspect of sustainability. Figure 3 displays the three mostly used models.

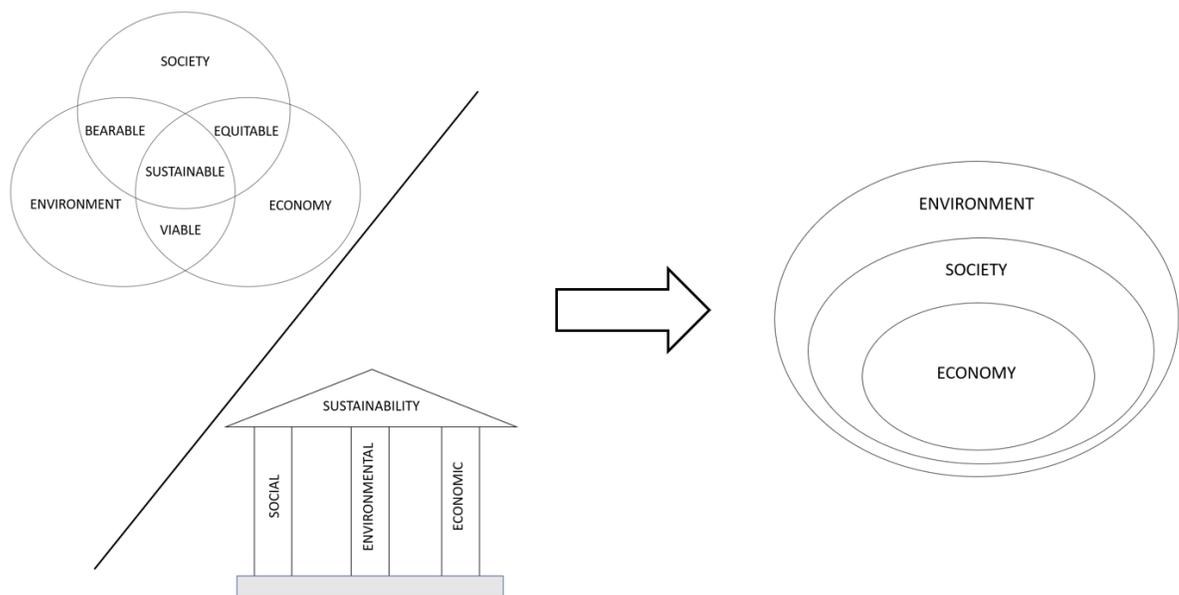


Figure 3 Sustainability models

The three-legged stool -model (Circular Ecology, 2016) as the name suggest the model portrays sustainability as stool with three legs each one representing one aspect of sustainability: economy, environment, and society. It is general knowledge that no stool can stand firmly if the legs are not equal in length and strength, applying that operations require all three aspects to be truly sustainable. However, each leg is a separate entity without linkage to each other which means that actions in one leg/aspect does not affect the others (until the whole stool falls over).

The three overlapping dimensions -model could be viewed as an advancement of the former. As suggested in its name, the model allows the three dimensions of sustainability to overlap each other creating various scenarios; true sustainability is achieved when the economy, environment, and the society overlap. The model acknowledges that the dimensions have interlinkage applying that actions in one dimension affect the other two dimensions as well, for example thriving business generates jobs and income for people who pay taxes to the society which can invest in education to provide skilled workforce for companies. Compared to the three-legged stool -model the overlapping dimensions -model allow dimensions to be asymmetrical to achieve sustainability. Despite the interlinkage the model does not clarify the limits for the dimensions allowing any segment to grow indefinitely yet the system stays sustainable.

The nested dependencies -model states a clear “hierarchy” between the dimensions. The environment provides the natural resources, necessities for life, valuable minerals, and recreation. The finite environment defines limits in which the society must live in; the society is shaped by the people it consists of. The economy is seen as a tool for exchanging goods and services within the society (whether local or global).

Chardine-Baumann & Botta-Genoulaz (2014) suggest evaluating company's sustainability using sustainability performance. This framework combines the assessments of the company's financial, social, and environmental performances into holistic view of sustainability performance. The model does not allow compensations between dimensions i.e. a good financial performance cannot offset neglecting environmental standards or social obligations. The researchers' view is in line with the nested model of sustainability. In the nested model the environment lays the limits in which the society can operate, in turn the society lays the foundations for the economy to operate.

The social dimension of sustainability or social responsibility depending on the context, has plethora of decisions and viewpoints. On one side social sustainability builds on the UN's human rights for necessities for good life (basic level), and on the other side there is the business drivers for employee wellbeing (high-end). Murphy (2012) defines the social pillar in terms of equity, awareness of sustainability, participation and social cohesion. McKenzie (2004) suggests that social sustainability can be achieved through several factors, including equity of access to key services, diversity, political participation at local level, transmitting awareness of social sustainability from one generation to another, and mechanisms of community to fulfil its own needs. Harmaala & Jallinoja (2012) emphasize that the social responsibility has internal and external viewpoints, especially in business context. Internal responsibility refers to stances towards employees whereas the external responsibility leans more towards corporate citizenship and role in the society. Through supply chain management, companies' actions and decisions affect also their suppliers, this is a vital aspect in sustainable supply chain management practices.

Harmaala & Jallinoja (2012) state that companies are accountable for impacts they cause to the environment, this can be viewed as environmental liability. It is crucial for any company to be aware of their environmental impacts, however, identifying and measuring all the possible forms of environmental impacts is resource consuming and sometimes nearly impossible. Sindhi & Kumar (2012) discuss how the corporate environmental liability can be view from either natural resource-based view (NRBV) or neo-institutional theory (NIT). NRBV state that the company's key to success is its hard-to-mimic capability to utilize the natural resources in a way which minimizes the loss and maximizes gain. NIT emphasize the external influence and stimulus stemming from socio-cultural structures and society. NRBV see sustainability as gaining profit whereas NIT see sustainability as result from a general mindset.

According to Harmaala & Jallinoja (2012) the economic sustainability or economic performance is vastly based on current laws and regulations. The minimum level of economic sustainability is abiding the local rules and regulations where the company operates. However, since the laws differ in each country it is challenging to define a universal level for economic sustainability. Internally company can achieve high profits by operating in lowly regulated developing country compared to the developed countries, but externally this steers the overall tax streams and affects the local employment rates.

Knuutinen (2014) calls for companies to be accountable on their operations. As the fundamental requirement for any long-term business is the ability to operate profitably, it is normal for companies to make decisions which maximize their profits, this is accountability to shareholders. In addition, companies should also be accountable to their internal and external stakeholders. Due to the accountability it is pivotal that the companies embrace sustainability mindset in their core strategy and decision-making. By this companies' paradigm shifts from "investing in sustainability if they can afford" to "sustainability as main driving force for profitable business".

Drawing from this we can state that a sustainable company adheres most towards the nested model of sustainability due the interlinkage of dimensions. Sustainable companies should identify themselves as part of society and acknowledge the boundaries of the environment. They should have incorporated sustainability in their core strategy and operations instead of discussing it as a separate topic.

3.2 Strategic steps towards SSCM

This chapter aims to build strategic process which would enable companies to incorporate sustainability into their existing supply chain. The suggested model is

based on the notion that incorporating sustainability aspect into traditional turnaround strategy, could provide a method for transforming traditional supply chain into sustainable supply chain. Although traditional turnaround strategy has focused on correcting financial performance of a single company or the entire concern, it provides a good strategic tool with clear steps which could be applied to any business scenario. The chapter will first introduce the triggers for a turnaround strategy. Secondly, this chapter examines the internal and external elements of the turnaround strategy. Third part describes the steps in the suggested sustainable turnaround strategy.

According to Yandava (2012) the roots of business failure often lie within refusal to adapt to the changing markets, poor core strategy execution, lack of long-term vision, and poor governance structure and most importantly having the current state drifting too far from the core of the business; this can be referred as market blindness. Market blindness can result in a corporate crisis in which the company has faced a continuous decline in performance (Abatecola, Farina & Gordini, 2014). Sustainable development can be viewed as change in the market, which requires a response from companies and if left unattended, this might lead to declining business. Traditional warning signs for declining business have been financial indicators such as decreasing amount of working capital and the weakening ability to service short- and long-term obligations; the process to correct this decline Yandava (2012) refers as turnaround strategy.

Pearce and Robbins (1993) describe the turnaround strategy as a multi-stage-process. The primary goal in a turnaround process should be to prevent the company's downturn, seek strategies which increase the profitability of the company through changed resource commitment or new growth channels (Bibeault, 1982). Typical balance sheet-based approach for turnaround involve cost reduction and fixed asset reduction; with relocation of capital structures, shutting down manufacturing plants, reducing labour costs, and relocating to lower cost level countries. The traditional view of relying mainly on financial methods is too simplistic viewpoint on turnaround strategy

management. Therefore, Yandava (2012) suggest a more strategic outlook which encompass the whole value chain, short- and long-term goals, business model, and strategy. If the company would incorporate sustainability in their core strategy and build turnaround strategy around that strategy, it would result in sustainable turnaround strategy.

3.2.1 Strategic change approach in turnaround process

Barker & Duhaime (1997) see strategic change as a key element of successful turnaround and present an empirically modelled theory suggesting that the extent to which company can implement the changes varies systematically with the company's ability and need to reorient its strategy. Studies have shown that top management generally favors cutback or retrenchments over more overall strategic reorientation. Barker & Duhaime (1997) state that the implemented turnaround strategy must address the core issues behind the decline on both operational and strategic level in order to efficiently reverse the decline.

Barker & Duhaime (1997) have shown in their research that the strategic changes of the turnaround process vary depending on the company's capability for implementing the change and on the underlying cause triggering the requirement for change. Their research additionally pointed out that extensive strategic change was more likely to result in recovery on company-based declines over industry induced declines. The authors also highlight that declines caused by economic cycles were generally combated with more financial rather than strategical approaches.

The pivotal factor for a company is to identify the root cause for the decline. If the decline is caused by market blindness (Yandava, 2012) and the inability to response to the competition and demand from the market, or strategic stagnation (Barker &

Duhaime, 1997), the company should engage in extensive strategic approach. As the global awareness for sustainable development has arose in the global market, this requires companies to respond in order to keep operating. This requires companies to engage in realigning their strategies to response to the changed market.

3.2.2 Internal and external causes for business decline

Academic literature has traditionally examined the turnaround strategy in the light of retrenchment and reposition strategies, however, Boyne and Meier (2009) emphasize the importance of more comprehend understanding of the turnaround process itself; the authors emphasize acknowledging the internal characteristics of the company as well as identifying the external constraints. The company's decline can be caused by either internal or external elements. Internal elements are functions which the company has direct control over such as marketing, finance, and manufacturing. As the internal elements are under the company's control and influence, also the responsibility of these aspects lays with the company. 80% of business failures stem from failures in these internal elements which can be interpret as managerial inability or failure. On contrast the external elements cannot be directly controlled but there is a possibility of influencing them. As an example of these external elements are competition, industry standards, and global market development. The external elements affect the entire market and industry and how well the company manages to adapt to the changes depends on the strategy and management of the company itself. (Scherrer, 2003)

Even though a company has extensive control over its internal elements and strategy, they are affected by the overall dynamics of the business environment which calls for constant monitoring and assessment. The company management should invest in holistic and detailed monitoring of these internal elements in order to grasp enough information for decision-making. Partial and one-sided information can lead to misjudgment of the situation. The management should complement different data

sources with each other such as complementing the financial results of the operations with safety statistics and customer satisfaction polls. The management should understand the relationships of the factors, and not just evaluate the individual aspects. (Scherrer, 2003)

External elements are virtually uncontrollable, although, the company might have the potential to influence and predict them. The scale and scope of these external elements vary greatly. As an example, a company might have a heavy influence on the local market but might be a small player even on the national level. Additional complexity of the external elements is the interrelatedness they pose. As example from recent history was the Findus horse meat scandal which caused changes in the whole food industry due to customer demands. The company management needs to have a risk management plan, but due to complexity of the external elements not all risks can be individually discussed. The available tools and processes are not as straightforward as with internal elements thus the emphasis should be in overall risk identification and dealing with uncertainty rather than individual potential incidents. (Scherrer, 2003)

3.2.3 Stages of a turnaround process

According to Balgobin & Pandit (2001) turnaround strategy can be divided into five subsequent although, partly overlapping, stages being: *Decline and Crisis, Triggers for Change, Recovery Strategy Formulation, Retrenchment and Stabilization* and *Return to Growth*. Applying these stages to the sustainability framework would results in the following stages: *Sustainability Decline and Crisis, Triggers for Change, Sustainability Recovery Strategy Formulation, Retrenchment and Stabilization* and *Return to Sustainable Growth*; displayed in Figure 4.

