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Sustainable value creation through circular economy

Multiple case study of Finnish multinational corporations

Master's thesis
in International business

Author:
Tuomas Ostela

Supervisors:
D.Sc. Elina Pelto
D.Sc. Riikka Harikkala-Laihin

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Increasing global consumerism has significantly strained Earth's natural resources. This depletion of raw material has created a need for sustainability, a need to change the perspective of businesses from economic lead shareholder view to sustainable stakeholder view in order to balance the economic, social and environmental elements so that one is not pursued at the cost of others. This study focuses on circular economy, which is one of the solutions to introduce sustainability to business. The purpose of this study is to identify how circular economy business models create sustainable value and how this is noticeable in the activities of Finnish multinational companies. A circular business model is a way to create value by using circular business actions of regenerate, share, loop, optimize, virtualize and exchange. This study used a qualitative case study approach, where secondary data was gathered from official sustainability reports and analysed by deductive structural coding. The chosen coding categories were derived from theory, and they were used to analyse the case companies' circular business models. The case companies chosen for this study were Kone, Kesko, Neste and Metso Outotec. The theoretical framework presented 26 circular business models and 6 circular business action that those circular models use to create sustainable value. Several circular business models were identified from all of the case companies and some mainly industry related differences discovered. This study concluded that even though the verification of any value created of being fully sustainable is problematic, it can be argued that the circular business models create sustainable value by not clearly reducing the other two value forms when creating one. Furthermore, the sustainable value form circular business models create the most is environmental value. Future studies focusing on companies that are based in different countries could add to the practical implementation of circular business model in companies and a study that would include and compare companies that are different in size could also produce useful information as the process of creating a unifiable implementation strategy for sustainable development into business is still ongoing.

Key words: sustainability, sustainable business model, sustainable value creation, circular economy.

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Kasvava globaali kulutus on merkittävästi rasittanut maapallon luonnonvaroja. Raaka-aineiden vähentyminen on luonut tarpeen kestäväälle kehitykselle ja yritystoiminnan keskittymiselle osakkeenomistajien taloudellisten intressien sijaan kestävämmälle mallille, jossa huomioidaan kaikkien sidosryhmien tarpeet. Tämän tarkoituksena on tasapainottaa taloudelliset, sosiaaliset ja ympäristölliset intressit, jotta yhdenlaista arvoa ei luoda tuhoamalla muita. Tämä tutkimus keskittyy kiertotalouden toimintamalliin, joka on yksi kestävä kehityksen ratkaisumalli. Tämän tutkimuksen tarkoituksena on selvittää, miten kiertotalouden liiketoimintamalleilla voi luoda kestävä arvoa ja miten se on nähtävissä suomalaisissa kansainvälisissä yrityksissä ja niiden toiminnassa. Kiertotalouden liiketoimintamalleissa arvoa luodaan eri kiertotalouden toimintamalleilla, jakamalla, kierrättämällä, optimoimalla, virtualisoimalla ja vaihtamalla. Tämä tutkimus käytti laadullista tapaustutkimusmenetelmää ja hyödynsi lähteinä yritysten kestävä kehityksen raportteja, joita sitten analysoitiin deduktiivisen ja rakenteellisen koodauksen avulla. Koodatut kategoriat olivat teoriasta johdettuja ja niiden avulla analysoitiin yritysten kiertotalouden toimintamalleja. Tapaustutkimukseen valitut yritykset olivat Kone, Kesko, Neste ja Metso Outotec. Teoreettinen viitekehys toi esille 26 kiertotalouden toimintamallia ja kuusi kiertotalouteen liittyvää toimintatapaa, joita hyödyntämällä kiertotalouden toimintamallit voivat luoda kestävä arvoa. Useita kiertotalouden liiketoimintamalleja löydettiin tutkittujen yritysten liiketoimintamalleista ja joitain lähinnä toiminta-ala kohtaisia eroja havaittiin yritysten välillä. Tässä tutkimuksessa todettiin, että vaikka täydellinen luodun arvon kestävyys arvioiti on ongelmallista, voidaan sanoa, että kiertotalouden liiketoimintamallit luovat kestävä arvoa, sillä ne eivät selvästi vähennä tai tuhoa muita kahta kestävä arvon elementtejä luodessaan yhtä. Lisäksi huomioitavaa oli, että kiertotalouden ratkaisut luovat eniten juuri ympäristöarvoa. Jatkotutkimukset, jotka kohdistuvat yrityksiin, jotka toimivat pääasiassa eri maissa, loisivat lisää tietoa kiertotalouden implementointiin liittyen ja tutkimukset, joissa otettaisiin huomioon myös yrityksen koko ja vertailtaisiin sen vaikutuksia, lisääisivät relevanttia tietoa ja olisivat hyödyksi, sillä yhtenäisen ja yleispätevän implementointistrategian luominen kestävä kehityksen ratkaisuille on yhä jatkuva prosessi.

Avainsanat: kestävä kehitys, kestävä liiketoimintamalli, kestävä arvon luonti, kiertotalous

TABLE OF CONTENTS

1	Introduction	9
	1.1 Sustainability in business	9
	1.2 Research questions and structure of the study	14
2	Sustainable value creation in circular economy	16
	2.1 Sustainable business model	16
	2.2 Sustainable value creation	18
	2.3 Circular economy	20
	2.3.1 Circular economy in business	20
	2.3.2 Circular business model canvas	24
	2.3.3 Product-service system model	27
	2.4 ReSOLVE -framework in circular economy	28
3	Research design	32
	3.1 Qualitative case study approach	32
	3.2 Case selection	33
	3.3 Data collection	35
	3.4 Data analysis	36
	3.5 Evaluation of the study	37
4	Findings and analysis of the cases	39
	4.1 Case 1 – Kone	39
	4.1.1 Kone’s Value proposition and Customer segments	39
	4.1.2 Kone’s Channels and Customer relationships	40
	4.1.3 Kone’s Revenue streams and Cost structure	42
	4.1.4 Kone’s Key resources and Key activities	42
	4.1.5 Kone’s Partnerships	43
	4.1.6 Kone’s Adoption factors and Take-back systems	44
	4.2 Case 2 – Kesko	45
	4.2.1 Kesko’s Value proposition and Customer segments	45
	4.2.2 Kesko’s Channels and Customer relationships	48
	4.2.3 Kesko’s Revenue streams and Cost structure	48
	4.2.4 Kesko’s Key resources and Key activities	49
	4.2.5 Kesko’s Partnerships	50

4.2.6	Kesko's Adoption factors and Take-back systems	51
4.3	Case 3 – Neste	52
4.3.1	Neste's Value proposition and Customer segments	52
4.3.2	Neste's Channels and Customer relationships	54
4.3.3	Neste's Revenue streams and Cost structure	54
4.3.4	Neste's Key resources and Key resources	55
4.3.5	Neste's Partnerships	56
4.3.6	Neste's Adoption factors and Take-back systems	56
4.4	Case 4 – Metso Outotec	58
4.4.1	Metso Outotec's Value proposition and Customer segments	58
4.4.2	Metso Outotec's Channels and Customer relationships	61
4.4.3	Metso Outotec's Revenue streams and Cost structure	61
4.4.4	Metso Outotec's Key resources and Key activities	62
4.4.5	Metso Outotec's Partnerships	63
4.4.6	Metso Outotec's Adoption factors and Take-back systems	64
4.5	Cross-case analysis and comparison	65
5	Conclusions	71
5.1	Discussion	71
5.2	Theoretical contribution	72
5.3	Managerial implications	73
5.4	Limitations of the study and future research	74
6	Summary	75
	References	77
	Appendix	83
	Appendix 1 List of publications used in the empirical analysis	83

LIST OF FIGURES

Figure 1: Three overlapping elements of sustainability	10
Figure 2: Sustainable value	19
Figure 3: Circular economy	22
Figure 4: Linear economy	23

LIST OF TABLES

Table 1: Circular business model canvas	25
Table 2: Framework for circular business models	28
Table 3: Circular business actions found in the components of the circular business model canvas	30
Table 4: Kone's circular business model canvas	41
Table 5: Kesko's circular business model canvas	47
Table 6: Neste's circular business model canvas	53
Table 7: Metso Outotec's circular business model canvas	60
Table 8: Cross-case comparison of case companies	69

1 Introduction

1.1 Sustainability in business

In this era of increasing consumption, the impact humans have on Earth has become increasingly evident and highly relevant topic for discussion and research and the call for more sustainable actions can be seen around the world (Chang et al. 2019, 1136). It is difficult for companies to design new or identify already used sustainable models and implement these into their operations due to the lack of information available about the demands and opportunities of these strategies. There is a very limited amount of case studies focusing on to the challenges and solutions that rise when dealing with sustainable business strategies. (Evans et al. 2017, 605; Stubbs & Cocklin 2008, 103.) Therefore, providing companies with more information about other companies who have successfully chosen a sustainable strategy and implemented it into their corporate strategy is vital and might encourage them to try sustainable business models themselves in the future.

According to Faber et al. (2005, 3–4) change is often unpredictable. The more positive information companies around the world have about sustainability and corporate strategies incorporating sustainable business models into their operations, more likely they are motivated to do this themselves. With positive results of sustainable business models and sustainable innovation, the fears and doubts could be changed to optimism. Finding out ways to do that successfully and finding out how it will affect the company beforehand would be useful. Furthermore, given the accelerating climate change and other problems caused by overusing nature, companies should be strongly encouraged to incorporate sustainability. Adding to the literature and studies about the positive effect and outcomes of sustainable business models seems highly meaningful. This study will focus on the benefits of one of those sustainable business models, circular economy.

Sustainability as a concept began forming in the mid-1980s and its definition has since been quite susceptible to change. Even the modern definition of sustainability is still somewhat debated, and it is often used with words like sustainable development or sustainable ecosystem. Sustainability is in simple terms and highly generalized, actions that will secure the future of Earth and its people by not depleting its resources. (Portney 2015, 1–2.) According to Faber et al. (2005, 3) and Hart and Milstein (2003, 56) sustainability is the interactions between two parties that affect each other without

depleting or destroying one another. Usually, this balance happens between an actor and the environment supporting it. The concept of sustainability was first introduced in the work of United Nations' World Commission on Environment and Development in 1987 also known as Brundtland Commission (Portney 2015, 4; Stubbs & Cocklin 2008, 104). The purpose of this report was to create an international agenda for environment protection (Portney 2015, 23). It introduced three elements of sustainability: economy, environment and equity or the social aspect. In order to reach sustainability these three aspect or pillars all need to co-exist and support each other. The essential idea is that one should not be achieved by sacrificing the others. Equity, environment protection and economic growth all can and need to be accomplished to have real sustainability. (Portney 2015, 7.) This concept of overlapping elements is presented in the Figure 1.

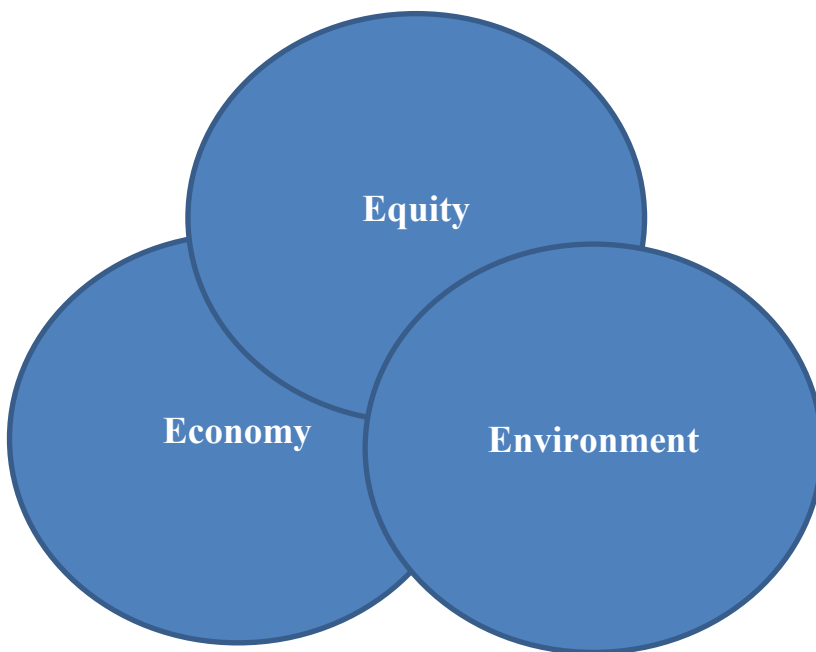


Figure 1: Three overlapping elements of sustainability (Evans et al. 2017)

The triple bottom line theory, developed by John Elkington, from which the above-mentioned concept originates, studies this transformational framework for companies moving to a more sustainable business models where the elements of people, planet and prosperity, also called the three Ps, are all considered and balanced. This theoretical framework that focuses on all of the tree elements instead of just the economic one is the core idea behind sustainability in general and is therefore at the back of the entire theme of sustainability. (Slaper & Hall 2011, 4–5.) This study will focus more on the specific

ideas of circular economy, but as it is a sustainable business model, the core idea of the three Ps should be considered as background over which the other elements of the theory are built. In terms of sustainable solutions circular economy has been identified as a potential solution for many sustainable problems. Circular economy is a production model where the materials that would end up as waste after they have reached the end of their product life cycle are looped back into production by for example recycling the materials. This kind of action minimizes waste and closes the material loops in industrial ecosystems. The use of circular economy has been increasing steadily as its benefits have been globally realized in the world of business. (Stahel 2016, 435.) Korhonen et al (2018, 45) however points out that there is a lack of scientific research when it comes to circular economy as development of the concept has been led mainly by practitioners. Therefore, validating the existing theoretical frameworks regarding the topic by conducting scientific research to support them, is meaningful and required.