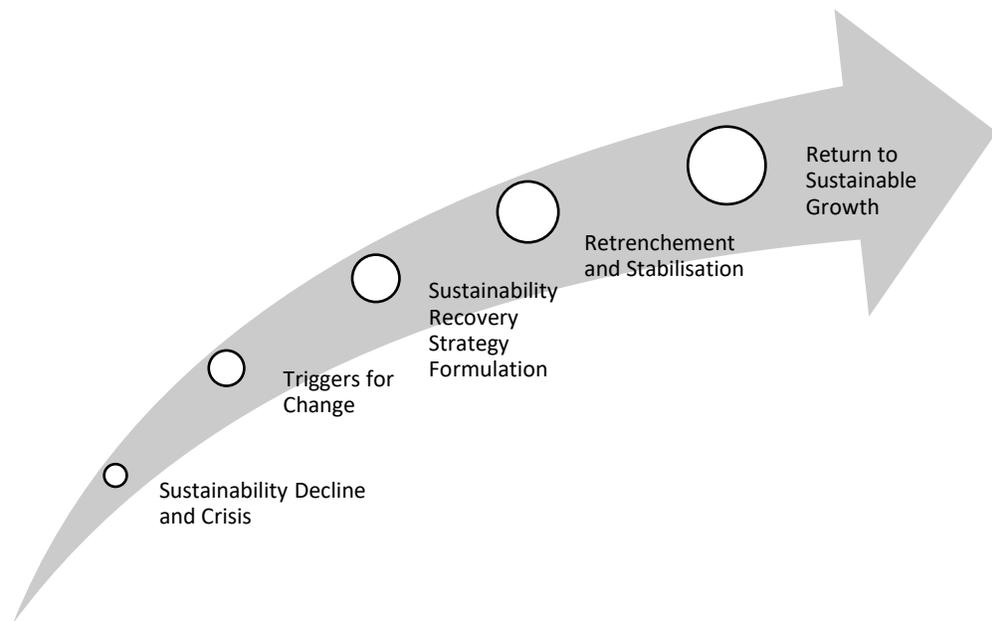


Figure 4 Stages of sustainable Turnaround Strategy (modified from Balgobin & Pandit, 2001)

Scherrer (2003) states that decline results in company crisis which can be caused by either internal or external factors; the author emphasizes the top managements incapability to confront and overcome these challenges in the best interest of the company. In sustainability viewpoint the decline can be caused by either internal operations which cause negative sustainability performance such as social neglect or environmental pollution or external stimulus such as combatting global warming. According to Grinyer, Naves & McKiernan (1990) there is plethora of triggers for company to engage in turnaround process; but according to authors the most common triggers are new CEO or change of ownership, intervention from external bodies, and perception of new opportunities. In sustainability sense the most likely triggers are intervention of external bodies caused by changes legislation or international treaties which might be for example limiting global warming; or perception of new opportunities presented by sustainable business venture, for example electric vehicles. After the company has realized the current decline and triggered into engaging in turnaround process, the management needs to formulate a recovery strategy, which according to

Balgobin & Pandit (2001) includes the following steps: *analyzing the current situation, gaining control of the company financially and strategically, managing stakeholders, and improving motivation.*

Balgobin & Pandit (2001) describe the situation analysis as the first phase in the recovery strategy process in which the management must gather information from several sources in order to form comprehensive picture of the current situation. In-depth analysis as well as communication spanning the whole organization is pivotal for this process to be fruitful. Remick (1980) further emphasize the importance of involving all the organizational levels in the situation analysis. The author additional emphasizes the importance of interaction over pure numerical analysis of the situation to enhance the overall view from the operational level to the top management. The interaction aspect also provides an opportunity for the management to better communicate their intentions to throughout the company, motivating all for the upcoming changes.

Reformulating the financial strategy is the second phase in the recovery strategy process. (Balgobin & Pandit, 2001) emphasize in engaging a path that leads to asset reduction and increased positive cash flows. Vance (2009) emphasizes the importance of strategy over budgeting because in the author's opinion merely meeting the budget lacks a strategic approach. However, according to Schoenberg, Collier & Bowman (2013) this reformulation should not wither the revenues too much, at least on the long-term or the efforts will promote the decline. Third phase involves co-operation and communication with internal and external stakeholders of all related sectors. Communicating the changes is as crucial as the changes themselves. The company must convince their stakeholders of the coming changes since this kind of radical changes receive external evaluation and criticism. (Balgobin & Pandit, 2001). Fourth phase focuses on improving the overall motivation within the organization (Balgobin & Pandit, 2001). Remick (1980), highlight the role of leadership in motivating people and pursuing strategic changes. Author calls for personal commitment from the

management in order to convey the positive mindset of the changes throughout the organization.

The fourth step of the turnaround process focuses on the operational phase which Balgobin & Pandit (2011) refer to as retrenchment and stabilization. This step is two-phased: one addressing the practical actions and processes the organization must implement to improve the course of the organization; second drawing the management's attention to the pivotal cross points which require further work and additional resources. If all the steps have been completed the organization should reach the final step of the process and return the path of sustainable growth.

As a summary, the sustainable turnaround strategy provides a roadmap for the company to face the opposing challenge by focusing on its strategy and realigning its operation in order to overcome the obstacle. In supply chain context the scope needs to be widened to include the entire network instead of the focal company. However, the sustainable turnaround strategy needs to be supplemented with adequate tools for measuring and tracking the process and these tools are introduced in the following chapter.

3.3 Measuring and tracking the process

This chapter provides measurement tools to complement the sustainable strategy approach build on the previous chapters. This chapter first outlines the prerequisites for utilizing Lean Six Sigma as a medium towards sustainable business practices as well as building the framework for sustainable lean six sigma. Secondly the methodologies of Lean and Six Sigma will be discussed separately to highlight the underlying principles of Sustainable Lean Six Sigma. Thirdly this chapter will introduce

tolerance management, which is crucial part on managing deviations in applied strategies and measurements.

It has been a topic of debate whether Lean or Six Sigma itself is viewed as sustainable business practice. Proponents state that removing the excess and making the operations lean promotes towards sustainability, whereas, opponents see it as merely business optimization. This thesis considers the Lean Six Sigma as a proficient methodology for sustainable business practice provided the organization has sustainability incorporated into its strategy and core functions. When the organization is fundamentally guided by sustainability then it is working towards a sustainable future.

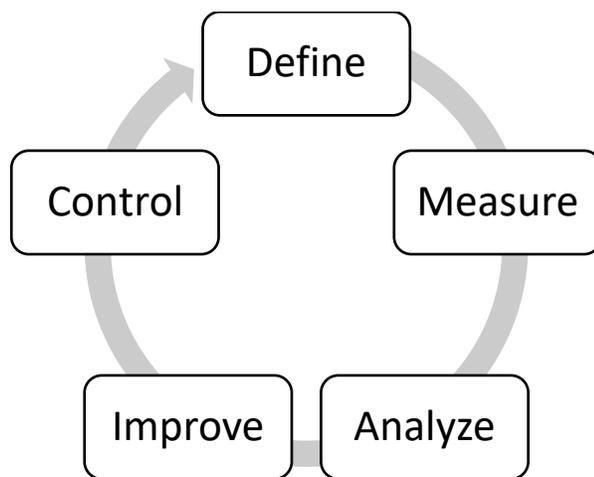


Figure 5 DMAIC cycle (modified from Tenera & Pinto, 2014)

According to Yusr, Othman & Mokhtar (2012) the adopted Six Sigma strategy can enhance both the financial as well as the innovation performance of the organization; the latter is viewed as promoting the opportunities towards sustainability. In addition, Pepper & Spedding (2010) highlight the importance of strategy by stating that Lean provides the tools for improvement but lacks the strategical motivation and drivers for engaging improvement and incorporating it into a concrete system. Based on Tenera

& Pinto (2014) the Lean Six Sigma combines the philosophies of both Lean and Six Sigma into a DMAIC framework, illustrated in figure 5. The DMAIC abbreviation stands for Define, Measure, Analyze, Improve, and Control.

Based on Tenera & Pinto (2014) applying Lean Six Sigma via DMAIC cycle, has the potential to result in reduced defects and process variability by waste reduction, process simplification, and standardization. However, the author emphasizes the Lean Six Sigma requires continuous and formal application of the methodology and a stable project management system and processes. Mapping the current value stream, by identifying the existing losses and problem aspects with their root causes, enables the creation of a future value stream map in which the improvements are already defined and adjusted in real time for the project management.

According to Pamfiliea, Petcu & Draghici (2012) Lean Six Sigma methods provide organizations with tools which promote aligning the vision and strategy with their excellence model. However, the authors highlight that managing and developing the organizational culture towards the desired state is not a simple task. Modifying the organizational culture requires well-managed communication on a large-enough audience stemming from operational to managerial level in all organizational units. The role of vision and managerial commitment are crucial.

The both Lean and Six Sigma methodologies have clear individual focuses and combining them under one framework propose clear synergies. In addition, this framework can be supplement by tolerance management methods since it is crucial to map the acceptable variations for unforeseen, but anticipated, changes and possibilities without risking the outcome of the original process. There is a plethora of methods for tolerance management, but the fundamental ideology follows the lines of identifying the current state, setting the goal, implementing the tool, and control. The

vital aspects of Sustainable Lean Six Sigma is the underlying sustainable strategy which guides the organization, systematic implementation of Lean Six Sigma methodology, and profound tolerance management allowing minor variations without endangering the overall goal.

3.3.1 Lean methodology

The Lean ideology, illustrated in Figure 6, is based on the five principles which are firstly **specifying** what creates value and what does not on the viewpoint of the customer. Secondly **identifying** the whole value stream to map the value and non-value adding points. Thirdly managing the operations in a way to create a **continuous flow** without interruptions, detours, waiting, or other completely unnecessary features. Fourthly **produce** only what the customers are willing to acquire from you. Fifthly **aiming for perfection** through continuous trimming of the excess. (Hines & Taylor 2000) The steps are clearly defined but applying them into practice requires thorough knowledge and pedant investigation of the process targeted for improvement.

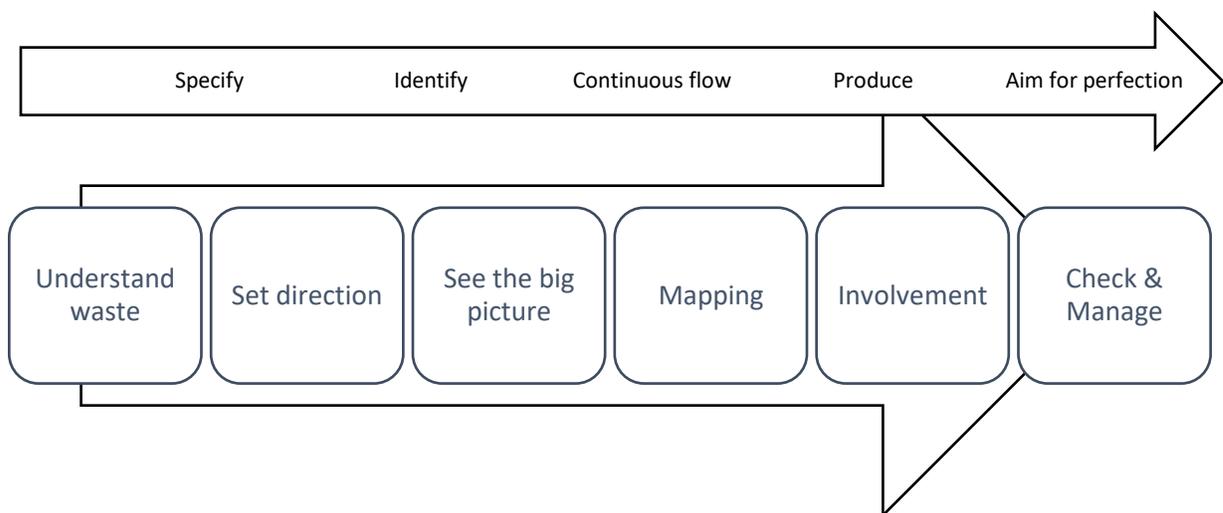


Figure 6 Lean thinking steps (modified from Hines & Taylor, 2000)

The fundamental idea in Lean is to remove the excess, which in Lean is referred to as the waste. For successful removal of waste, it is pivotal to understand what is waste. According to Hines & Taylor (2000) there are seven different types of waste, each with different attributes. The mentioned authors have categorized the waste in the following way:

1. **Overproduction**, which refers to producing too much or prematurely.
2. **Defects**, referring to errors in process such as underperformance or poor quality.
3. **Unnecessary inventory**, meaning excessive storage
4. **Inappropriate processing**, using wrong methods, tools or process
5. **Excessive transportation**, referring to logistics, movement of human, information, and goods
6. **Waiting**, periods of inactivity for any goods, information, or people
7. **Unnecessary motion**, referring to poor organization and for example extra footsteps or turns in the production line.

To aid in waste identification, Hines & Rich (1997) have categorized organizational activities into *Non-value adding*, *Necessary but non-value adding*, and *value-adding*. **The non-value adding** refers to any unnecessary action or process that merely consumes time and/or resources such as waiting time, overuse of material, or double handling. This category is called pure waste and should be eliminated completely. **Necessary but non-value adding** refer to seemingly wasteful operations and processes but are mandatory due to current tools and methods such as working in inefficient order due to factory layout or manually typing orders instead of machine scanning. This category provides an opportunity for improvement but implementing the required changes might require considerable investment of time and resources. **Value-adding** activities are the essence of the organization's profit generation. These activities should be under constant optimization.

According to Machado & Leitner (2010) value stream mapping is the most used analytical tool in Lean. Value stream mapping can be viewed as an extended process

flowchart providing information about the speed, continuity of flow, and work in progress. It shows both the non-value-added and value-adding steps, and bottlenecks. Time measurements play an important role in the value stream mapping since time is the most wasted resource in the production. Lead time indicates how long the work will take to be completed. It can be calculated by dividing the work in process with the average completion rate, and Cycle time refers to the amount of time required to complete one cycle of a process. However, it is good to differentiate process cycle time since it tells the total time for completion but through observing each individual step on the contrast to average time as with lead time calculation.

Another utilized tool in lean is the **5s** which refer to “*seri-seiton-seiso-seiketsu-shitsuki*” which translates into “*organize-orderliness-cleanliness-standardize-discipline.*” The idea behinds the 5s is the elimination of unneeded tools from the workplace. Standardization refers to producing rigid scripts of the work to ensure that each phase is done identically by each worker. The definitions and standardizations can be done once but the crucial part is the implementation and maintaining procedures continuously. Related to standardization is the stopping-the-line which refers to every worker’s power and opportunity to stop the work when an error or a defect is detected or suspected. (Machado & Leitner 2010)

On contrast to the value stream map, the Process map refers to end-to-end sequence of steps which are required to transform a raw material into a finished product. It uses standardized symbols and time descriptions. A process map can identify specific waste and improvements where the value stream map identifies opportunities. Drawing from the continuous improvement, the Plan-do-study-act can be utilized. To perfect a process, one must first design (plan), what aspects are implemented (do), then the effects are measured (study), and finally the adjustments are made on the bigger scale (act). (Machado & Leitner 2010)

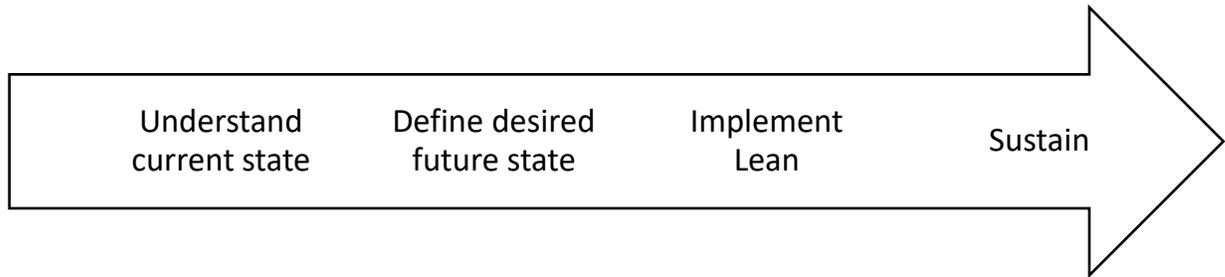


Figure 7 Four phases of Lean (Machado & Leitner, 2010)

According to Machado & Leitner (2010) there are four steps, illustrated in Figure 7, that the organization needs to take to benefit from the lean approach. First is to understand the current state, with the help of the Lean tools. Second is to define the desired future state. Third is to implement the changes and remove the excess identified by the Lean tools and defined in the second phase. Fourth is sustaining the achieved level or state.

3.3.2 Six Sigma -methodology

The aim of Six Sigma is to enhance profitability, productivity, effectiveness, and efficiency of all business operations in order to meet and/or exceed customer demands and expectations. It is a strategy which combines management philosophy and improved metrics to reduce defects, which in Six Sigma are considered as a failure of the process. At the strategic level Six Sigma aims to fine tune the organization to “perfectly fit” to its market needs and realize concrete improvements on the bottom line, whereas at the operational level the aim is to shrink process variation. The Six Sigma method can be conceived as a process that continually aims to reduce defects as well as a business strategy focusing on the financial performance. (Yusr et al., 2012)

The focus of Six Sigma is to improve the internal processes in order to achieve zero-defects which requires understanding the customer requirements. This results in companies which engage in applying Six Sigma, the need to give attention to external

sources of information; hence requiring well-functioning absorptive capacity to fully utilize the external information. It can be argued that Six Sigma enhances the organization's innovation performance by translating the voice-of-customer into improvements in the processes. (Yusr et al., 2012)

Although Six Sigma as a strategy can provide a multitude of tangible and intangible complementary sources for innovation and competitive advantage, without the absorptive capacity this potential will not be realized into improved innovation performance. Building on this, it can be stated that Six Sigma can improve and promote innovation through translating external stimulus into internal improvements but requires pre-existing mindset and tools for knowledge-work from the organization. (Yusr et al., 2012) Supply Chain Management can gain a great many benefits from the Six Sigma methods. In one case study of Samsung, the authors Yang, Choi, Park, Suh & Chae (2007) listed four key synergies between SCM and Six Sigma. These were categorized as: *Project discipline*, *Sustaining results*, *Well-established HR-framework*, and *Quantitative strength*.

Project discipline was achieved by utilizing the DMAIC framework on the processes. This more disciplined approach resulted in Supply Chain Management projects with less variation. Also, the continuous analytics and measurements identified root causes of problems and resulted in improved operations. Additionally, through control, the achieved **results** were **sustained** since the past experienced were used as basis to improve future projects. Additionally, the Six Sigma could be a proven framework to develop people. This resulted in **well-established HR-framework** keeping the know-how within the supply chain management personnel. The **quantitative strength** came from the Six Sigma's nature to use analytics, utilizing the methodology emphasized the gathering and usage of appropriate numerical data as basis for decision-making. Formally planning and implementing a framework tuned for the supply chain

management and by training and educating the supply management personnel allowed to utilize the data more efficiently. (Yang et al. 2007)

3.3.3 Tolerance management

Both the Lean, rooting from Japanese automotive industry and promoting cutting out the excess, and the Six Sigma, rooting from American electronic industry focusing on engineering improvements to remove defects, are powerful methods for improving quality, optimizing material flow, reducing waste, and numbers of defects within manufacturing and service. The zero-defects and zero-waste philosophies in these approaches implies deep understanding and reduction of variation in manufacturing. (Krogstie & Martinsen, 2013)

One important aspect in reducing the variation is tolerance; which can be defined as accepted degree of measurement uncertainty towards impacts and small changes on the product performance and functional behavior which cannot always be quantified. Tolerance management refers to tools for defining and managing the accepted degree of tolerance. Despite both Lean and Six Sigma have been developed further towards product development, Lean Product Development (LPD) and the loosely defined Design for Six Sigma (DfSS), there is still lack of tolerance management in the approaches. Both the awareness of variation and the awareness of tolerances are important in both Lean and Six Sigma approaches. (Krogstie & Martinsen, 2013) Figure 8 illustrates the closed loop relationship of tolerating to other aspects in the process.

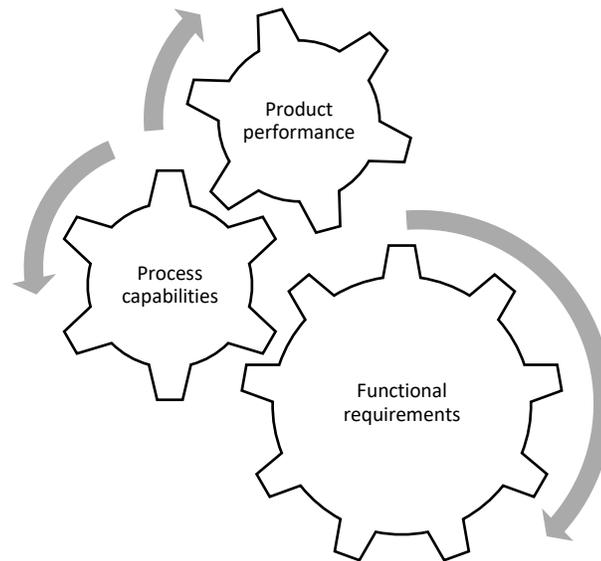


Figure 8 Closed loop tolerance engineering (modified from Krogstie & Martinsen, 2013)

The product performance is linked on the capabilities of the process which should be based on the functional requirements. What kind of results the selected strategy will yield, depends on how effective methods the company can translate the strategy into, and how efficiently they can execute the selected methods. The relationship of effectiveness and efficiency to the resulting productivity is illustrated in Figure 9.

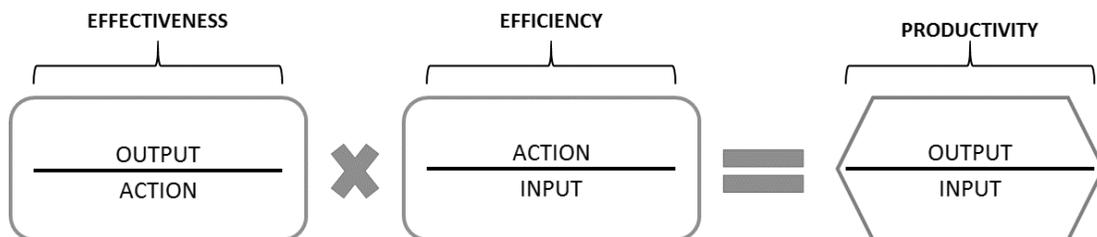


Figure 9 Effectiveness and Efficiency (Suematsu, 2014)

Effectiveness refers to how potent the activity is in achieving the desired goal. Efficiency refers to how much resources executing these activities consume. This can be then

translated into productivity which is the firm's ability to generate outputs from inputs. (Suematsu, 2014) In practice this finding an equilibrium of costs which the company is willing to bear in relation to the desired profits. The suitable and effective methods vary on each strategic approach and induce costs and savings on different scales and scopes.

To summarize the measuring and tracking chapter, it is pivotal to define desired goals and set appropriated measures for those goals. Although the most important part is the structured measurements and analysis of those measurements. Overall the Lean Six Sigma provides efficient tools and framework to measure and develop sustainable business practice provided the underlying strategy is geared towards sustainability. It is also curial to define the acceptable tolerances for variation of performance.

3.4 Flexible supply chain structure

The motivation for this chapter is to build a model for flexible and adaptable supply chain structure which allows an organization to better incorporate sustainability into the entire value chain and seize sustainable opportunities. This chapter will first outline the idea of a company as an actor in a network. It will discuss the concept of a business ecosystem and a virtual enterprise. Then the different mechanisms to form these arrangements are examined. Sustainability of the supply chain is seen as the sum of each actor so communicating sustainable values throughout the chain is important.

The futuristic vision from Kandiah & Gossain (1998) from two decades ago describing digitalization of the entire value chain is a necessity for companies in the current market. This modern market is a global race of seizing the opportunities faster than competitors. Product centered view has shifted towards service-based view where the product is an extension of a service. This shift requires companies to focus on their competence and

source additional features from their partners. Instead of building individual competences organizations need to build networks and develop dynamic capabilities with other actors working towards a shared business goal. (Samdantsoodol, Cang, Yu & Tumur-Ochir, 2013)

Business environment has undergone a change from dyadic and static supplier relationships towards a dynamic and networked value chains which encompass the entire stream from raw material suppliers to end-users (Chatzidimitriou, Symeonidis, Kontogounis & Mitkas, 2008), this has required companies to evolve in order to cope with the development. Discussion about de-centralized decision-making rose among management theorists around the 1950s and 1960s, it was hypothesized to improve efficiency especially in larger companies. The strategic concept of a networked organization surfaced in the 1980s and 1990s and the development has continued to this day. (Sarkis, Talluri & Gunasekaran, 2007)

According to Sarkis et al. (2007) network organizations could be categorized as *internal*, *stable*, and *dynamic*. In internal network the host organization is in possession of the majority or all the assets, and the organization structure consists of divided departments which have specialized in different functions. The firm has not outsourced any phases of the production. In stable network, which is the most common scenario, the company complements its own production by outsourcing parts of the manufacturing and partners with other companies to enhance own functions or provide additional services and value. Dynamic network is a cluster of independent actors which co-operate by providing their core competence for others in the network. In every network there is a leading firm or a focal company owning most of the network's assets. Generally, this refers to the intellectual property such as the brand. The focal company usually focuses on orchestrating the network and refrains from the other operation tasks such as manufacturing.