When moving from sustainability to sustainable development or sustainable economy the focus shifts to the potential trade-off between economic performance and growth and environmental issues (Faber et al. 2005, 4). McDonough and Braungart (2002, 252) point out that this shift is a challenge to many, but it can also be an opportunity for sustainable orientated innovation. The idea that economic growth is only attainable by consuming the biophysical environment is the source of this problem and it is what sustainable development aims to provide a solution for and correct. (Porney 2015, 16–17.) The main problem with sustainability is, that for many it seems to mean the opposite of positive economic goals (Stahel 2016, 436). Argandoña (2011, 12) points out that the economic goals of companies will cause problems when trying to reach this equilibrium as long as the economic value is prioritized above others.

This act of balancing the company's focus is a major problem for many businesses (Faber et al. 2005, 9). The conflicts that rise from the imbalance of the economic, social and environmental aspects can be corrected by reorganizing the value creation process to take all the stakeholders into consideration and providing value to them all, including the environment (Argandoña 2011, 11; Lahti et al. 2018, 1–2). For example, economic growth of companies and the idea of consumers using less and consuming less do not seem to work together. The basic idea of circular economy is to lengthen the product life cycle, and this clearly fights against the basic principles of creating demand by offering newer products to replace the old one. (Stahel 2016, 436.) This can be observed in many situations across the world. When the economy is down and there is a need for economic

growth, sustainable goals and guidelines seem to be in the way. For example, in the United States president Trump went back on most of the country's sustainable policies during his term in order to enhance economic performance. (Boerner 2021.) Therefore, as long as people in a position of power, who make these kind of policy decisions are uninformed about the requirements and opportunities of sustainable business models, this remains a problem that needs to be corrected by informing about, for example circular solutions both from theoretical and practical perspective. Therefore, it is highly relevant to add to the existing theoretical and practical information regarding different sustainable solutions. Adding to the theoretical perspective will create generalizable frameworks that can then be used to implement sustainable solutions into business models.

The other problem with sustainability is that apart from seeming anti-profit and anti-growth, sustainability is a long-term goal requiring long-term commitment. The benefits of sustainable decisions and actions now will be received in the future. There are many business leaders who have envisioned long-term closed material and production loops and low carbon economy with zero waste. In this the main problem is in how to achieve such goals in practise. (Krantz 2010, 7.) This is what the managerial implications gained from relevant studies will provide an answer for.

Business in general has also shifted towards more stakeholder orientated view as different stakeholders have become increasingly important and even essential for the companies' success (Argandoña 2011, 6; Lahti et al. 2018, 1; Adams et al. 2016, 181). The need to engage with different stakeholders like governments, NGOs, suppliers, customers, consumers, academic communities, local communities, peer companies and trade associations has changed from a preference to a necessity (Jeffery 2009, 3; Freudenreich et al. 2020, 6). This has led to more substantial stakeholder engagement in order to create long-term sustainability (Krantz 2010, 8). Broader stakeholder view is especially important in circular economy, because the circular model impacts many of the company's stakeholders, including the environment. Circular economy is a sustainable business model that is based on the idea of material looping, where products do not end up as waste at the end of their product-life cycle, but through material loops are brought back to production via recycling (Lahti et al. 2018, 1–2; Chen 2020, 48). Circular economy can be introduced into business operation by circular business actions, which are regenerate, share, optimize, loop, virtualize and exchange (Lewandowski 2016, 19). These circular business actions and how they form the ReSOLVE framework to analyse circular business models are discussed in more detail in chapter 2.4.

The larger stakeholder view also includes external actors like the government. In order to bring the element of governmental impact into the sustainable solutions companies are using, particularly circular solutions, it is useful to understand the different ways a government can impact the sustainability of companies. Furthermore, the fact that the government is one of the key stakeholders that shape the business environment, it makes this even more relevant to discuss (Lewandowski 2016, 14). When it comes to how nations and governments can affect the business environment around them in order to reach long-term sustainability, the focus is on system-level sustainability actions. Different policies like laws, taxation, education, incentives and other rules that regulate for example use of different materials, energy consumption, emissions, waste management and the distribution of wealth are the tools for the government to impact the change. These governmental policies can affect business operations in individual firms or in a larger scale throughout industries. To do this as efficiently as possible it is crucial for the policymakers to understand sustainability, sustainable business models and how they affect the business. (Evans et al. 2017, 600–601.) To make this task especially hard there are multiple hurdles to cross when dealing with issues like trade-offs for sustainable solutions, complex interlinked systems and networks that impact the business, political and natural environments. (Krantz 2010, 7).

As sustainability is a global issue it needs to be viewed from a global perspective, which makes the international community a relevant element for this discussion. The international collaboration in the governmental level for sustainable development began at the Earth summit in 1992, where a statement called Agenda 21 was formed. It states the common principles for countries when pursuing sustainable economic development in the 21st century. (Portney 2015, 32.) For several years now, Finland has ranked in the top three countries with sustainable actions according to the Bertelsmann Foundation and the UN Sustainable Development Solutions Network, after Sweden and Denmark. All the Nordic countries rank high when it comes to international comparison in sustainable development. (Kestävähelyys 2020.) However, it should be noted that Finland was not even in the top 15 in 2014 according to the Environmental Performance Index unlike the other Nordic countries (Portney 2015, 34). This kind of positive development and supportive operating environment arguably gives companies an advantage when doing sustainable business in the Nordic countries. When the host country's government promotes and upholds the same sustainable values and goals as the company, the shift to more sustainable corporate strategy becomes easier due to for example policy decisions

which not only enable but support sustainable solutions and actions.

The Finnish government has committed to reaching the 16 individual goals for sustainability in its Agenda 2030- program. Many of these Finland has already reached or is well on its way to reaching like clean water, clean energy, reaching social equality and eradicating poverty. However, there are still few that require work and development, like increasing climate actions, changing consumer's consumption habits to reduce waste, improve the state of the Baltic Sea and encouraging other countries to target and reach these same goals of the Agenda 2030. (Valtioneuvosto, 2020.) Finland has also set a target for carbon neutrality and a fossil free welfare society by 2035 and this makes the evaluations and analysis of Finnish companies and their sustainable policies and circular business model highly relevant and topical issue (Ympäristöministeriö, 2021). To this end it is relevant to look at how Finnish companies are performing and contributing to the country's goals of better sustainable development. In terms of international comparison Finnish companies have done very well in their sustainable actions as 6 Finnish companies: Neste Oyj, Outotec Oyj, UPM- Kymmene Oyj, Kone Oyj, Metso Oyj and Kesko corporation all reached Corporate Knight's top 100 list of most sustainable companies of 2020 (Todd, 2020).

1.2 Research questions and structure of the study

This study will attempt to discover and analyse the sustainable value creation methods in circular economy by conducting a comparative case study to answer the research questions. The main research question is: How can circular economy business model create sustainable value? The study will analyse the case companies first from a more general viewpoint and then focus on the sustainable value creation via circular economy business model with the following sub-questions.

1. What circular business models or circular solutions are Finnish MNE companies currently using?
2. What circular business actions are the companies using to create sustainable value?
3. How do the circular solutions of Finnish companies differ from each other?

The general analysis of the different business components of the case companies will provide an answer to the first sub-question as the different circular solutions the case

companies have will be presented and analysed. The circular business actions will be identified from the collected empirical data to answer the second sub-question and finally a cross-case comparison will provide an answer to the final sub-question. This study will be limited to the analysis of the Finnish case companies and into the circular elements of their business as circular economy was identified in chapter 1.1 as one of the more promising solutions to create sustainability. Although some of the more general business actions related to sustainability will be included as they were relevant for the study's overall picture of the case companies' sustainable solutions. In this study a comparative case study is done to analyse the circular value creation of Finnish companies and the case companies for the study were chosen amongst the companies listed in chapter 1.1 as they represent the best performing Finnish companies when it comes to successful sustainable solutions and their implementation. The chosen case companies are Kone, Kesko, Neste and Metso Outotec. Finland was chosen as the origin country of the case companies due to its high performance in the international comparison for sustainability, which was discussed in chapter 1.1.

This study began with an introduction to sustainability and sustainable development in business and the motivations of the study were covered in order to justify a need for this study. In the second chapter the elements of the theoretical framework will be presented. These elements are sustainable business model, sustainable value creation and circular economy. A circular economy framework is then presented alongside a secondary framework for the case comparison. Chapter 3 focuses on the research methodologies and methods used in this study. Chapter 4 is the empirical part of the study where the relevant data collected will be presented in a case-by-case form and then analysed and compared. After the comparison and analysis, some final conclusions will be presented in chapter 5 with both theoretical contributions and managerial implications. Finally, in chapter 6, the whole study will be summarised to give the reader an overall view of the topics discussed in the study.

2 Sustainable value creation in circular economy

2.1 Sustainable business model

In order to understand the concept of circular business model which is one of the main topics this theses addresses, it is logical to approach the subject from the point of sustainable business model as the circular model is a sub-category of the broader concept of a sustainable business model. No one universally accepted conceptualization of the term business model currently exists, but a business model is essentially the way a company creates, delivers, and captures value in its business operations (Teece 2010, 173; Lahti et al. 2018, 2; Evans et al. 2017, 598). A business model describes the company's strategic choices and the core logic of its operations (Barquet et al. 2013, 695). Spieth et al. (2014, 238) however points out that the concept of business model should be more holistic and cover all the aspects of the company's operations and not just simply how they do business. For example, elements like technology, business practices, logistics and even corporate culture to some degree, should be considered when innovating a new business model or altering the existing one (Szekely & Strebel 2013, 469). Business model innovation towards more sustainable business strategies is becoming more and more common in international business due to the financial, environmental and social requirements for a more sustainable world and it has pushed forwards the idea of a sustainable business model that not only answers to shareholder's economic demands, but to social and environmental requirements as well (Evans et al. 2017, 597).

For companies, the ability to innovate and incorporate sustainability and sustainable solutions into their operations and strategies has become a necessity to retain their business capabilities (Adams et al. 2012; Teece 2010, 173; Evans et al. 2017, 598). Sustainable business model (SBM) is still an emerging field of study and as such a unified theory of its successful adoption has not yet been created. Even though it is a topic that is currently the focus of many studies, there is little theoretical grounding and a lack of empirical studies, especially case studies, in the field. This current lack of data makes it harder for companies to successfully innovate and redesign their business models to be more sustainable. (Evans et al. 2017, 598.) However, the ability to innovate and redesign ones business model allows the company to adapt to the new requirements of the business and if needed, completely shift its focus and activities to a more sustainable direction. This can enable the company to better work with partners, customers and other

stakeholders as the need for sustainability often comes from them. (Teece 2010, 176.)

Although elements of SBM can be achieved by innovating products, services or new technology designs, one of the best ways to reach true and long-term sustainability is by innovating the business model in its entirety (Yang et al. 2017, 1795). In order to introduce a change of this magnitude in all the levels of the value chain it is crucial to build and uphold long-term and enduring relationships with company's stakeholder groups. The successful balance between different stakeholder interest is a key component in reaching competitiveness through sustainability. (Evans et al. 2017, 600.) When considering the stakeholders in a SBM an argument could be made that the environment should be considered a stakeholder as it is affected by the company's operations (Stubbs & Cocklin 2008, 104). The natural environment has always been affected by business operations, but it has not previously been considered as a stakeholder whose needs should be considered (Evans et al. 2017, 601).

It is relevant to point out that not all sustainability implementation efforts are successful. In general, there are many reasons for why companies have difficulties to innovate and implement sustainable strategies (Chen 2020, 51). Among these are for example the inability to balance the economic, social and environmental requirements of the triple bottom line. If one is prioritized above another, long-term sustainability can be hard to achieve. (Stubbs & Cocklin 2008, 104.) Another problem might be that the company and its employees have a wrong mind-set and change and innovation towards new business models cannot happen. It can be due to organizational norms, rules, or general organizational behavior that prevents the comprehensive commitment to the new operating strategies. (Johnson et al. 2008, 56.) Because of the requirement of comprehensive inclusion of elements and networks have to be considered the number of changes can be overwhelming when designing a new circular model or implementing an existing one (Chen 2020, 51).

The difficulties can also stem from insufficient resources or their allocation to business model innovation and its implementation. The commitment of resources especially in the beginning is an insurmountable barrier for many companies despite their motivations for sustainable change (França et al. 2017, 156). Another problem is the integration of new and sustainable technologies that are needed to follow through with the new business model. These new technologies, like clean technology is a multifaceted element and it can be difficult to integrate. (Björkdahl & Holmén 2013, 216.) The extensive value chain creates a large value network, and its management can be a

challenge and again require more resources than the company is willing to invest (Stubbs & Cocklin 2008, 116; Chen 2020, 51).

The problem can also be the simple lack of strategical guidance and knowledge on how the company should support the sustainable actions (França et al. 2017, 156). The final point is that, as mentioned before, the amount of already existing and tested business models is not large and often they might have a sustainable aspect incorporated into them but are not fully sustainable or driven by sustainability (Evans et al. 2017, 598). In order for a business model to be fully sustainable and long-term, the starting point, motivation and focus needs to be sustainability, with equity and ecological dimensions included and not only economic gain, as it often tends to be. (Yang et al. 2017, 1802; Björkdahl & Holmén, 2013, 220.) When designing a new SBM or adopting an already existing one, one of the most essential elements of the process is the sustainable value creation, which essentially describes what the company is providing for the customer and what added sustainable value it produces. (Tapaninaho & Heikkinen 2021, 2.) This is discussed next in chapter 2.2.