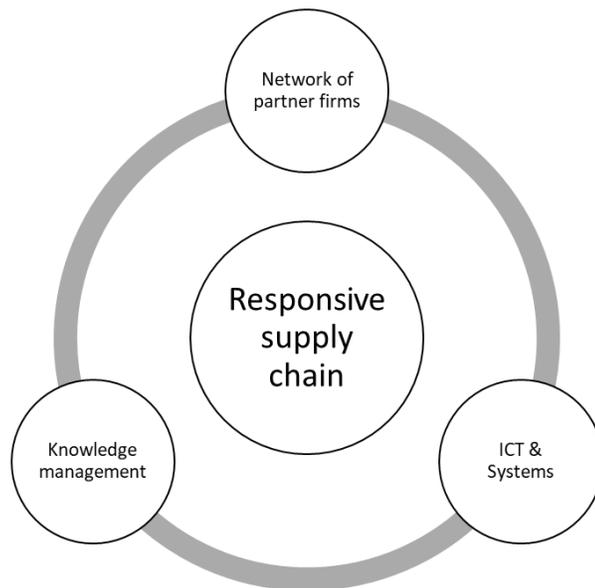


Figure 10 Responsive supply chain (modified from Gunasekaran, Lai & Cheng, 2008)

For a company to transcend its dyadic supply partnerships into supply networks they need to adjust their supply chain operations accordingly. Figure 10, above, portrays the three main characteristics required in a supply chain for it to be adaptable for a network setting. The first requirement is the potential cluster of partnering firms. Second requirement is functional and scalable ITC-infrastructure which allows interlinkage of the companies' ERP and other management systems. This does not mean that the network should share the same individual system but rather have the technical solutions so these different systems can communicate with each other easily and efficiently. Third requirement is the shifting the managerial paradigm from traditional leadership towards more dynamic knowledge management on the network level. (Gunasekaran, Lai & Cheng, 2008)

Virtual enterprises and business ecosystems are products of evolved networks enabled by technology and strategic approach. According to Gunasekaran et al. (2008) virtual enterprises are dynamic structures which are built on the core competence of the actors

in the network. Whereas business ecosystems aim to provide greater output collaboratively than any company could individually produce (Pyykkö, 2015). The characteristics of these two are now discussed in more detail.

Virtual enterprises form to meet emerging market opportunities and dissolve when the opportunity passes. The formed enterprise does not directly own any of the designing, manufacturing, or marketing functions required for producing the sold goods or services but acquires the value-providing services via temporal partnerships which form the virtual enterprise. (Sarkis et al., 2007) According to Chandrashekar & Schary (1999) the fundamental characteristics of a virtual enterprise is the flexibility and adjustability by rearranging its structure and features to meet changing requirements of the environment. Meaning that that supply chain structure undergoes constant movement; sections are added or removed, connections are rerouted differently. The re-configurability of the relationships and the organization itself in short time frames enables customization of the supply chain to fulfill emerging demand without clear limits.

The Figure 11, on page 46, illustrates one possible structure for a virtual enterprise. The straight consistent lines portray the existing and continuous relationships between the actors. The temporal relationship which are used in suitable situation are portrayed by the dotted lines. The dotted lines create the virtual enterprise emerging to meet passing business opportunities alongside the traditional supply network.

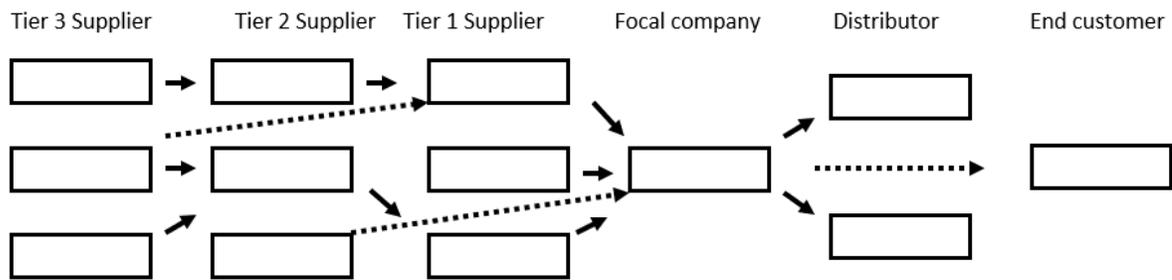


Figure 11 Model for Virtual Enterprise (modified from Chandrashekar et al., 1999)

In a virtual enterprise the role of supply chain management is not a separate function overseeing the material and information flows between the network actors but an inseparable organ which orchestrates, designs, organizes and optimizes the resources, process, and competences of the entire network. It is also responsibility of the supply chain management to expand and reshape the network to meet the requirements. This means acquiring new actors and value from outside the network and incorporating them into the existing network, but also removing exhausted or outdated parts of the network.

Hellström, Tsvetkova, Gustafsson & Wikström (2015) have suggested that the birth phase for the business ecosystem is where the “inertia of incumbent firms meet entrepreneurial action.” Based on their article, characteristic of organizations involved in ecosystems tend to have business models which are outward bound and open. Business ecosystem topic boomed in the 2000 (Hwang, 2014) and has become reality in modern business practice. Chandrashekar et al (1999) describe business ecosystems as a concept that consists of companies constantly rearranging their networks thus causing the entire system undergoing changes to meet the emerging demands. The ideology behind the ecosystem thinking is that all the actors working together amount to greater output and overall value compared to everyone working individually. Additionally, the value and information created within the ecosystem is available to all actors and benefits the entire system, for example market data and

forecast are shared in the network instead of linearly from buyer to supplier. (Pyykkö, 2015)

Despite the popularity of business ecosystem -term, Shaughnessy (2014) emphasizes the lack of scientific information on especially on managing an ecosystem. The supply chain performance is traditionally evaluated based on the dyadic supplier – customer –relationships being the unit of measurement. The physical flow of goods throughout the chain is well established and communicated but many supply chains tend to omit the financial flows in the overall chain. (Silvestro & Lustrato 2014) Additionally, business profit calculations require more defining. As an example, calculating ROI poses a challenge due to individual actor making the investment but the entire ecosystem can benefit from it. To overcome these challenges, the ecosystem requires a financial collaboration as well. Silvestro & Lustrato (2014) would deepen this collaboration by integrating financial institutions as actors in the ecosystem, not as mere banks but as sources of financial competence. Furthermore, the authors emphasize the increased feeling of trust between actors due to the security provided by the capable financial institutes. Involving the financial institutes would also grant them access to the knowledge and data of the ecosystem which would translate into more realistic credit assessments.

Darling, Whitley & Dini (2008) have stated that the concept of business ecosystem incorporates a fundamental paradox as the system is thought to consist of self-governing actors standing on equal pedestals leaving no room for centralized governance. Chatzidimitriou et al. (2008) highlight the vital importance of technological solutions in managing these continuously evolving consortiums and hint that a highly sophisticated software could be more efficient than human managers in these kinds of consortiums.

Samdantsoodol, Cang & Yu (2012) identify two kinds of integration: process integrations which means adjusting patterns of behavior and ways of working, and technological integrations which relates to the tools and software. Silvestro & Lustrato (2014) see supply chain integration in three categories: customer integration, supplier integration, and internal integration. The customer integration refers to the integration of downstream, whereas, the supplier integrations refers to the integration of the upstream. The customer and supplier relationships are co-dependent since the same actor is customer to another company while supplier to another. The internal integration encompasses the extent to which the focal company has managed to integrate its own strategy, processes, and organizational structures into the supply chain in order to form a more synchronized and coherent form of collaboration.

Smart (2008) suggests that networking the ERP systems of the companies in the supply network would enable integrating both the downstream and the upstream of the supply chain. However, this approach would require for the leading company to provide the foundation for the integration. Additionally, other actors in the network need to make investments into ICT to ensure compatibility. Network-wide solutions for the ICT integration would allow standardizing data and processes throughout the network. Furthermore, reports with standardized measurement would enable more coherent and structured processes for improving functions, eliminating errors, and correcting deficiencies. This kind of approach could increase the visibility of the supply chain and enhance trust among the actors of the network.

Smart (2008) further argues that strategical approach is paramount in successfully integrating ICT solutions throughout the supply chain, although operational approach should not be overlooked. Smart grounds his notion on the fact that modern businesses are filled with sophisticated software measuring company performance on multiple levels, but the lack of managerial and strategic interference does not enable the

possible changes indicated by the data. Thus, functional software itself is not the answer, merely a tool.

Henttonen & Blomqvist (2005) agree that ITC solutions have a vital role in communication within virtual consortiums, however, the authors argue that developing trust among the actors and focusing on the social design of the community should be emphasized over the technical solutions. Managing a virtual enterprise requires both strategic and operational viewpoints. Tangible and intangible measures need be used in analytics and in decision-making. Inter-organizational factors such as time to form partnerships, trust between actors, communication and technological compatibility require heightened focus. It is paramount for each actor to be treated equally and receive a fair compensation on their input. (Sarkis et al., 2007)

3.5 Orchestrating the supply network

As networks vary in size and can contain vast numbers of actors, it is advisable for companies to map out their networks. Möller & Rajala (2007) have introduced the concept of strategic nets. The idea behind these nets is that they are clearly defined sets actors with clearly defined characteristics and objectives instead of list containing every partner and stakeholder related to business operations.

According to Möller & Rajala (2007) there are three different kinds of nets and they suggest different managerial approach for each kind. *Current nets* are stable structures where partners have embedded positions. The value chain is clearly defined, and managerial approach should be on controlling and improving efficiency. In *renewal nets* the companies wish to create new offering or process in addition to the existing; the composition of the net does not change, only the outcomes will be affected. The managers should focus on coordinating the collaboration by pooling dispersed

resourced and enhancing trust between actors. In *emerging nets*, the structure will change by removing, changing, or adding actors; the value chain will change dramatically and can change completely. These kinds of nets are usually self-governed, so managerial focus should be on interaction and communication between actors rather than centralized decision-making. Figure 12 summarizes the managerial approaches and differences.

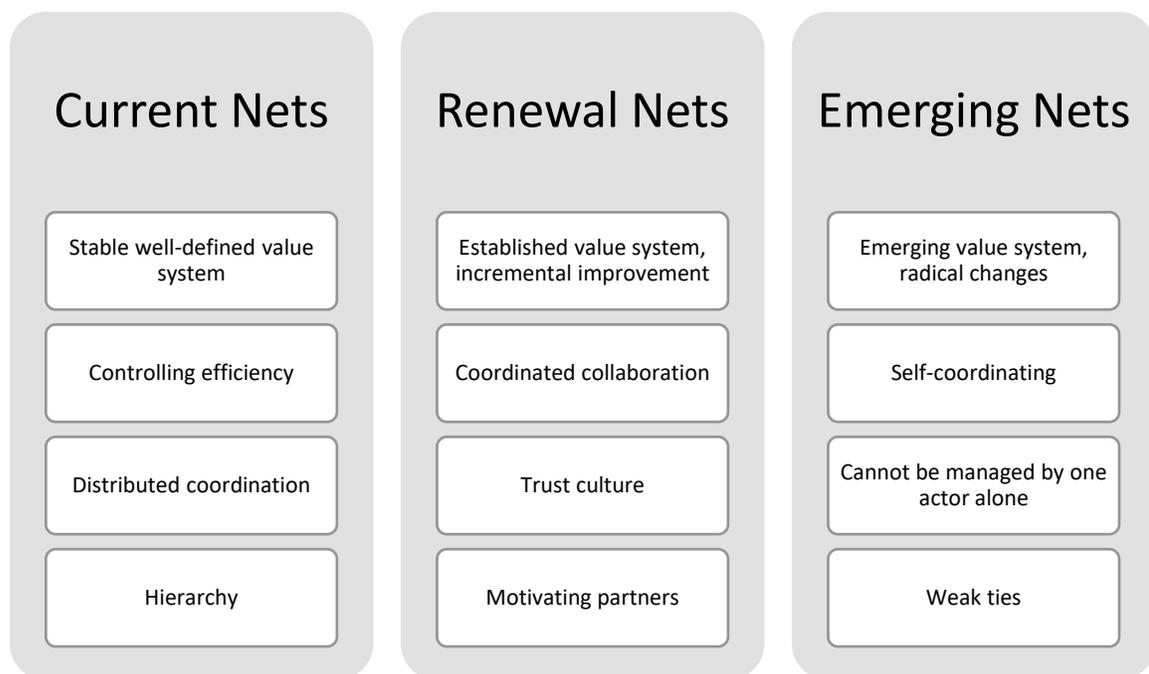


Figure 12 Net differences comparison (Writers own illustration based on text)

Håkansson & Ford (2002) support the notion that the focus should be on the interaction itself. They provide three rules which the companies should abide by to be successful in a networked business environment. *The first rule* is to utilize constant interaction with the other parties to embed their own role in the relationships and to the surrounding network. *The second rule* is to use interaction to learn how the company's resources are linked to the network. This does not refer to dependencies to others but rather the

potential which the other actors could utilize. *The third rule* is to always aim for control, not in sense of dictatorship but more in providing understanding of each actor's role.