2.2 Sustainable value creation

Value creation, value delivery, value proposition and value capture are the core elements of a business model (Teece 2010, 183; Freudenreich et al. 2020, 3). Value as a concept can have multiple meanings depending on the context, but one that has recently gained interest is the concept of shared value. The idea of shared value is that economic value should be shared by other stakeholders and not just shareholders by creating economic, social and environmental value. (Den Ouden 2012; Porter & Kramer 2011, 381.) There are different combinations of these elements based on where the focus of the activities is and when balanced together a truly holistic sustainability can be achieved. When integrating environmental, social and economic goals the value created is truly sustainable. (Ueda et al. 2009, 685.) According to Hart & Milstein (2003, 58) different ways to create sustainable value are for example, waste reduction, use of clean technologies, pollution prevention, poverty alleviation and reduction of the company's carbon footprint, but also creating a secure working environment for employers and company's long-term financial viability. As this list of shows, sustainable value is a very large umbrella term, that covers elements from all of the three value forms.

One of the core requirements of a truly sustainable business is its ability to maintain its sustainable business operations. Many companies that attempt to engage in

sustainability may succeed first but as the sustainability was not the main driver, it ends up being a short-term success and as such, not truly sustainable. (Evans et al. 2017, 600.) In Figure 2 the practical examples of sustainable value are presented in context with the triple-bottom line framework.

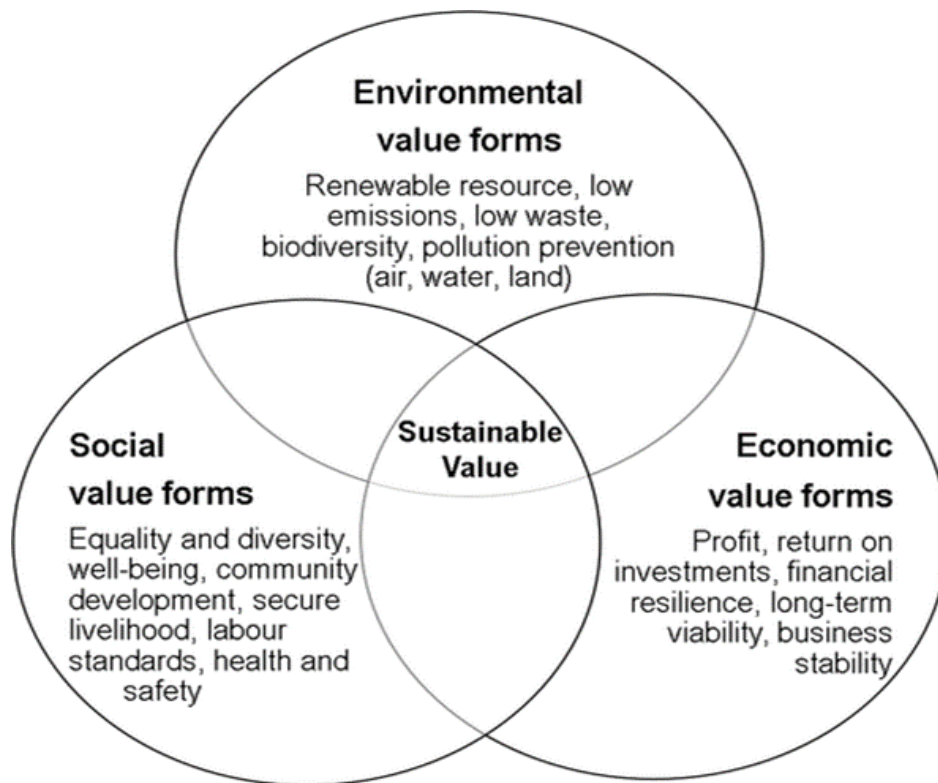


Figure 2: Sustainable value (Evans et al. 2017)

When considering the multitude of actors that are involved in creating any of these different value forms the concept of stakeholders and stakeholder engagement comes to the forefront. The concept of stakeholder was introduced earlier in the introduction and the following will build on that.

It is important to consider all the stakeholders and not just shareholders when attempting to create economic, environmental or social value (Freudenreich et al. 2020, 5). This kind of inclusion in value creation is an important aspect of sustainable business model creation (Stubbs & Cocklin 2008, 106). When the whole stakeholder network is engaged in the value creation, the value flows become multi-directional, and all the stakeholders can be both creators and recipients of sustainable value (Freudenreich et al. 2020, 4). This can be observed for example in different partnerships companies have with each other and in different kinds of shared operating networks like supply chains. Without the mutually beneficial outcomes a company could lose resources and business partners

(Freudenreich et al. 2020, 5).

When designing a sustainable business model, the elements from all of the different value forms need to be considered. Environmental value forms like waste and emission reduction and using renewable materials in production, economic values like profits and long-term viability though economic stability and finally social values like equal rights and good working conditions in a workplace. (Evans et al. 2017, 600.) So, the sustainable values should flow through the collaborative networks and produce value to stakeholders and not just for the company (Freudenreich et al. 2020, 3). This creates a positive value flow that effects the regular stakeholders but also the more recently identified and accepted primary stakeholders like the natural environment and the society (Den Ouden 2012). In order to create equal distribution of value between the stakeholder there might be a need to incorporate a new governance model to maintain stable stakeholder networks and integrate sustainability into the value chain. Moreover, as the sustainable view adds the element of natural environment as a stakeholder, a systemic change might be required. (Evans et al. 2017, 601.) In the next sub-chapter, the focus will move from sustainable business models in general to a specific one, circular economy.

2.3 Circular economy

2.3.1 Circular economy in business

The idea behind circular economy according to Lewandowski (2016, 5) and Stahel (2016, 435–436) is the shift from a linear product lifecycle model to a circular one. In simple terms, in the linear model a product's lifecycle ends as a waste but in circular economy with material loops, recycling, reuse and longer product lifetime the products will not end up as waste (Chen 2020, 48). Many companies like Unilever, Google and the case companies analysed in this study Kone, Kesko, Neste and Metso Outotec have all incorporated at least some of the ideas of circular economy because of the potential environmental, social and economic benefits. However, as Stahel (2016, 436) points out there is still a lot of uncertainty and fear when it comes to circular economy as a business model. This is one of the reasons why the concept and its adoption to business models has been slow to gain traction.

Policymakers around the world have also shown increasing interest towards the circular economy business model as it offers a solution for many global environmental issues, like waste management and resource depletion (Lewandowski 2016, 1–2). As a

sustainable business model, the idea of company's responsibility to all of its stakeholder and not just to its shareholder in order to create and uphold both environmental and social values in addition to economic ones is present in the circular economy business models (Lahti et al. 2018, 2). There is a need for a comprehensive and universally implementable circular model framework as companies large and small are attempting to adapt the ideas of circularity, but as existing models are not compatible from company to company this has not been very successful so far. A circular model that fits a large multinational company in the industrial sector does not necessarily transfer to a smaller national company operating in a different country and in a different sector. (Lewandowski 2016, 2.) This is one of the reasons why there is still some criticism towards the idea of circularity as a solution and doubt that companies would actually move away from the shareholder viewpoint, especially as this would likely have a short-term negative impact on the business performance (Lahti et al. 2018, 1; Stahel 2016, 436). Another thing that makes implementing circular solutions hard is that the operating environment diversity and the industry diversity makes most of the existing circular practices incompatible for other companies without individual adaptation and this kind of adaptation is risky and can be very costly, especially if it fails (Lewandowski 2016, 14–15).

Another issue with circular economy business models is that even though they might aim at high levels of resource reuse and effective waste management solutions, these actions might not always produce sustainability even if that was the goal. There are several circular economy-oriented business models that are not truly sustainable and can even cause degradation of the natural environment. For example, biodegradable production materials is an example of this kind of circular solution that might not be sustainable. Although biodegradable materials might be the more environmentally friendly solution than a product made of nondegradable materials, they also have a shorter product-life cycle and cannot be looped back to production, which is the core point of circular economy. (Chen 2020, 52.) So even though the aim might be sustainable the outcome is not. The concept of circular economy is illustrated in Figure 3.

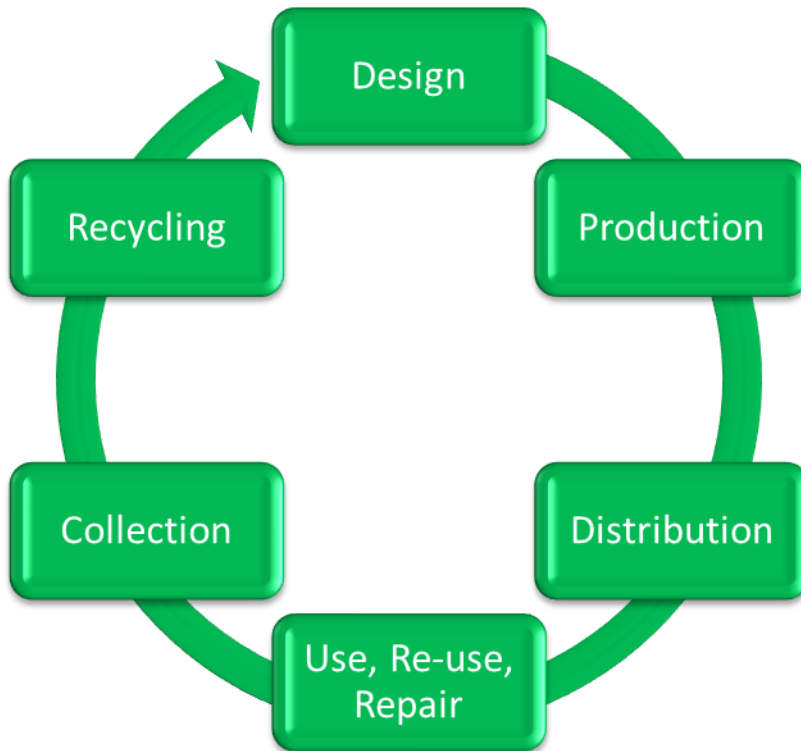


Figure 3: Circular economy (Lewandowski 2016)

As presented in Figure 3, the circular economy process consists of six different stages. In the chronological order from production perspective these stages are design, production, distribution, use, re-use and repair, collection and finally recycling of the product thus looping the materials back into production (Korhonen et al. 2018, 37–38). The reason circular economy has been gaining a lot of attention lately is that it is both cost effective as it can potentially bring savings of hundreds of billions, and it can reduce the impact that businesses have on the natural environment. At the moment, circular economy is considered one of the most promising solutions for sustainability. (Lewandowski 2016, 1–2.) The alternative concept of linear economy is illustrated in Figure 4.



Figure 4: Linear economy (Johansson 2021)

Linear economy is the previous production solution before the ideas of circularity came about. In linear economy the production process starts with gathering of natural resources and turning them into materials, which are then used to manufacture products to be sold. (Chen 2020, 48.) After the products reach the end of their product life cycle, they are often dumped as waste for disposal. This has created significant problems in global waste management as the disposal of materials is often a costly and complicated process. (Stahel 2016, 436.) The use of a linear production model does not mean that no recycling or reuse element were present before circular thinking. The difference was that it was by choice of the consumer where the product ended and there were no active take-back systems from the production and sales companies to loop the material back into production to minimize the requirements of new raw materials.

In circular economy the different methods for producing circularity to create sustainable value can be categorized by business actions. Those actions are regenerate, share, optimize, loop, virtualize and exchange. (Ceptureanu et al. 2018, 312.) Regenerative actions are for example, the use of circular supplies like renewable energy or concentrating business operations into efficient buildings or eco-parks to retain and regenerate the health of the ecosystem. Sharing actions can include different product-service systems like leasing or shared repair and maintenance operations between partners to decrease waste and logistic cost and lengthen the product lifecycles. The main aim of the sharing actions is to maximize the use of a product or s service. (Lewandowski 2016, 6.) Optimizing can be done with better and more efficient asset management by collecting, refurbishing and reusing of products or by better waste reduction in the production. Looping actions come from closed or partially closed material loops where the materials are recycled and reused, or they are produced from bio-based and fully recyclable materials. (Ceptureanu et al. 2018, 313.) Virtualization is simply the

dematerialization of services where products, services and processes are transformed into virtual operations. Finally, the exchange actions are for example designing and using better and more efficient and sustainable technologies in production. The core idea is to replace old and non-circular materials and technologies. (Lewandowski 2016, 8–9.)

When working with sustainability and circular economy and their incorporation into business models an all-encompassing value network analysis is needed and for this a business model canvas and its components are a suitable tool (Stubbs & Cocklin 2008, 105; Sparviero 2019, 237). A traditional business model canvas consists of the value proposition, customer segments, channels, partners, key activities, key resources, customer relations, cost structure and revenue streams (Lewandowski 2016, 4). The topic of business model canvas, its components and its suitability to circular business model analysis is discussed next in chapter 2.3.2.

2.3.2 Circular business model canvas

A business model canvas is an organizational management tool that can be used to present and analyse how a company's business model is built or to design and innovate to create an entirely new one (França et al. 2017, 157). The traditional business model canvas includes nine different elements. These elements are the company's value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, partnerships and finally cost structure. (Osterwalder et al. 2005, 12.) The business model canvas used in this study differs a little from the traditional canvas. Lewandowski (2016, 20) added two circular economy components into the existing framework that observe the take-back systems, the ways the company closes the material loops and gathers the used products back to be recycled and reused. The other one is adoption factors which looks at the surrounding external aspect of the business environment and internal aspect of the company.

According to Lewandowski (2016, 3–4) the circular business model canvas is a modified version of the traditional and it is adapted to better fit to the presentation and analysis of a circular business model. The altered version of the business model canvas offers better understanding to the business model that has incorporated circular actions into its business model. In Table 1 the circular business model canvas is presented with an overview of what the different business model elements can include.

Table 1: Circular business model canvas (Lewandowski 2016)

Partners <ul style="list-style-type: none"> • Cooperation networks and types of collaboration 	Activities <ul style="list-style-type: none"> • Recycling and remanufacturing • New product designs • Policy lobbying • Performance optimization • Technology exchange 	Value Proposition <ul style="list-style-type: none"> • Virtual services • Product-service systems • Circular products 	Customer Relationships <ul style="list-style-type: none"> • Creating shared value via customer input • Community partnerships 	Customer Segments <ul style="list-style-type: none"> • Customer types
	Key Resources <ul style="list-style-type: none"> • Recycled materials • Regeneration • More sustainable and efficient materials • Virtualization of materials 		Channels <ul style="list-style-type: none"> • Virtualization 	
Cost Structure <ul style="list-style-type: none"> • Material costs • Costs from material flows 		Revenue Streams <ul style="list-style-type: none"> • Usage-based • Availability-based • Input-based • Value from material looping 		
Adoption Factors <ul style="list-style-type: none"> • Organizational capabilities • Business environment factors 				

Company's value proposition is one of the core elements of the business model canvas. The value proposition describes what product, services or product-related services the company offers to its customers. (Lewandowski 2016, 16–17.) França et al. (2017, 158) further emphasizes that the products or services usually have some new value adding aspect like customizability, better performance or it can simply be a cost reduction. Customer segments describes the different groups of customers a company has or aims to direct its marketing and sales towards. Channels are the way a company communicates with its customer segments in order to deliver the value created. Customer relationships describes what types of relationships a company has and how they are created and maintained. (Lewandowski 2016, 17.) Different forms of customer relationships can be for example automated service, self-service or personal service. According to Franca et al. (2017, 158) revenue streams describe how the revenues are gained in the business model and from what customer segments. Cost structure describes all the costs that are caused by the business model and key resources lists the essential resources, for example materials, that the business model needs to function. The resources can be financial, physical, human or intellectual. Next element in the business model canvas is key activities (Lewandoswki 2016, 18). It includes all the activities the company performs to create and offer its value proposition. Key partners are the network of actors that work with the company. These can be other companies with whom the company cooperated in for example technological development or simply suppliers or distributor collaborating with the company. (Franca et al. 2017, 158.)

Lewandowski (2016, 20) adds two new components to the traditional business model canvas in order to include the circular dimension into the canvas. This adapted canvas is the circular business model canvas presented in Table 1. The two new components are take-back systems and adoption factors. Take-back systems are the logistical network a company has in place to enable material looping and the management of these systems. When circular economy is implemented into the business model there are factors that a company needs anticipate and counterattack. These adoption factors can be divided into internal and external factors. Internal factors are the organizational capabilities the company needs to adopt circular economy, like relevant intangible resources, suitable organizational culture, required knowledge about circularity and transition procedures. External adoption factors can be governmental policies, customer behaviour and values they have or the availability of external resources. (Lewandowski 2016, 14.) Based on the number of variables and elements in this last adoption factor

segment that need to be considered in order to succeed in sustainable development, it could be argued that the adoption factors are probably the most complex group of them all. Therefore, external factors like the host country's collective attitude towards sustainability and the existing relevant legislation need to be assessed before a company commits to actions. As discusses the value proposition is one of the key elements of a business model canvas and next a value proposition that can be introduced to create sustainable value is introduced.

2.3.3 Product-service system model

Product-service system is one of the ways a company can deliver a new value proposition in addition to for example virtual services or products designed as fully circular. Product-service system is a service-based concept where the intangible service and the tangible product are combined to create value. (Barquet et al. 2013, 694.) This business model can create sustainable value by reducing the environmental impact of production. (Tukker 2015, 77.) Companies can either develop a new product-service system or simply change an already existing concept towards a service orientated concept (Evans 2017, 603). The product can be seen as more of a distribution mechanism for the service (Barquet et al 2013, 694; Vargo & Lusch 2004, 2).

Product-service system design can be a result-based design where a company provides a result instead of a product to reduce material consumption (Reim et al. 2014, 69). Another design idea is shared utilization services where the materials or products are more efficiently utilized through collaborations between actors. Third is a product-life extension services that focuses on repair, maintenance, reuse and recycling of materials and products to extend product-life. This design particularly is strongly connected to the ideas of circular economy. The last product-service system introduced originates from the energy industry and focuses on reducing demand instead of increasing supply and providing the option that causes least environmental and economic costs. A company providing products that are energy-efficient is an example of this system as the energy capacity needed to use the products is smaller and thus more sustainable. (Roy 2000, 81–84.)

2.4 ReSOLVE -framework in circular economy

In order to effectively analyse the collected data, a circular framework called ReSOLVE was chosen to find out how the circular business actions of regenerate, share, optimize, loop, virtualize and exchange apply to different circular business models. This framework is presented in the Table 2.

Table 2: Framework for circular business models (Ceptureanu et al. 2018)

Business action	Models	Description
Regenerate	Energy recovery	Converting non-recyclable waste materials into energy.
	Circular supplies	Use of renewable energy.
	Efficient building	Localizing business activities into efficient buildings
	Sustainable product locations	Localizing business activities into sustainable manufacturing locations.
	Material leasing	Selling company's products/services functions, minimizing impact on the environment.
Share	Maintenance and repair	Maintenance and repair to extend product life cycle.
	Collaborative consumption	A product of service which enables collaborative consumption.
	PPS: Product lease	A non-ownership-based solution for products and services.
	PPS: Availability	Product or service is available for a specific period of time.
	PPS: Performance	Revenue is created by offering a solution.
	Return and reuse of products	Customer is incentivized to return a product to be refurbished and resold.
	Upgrading	Replacing components of products with higher quality ones.
	Attachment and trust	Created products that rely on brand.
	Use of own device	Using customer own device to access a service.
	Hybridization	A durable product contains short-lived consumables.
Optimise	Gap-exploitation	Exploit lifetime value gaps in company's products or services
	Asset management	The internal management of collecting, reusing and reselling used products
	Produce on demand	Business has zero stocks as products are only produced when ordered.
	Waste reduction	Waste reduction is focused both during and before production.

	Outsourcing	More efficient use of materials, human resources and capital goods through outsourcing.
Loop	Remanufacture	Restoring used products.
	Recycling	Recover resources out of disposed products or by-products.
	Upcycling	Materials are reused and their value is upgraded
	Circular supplies	Use of supplies from material loops, bio based or fully recyclable.
Virtualize	Dematerialized services	Changing physical products, services or processes to virtual.
Exchange	New technology	Use of new manufacturing and production technologies.

The ReSOLVE framework offers a total of 26 circular business models or circular solutions that companies can implement into their business models. Therefore, the framework offers a wide variety of solutions making it suitable for a wide array of industries. The ReSOLVE framework was originally developed by the Ellen MacArthur Foundation, which is one of the foremost influencers regarding the topic of circular economy. (Ceptureanu 2018, 312–314.) The framework demonstrates how different circular business model can create sustainable value by regenerating, sharing, optimising, looping, virtualizing and by exchanging. In the Table 3, the framework which this study will use to compare the case study companies is presented.

Table 3: Circular business actions found in the components of the circular business model canvas (Lewandowski 2016)

BM Components	Regenerate	Share	Optimize	Loop	Virtualize	Exchange
Partners		X		X		
Activities	X		X	X	X	
Resources	X		X	X	X	
Value proposition and Customer segments		X		X	X	
Customer relationships						
Channels					X	
Cost structure	X		X	X		X
Revenue streams		X		X		
Added circular BM components						
Take-back system				X		
Adoption factors	X	X	X	X	X	X

As can be observed from the Table 3 specific circular business actions can be identified in certain components of the circular business model canvas making illustration of the cross-case analysis easier and more convenient for the reader. The x indicates that the specific circular business action applies to the corresponding business model component. The framework combines the components of the circular business model canvas and the circular actions derived from the ReSOLVE framework to compare the circular business actions each company has implemented into their operations. It also shows if there are some clear differences and possibly missed opportunities for sustainable value creation. The component of customer relationships is left out of this

framework as none of the circular business actions apply to it directly (Lewandowski 2016, 19).

3 Research design

3.1 Qualitative case study approach

The decision between qualitative and quantitative research method is done mainly by determining the starting assumptions and desired outcomes of the study. When the goal is to give a holistic view of a phenomenon and describe and explain it to enhance understanding, a qualitative research approach is more suitable. (Creswell 2007, 40; Erikson & Kovalainen 2008, 5.) According to Creswell (2007, 40) qualitative study is useful when trying to increase understanding of complex issues. As this study focuses on this very goal, it is appropriate to use a qualitative research approach in this study. Furthermore, due to the lack of quantitative information or statistics into whether adopting a sustainable business strategy, like circular economy, creates value and in what way, this study will use a qualitative approach. When it comes to sustainability and business model innovation, the measurement of achievements such as value creation is very difficult, even though there are several ESG metrics or environmental, social and governance metrics, as the separation of sustainable results is problematic (Evans et al. 2017, 604).

The two main problems in value creation analysis are the above mentioned, lack of accurate measurement systems and the vastness of the value chain (Portney 2015, 24). Especially in multinational corporations whose operations are global, the entirety of the value chain is very difficult to analyse in a clear manner to get specific statistical results (Evans et al. 2017, 601). Therefore, a qualitative research approach is more suitable for this study. In qualitative research there are several philosophical viewpoints and multiple methods for collecting and analysing data (Erikson & Kovalainen 2008, 3; Creswell 2007, 39). The method chosen for this study is a case study research method.

Case studies are often used to study diverse and complex issues (Yin 1989, 14). The case study approach enables the study to compare the cases in order to find similarities and differences between the case companies. For this reason, it is usually meaningful to include cases that represent the studies topic in a comprehensive way. (Erikson & Kovalainen 2008, 117.) The case study method enables the researcher to create holistic view of the target of the case study, focus on several different factors and to create a frame for analysis and comparison of the case targets (Kreuger & Neuman 2006, 34). Rowley (2002, 17) argues that when the researcher has no control over whatever the study is focused on, a case study is an efficient method. In the context of

this study the target of the research is not subject to manipulation or to certain extent even interpretation. Therefore, a case study method is suitable for this study. Eisenhardt and Graebner (2007, 27) argue that in order to reach more holistic and generalizable findings, a case study should focus on multiple different cases. For the purpose of attaining enough information to find similarities and differences this study chose to include four cases. This allowed the study to focus more to each individual case instead of creating a more superficial overview of a larger number of cases. A multiple-case studies usually begins with individual analysis of each of the cases which is then followed by a cross-case analysis to discover similarities and differences between the cases (Eriksson & Kovalainen 2008, 131).

3.2 Case selection

The companies chosen for this study represent multiple different industries in order to give a diverse view of the circular economy operations in business. Eisenhardt and Graebner (2007, 27) point out that if the purpose of the study is to increase the knowledge about a specific phenomenon the case selection should reflect this by including cases that serve the aims of the study. To this end, the companies chosen are all large Finnish companies with multinational operations, multinational partnerships and multinational value chain networks. The companies chosen for this study are Kone, Kesko, Neste and Metso Outotec. The case companies were chosen based on their achievements in successfully implementing sustainable business strategies as well as circular solutions into their operations. They have also all been selected into the top 100 most sustainable companies in 2020 by Corporate Knight (Todd, 2020). These four companies represent different industry segments and therefore will have different opportunities and solutions for engaging in sustainability. All the companies in this study are large Finnish companies with multinational operations which makes their scale of operations comparable.

Eriksson and Kovalainen (2008, 125) point out that the case selection criteria can also be based on pragmatic considerations like feasibility and access. For the purpose of this study these pragmatic considerations were involved as the companies chosen for this study were required to have extensive sustainable reporting available for public use. This was also the reason for choosing only Finnish companies as the sustainable reporting of for example a specific Russian company was considered too superficial to give enough information for a thorough analysis and with a Chinese company that was considered, there was no sustainability reporting available in English.

Kone is one of the biggest companies in engineering and service within the technology industry by manufacturing for example elevators, escalators and automated doors and gates. They also offer service solutions for maintenance and repair in order to add value to the product throughout its lifecycle. The main vision of the company is to provide mobility solutions for people in and between buildings through safe and smart products. Kone is a public limited liability company with around 10 billion euros in sales and as of 2019, they employed roughly 60 000 people. The company is listed in Nasdaq Helsinki and are based in Helsinki. (Kone, Tietoa meistä.) Based on the most recent sustainability report Kone has integrated the sustainable ideas into its strategy and even though the business remains economically led, the company has made significant efforts to balance the driving forces of business operations. Kone has been consistently reporting the sustainable elements of their operations since 2008. (Kone, sustainability report 2021.)

Kesko is a retailing multi-industry company or a conglomerate that operates in Finland, Norway, Sweden, Estonia, Latvia, Lithuania, Poland and Belarus through its 1800 operating locations. Their business areas include daily retails like groceries, sales of building technique and housing technique and car sales. They also provide an extensive online shopping service. K-group, which is formed by Kesko and the individual K-retail entrepreneurs under the K-group, reached 13 billion in sales in 2019. K-group is the largest business in its industry in Finland and one of the largest in Northern Europe with about 43 000 employees. They have set a goal to be a leader in circular solutions in the industry. Kesko is a public limited liability company based in Helsinki and listed in Nasdaq Helsinki. (Kesko, Kesko lyhyesti.)

Neste is one of the world's largest companies producing renewable fuels and airplane petrol. They offer solutions in the industries of plastic production and its waste management, chemicals and oil refining. Neste reached 15,8 billion euros in sales in 2019 and has roughly 300 000 employees worldwide. Neste has sustainability goals for example to support its clients to decrease 20 million tons of greenhouse gasses per year by 2030. (Neste, Tietoa meistä.) Neste reached third place in the listing of most sustainable companies in the world, made by the Canadian research firm Corporate Knight. They have been on the list 13 consecutive times making them the best performing energy company in the world, when it comes to sustainability. (Neste, sustainability report, 2019.) According to Portney (2015, 37) sustainable energy solutions are one of the most researched fields of sustainable development. This makes studying Neste and its

sustainable operations highly meaningful and essential.