One aspect of changing the network structure is the partner selection. According to Sarkis et al. (2007) the partner selection in networked context requires analyzing multiple simultaneous options. In addition to the partner compatibility in a dyadic-relationships between the supplier and customer, the potential choice must also benefit the whole network. Also, the new partner should fit in the existing cluster of partners. The focus when selecting suitable partners should be in increased value instead of lowered costs.

Since the networked enterprises undergo constant evolving in reaction to the environment, the timeframe for the formed partnerships also varies. The dynamic environment adds to the complexity of the partner selection. Where static partnerships allowed longer periods for evaluation and decision-making, the dynamic network constantly undergoes reconfigurations which affect the overall partner compatibility. Selecting the best fit partners for each situation poses a challenge on the overall cost, quality, and lead time of the offered goods, or service. (Samdantsoodol et al., 2012) Sarkis et al. (2007) emphasize the agility of the potential partners. The authors have proposed time, cost, robustness, and scope as measurements of partner agility. In addition to agility, each partner must provide additional value to the network. This value has been identified as logistics, design, manufacturing, or service. Furthermore, the time period for each formed partnership is limited and this should be considered when selecting the best fit partner.

Sarkis et al. (2007) have suggested a framework for agile partner selection which is based on three metrics being: *time horizon*, *performance metrics*, and *value adding process*. The time horizon refers to the time period for the relationship. It can range

from short individual transactions to longer more strategic alliances. Performance metrics are the capabilities related to the partner such as costs capability, time, robustness, and scope. Third metric represent the value adding process which are identified as logistics, design, manufacturing, and service. This model shows interdependence between the desired duration of the relationship (time horizon), capabilities of the partner (performance metrics), and the added value the partner is providing. The interdependence is important in the constantly changing environment since one partner can be functional and cost-saving on long-run whereas another partner can provide short time additional capacity. This thesis suggests including sustainability factors under the performance metrics in the mentioned partner selection model. This suggestion is based on the argument that sustainable supply chain should evaluate sustainability of the partnership when selecting partners into the chain. The modified partner selection model is illustrated in Figure 13.

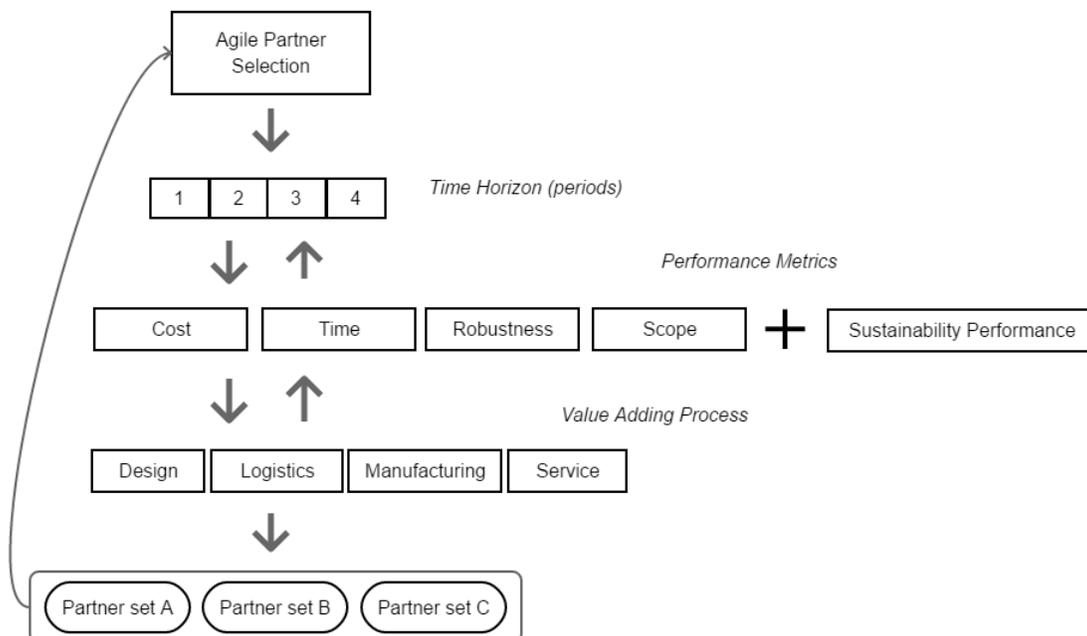


Figure 13 Partner selection framework (modified from Sarkis et al., 2007)

As the composition of the supply network evolves to respond changed environment, also the roles of each actor can change and develop. Pyykkö (2015) highlight the importance of defining clear roles for each actor. This allows for the actors to identify points of development and further collaboration. Additionally, Henttonen & Blomqvist (2005) state that the process of self-categorization decides whether the formed companionship will flourish or wither. The self-categorization refers to whether the members feel belonging to the network or do they feel as outsiders.

Once the composition of the network has been changed it undergoes steps suggested by Rong, Shi, & Yu (2013) to achieve synergies in the new situation and composition. The steps, illustrated in Figure 14, consisting of *adjustment*, *adoption*, and *convergence*. The first phase is adjustments when companies begin to adjust their own strategies and operations to meet the emerged challenges the new composition has brought about. The second phase is adoption of strategies from partners in the network. This means incorporating elements from others in their own strategy and business. The third phase is convergence where the final form of partnerships of the current composition is formed. This formed partnership should enable best possible synergies and enhance the overall network capability.

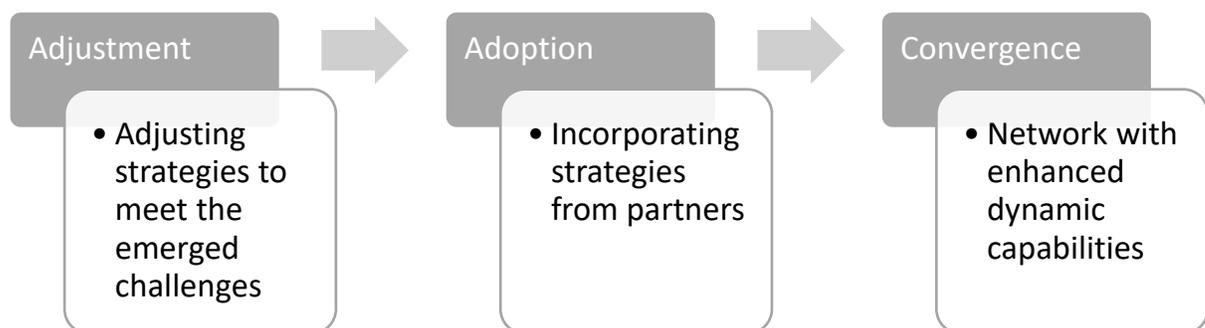


Figure 14 Three steps in network formation (Writers own illustration based on text)

Samdantsoodol et al. (2013) argue that companies are required to engage in emerging collaborative strategies and networks in order to seize the narrow windows and passing opportunities in the highly volatile global market. The constantly changing environment and partners means short time frames and limited schedules which hinders the knowledge transfer between the actors, resulting in people resorting in stereotypical impressions from previous experiences. Thus, good management is required to build trust among the actors and participants. This reinforces the notion of role division which allows identification of one's role and entrusting work phases to others enhancing productivity. However, too restrictive roles will inhibit flexibility and hinder creativity (Henttonen & Blomqvist, 2005)

4 EMPIRICAL PART

This section of the thesis focuses on the empirical part of the research. The chapter first describes how the data was collected and what type of data was used in the analysis. Secondly the structure of the analysis will be described. Thirdly the case company analyses will be presented. Fourthly summaries from the overall findings will be discussed. Finally, the observed characteristics from the analysis are drawn together.

4.1 Data collection and material

This thesis analyses annual reports from five companies that have appeared the most on the Global 100 sustainability listing during the list's history. The annual reports were selected since they follow a more formal structure and their purpose is to report the company performance and state strategical objective for a professional audience. Other marketing material such as websites were omitted since their audience is broader in scope and aimed more on marketing purpose rather than reporting to official stakeholders.

The Global 100 index is maintained by the Corporate Knights research group. Due to diversity and complexity of defining corporate sustainability, in addition to plethora of company structures, industries, and geographical locations, the research team has divided corporate sustainability into clearly defined and quantifiable components. The methodology is objective and replicable. More detailed information of the Global 100 methodology is provided on Appendix 1 Global 100 Methodology. The Global 100 listing utilizes quantitative and mathematical analysis to rate the companies based on their disclosed data. Compared to other analysis which focus solely on analyzing the supply chain performance from financial perspective such as Gartner Inc, the Global

100 provides a sustainability focus and the data leaves room to further analyze the supply chain.

It is good to note that the Corporate Knights is a medium promoting more ethical and sustainable capitalism and therefore can be, to some extent, viewed as biased source of information. However, their annually published Global 100 -listing is widely acknowledged as promoting the world's most sustainable companies and it is based on scientific analysis of GRI-standard sustainability reports which the companies have published. Corporate Knights have published the listing since 2005 thus providing good historical data. This provides a good starting point on analyzing the companies' historical development and status on sustainability.

Global Reporting Initiative (GRI) was created as a harmonized reporting system, providing methods and metrics for reporting sustainability related performance and impact (Association for Global Reporting Initiative 2019a). The goal of these harmonized systems is to provide harmonized datasets which can be used for evaluation and analysis. GRI report presents guidelines for objectivity, clarity, comparability, reliability, and punctuality of the reported data in order to ensure the quality of the and comparison of the reports. The role of GRI report is to act as supplementary, rather than principal source of information. Isaksson & Steimle (2008) state that a profound GRI report summarizes the findings on how sustainable the company is, and how the company's actions are related to the overall sustainable development. In addition, the authors highlight that answering these questions requires that the companies have clearly defined the sustainability within their organizational context.

The historical listings of the Global 100 index were collected from the official Corporate Knights' website where the data is openly available. It is good to note that the listings

for individual years are free and available in Excel format. The ready-made data set of the historical listing is priced; this thesis collected the data from individual years and compiled into one dataset. Then the company names in the dataset were unified since some companies had changed their names or spelling of their name during the history of the listing.

The data was then organized in the descending order by the number of appearances on the dataset. The top five companies were selected as cases for this research. The ranking was omitted in this phase since the aim was to find companies with the longest history in sustainable business. The annual reports from each case company was retrieved from official company websites and each report covers the financial year 2018. The reports were printed out as they were. The rankings of the selected companies are presented as background visualization on their appearances on the Global 100.

As stated in the methodology chapter, the sample size in qualitative analysis is not as important as the reasoning and criteria behind the selection. This research based the selection on the historical statistics of Global 100 index and narrowed the sample with focusing on the companies appearing the most times during the Indexes history. The reasoning behind limiting the cases to five was made due to time limitations of the research.

4.2 Analysis

The aim is to find aspects to support or disapprove aspects outlined in the theoretical framework of this thesis. The focus is to identify sustainable supply management aspects from these reports. The reports themselves are not evaluated since that has been done when the reports went through the evaluation to appear on the Global 100

listing. The reports are analyzed based on sustainable supply chain management practices and sustainability actions focusing solely on the focal company are omitted. Since the Global 100 methodology gives zero points on sections of which the companies have not disclosed any information, we can assume that these reports should contain enough relevant information for this research.

The first phase of the analysis was to identify the companies which have appeared the most times on the Global 100 index during the listing's history. As mentioned in the previous chapter the rankings were omitted and the focus was purely on the number of appearances. The dataset consisting of the listings from 2005 to 2019, which covers the entire history of the Global 100 index. The data was simply arranged in descending order and the top five companies were selected for the second phase. The second phase of the analysis focuses on more in-depth analysis of the annual reports covering the fiscal year 2018. The reports were retrieved from the official company websites and printed out as they were for further analysis. The reports were then read through three times with a slightly different focus and aim each time.

The first readthrough focused on identifying the sections which discussed sustainability and supply chain activities. These sections were roughly categorized with either "sustainability" or "supply chain" depending on their context. Parts with no clear linkage to either theme was omitted from future analysis. The second readthrough analyzed the identified sections from the first readthrough. The focus was to find linkages between the identified sustainability and supply chain themes. Found linkages were highlighted and parts without clear linkage were marked as "separate". The following subchapters allocated for each case company focuses on discussing the findings from the second readthrough. The third readthrough adds an additional layer to the analysis by comparing the different cases and finding common nominators and themes. These findings are used in gathering the summary of observations and building the characteristics of a sustainable supply chain.

Figure 15 presents the historical performance of the five companies which have appeared the most times on the Global 100 index during its history. These companies presented in alphabetical order are: Intel, Kesko, Neste, Novo Nordisk, and Unilever. The selected companies represent the most sustainable companies from their industries. Since the companies represent different industries, it provides different views on sustainability and supply chain approach. This minimizes the industry specific practices and gives room to analyze practices beyond industry borders. As shown in the figure the rankings have fluctuated heavily during the years and none of the companies have a stable ranking. The rankings range from 100 being the lowest and 1 being the highest place.

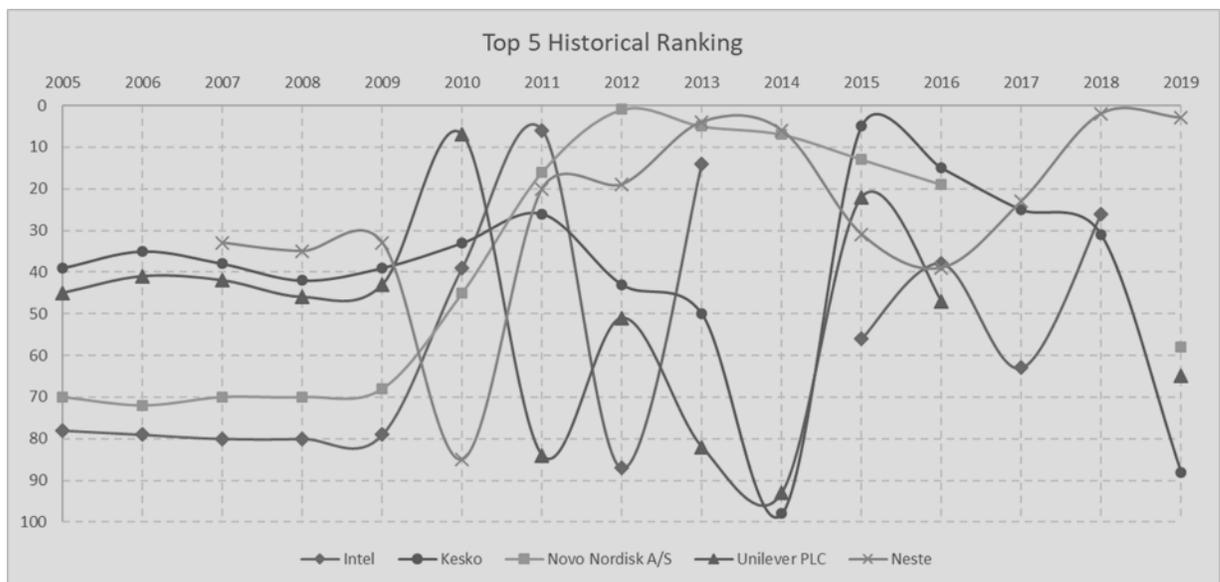


Figure 15 Companies' historical development on Global 100 listing

The analysis investigates the visibility and inclusion of both the upstream and the downstream of the supply chain. The aim is to identify what kind of roles and values the focal companies give to their suppliers on the upstream and to the end-users at the downstream. These aspects are related to self-identification of the focal company's role and position in the supply chain as well as the overall value co-creation of the network.

The sustainability aspects which are used in the analysis are divided into five categories being:

1. Added sustainability value: Does the focal company offer additional sustainability value to actors in their network. This aspect is analyzed based on various forms of collaborations, life cycle management, and relationship building.
2. Environment: Evaluated based on waste management and effluents, recycling of materials, end-life-treatment, and use of natural resources.
3. Social: Evaluated based on human rights, labor conditions and worker rights regulations for suppliers, social incentives, and giving to communities as a part of the network.
4. Financial: Evaluated based on factors such as responsible tax planning, worker/supplier compensation, responsible sourcing practices, and end-user value.
5. Control: How far along the supply network does the focal company extend their orchestrating role? Evaluating the actions related to supply chain transparency.

The findings are presented in a visual form which shows to what extent these mentioned aspects reach out from the focal company. The aim of the visualizations is to give a short overview of the analyzed supply chain. More detailed findings and interpretations are explained in a written format in each chapter.

4.2.1 Intel

Intel does not include sustainability directly under their annual report but publishes a separate annual sustainability report (Intel, 2019). Figure 16, on page 61, visualizes how the different aspects are visible on the Intel's supply chain based on the analysis. Straight line portrays direct control interaction from Intel whereas the dotted line

portrays interaction via other actors. The extent of the company's reach through the chain is analyzed on the base of their strategic emphasis.

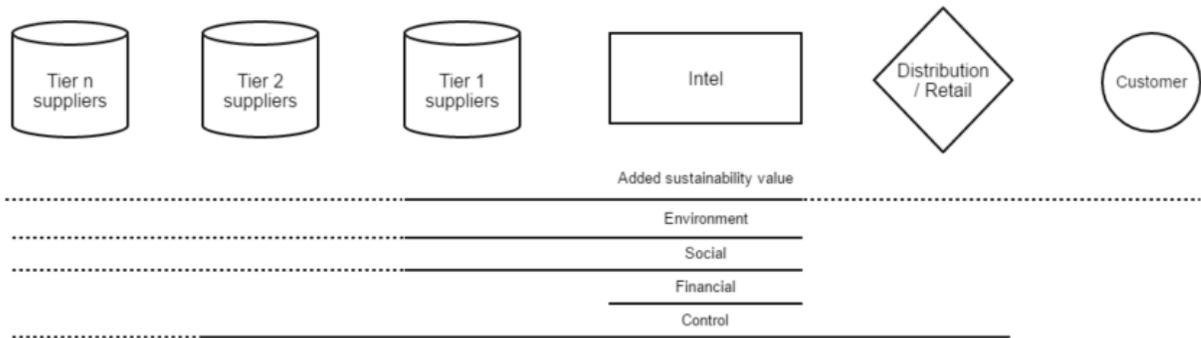


Figure 16 Intel's supply chain sustainability aspects

Intel portrays high sustainability standards and demand on their own operations which they extend upstream in their supply network. In addition to their high demands, Intel also provides a wide range of resources for their suppliers to improve their Intel related sustainability performance.

Intel views their supply network as a source for innovation and added value but also as a source of risk. The added value is supported by providing the suppliers with extensive resources in management education, developing own sustainability practices, supply chain management, safety programs, and extensive supplier engagement. To manage the potential added value, Intel displays varied collaborations such as the Responsible Business Alliance (RBA), eco-design to eliminate hazardous materials from any parts of the supply process and manufacturing and ensure proper recycling/dispose of the used product.

The risks are management on extensive control and audits which aim on identifying both risks and potential risks, and development areas. It is valuable to note that Intel's focus is on overall co-development of their supply chain. This can be seen from intel's approach on poor supplier performance; the aim is primarily to aid the supplier in restoring/improving their performance to acceptable levels instead of levying a sanction on the supplier and finding a replacement right away.

Responsible mineral sourcing (RMS) extents Intel's control to the beginning of the chain: the raw material sourcing. However, their RMS policy is mainly focused on avoiding sourcing from conflict areas and does not consider the environmental impacts of mining. Although, this is balanced on Intel's goal to eliminate hazardous materials altogether, and their aim to reach circular ecology which would diminish virgin raw material extraction completely.

Intel requires their 1st tier suppliers to set structured climate goals and majority of these have complied to these requirements and others are in the process of setting them. In upstream, Intel invests in actively engaging with the 1st tier suppliers. Intel aims to cooperate and develop the 1st tier suppliers so they would in turn do the same with their suppliers. In transparency of raw materials, Intel extents their oversight right to the source and cooperates with the network actors related to those. However, downstream the most notable mentions Intel provides is their customer's potential role in co-developing products and designing the recyclability of their products. Intel provides notable charitable and volunteering work to communities globally. Workers are encouraged and financially supported to participate in communities and volunteer to various organizations on a regular basis.

4.2.2 Kesko

Figure 17 visualizes how the different aspects are visible on Kesko's supply chain based on the analysis. Straight line portrays direct control interaction from Kesko whereas the dotted line portrays interaction via other actors. The extent of the company's reach through the chain is analyzed on the base of their strategic emphasis.

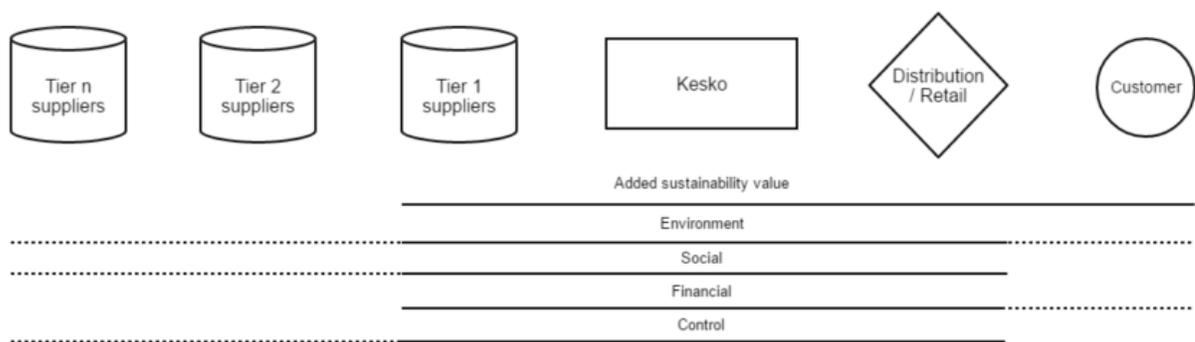


Figure 17 Kesko's supply chain sustainability aspects

Kesko has included sustainability as a chapter in their annual report and state their sustainability vision as “we enable sustainable lifestyle for our customers” (Kesko, 2019). This shows great added sustainability value and strategic importance of the downstream and the output of the supply chain. Their sustainability vision is translated into four strategic objectives of which none is directly linked to supply. The objectives are derived into six strategic actions of which two refer to supply chain: on being the pursue of circular economy solutions and the other being responsible and transparent sourcing. These are portrayed in Figure 18, on page 64. It is notable that Kesko has stated responsible sourcing as a strategic action.

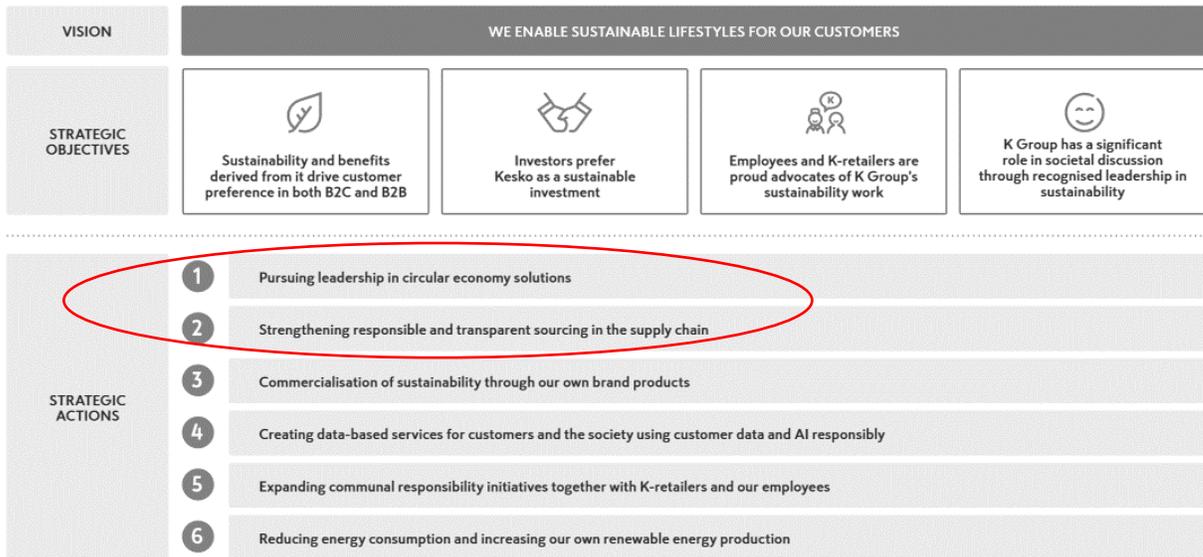


Figure 18 Kesko's sustainability vision and strategy

Kesko audits the social responsibility of their suppliers' factories and plantations in high-risk countries (based on the amfori). Kesko requires that all their suppliers in the high-risk countries have an approved audit in order to conduct co-operation with them. Kesko is mainly engaging with the 1st tier suppliers, however, when discussing their own brands, such as Pirkka, Kesko has set clear requirements from the supplier performance to the raw material standards. Their policy on responsible fish and shellfish policy is levied on their entire offering.