Metso Outotec is a newly formed company that was created via the merge of Metso and Outotec to unify their business operations and gain advantages of cost synergies and production synergies. The company's business areas are processing solutions, products and services for metals, minerals and aggregates. The company operates in 8 market areas which are North and Central America, South America, Africa, Europe, Russia, Middle East and India, Greater China and Asia Pacific. In the aggregate business Metso Outotec has its own product brand, but they also sell products from other brands like Shaorui, Jonsson and McCloskey. The company employs more than 15 600 people in more than 50 countries. Their sales are equally distributed between their different market areas with Europe in the lead with 28% of the total sales. Minerals are the highest sales segment for the company with 60% share of the total sales. (Metso Outotec, Business overview report 2021.)

3.3 Data collection

According to Eriksson and Kovalainen (2008, 126) the use of secondary data is common in case study research. This secondary data can be for example annual reports, letters or progress reports. Already existing empirical data is sometimes even preferable in terms of evidence and as they offer transparency to the study. The data for this study was collected from the sustainability reports of the case companies. Eriksson and Kovalainen (2008, 126) argue that it is important to consider the original purpose of the existing data as it might impact the content and validity of the data. As the focus of this study is to gather and analyse information about sustainability, official sustainability reporting is a suitable source of information. Sustainability reports from two years were analysed for a more holistic view of the case companies' circular business actions. Data was collected from all the four case companies, but due to the novelty of Metso Outotec as a company, the multiple year approach was not applied and only the most recent sustainability report included in the data collection as there did not exist earlier reporting from the new company and the separate analysis of the companies Metso and Outotec from previous years would have created essentially two different analyses of two different companies.

The information about the case companies came from the companies' published information, like sustainability reports, dealing with their actions, achievements and goals regarding sustainable strategies. Already existing secondary materials was used as the study involves companies that have multinational operations and deals with

complicatedly measurable problems. Interviews and other methods of collecting first-hand information are not practical for this study as the information gained from them would likely be very similar to the information gained from the corporate reports and thus would likely yield little or no new information relevant for the study. In addition, there is no valid reason to assume that the information gained from interviews would be any more reliable than the information collected from the companies' official reports and therefore the information gathered from secondary sources was considered sufficient. Flick (2007, 69) points out that as interviews create considerations regarding participants privacy, right to use the gained information and the decreased transferability for another research to access the same data, interviews are not necessarily the optimal method for data gathering in qualitative research. The sustainability reporting used for this study are listed in appendix 1.

3.4 Data analysis

The empirical findings are analysed via deductive structural coding. Deductive coding was chosen for this study as suitable coding categories already existed and therefore the creation of new ones was considered unnecessary. Deductive structural coding is the systematic process of theory driven classification and structural organizing of the themes or issues found in the collected empirical data (Eriksson & Kovalainen 2008, 129). In this study the sustainable business models used by the case companies are identified and the elements of circular economy analysed in order to find the sustainable value creation methods of their business models. For this study, pre-existing codes derived from the ReSOLVE framework and the categorisation of the organizational management tool circular business model canvas were used to organize and analyse the gathered information. The coding categories of circular business model canvas were used as they are suitable for the purpose of this study. They present a clear way of categorising the information relevant for the circular operations of the case companies. As presented in the theoretical part of this study, the modified version of the generic business model canvas was used to compile the relevant aspects of the case companies' business models. This modified version of the business model canvas is more suitable for this study as it includes the two new dimensions which are relevant for the analysis of the circular elements of the business models. Lewandowski (2016, 4) supports this argument by stating that the circular business model canvas offers better results when analysing circular elements of a business model.

For the purpose of the cross-case analysis that is presented in the chapter 4.5, a combined coding category is introduced in the theoretical part in chapter 2.4 in table 3 in order to present a framework to compare the circular business elements and circular business actions of the four case companies to find similarities and differences between the case companies and in what circular business model canvas components they can be found. Given that this study only focused on one case company per industry sector, no overall generalization can be made, but some interesting differences between the case companies' circular models is presented which led to managerial implications discussed in chapter 5.2.

3.5 Evaluation of the study

When conducting research, it is important to evaluate the trustworthiness of the study and its results. According to Eriksson and Kovalainen (2008, 134) a case study can be evaluated with similar criteria as any other research. The evaluation criteria used for this study is the evaluation criteria developed by Lincoln and Guba (1985) which includes four criteria for the evaluation of the trustworthiness of a research study: dependability, transferability, credibility, and conformability. Eriksson and Kovalainen (2008, 294) define the first element of dependability as the availability of the research materials for the reader to verify the data used. Given that this study used pre-existing secondary materials which are available for the public, this requirement of the evaluations was filled. The specific sustainability reports used for the data collection are listed in the Appendix 1, giving the reader access to the same source material that were used to create this study. A point of note is that the case study of the companies' circular economy actions was based on the information gathered from the companies in question. This makes the information subjective, and this could be observed when reading the sustainability reports. The companies advertised the sustainable actions they had done or were trying to achieve, but understandably there was no mention of the element of circularity that their operations lacked, or they had failed to achieve. In the study the aspects that were not specifically mentioned in the sustainability reports were assumed not to exist and based on this the amount of sustainable and circular actions evaluated.

The second criteria of transferability evaluates whether the study is similar to previous studies conducted about the same topic and is it likely that the future studies will come to the same conclusions (Eriksson & Kovalainen 2008, 294). The findings of this study were consistent with the theoretical assumption used to create the theoretical

framework for this study. The elements of the used theoretical frameworks were consistently found from the business models of the case companies and so it can be stated that the as the theory-based expectations were met it is likely that similar studies will come to similar conclusions, making the study repeatable in a different context.

The third criteria according to Stake (2005, 453) is the credibility of the study. The accuracy of describing the topic of the study is at the centre of credibility. The target of this study was stated in the research questions and the topic which this study focused defined in the introduction. The theory in which the study was based on was collected from multiple sources to improve the credibility of the study. The fourth and final criteria for evaluating the trustworthiness of a research study is confirmability which means that the conclusion presented need to be easily and understandably linked to the data provided (Eriksson & Kovalainen 2008, 294). The conclusions presented in this study are directly linked to the derived data gained from the analysis. In conclusion, this study meets all of the criteria of trustworthiness of a research study.

In terms of ethical considerations Eriksson and Kovalainen (2008, 62) argue that ethical principles govern all research and therefore should be taken into consideration. Ethical considerations are especially important when conducting interviews in case studies or in ethnographic studies. Different elements of ethics that need to be considered in business research are anonymity, confidentiality, trust, informed consent and professional integrity. This study used only publicly available information and the researcher was objective and did not impact the data but observed and analysed pre-existing materials, so the issues of confidentiality and consent did not create problems. Due to the use of secondary data, there was no interaction with members of the case companies and therefore trust and anonymity did not present a problem. The materials used for this study were official company reports and are available for other researchers to study and evaluate the data that this study's analysis was based on. Furthermore, the use of the plagiarism checking software validates the integrity of this study.

4 Findings and analysis of the cases

All of the case analysis are based on information collected from sustainability reports of the case companies and they are listed in Appendix 1.

4.1 Case 1 – Kone

4.1.1 Kone's Value proposition and Customer segments

Kone offers both ownership-based products like auto walks, escalators, automated doors and elevators, but also service-based solutions. They can create added value for their products by offering for example repair, maintenance, upgrade or refurbish options to extend the product-lifecycle. A good example of this is Kone's KONE Care DX, which is the first carbon neutral maintenance service in the elevator industry. In addition to repairing and maintaining their own products, Kone also offers its customers repair and maintenance to other manufacturer's products. An example of the company's product lifecycle extension designs is KONE UltraRope. It is a high-rise hoisting technology that offers twice the lifetime compared to a conventional steel rope. This is a good example of Kone's product optimization in their value proposition. Another form of optimization is their product's energy efficiency. When compared to Kone's own earlier models back in 1990, their current volume elevators are 90% more energy efficient.

The value proposition differs based on the customer as the need of one customer differs from that of another. Kone has enhanced its circular economy by introducing digital service transformation and offering its customers remote data collection and analysis systems. Technically this kind of availability-based product-service system can be argued of filling the definition of the circular action of sharing as bilateral information flow adds value to both the company and the customer. The remote service is available to the customer if the customer is using Kone's products. Furthermore, as the remote service platform is meant to give information both to the customer company and Kone this enables the bilateral sharing of information between two actors. This kind of virtual service is also clearly a value proposition which includes the circular business action of virtualization. The customer segment of Kone is comprised of building owners, builders, facility managers and developers. By collaborating with its customers Kone can bring more sustainable solutions into its customer companies and in this way cause a ripple effect that flows to its customers' value networks by promoting sustainability.

4.1.2 Kone's Channels and Customer relationships

Kone interacts with its stakeholders through its website, social media channels, company reports, press releases and other marketing material. They also provide around the clock data analysis for their products in order to predict maintenance and avoid unnecessary repairs as they cause more logistical costs and waste. As can be observed Kone has integrated the ideas of virtualization which is one of the main ways to implement circular thinking into the channels of communication. Providing virtualized value by communicating with clients virtually and providing virtual services Kone has strongly brought circularity to its channels of contact. By using these virtual communication channels Kone periodically and systematically collects customer feedback to enhance its products and supply chain to better accommodate the customer's needs.

The company is further engaging with its customers even on the design stage of its operations as Kone has joint technology design operations to co-create circular solutions. They also offer customized product solutions, so they produce on order to match the customers' requirements. The circular business model canvas of Kone is presented in Table 4.

Table 4: Kone's circular business model canvas

Partners <ul style="list-style-type: none"> -Technological partners -300 educational institutions -Co-creation with customers 	Key activities <ul style="list-style-type: none"> -Optimizing performance -Durability testing -Six Sigma – quality management -24/7 remote maintenance -Waste recycling and zero waste to landfill 2030 	Value proposition <ul style="list-style-type: none"> -Virtual information sharing service -Carbon neutral KONE Care DX service -KONE UltraRope -Availability based Product service systems 	Customer relationships <ul style="list-style-type: none"> -Produce on order -Co-design with customers -Collaboration with community partners 	Customer segments <ul style="list-style-type: none"> -Building owners, builders, facility managers and developers
	Key resources <ul style="list-style-type: none"> -Recycled materials from installed machinery -Optimized material manufacturing Renewable energy 		Channels <ul style="list-style-type: none"> -Virtualization in communication and data sharing 	
	Take-back systems <ul style="list-style-type: none"> -Take-back systems for packaging products and materials 			
Cost structure <ul style="list-style-type: none"> -Reduced production costs <ul style="list-style-type: none"> -Recycling and looping materials -Decreased need for raw materials -Optimizing the use of wear parts -Reduced logistical costs <ul style="list-style-type: none"> -Maintenance data monitoring system -Use of circular supplies: renewable energy 		Revenue streams <ul style="list-style-type: none"> -Availability-based 24/7 maintenance service -Value of collected and recycled materials 		
Adoption factors <ul style="list-style-type: none"> -Impacting policies by being part of international organizations for sustainability -Over 5000 patents granted or pending -Employee training for both own and partners employees -External recognitions for sustainable and circular actions -Internal policies for better performance 				

4.1.3 Kone's Revenue streams and Cost structure

Kone receives revenues through the conventional means by selling products but also by offering product-system services like availability-based service concepts like the 24/7 remote maintenance. This type of preventive and predictive service can decrease the use of excess materials, waste of production and reduce logistical emissions. By optimizing the use of their products and targeting maintenance to when actually required Kone is most likely saving in logistical and manufacturing costs due to reduced requirements for example for spare parts and physical maintenance services. All Kone's recycling operations performed during repair services are also revenue streams as they retrieve value from materials collected back and looped into new production.

When it comes to Kone's cost structure, the circular economy actions of regeneration through use of clean energy, sharing technology between partners and using the most resource-efficient manufacturing methods and looping materials for reuse thus saving the sourcing costs of new materials, have all had a positive effect on Kone's economic performance. The company also recycled 91% of its produced waste reducing the need for new raw materials and creating economic value via looping actions. Given the amount of waste Kone produced last year, 37,400 tonnes, by recycling majority of the waste produced they created significant amount of environmental value in addition to economic value.

4.1.4 Kone's Key resources and Key activities

Kone is improving the resource efficiency of its operations by reusing packaging materials, recycling waste and using robotics and automation to optimize material manufacturing. In 2019, 90% of the metals used by Kone in their production were recyclable and the packaging material for their product were recycled and reused in manufacturing, distribution or by suppliers. By using better performing and recycled materials in production of new equipment and spare parts Kone is both looping its resource and optimizing they effective use. Given the company's business industry is manufacturing, the dematerialization of products is not really applicable for the company even though the virtual service provided by their remote monitoring solution can be considered as offering a virtual evaluation service instead of a physical maintenance inspection.

Kone is constantly designing new, cleaner and smarter products to optimize their

performance and to add sustainable value to the products by creating material loops with the aim of achieving closed material loops in order to reduce waste. In regard to waste management Kone has set a target of zero waste to landfill in 2030, which is a clear signal of their circular efforts to create sustainable value. When it comes to research and development the company has 7 global R&D units and they spent 1,8% of total revenue to new R&D projects. Kone also provides, as mentioned before, service-based solutions with their real time information collection and analysis regarding product repair and maintenance. This value adding and product life lengthening feature of their products is a good example of a combination of PPS that incorporates the ideas of product-life extension and the availability-based solutions.

In order to optimize their operating performance Kone uses the Six Sigma tool to better enhance its quality management. The core idea of this tool is to provide the ability to measure and analyse different parts of the business processes to enhance them in order to make operations more efficient. As part of this quality management Kone actively tests its product component in changing environmental conditions to enhance product reliability and resilience. All of this performance optimization is intended to produce products with long product lifecycles and so enhance the circularity of their product development.

4.1.5 Kone's Partnerships

Kone collaborates with companies that provide for example architectural and consultant services. Technological partners are also a key aspect for Kone as they enable the company to share technological solutions. Kone also has collaborations with more than 300 universities and educational institutions. By working through cooperative networks Kone receives advantages by sharing for example product designs, logistical networks, production processes and research. By doing this Kone can simultaneously, better obtain key resources and enhance its key activities, making its different value chain operations interconnected.

Kone is also actively trying to reduce the waste and emission from packaging related operations by not only optimizing their own packaging but by managing this for their suppliers and other members of Kone's supply chain. Kone has brought the circular economy actor of sharing into its dealings with partners, but they still seem to lack any shared material loops to gain the advantages of a shared closed material loops. This could be achieved for example through some form of collaborative production operations. Kone

has 13 manufacturing facilities in countries like Finland, the United States and Italy so there are opportunities to work with partners from the same manufacturing industry if the company is motivated to do so.

4.1.6 Kone's Adoption factors and Take-back systems

Kone does seem to have sustainable ideology strongly embedded into their corporate strategy as they have created and implemented several policies to enhance and monitor this. The company has policies like Environmental Excellence Program, Kone's Code of Conduct and Competition Compliance Policy. The company is also committed to external global goals and initiatives like UN sustainable development goals and Paris pledge of action. Kone is involved in these organizations that promote sustainability in order to advance the goals of sustainable development. This organizational culture shift towards more sustainable values has most likely enhanced motivation in employees who share these values.

According to the company, Kone periodically organizes learning opportunities and training for its employees and even to its partners and their employees to further increase the sustainable and circular thinking amongst its internal and external stakeholders. Kone is part of organizations like the World Business Council for Sustainable Development, Cleantech Finland, United Nations Global Compact and Climate Leadership Coalition and many others. By collaborating with organizations promoting sustainability Kone has been able to affect the conversation and actions around sustainability circular economy. Given the global operating scope of the company, Kone has also taken into account the different sustainable policies and local legislation of their operating countries and it is involved in improving them with their own sustainability standards. This kind of active operating environment monitoring could be considered vital as the public opinion and the governmental policies towards sustainable actions can change in an instant. To reuse the example of Donald Trump and the situation in the United States during his term in office, President Trump's actions against sustainable ideas serve as an example to the possibility of radical change in the operating environment where Kone has production operations. Therefore, being aware of the dynamic operating environment is crucial in order for the company to adapt to changes.

As discussed previously Kone is constantly developing more sustainable technologies to offer more energy efficient solutions and to be as resource-efficient in its production as possible. Towards this end Kone has currently over 5000 patents granted

or pending. The internal capabilities like creation of new patented solutions are essential when competing in sustainability with their global competitors. By sharing these technological innovations with their partners, they are enhancing circular economy in other companies as well as in their own.

Trust in the company and product attachment are important brand related elements that can increase the social value of a company and its products (Lewandowski 2016, 17). In this regard Kone has done well branding itself as a sustainable actor and marketing smart and sustainable solutions to its customers. They are also aware of the changing demographics and the growing demand for sustainability as well as the impact society around them has in creating shared value. This shared value creation is done for example via the collaboration with educational institutions as mentioned earlier.

As Kone's main business operations are manufacturing and installing elevators and escalators that have long lifecycles the need for active take-back system in terms of collecting old equipment is not as important as with products with a shorter life cycle. In terms of take-back systems Kone is more focus on for example recovering, recycling and reusing packaging materials and the manufacturing waste from production. In order to accomplish this the company has logistical chains in place to circulate reusable packages between their distribution centres, suppliers and manufacturing unit. Although this is not actually recycling, the reuse of products can be considered as active take-back system. Therefore, it can be argued that Kone has active looping actions embedded into their operations despite its focus on packaging related materials instead of actual product.

4.2 Case 2 – Kesko

4.2.1 Kesko's Value proposition and Customer segments

Kesko's value proposition is built around the chain business model of independent K-retailer operations covering about 45% of Kesko net sales, but also around building and technical trade, online stores and car trade. Kesko creates sustainable value through its car trade by having electric cars and hybrid cars in its selections and provides a value adding service through an extensive charging network in 99 of its store locations. The electricity provided in these high-charging power stations is renewable energy produced with Finnish wind power. In their online based K-ostokset service Kesko provides additional value by informing the customers for example the carbon footprint of their purchases. This service system offers customers better options to be sustainable and

choose recyclable and sustainably produced products. In terms of fully circular products Kesko has increased products in its selection that are made from for example food waste and are fully recyclable making them fully circular products.

Kesko's customers consist of day-to-day grocery customers, building and housing related customers of K-rauta and car sale customers of K-caara. K-caara offers a usage-based service in a form of car rental service. This products lease PSS circular model is an example of sharing based value proposition as it moves away from the traditional notion of ownership-based value proposition that most of the other Kesko's products are included in. The circular business model canvas of Kesko is presented in the following Table 5.

Table 5: Kesko's circular business model canvas

Partnerships -Technology partnerships -Digital partnerships -Shared material loops with L&T -Cooperation with NGOs and institutions -Training partner's employees in India	Key activities -Energy efficiency solutions -Donating past sell date food -40 solar plants -Creation of carbon neutral grocery stores -Non-edible organic waste for energy production	Value proposition -Fully circular products -Digital K-ostokset service -Car purchase and rental service	Customer relationships -Customers impact on the products sold -Engagement with surveys and inquiries	Customer segments -Retail customers -Building and housing related -Cars sales and rental
	Key resources -Products are more recyclable, reusable or biodegradable -More efficient use of plastic in packaging		Channels -Virtualized communication and engagement	
	Take-back systems -407 Rinki eco take-back points -Reverse logistics operation for purchase loads, carrier trays and roll containers			
Cost structure -Improved asset management -Energy efficient solutions		Revenue streams -Circular products -Car leasing -Sale of electric cars		
Adoption factors -2,3 million euros in financial aid -Sourcing policies and supplier audits -Energy Efficiency Agreement and Single-Use Plastics Directive -Team building and training				

4.2.2 Kesko's Channels and Customer relationships

Kesko's business model is mostly based on physical products as the main source of income. This is difficult to change to a virtual value proposition. However, the online service offers a virtual channel to shop, but as most of the products are still in physical form this is not fully circular service. Kesko does use virtual communication like online marketing and social platforms to communicate with its customers and other stakeholders. They organize customer surveys, virtual press conferences and different kinds of activities to engage with stakeholders. These engagements can be about biodiversity, sustainable products or food waste and circular solutions to prevent this.

As Kesko is mainly a provider of daily consumer products, they do not offer product on demand, like for example machinery manufacturing companies. That kind of waste reductive solution would not be suitable for Kesko's business model. Kesko has however provided a solution for the problem their business model creates by increasing the offerings of products made from food waste.

Kesko has commercialized sustainability by creating products that are branded as sustainable. This marketing strategy to promote sustainable products is especially viable in Kesko's operating countries as the public opinion is favourable towards sustainable development. Kesko provides recycling information attached to its products and information about the products sustainability so that consumers can better choose sustainable products. This action in itself, is a value creating as for many customers the knowledge of sustainable production makes the product more appealing due to the positive attitudes towards circular thinking. With this kind of sustainable marketing strategy Kesko is also improving its brand as a sustainable provider of goods. As the company also engages with customers to gain their opinions on products offered the company is giving its customers means to impact the circular and sustainable offerings.

4.2.3 Kesko's Revenue streams and Cost structure

Kesko's main revenue stream is selling of retail products as they cover about 45% of the company's overall sales. One revenue stream that can be considered circular is the K-caara's product service system of leasing cars to customers. The car sales of electric cars and the sales from circular products sold by K-retailer are also revenue streams that come from circular solutions.

Kesko has optimized its cost structure related to material costs with improved asset management for example updating refrigeration systems, more efficient heat recycling systems and using LED lights. For reference, the switch to LED lights has reduced the electricity consumption of lighting by 40KWh/m², which in turn has created annual savings between 5000 euros and 50000 euros depending on the store size.

4.2.4 Kesko's Key resources and Key activities

Kone was awarded the Energy Genius of the year in 2019 by Motiva for their energy recycling model. This model is capable of reducing heat consumption in stores by 95%. When it comes to sustainable sourcing of materials, Kesko is involved in its suppliers' operations by implementing and monitoring policies for different resources. Kesko has policies for example sourcing of timber and paper, cotton, palm oil, cocoa, soy and fish and shellfish. By enforcing these policies Kesko can affect its suppliers in a meaningful way to promote sustainability and circular economy by buying recyclable and biodegradable products. The company is still trying to reach some of their policy goals so it remains to be seen if Kesko will reach its targets and how effectively it can uphold them long-term.

In terms of circular materials Kesko has set a plastic policy, which states a goal for 2025 that all of the packaging used in Kesko's own brand products will be recyclable, reusable or biodegradable. A secondary objective of the policy is to reduce the amount of plastic contained in the packaging of their own brand products by 20% by the end of 2025. Currently they have reached a 12% reduction compared to the 2015 level. The circular business actions of optimizing product design and material and the action of enabling the looping materials are observable. Kesko has a related policy regarding excess packaging that further brings out the circular action of optimization.

Kesko optimizes the resource and product usage by donating around 90% of grocery product to local charities when they cannot be sold in stores because of expiration dates. This significantly reduces the food waste that would exist otherwise. 100% of Kesko's electricity comes from renewable sources and they currently have over 40 solar plants owned by Kesko to produce sustainable energy for the company's operations to optimize energy efficiency and create environmentally sustainable value. Through the use of renewable energy and switching to biofuels in transports in Finland Kesko aims to reach carbon neutrality by 2025.

Kesko has been working with Natural Resources Institute to create carbon neutral

grocery stores, which they have tested out in three K-food stores. The purpose of this model is to analyse and then reduce the carbon footprint of the stores to match Kesko's overall target of emission reduction. This kind of analysis and optimization tool can be an effective way for the company to firstly become aware of the carbon footprint and then choose appropriate actions to reduce the emissions. Given the number of K-food stores in Finland and abroad, this has significant potential if they manage to gain meaningful results and then act on the data received. This can also be a branding tool as Kesko can inform precise data to the customers regarding the company's carbon footprint and given that Kesko's most significant climate impact is the 94,000 tCO₂ yearly emissions, this is arguably the single most effective way for the company to produce sustainable value.

Kesko is also reducing food waste with actions like price reductions for products with a closing best before date, donating edible waste food and providing non-edible organic waste for energy production. Kesko is working with Gasum to produce biogas from the food waste and in 2021 approximately 5,800 tonnes of organic waste were turned into 4,290 MWh of biogas. Overall, Kesko has taken a systematic approach to reduce waste with a food waste roadmap meant to better structure the existing waste management and to innovate new ways of reducing food waste. An example of this more systematic approach is more efficient forecasting of demand and better material requirements planning.

4.2.5 Kesko's Partnerships

Kesko has formed partnerships in the field of information technology to build long-term strategic business relationships. They are working with strategic partners like TietoEVRY, digitalization partners like Elisa, Futurice and Reaktor and technology partners like DieboldNixdorf, Euvic, Fujitsu and OpusCapita. With its partners Kesko is developing better and more efficient enterprise resource planning systems and new technologies, for example automated solutions.

Kesko invests into communal activities like NGO's and science and education to promote social and environmental wellbeing. Kesko has also promoted sustainability and circular values to countries it does not have a significant presence as a company, but where its suppliers operate. Kesko organized a sustainability training for its local suppliers in India together with ICA Global sourcing in 2019 to discuss matters like product quality and suppliers' social responsibility requirements. Kesko has created shared material loops by collaborating with Lassila & Tikanoja to recycle its old working

clothes to be reused in future production and working with Globe Hope to recycle coffee packages. This kind of material looping is a good example of circular business model and Kesko has added the shared value creation dimension as they have partnered up with L&T.

4.2.6 Kesko's Adoption factors and Take-back systems

Having operations in countries like Finland and Sweden has proved beneficial for Kesko as they have received around 2,3 million euros in financial aid in order to build the electric car charging networks and to produce renewable energy like solar power. Kesko has developed its human resources to promote and uphold the company's sustainable strategies through team building and training. As the other member of the duopoly in the Finnish day-to-day grocery business with S-group, Kesko has a strong position to introduce sustainable development operations without risking its market position. Kesko has also retained its financial performance stability despite of its circular actions, which shows the readiness of the business environment in which they operate to be sustainable. This is the case for example in Finland and Sweden as their national business environments are highly supportive of companies' sustainable solutions.

Kesko has multiple ways to impact its supplier via different sourcing policies and supplier audits that the company conducts for suppliers located in high-risk countries. Kesko is for example part of the IGS (ICA Global Sourcing), which has Environmental Assessment policy where suppliers' energy consumption and material sources are evaluated. By monitoring their suppliers sustainable practises Kesko is trying to optimize the entire supply chain. They also have responsibly to meet for example the energy efficiency target set in the Energy Efficiency Agreement for the retail sector by 2025. The company has already reached this target by reducing energy consumption by 80 GWh from the 2015 level.

Another relevant external requirement for Kesko is the Single-Use Plastics (SUP) Directive which was put in place in August 2021 to promote circular economy by reducing plastic waste in the environment and to harmonize EU regulation. The directive includes targets to reduce consumption and measures for market restrictions. Kesko is also a part of a joint research project called 4EverPack to gather data about the potential benefits but also possible drawback of reuse. This is a joint project including multiple Finnish companies and run by VTT together with the University of Vaasa.

In regard to take-back systems Kesko has 407 Rinki eco take-back points in its

store locations for customers to return cardboard, glass, plastic and metal packaging for recycling. They also offer their extensive plastic bottle recycling service for customers to enable sustainable behavior and decrease plastic waste in the nature. Furthermore, Kesko has a reverse logistics operation to collect purchase loads, carrier trays and roll containers.