Kesko has mapped the greenhouse gas (GHG) emissions from the whole length of their supply chain from the sourcing to end customer and end-of-life treatment of the products. Logistics plays an important role in Kesko's supply chain and their aim is to reduce their GHG emissions nearly 20% in their own operations and have at least 90% of their suppliers set a GHG emission reduction goals by 2025.

Upstream Kesko is focused on responsible raw material sourcing and monitoring that the 1st tier suppliers adhere to the human rights. Downstream Kesko has a great emphasis on providing added sustainability value on their customers. Majority of this is the Circular economy solutions and reverse logistics solutions which allows Kesko to utilize operational induced waste as energy in their own operations. Additionally, Kesko emphasizes good corporate citizenship and their role as tax payer in society and as a responsible employer.

4.2.3 Neste

Neste's annual report portrays sustainability before financial figures which shows the strategical emphasis the company places on the subject. Neste's strategy is to "help transport and cities, aviation, polymers and chemicals customers make their business more sustainable" and their vision is to "create responsible choices every day." By using Neste's renewable products, 7,9 MT GHG emissions were reduced. (Neste, 2019)

Figure 19 visualizes how the different aspects are visible on the Neste's supply chain based on the analysis. Straight line portrays direct control interaction from Neste whereas the dotted line portrays interaction via other actors. The extent of the company's reach through the chain is analyzed on the base of their strategic emphasis.

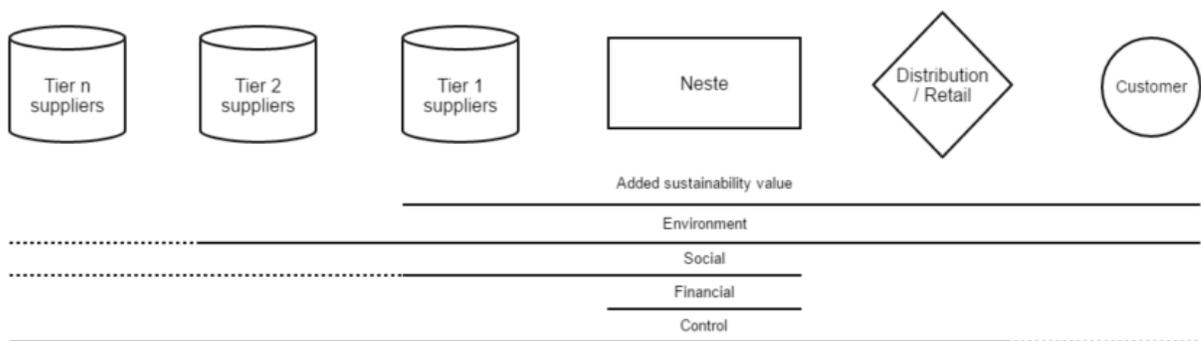


Figure 19 Neste's supply chain sustainability aspects

Figure 20 displays Neste's business model and what is notable that the company has included the direct and indirect streams in their value chain. These have been further divided into economic, social and environmental dimensions. This shows the company has knowledge on their supply network and impacts on each phase and actor.

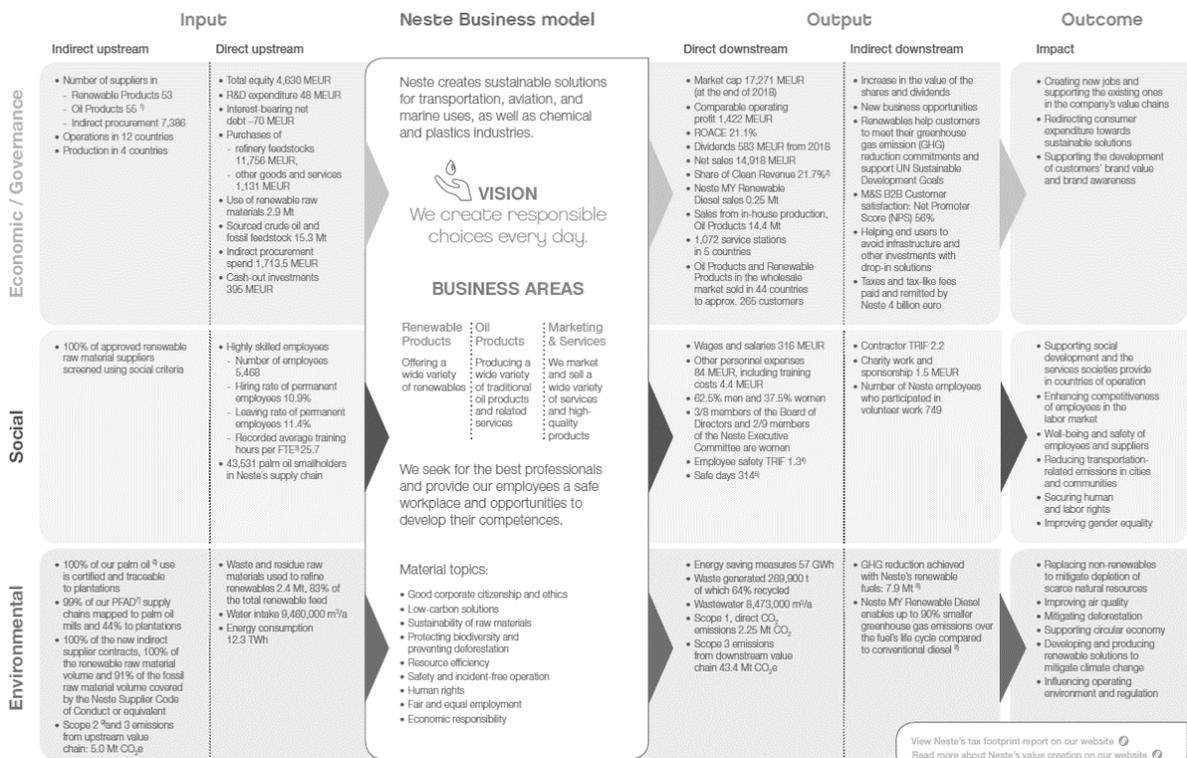


Figure 20 Neste Business model

Neste sources only sustainably-produced and renewable raw materials solely from suppliers which have met Neste's criteria and fully comply with industry-specific regulatory requirements. They do not purchase crude oil drilled from the arctic seas or conflict areas. Neste also imposes their supplier code of conduct over crude oil suppliers, of which 91% have been covered. Neste has 100% mapped their palm oil supply chain to the palm oil mills and next target is to map the chain to the plantation level by 2020.

Upstream Neste has set sustainability KPIs which require that their 1st tier suppliers utilize Neste's responsible sourcing principle through their entire supply chain, this includes also third-party suppliers. Additionally, Neste has collaboration with their renewable raw material suppliers and monitors their performance on a regular basis. Downstream Neste aims to provide huge added sustainability value to their customers and whoever utilizes their products. Overall, Neste seems to emphasize on not only doing their business sustainably, but rather transforming the entire industry in order to provide people a better tomorrow and a healthier planet.

4.2.4 Novo Nordisk

Figure 21 visualizes how the different aspects are visible on the Novo Nordisk's supply chain based on the analysis. Straight line portrays direct control interaction from Novo Nordisk whereas the dotted line portrays interaction via other actors. The extent of the company's reach through the chain is analyzed on the base of their strategic emphasis.

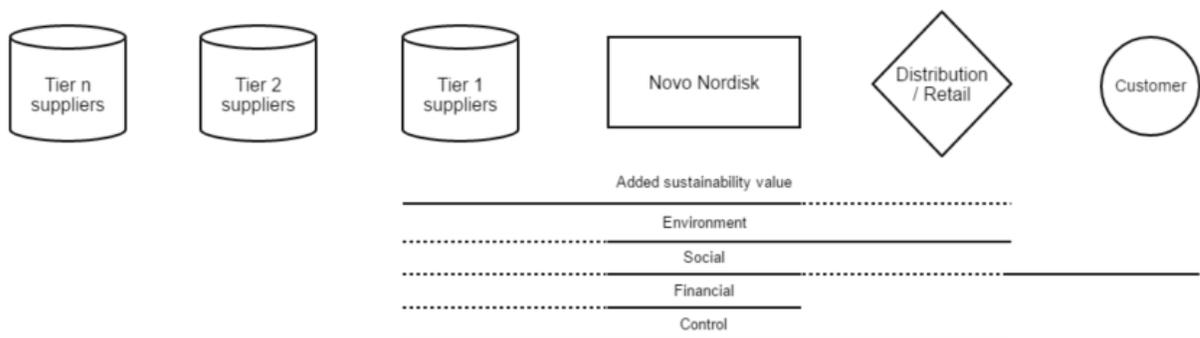


Figure 21 Novo Nordisk's supply chain sustainability aspects

Novo Nordisk clearly states on their annual report to adhere to the Triple Bottom Line as basis for all their business conduct (Novo Nordisk, 2019). However, their explanation on supply chain activities in this report was rather thin. The company mentions to audit

their suppliers (1st tier) on their compliance to responsible sourcing policy. However, the exact content of their responsible sourcing policy is disclosed only by referring to the Triple Bottom Line, it has not been supplemented with KPIs or other targets and objectives. Emissions from logistics related to product distribution are measured and target is to reduce them by switching to more sustainable means of transport. Additionally, several of their suppliers have committed in reducing their carbon emissions and increasing their energy efficiency use of renewable energy. Supply disruptions are viewed as a major risk since it could danger the life of patients using their medicine.

Overall Novo Nordisk places high emphasis social issues such as improving the life of the patients who could benefit from medicine produced by Novo Nordisk. The visibility of supply chains is limited to subsidiaries and responsible tax planning and logistics emissions. The upstream is audited by internal organization and the downstream is benefiting from the quality products of the company.

4.2.5 Unilever

Unilever states their purpose as “to make sustainable living commonplace” (Unilever, 2019). Unilever’s approach is to provide sustainability throughout their supply chain. The Unilever sustainable living plan shows a holistic approach on their business and on sustainability. The sustainable living plan starts with responsibly sourced raw materials and aims to enhance the quality of life of the consumers and provide them products with lessened negative impact on the environment. Unilever states that business growth and sustainability are not mutually exclusive but viable with correct strategical approach.

Figure 22 visualizes how the different aspects are visible on the Unilever's supply chain based on the analysis. Straight line portrays direct control interaction from Unilever whereas the dotted line portrays interaction via other actors. The extent of the company's reach through the chain is analyzed on the base of their strategic emphasis.

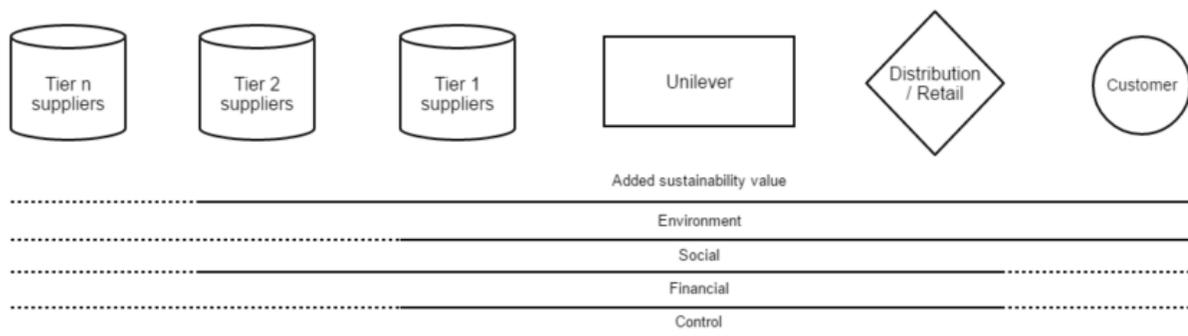


Figure 22 Unilever's supply chain sustainability aspects

Unilever poses preliminary requirements for their suppliers and aims on building long-lasting relationships with their strategic suppliers to achieve mutual growth. In 2018 35% of the company's procurement spend was allocated on these suppliers. All their suppliers (1st tier) undergo regular screening for capabilities and level of social and environmental risks. Unilever extends its sustainability requirements downstream the supply chain and has set clear goals to for example to halve the water associated with commercial use of their products by 2020. The company has also set waste, and greenhouse gas goals for the consumer use phase. Financially their goal is to enable small-scale retailers and empower women. Also, in upstream Unilever aims to enact smallholder farmers in addition to responsible sourcing practices.