4.3 Case 3 – Neste

4.3.1 Neste's Value proposition and Customer segments

Neste offers renewable jet fuel and diesel and solutions for chemicals and polymers industries. Neste has managed to create economic value by creating a sustainable brand which encourages customers with same sustainable values to do business with Neste. Neste is creating social value by aiming to reduce transportation emission in and around communities and cities and finally environmental value by shifting from the use of fossil fuels to more sustainable options. The main customer segment for Neste are the transportation actors on land and in the sky, from individuals to airlines and consumers in the energy industry.

Neste's whole business model is built around sustainability and by 2030 they will have three renewable business areas. These are renewable aviation, renewable road transport and finally renewable polymers and chemicals, which will all offer new or effective ways of producing value to the customer with circular products. Although the value proposition Neste is offering is not fully circular, the company is getting closer as the renewable products they produce are made almost entirely of recycled waste and residue. If they ever reach the point where production materials for renewable energy supply come 100% from recycled materials the value proposition will be fully circular, and they can offer a fully circular product. Neste also launched a digital service to provide their customers information regarding their transport fuel emissions called MY Renewable Diesel. This kind of digital service creates circular and therefore sustainable value by virtualized value proposition. Neste is the first company in Finland to offer this kind of monitoring service and it will likely be very useful for Finland in general in order to reach the country's carbon neutral target by 2035. Given that the demand for renewable diesel will likely keep growing the monitoring service Neste provides will become more and more useful in the future as Finland transitions to renewable fuels. The circular business model canvas of Neste is presented in the following Table 6.

Table 6: Neste's circular business model canvas

Partnerships -Shared R&D projects -Cooperation with supplier in Southeast Asia -Veturi Ecosystem -Foreign community partners	Key activities -1 Mt of waste processed annually -Development of more efficient technologies -CO2 recovery plant	Value proposition -Renewable jet fuel and diesel -Sustainable solutions for chemicals and polymers industries -Products made of recycled waste -MY Renewable Diesel	Customer relations -Engaging with community partners -Bi-annual stakeholder study	Customer segments -Transportation actors on land and in the sky
	Key resources -Materials from waste and residue -Refineries use waste produced by other companies -Energy recovery		Channels -Virtual communication with stakeholders	
	Take-Back Systems -Reverse logistic networks -Looping collaborations			
Cost structure -Recycling production materials -Use of energy efficient solutions in operations		Revenue streams -Sale of renewable energy -MY Renewable Diesel service solution -Sale of recovered CO2		
Adoption factors -54 million euros in research and development -Committed to Chemical Industry Federation of Finland's goal for sector wide carbon neutrality by 2045 -Circular economy award by Sitra and Laatuokeskus -Cooperation with Finnish energy companies -Supplier policies -Strong renewable fuel patents portfolio				

4.3.2 Neste's Channels and Customer relationships

As the products Neste offers are mainly physical the virtualization of products is not plausible. Neste does however use online communication means like social media to deal with its stakeholders. Neste engages with its customers to build better relationships to the customers and to the community in order to change and uphold their customers' values to reflect the company's own. By creating and improving their brand through social-marketing strategies Neste is in a position to effect change. Neste is continuously building its relationships with the community and engaging with community partners to create shared sustainable value in forms of pollution prevention, better social well-being and reduced emissions.

Building on the brand of sustainable company that offers circular solutions for its customers, Neste is in a position to build better community relationships in locations where sustainability and circular thinking are valued. Furthermore, engaging with local authorities, interest groups and other local communities Neste and other similar companies can change the local opinions regarding sustainability and circular economy. To assess the local stakeholder opinion Neste organizes bi-annual stakeholder study at its refinery in Porvoo with the goal to better understanding the current public opinion and whether there are for example environmental safety concerns that the company should address.

4.3.3 Neste's Revenue streams and Cost structure

Neste's revenue stream comes mainly from traditional product and energy sales and the service solutions they offer to monitor and measure emissions. A circular aspect of their revenue stream is the material loops the company reaches due to their recycling and waste management operations, including chemical recycling. Neste also sells some of its CO₂ generated and then recovered by their refining operations for example in Porvoo, to local gas companies. By performing these material and energy looping actions Neste is bringing circular development to most of its operations.

Like Kone, Neste gains from recycling production materials to be reused and from new material costs that can be saved. The financial changes of the corporate cost structure are not presented in detail in the company's external reporting, but as statistical analysis

of the companies' economic performance is not the topic of this study, this does not present a problem.

4.3.4 Neste's Key resources and Key resources

Neste gets 80% of the materials used for renewable product production from residues and waste and all of their production units for renewable products have the technical capability to run on residue and waste. Here the circular business model of energy recovery is present as Neste is converting waste materials into electricity and fuel. Neste has also measured the greenhouse gas emission their customers have reduced with using Neste's renewable products. In 2021 the amount was 10,9 Mt and the company has a further goal of 20 Mt for 2030.

Neste gains synergy benefits because of its production locations in industrial areas. This enables the company to for example use the waste produced by other companies. This is the case in Neste's refineries in Singapore and Rotterdam where the neighbouring manufacturing companies produce waste that Neste is able to use in its own production. The circular business actions of regenerate, optimize and loop are clearly present in the circular solutions Neste has regarding its resources. Neste has set a goal that by 2030 they have the ability to process 1 Mt of waste annually and according to their No-Deforestation and Responsible Sourcing Guideline Neste is improving their monitoring of biodiversity in all supply chain operations. They are constantly developing and co-developing new and more energy-efficient technologies that enable better material efficiency in production and less emission from production. Neste has also set a target to reduce production related emissions by 50% by 2030 and by 2035 reach carbon neutral production. To this end Neste is continuously improving and optimizing its product designs to a more circular direction together with its partners with the ultimate goal of or carbon neutral value chain by 2040. Neste has clearly set some ambitious targets and it is trying to bring the other actors of products' value chains with it. The company is in position as a multinational company with large business networks to impact the industry and bring change and at least in countries where there are few barriers for this kind of development, they are likely to succeed. Neste's CO₂ recovery plant can be mentioned as another example of the company's efforts to impact the emissions and to increase resource efficiency of their refineries.

4.3.5 Neste's Partnerships

Neste is working in partnership with organizations like World Business Council for Sustainable Development and companies like LyondellBasell, Borealis, Clariant, Ravago and Remondis. Neste successfully collaborated with LyondellBasell to co-produce a bio-based polypropylene that can be used for example in food packaging. Neste has been developing ways to chemically recycle plastic waste with Ravago and Remondis. Neste has collaborative shared operations to create and optimize circular economy solution in both ends of the product life cycle. Neste is also working closely with its supplier in Southeast Asia to develop their sustainability awareness and compliance to Neste's and international sustainability policies.

In terms of cooperation with communities and institutions Neste is collaborating with a network of universities and research institutions to create new circular solutions and technological innovations. Neste is for example part of joint research project called Veturi Ecosystem together with other Finnish companies, universities and start-up firms. In addition, Neste is also working with Alterra Energy to further develop chemical recycling and with Sunfire GmbH to develop green hydrogen production technologies. As can be seen from the amount of technological research collaborations of the company, Neste seems to be highly committed to advancing related technology. Neste has clearly optimized its technological development by sharing the responsibilities and rewards of new circular solutions with its partners, which has undoubtedly made the technological innovation process more efficient. Neste is also collaborating with foreign community partners like the city of Oakland in California, USA. The city's municipal vehicles like garbage trucks are using Neste's MY Renewable Diesel service to measure emission after they switched to renewable diesel in 2015.

4.3.6 Neste's Adoption factors and Take-back systems

When it comes to internal adoption factors Neste has focused strongly on technological development to gain circular value. Last year the company invested 54 million euros in research and development to develop for example renewable transportation fuels and enhance and develop its business areas like renewable aviation and chemical production. The investment into R&D is the reason Neste has a strong patent portfolio in renewable solutions. An example of this is the NEXBTL proprietary technology patent Neste was granted in Europe and in the United States. The technology makes it possible to produce

renewable products from waste fats and vegetable oils. They also gain the benefits of shared R&D due to the collaborations in technological development for sustainable solutions. Neste is supporting Finland's goal for carbon neutrality by 2035 and the Chemical Industry Federation of Finland's goal for sector wide carbon neutrality by 2045 with its sustainable development actions and circular economy models. They have won the circular economy award by Sitra and Laatu keskus for their work and innovation on circular economy. This kind of mutual support between the company and governmental organizations helps Neste to further develop sustainability and build its brand as a sustainable actor.

Neste is also committed to the directives set by the European Parliament and the Council to set new requirements and goals for the reuse and recycling of packaging materials and reducing the landfilling of municipal waste. Like mentioned before, different countries have different environmental standards and goals and a company desiring to do business in other countries needs to take these into account. Sweden has for example set a target to decarbonize aviation by 2045 and Neste is committed to this goal. In order to reach the national carbon neutral target of Finland and its own targets for clean energy Neste is working with Vattenfall on hydropower and with Fortum, Ilmatar and Statkraft on wind power. The collaboration of Finnish companies operating in the energy sector is essential if the carbon neutrality target set by the Finnish governments is to be achieved.

Neste has set policies for its supplier, like their Supplier Code of Conduct and other members of the stakeholder network, including partners. For the company's renewable material suppliers, they have more stringent requirements like Neste's Responsible Sourcing Principles. In order to monitor the compliance of their supplier Neste has put in place monitoring and management systems to increase the transparency of their supplier networks.

In terms of take-back systems, Neste has implemented reverse logistic networks with partner companies to enhance their recycling abilities. As mentioned above Neste acquires waste directly from other manufacturing companies to recycle it for reuse. Because of this looping collaborations Neste and its partners can be more efficient and cost effective in their take-back actions.

4.4 Case 4 – Metso Outotec

4.4.1 Metso Outotec's Value proposition and Customer segments

Metso Outotec's main value proposition comes from providing products and services that are used in refining metals and processing minerals. The main industries Metso Outotec is involved in are therefore mining and aggregates. Given that the company operates in material collecting and processing makes the circular action of looping materials especially important in terms of sustainable value creation. Metso creates products and full plant solutions in the mineral processing industry, equipment and solutions for chemical processing and metals refining and finally screening and crushing products to produce aggregates. The products provided for the aggregate market enable the customer companies to more efficiently produce and more importantly recycle aggregates to be used in construction or infrastructure business. As Metso Outotec also offers repair and maintenance services and spare and wear parts, they can extend their impact on the circularity of their customers businesses far beyond the initial purchase. The company offers products that for example enable the crushing of demolition waste so it can be used more effectively and spare wear parts that have three times longer usage lifecycle.

Metso Outotec offers product life-cycle related services in their other business area of mining and metals. The solutions provided by the company aim at increasing process optimization in order to be more material efficient. They also offer solutions for better and more efficient wastewater management for companies and digital and automated solutions for example for mineral processing. Energy efficiency is also a key component in Metso Outotec's value proposition as their products offer more energy efficient options for dewatering, mineral separation, size reduction and material transport.

Metso Outotec is further creating sustainable value by focusing its operations on megatrends like resource scarcity, electrification and urbanization of cities. One of their most recent projects is the Planet Positive project. The Planet Positive is Metso Outotec's product group that uses the most environmentally efficient technologies. It was introduced in March 2021 and deals with sustainable issues like energy efficiency, circularity of production, reduction of emissions, safety and water efficiency. The Planet Positive product range includes for example aggregate related products which are fully electric, low-dust and low-noise solutions meant for urban environments.

When it comes to offering virtual services Metso Outotec offers its customers a CO₂ emission measuring service with the purpose of measuring the amount of emission

their customers have avoided by using the company's products. In 2021 Metso Outotec reported that the CO₂ emissions avoided was 10,3 million tonnes. This shows the direct effect that Metso Outotec's has had on their clients CO₂ emission. Although this is clearly a marketing tool for the company to promote their products, it does serve an ulterior purpose in providing the customers information about their own emissions.

Metso Outotec offers a combined solution package of a product and a virtual service that enables a more efficient use of the product. With measuring and monitoring capabilities that can extend the products lifecycle, Metso Outotec enables the company and its customers to create shared sustainable value. By using virtual maintenance and monitoring that reduce the need for physical maintenance in the product locations and designing their products to be recyclable and upgradeable and therefore making the looping of materials easier Metso Outotec has clearly brought the circular actions of looping and virtualizing into their value proposition. One thing that was missing from their value proposition was the idea of collaborative consumption as Metso Outotec does not offer solutions for renting or sharing products, which could create cost savings. This could be managed for example through product-service systems in which Metso Outotec would retain the ownership of a product but share and rent the rights to use it. The virtual maintenance and monitoring service could technically be considered as such a solution, but as they are combined to the sale of a product it falls to the category of ownership-based product. The circular business model canvas for Metso Outotec is presented in the table 7.

Table 7: Metso Outotec's circular business model canvas

Partners -Joint project to decarbonize the supply chain -UN Global Compact -Culture Ambassador program -Joint technology projects -Supplier audits	Key activities -Optimization of production and logistics -Technology collaboration -Creating new technology designs -Recycling, repair and maintenance	Value proposition -CO2 emission measuring service -Planet Positive products -Longer product life-cycle designs -Virtual monitoring and maintenance service -More efficient waste management solutions	Customer relationships -Production on order	Customer segments -Companies in the aggregates, mineral processing and metals refining industries
	Key resources -Renewable energy -Sustainable brand -Retrieved materials -Better performing materials		Channels -Virtualization of communication -Cloud-based data application	
	Cost structure -Reduced production and logistical costs -Efficient building -Material looping -Efficient energy consumption -Optimization -Use of circular supplies: renewable enerav		Revenue streams -Planet Positive circular products -Value of collected materials -Additional product related services	
Adoption factors -External recognition -Knight's Top 100 sustainable companies, Carbon Disclosure project, Terra Carta -Over 6400 patents -Employee training				

4.4.2 Metso Outotec's Channels and Customer relationships

Metso Outotec has increased its utilization of digital technologies when communicating with clients, partners and other members of its network of stakeholders. Due to the problems caused by the pandemic, they have also increasingly shifted their internal communication into a digital form. Metso Outotec periodically conducts interviews and surveys in order to assess stakeholder expectations and enhance the bilateral engagement with their stakeholders. Moving from location-based meetings to virtual communication channels is the clearest virtualization action the company has done.