Unilever provides their small-scale supplier and retailers additional education and resources enabling them to meet sustainable business goals. This is achieved with various third-party service providers such as Mastercard to grand financial aid to small-

scale retailers. With bigger suppliers or retailers Unilever co-operates on a more strategical level and depends on the actors' own resources, since the focus is on knowledge and strategic sharing.

4.3 Summary of observations

The degree how much of the supply chain operations were disclosed varied between the companies. Working in the retail and consumer goods industries, both Kesko and Uniliver showed a great inclusion of both the upstream and downstream of their supply chain in their sustainability and in their supply chain actions. This might partly be due to sustainability being a megatrend for some time now, and consumers have become more aware and demanding in this aspect; translating into sustainability being an important competitive edge. On a positive note, both companies showed sustainable supply chain strategies stemming from overall sustainable development ideology, and not just reacting to market demand.

Strategy wise Neste showed great emphasis on circular solutions which can be translated into collaboration with the entire supply network to find synergies and dynamic capabilities. The concrete models on achieving this were not clearly shown from the supply chain management perspective, although, Neste did portray interest and results on supply network transparency meaning Neste invests on mapping and knowing their supply network. This provides viable data for further supplier collaboration or supply chain modification.

Novo Nordisk demonstrated a case where sustainability strategies and actions do not necessarily transform into clear and holistic sustainable supply chain strategies. The company was only to clearly state the sustainability model they adhere to, but did not extent it further along their supply network. Responsible sourcing and supplier audits

were disclosed, but it could not be observed to extend beyond 1st tier suppliers. Whereas Intel demonstrated great supply chain visibility and monitoring extending to raw material sourcing. However, Intel's practices did not reach downstream beyond end-product recyclability.

Based on the observations, the analyzed companies utilize supply chain management tools in varying degrees to advance sustainability. Supplier collaboration was seen to hold strategic importance on many occasions, especially with strategic partners. Building supplier capabilities and goodwill in the network by education and sharing co-developing programs were most notable means used. Using contractual means such as placing supplier's own sustainability programs and supply network management as requirement for collaboration, backed up with resources to achieve this, showed that companies can impose sustainability through their supply network despite the length of the chain. It was also notable that some companies included end-user based KPIs for their supply chain sustainability. This portrays a holistic understanding of the impact the company and its supply network have on the network itself plus on its stakeholders.

Companies demonstrated having preliminary requirements on sustainability for their new suppliers. However, the focal companies were willing to co-operate and develop their suppliers' capabilities and sustainability to enhance the overall sustainability of the supply network. It was observed that violations in sustainability were primarily responded with plans to correct these deviations rather than excluding the supplier from the network. This showed a degree of tolerance management and engagement in advancing sustainability instead of switching to a more sustainable supplier and excluding the unsustainability from the network.

4.4 Sustainable supply chain characteristics

Observed factors related to sustainable supply chain management were sustainable strategy, inclusion of both the upstream and the downstream of the supply chain, actor collaboration and engagement, supply chain transparency, and network wide KPIs and measurements. Figure 23 illustrates how these factors are linked and form a circular path for supply chain sustainability.

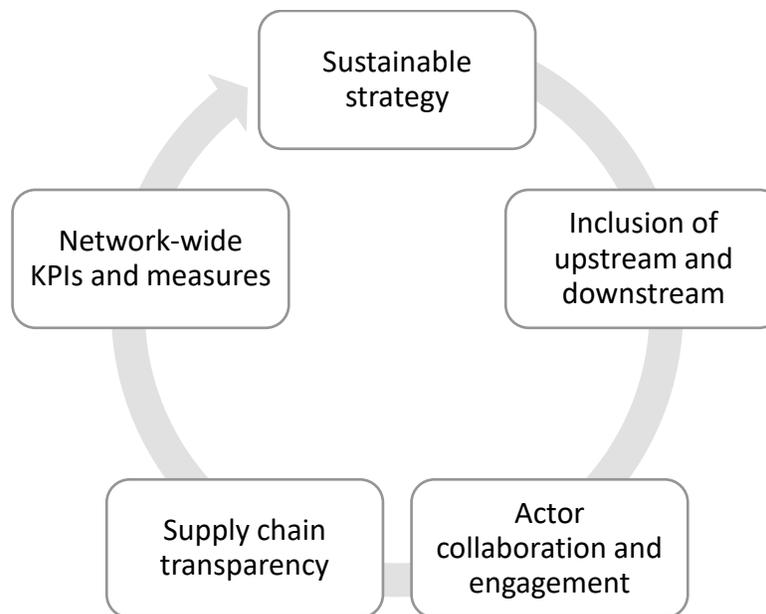


Figure 23 Characteristics of a sustainable supply chain

Sustainable strategy showed that companies had redefined their purpose for existence and the value they were offering. Instead of providing goods or services the companies provided sustainability as their value. In order to extent the sustainability further in the supply network the focal company needs to include both the upstream and downstream of the chain under strategical focus. Focal company needs to engage and empower its closest actors to further extent sustainability in the network. Collaboration should extent throughout the network with varying degrees. Actor engagement and collaboration enable supply chain transparency by providing new horizons for the focal company to

explore. Networkwide KPIs and measurements are required to reach strategic goals and engage the entire network on steering towards same direction.

There was no clear indication that the companies would be constantly re-aligning their supply chains to meet new challenges as suggested in the theory. Evidence showed that the companies had high criteria for new suppliers and invested in building the competence of the selected and existing suppliers to meet the high standards of the supply network. In cases of failure to meet the set standard, the focal companies evaluated the situation and utilized tools to correct the deviations rather than directly switch to another supplier which would immediately meet the set standards. This supports the idea of tolerance management on the supply chain management level.

Inclusion of upstream and downstream seemed more operational rather than technical. Although, some companies indicated providing platforms for information and capability-building there was no mention on sharing other kinds of ITC-solutions. The focal companies showed great interest on mapping their supply networks and identifying the sources for their raw materials as well as the end-of-life use of their offered products. The idea of triple value creation was present on some occasions where the value was generated for the suppliers, focal company, and the customers; companies engaged in retail industries had the highest indicators for this.

5 DISCUSSION & CONCLUSIONS

This chapter will draw conclusions from both the theoretical framework and the empirical research to answer what is sustainable supply chain management. The chapter will close with naming the limitations this research faced and providing some future research suggestions.

5.1 Summary of findings

The theoretical framework suggests that the first step in the sustainable supply chain management requires a holistic view on the sustainability which needs to be incorporated into the company's strategy. Second step requires structured and consistent measurement system with traceable goals which enable monitoring the progress. Traditional frameworks such as Lean and Six Sigma provide adequate tools for this providing that the company has fulfilled the sustainable strategy requirements. The third step requires collaboration throughout the entire supply network. The focal company should be aware of the entire network and adjust the means of interactions accordingly. Dynamic capabilities and trust between network actors create a basis for further collaboration, they also require constant attendance.

The company analysis portrayed various degrees of sustainability related supply chain practices. Although the focal company itself might demonstrate high levels of sustainability factors which others extend further along their supply networks compared to others. Notable observation was the inclusion of both the upstream and the downstream of the supply chains. Some companies utilized contractual means to engage their 1st tier suppliers on extending sustainability factors further along the chain. Some companies included the end-user as part of their supply network and imposed sustainability KPIs on the end-of-life of their products, showing emphasis on strategical lifecycle managements since the focal company does not have direct influence over

the end-user, but rather an option to provide opportunities for them to act on a desired way.

Supplier collaboration and building supplier capabilities within the entire supply network was showed to be a strategical choice. Companies investing in their supply network capabilities and supplier collaboration also expected great returns from these investments. Building supplier capabilities was presented as a risk management tools since focal companies enabled their educated suppliers to monitor the actors further in the upstream which resulted in increasing the transparency and visibility through the chain.

As a conclusion and answering the research question: sustainable supply chain management (SSCM) is a holistic approach combining the elements of sustainable development with the supply chain management practices. SSCM is viable to achieve by utilizing frameworks and tools traditionally used in business strategy and in the supply chain management provided, that sustainability has been incorporated in the fundamental business strategy. SSCM requires investing in supplier collaboration in order to engage more actors in the network to promote sustainability further along the network. Investing in supplier capabilities is a form of risk management by extending set measures along the chain. Additionally, inclusion of both the upstream and the downstream enables placing holistic KPIs and strategies covering the entire value chain and life-cycle of the produced product or service. The strategical focus of SSCM is creating sustainable valuable to each actor of the supply network and not just focusing on sustainability from the perspective of the focal company.

5.2 Limitations & future research recommendations

This study faces some limitations which are good to acknowledge. This study used secondary data, mainly corporate published reports, since it is the main source of company data for outside researchers without access to the actual company. Although, these public reports are used in various public and expert works and analyses making them a good source for information, they might leave out valuable insight on the strategy and operations available for the company personnel. The analysis was limited to analysis of 5 companies with the most appearances on the Global 100 through the whole history of that listing. The company reports for the analysis were from 2018, and not taking into consideration their historical development. This scope of this study is the companies sustainable supply chain activities. The sustainability actions and strategies focusing purely on the focal company were not analyzed unless those actions were also imposed throughout their supply chain.

Highlight of this study was the analysis of companies from different industries (retail, pharmaceutical, energy, technology) and identify similarities and differences in their sustainable supply chain management practices. Another highlight was building sustainability indicators especially for supply chain management context. These indicators included aspects of supply chain structure and partner selection, collaboration and extent of power, continuous improvement tools based on Lean Six Sigma, and strategical process focusing on sustainability.

Possible future research ideas for this study could include a longitudinal study of the company's historical reporting to investigate how the companies and their supply chains have evolved over the years. This could also identify if the companies have just been reacting and adjusting their actions based on external stimulus, or have they been trailblazers and setting an example in their industry and for the rest of society. A more practical research would be testing the viability of the sustainable turnaround strategy

on companies who have not yet reached a sustainable business model or have faced a crisis and require recuperation. The starting point for a future research could be based on highest ranking supply chain on some other listing and investigate their sustainability aspects.

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APPENDIX 1 GLOBAL 100 METHODOLOGY

The prequalification criterion for Global 100 entry is that company has to a publicly traded with market capitalization of at least 2 billion USD; this data is taken annually on October 1st.

First screening eliminates companies failing to disclose at least 75% of the priority indicators from their respective GICS industry group. Priority indicator is defined as any of the 12 key performance indicators disclosed by at least 10% of all large companies in a given GICS industry group. As an example, if there are 250 in the Energy GICS industry group, and 20 of those companies are found to disclose waste management, then Waste Productivity becomes a priority indicator for the Energy industry group.

The second screening utilizes the Piotroski F-Score which consists of nine individual pass or fail tests and company must pass at least five tests in order to qualify. The F-Score tests are:

1. Net profit is positive;
2. Operating cash flow is positive;
3. $\text{Net profit} \div \text{total assets at beginning of year}$, minus the same number for the previous year is positive;
4. Operating cash flow is greater than net profit;
5. $\text{Long term debt} \div \text{by average assets}$ has not increased;
6. The current ratio has increased (the change is more than zero, so even a negligible increase passes the test);
7. No raising of ordinary (common) equity over the previous year: this test is passed if the company did not issue any ordinary shares (excluding shares from dividend reinvestment plans);
8. Gross margin has improved over the previous year;
9. Asset turnover has increased.

Third screening eliminates companies with GICS sub-categories which are defined as unsustainable such as the “tobacco”; and if the company generates majority of its revenues from weapons manufacturing.

Fourth screening investigates the sanctions the companies have paid out on a trailing one-year basis in sustainability-related fines, penalties or settlements. The total amount of fines is represented as percentage of the company's total revenue and if this score is in the bottom quartile compared to their GICS Industry group peers, the company is eliminated. The only exception to this analysis is that companies that were part of the most recent Global 100 ranking are subjected to this test on a trailing two-year basis.

Global 100 companies from the previous year are added if they are not in the bottom quartile of their GICS Industry Group on the Fourth Screening.

The companies passed so far from the Global 100 shortlist Each company on the shortlist is scored on percent rank basis against their global industry peers on the priority KPIs for their respective GICS industry group. Each company receives an overall score representing the average score from each priority KPI. If the company has not disclosed the data for the priority KPI then the results for that KPI is zero.

The result of the analysis is the Global 100 listing which consists of companies with the top overall score in their GICS Sector. The listing assigns fixed number of positions for each sector based on the sector's share of the MSCI ACWI Index.

www.corporateknights.com/reports/global-100/methodology/