The latest addition to the company's digital offerings is their cloud-based application called metallurgical digital twin. This application provides customers support regarding the equipment purchased from Metso Outotec, but also offers information about improving safety, improving operational profitability and decreasing carbon emissions.

4.4.3 Metso Outotec's Revenue streams and Cost structure

Metso Outotec made 592 million euros profit in sales from the Planet Positive product group, significantly increasing the company's total profits. The company's goal is to increase the Planet Positive products share in their overall portfolio with an annual increase of 10% in sales and encourage their partners to focus on similar sustainable and circular technologies to create shared sustainable value by combining efforts and technological designs.

The merger between Metso and Outotec has impacted the cost structure of the newly formed Metso Outotec as it combined the layouts from both companies and is attempting to reach total cost synergy. Furthermore, creating and maintain long-term partnerships has decreased the logistical cost for Metso Outotec and so had a positive impact on the overall cost structure of the company. With these joint logistical operations, it could be argued that Metso Outotec is using the circular business action of sharing and it is affecting the company's cost structure. Therefore, it could be argued that the share action is applicable in the cost structure component even though the theoretical framework of Lewandowski (2016, 19) left it out. Metso Outotec managed to decrease both transportation cost and CO2 emission by optimizing the packaging process and using lighter packaging materials. The company has also reduced productions and raw material costs with more efficient recycling technologies

4.4.4 Metso Outotec's Key resources and Key activities

Metso Outotec has adopted the use circular supplies in the form of renewable energy in their largest operation locations to decrease the consumption of resources used in non-renewable energy production. This has been achieved by building ground-source heat pumps and solar power systems. This has led to significant operational CO₂ emission reductions as will be shown in the key activities sub-chapter.

Due to their sustainable actions Metso Outotec has been elected to the top 100 most sustainable companies by Corporate Knight. This kind of continued recognition from independent parties increases the company's brand image as a sustainable company and can lead to for example more sustainable partnerships as Metso Outotec has proved they have the knowledge and the knowhow to incorporate sustainable and circular economy models into their business operations. This kind of added brand value can be a crucial competitive advantage for Metso Outotec now and in the future.

Metso Outotec has increased the size of their service network by offering their customers digital and automated solutions to make the production process and the bilateral information gathering more efficient in order to improve their product selection. They have also developed methods to separate rubber from steel, which enables Metso Outotec to better recycle wear parts without producing unrecyclable waste. These kinds of technologies that make material looping possible and more effective are a vital element for resource retrieval that makes circular economy possible. In terms of material used Metso Outotec has increased the use of more insulating materials to decrease energy requirements and costs for heating and cooling of their production locations. This is a good example of the regenerate circular action with efficient building along with optimizing solutions.

When it comes to environmental efficiency and optimizing performance, Metso Outotec has decreased their production related CO₂ emissions by 58% compared to the 2019 levels, with a goal to first decrease CO₂ emission 50% by 2024 and ultimately to reach net-zero emissions by 2030. This was mainly accomplished with the transition to renewable energy. The 58% reduction corresponds to an amount of some 70 kilotons. The 2021 reported production related emission reductions were 52,216 tCO₂ and the same number from 2020 was 44,913 tCO₂, so the emissions reduction rate is clearly increasing. Another impactful source of CO₂ emissions is the logistical operation of Metso Outotec. The company has a 20% emission reduction target to decrease emission by 2025 from the

2019 emission rates. They have currently decreased the logistical related emissions by 18% when comparing to the 2019 numbers. The reduction rate is similarly increasing as the numbers from 2020 and 2021 show. The 2020 emission reduction was 86,000 tCO₂ and the 2021 reduction was 97,000 tCO₂. One of the key elements in achieving the emission reductions in the company's logistical operation was the use of strategic partnerships and the logistical network they create for Metso Outotec. These numbers show a significant decrease in both production related and logistics related CO₂ emission. However, as the company reported the transition to renewable energy resources as the main reason for this decrease in emissions, it remains to be seen can this action alone be enough to reach the company's targets for net-zero emissions.

Metso Outotec is also actively involved in sharing and co-developing new and more energy efficient and material efficient technologies with other companies. These product designs are directed towards upgradeable designs so that the outdated products can be outfitted with new repair parts and there is no need to replace the entire product. An example of this kind of upgrade and modernization is their Float-Force upgrade which enables up to 30 % lower energy use in related products. Other examples of more energy-efficient solutions are solutions to increase rainwater usage, improve sand reclamation systems and the introduction of smart water flow meters to assess the effectiveness of the water usage.

4.4.5 Metso Outotec's Partnerships

Metso Outotec has introduced joint actions with their partners to decarbonize their supply chains and began new collaborative projects with energy-intensive suppliers. They aim to build and maintain long-term stakeholder partnerships in order to enable the bilateral value flows to create shared value and to improve the circular economy models of their collaborative companies. Metso Outotec has set a target to acquire 30% of its procurements from suppliers with science-based CO₂ emission targets in order to increase the decarbonization of their supply lines. Currently the company reported that in 2021 10% of their procurement spend is with suppliers that meet Metso Outotec's demands. Another element of increasing their partners engagement in sustainable practises is Metso Outotec's supplier's Code of Conduct, which has been signed by 90% of the company's suppliers.

Furthermore, Metso Outotec is part of the UN Global Compact which encourages companies worldwide to adopt more sustainable operating practises and to share

knowledge about the implementation of sustainable and circular practises. To further this agenda Metso Outotec has implemented e-learning courses and a program called Culture Ambassador Program in order to spread their sustainable values, including circular economy, into their operating networks via for example workshops, where the participants are trained. Metso Outotec has clearly introduced the idea of sharing into their partnerships both in sharing their values and technological solution with their partners in order to increase the combined impacts of the networks they are part of. To monitor their supply chains Metso Outotec regularly audits its supplier based on their supplier sustainability risk assessment. In this way the company not only shows an example to the other actors in their networks but also requires these parties to comply with the same regulatory requirements as Metso Outotec.

4.4.6 Metso Outotec's Adoption factors and Take-back systems

According to Metso Outotec they have a 100% target for sustainability in their research and development department. Together with customers and other stakeholders Metso Outotec is aiming to bring sustainability target to all of its research and development projects. These targets are for example digitalization, automation, electrification and circularity. When it comes to successful research and development endeavours, Metso Outotec has currently over 6800 patents for products and solutions that their in-house research and development teams have created. Intellectual properties like patents and other intangible resources are an essential way to enable and maintain competitiveness. Especially with the company's circular economy and sustainable related patents. In terms of other internal organizational capabilities, Metso Outotec offers its employees learning opportunities to better understand sustainability and circular economy in order to commit the employees to the sustainable values of the company.

They also have security standards for employees which is directly linked to the social value dimension of the sustainable value concept. In addition to the inclusion to the top 100 most sustainable companies Metso Outotec has received other similar recognitions of their sustainable efforts from Carbon Disclosure Project and Terra Carta, both of which monitor companies' responsible and sustainable operating practises and reporting standards.

Metso Outotec created a so-called task force on climate related financial disclosure in 2021 to identify and provide information about the opportunities and risks related to the effects of climate change. This is supported by their Risk Management

Policy which is further used to analyse external issues that may have an impact on the company's circular business opportunities and threats. The most relevant risks for the company were continued technological development of products to meet the needs of the customers and the need to comply with the new and stricter legislation and regulation, on both international and national levels. Although Metso Outotec has already transformed majority of its operations to use renewable energy, they still recognize that the global transformation of all the industries towards renewable energy solutions will most likely cause pressure and increase in operating cost and product prices. Metso Outotec does not have independent take-back systems in place, but as they offer extensive repair and maintenance services the material collection that enables the material looping takes places during these maintenance services.

As can be observed from the data in this case analysis, Metso Outotec has the internal capabilities to engage in all of the different circular actions, although not in all the possible individual components of the circular business model canvas. The company has also recognized the external factors which can aid or hinder the development of their circular business model. The Finnish political and legal environment is well suitable for the companies' continued development of their sustainable business and by creating brand image as a sustainable corporation, they have taken into recognized the importance of public opinion, which in Finland is positive and supportive towards sustainable and circular solutions.

4.5 Cross-case analysis and comparison

The cross-case analysis will be performed by a categorical analysis based on the coded categories presented in chapter 2.4. The purpose of this cross-case comparison is to identify and present the similarities and differences discovered that the case companies of Kone, Kesko, Neste and Metso Outotec have in their circular business models by comparing the discovered circular business actions the companies have implemented into their corporate strategies.

All the analysed companies have incorporated the ideas of the circular economy in some degree into their individual business strategies. Based on the fact that all of the case companies have reached the top 100 most sustainable companies, indicates that they have managed to create sustainable value through their operations. The economic value produced by the sustainable actions is harder to estimate as most companies do not differentiate regular income from income that originates from sustainable actions alone.

The fact that all the case companies have been successful in incorporating their sustainable actions and uphold them without any significant negative economic effect to their respective businesses, does indicate that for the very least, the sustainable actions have not decreased the financial performance of the companies to the level at which the sustainable operation would have been removed. With smaller companies that have kept the sustainable business models in effect for a short time and then given them up, or in some cases, the company has gone out of business, it is easier to assess the effects of sustainability actions to the economic stability.

When cooperating with partners Neste has shared production, reverse logistic and recycling operations with business partners promoting the idea of collaborative sharing and Kesko is involved in material loops because of the recyclable products they sell and because of the recycling service they provide to their customers. Neither Kone nor Metso Outotec have these kinds of collaborative looping operations in place. All of the four case companies are however engaged in the sharing business actions with their partners via repair and maintenance, products leasing or Neste's service application that uses the Bring your own device business model. The focus of circular actions in Kone, Neste and Metso Outotec especially seem to be on partnerships and shared actions. Manufacturing and production companies have more options and opportunities for collaborative circular actions like sourcing, manufacturing, logistics and reverse logistics. Neste in particular, has formed joint collaborative operations in almost all of its production stages. Partnerships are crucial to build long-term relationships which in turn can improve creation of business stability, which is one of the examples of sustainable economic value presented in Figure 2 on page 19.

In terms of key activities and resources, all of the case companies have activities that use the business actions of looping, optimizing and virtualizing. They also all have resources that have been looped or optimized. The main difference to note is that only Neste and Metso Outotec have regenerative activities: Neste's circular model of energy recovery and Metso Outotec's model of efficient building in their production locations.

All of the case companies offer virtualized and shared value propositions to their customers with repair and maintenance, products leasing or Neste's service application that uses the Bring your own device business model. For example, Kone has its around the clock maintenance service and more specifically the remote data providing service which is an example of virtualized service to add value. The main difference in the value proposition component is that out of the case companies Kone is the only one that does

not offer looping related value proposition. They have no value proposition that would be based on for example recycling materials or circular supplies. This is not to say Kone does not have looping operations, but it is not part of the company's value proposition. All the case companies operate more in the field of physical products and because of that dematerialization of products through virtualization is not possible. The existence of the virtualize business action in all of the case companies channels was to be expected as majority of companies have digital services and communication with customers and other stakeholder is done via virtualized means.

The cost structure of companies that manufacture products like Kone and Neste is more effected by for example material loops as the company gains the reduced material cost themselves. Retailers like Kesko do not have this impact as they themselves are not the recipients of lower production costs of the products they offer. However, all of the case companies cost structures are affected by the use of renewable energy and the effects of looping, optimizing and exchanging. In turn, the share based circular models used by the case companies' all have an impact on the companies' revenue streams as well as the revenues gained from the looping actions conducted by the case companies.

When it comes to adoption factors all of the companies had internal capabilities to introduce the different circular business actions into their operations. All of the companies offered for example training to their employees regarding sustainability and its implementation to operations. This is important in order to create an organizational culture that supports the sustainable thinking. Furthermore, the companies operating in the manufacturing industry had made significant investments to technological development and had acquired significant number of intangible resources like patens. In regard to external factors, all of the four case companies have implemented elements of the Agenda2030 into their business strategies. This is a good indication of the sustainable collaboration between Finnish companies and the government to promote and commit towards sustainable development. However, despite of the sustainable efforts, for example Kone's production operations have increased in the last three years and with this their carbon footprint from operations has increased from 312,000 tCO₂e to 327,100 tCO₂e and the carbon footprint of products has increased from 4,832,300 tCO₂e to 5,299,300 tCO₂e. So even though Kone has implemented circular and other sustainable development actions their environmental impact in this regard, has not improved. It seems that to certain extent all of the companies have realized the requirement to pay attention to the external adoption factors than can impact the companies possibilities to be

sustainable and implement new and develop existing circular models. For example, the sustainable brand image of all of the case companies is a competitive advantage in countries where the public opinion is favourable towards sustainability. In addition to public opinion there are other sociocultural elements like customer habit that case companies have addressed by being in contact with their customer base to better meet their demand.

Finally, at the last stage of the circular value chain is reverse logistics that can be done by installing take-back systems to recover and recycle product waste to create new value. All the companies have some kind of logistical systems in place to perform take-back actions but as mentioned before, the kind of product manufacturing for example Kone and Metso Outotec are involved in, the need for retrieving old and obsolete products doesn't seem to be a priority or at least it is not mentioned in any sustainability reporting. Kone does focus on waste and packaging material recycling and enforcing the material loops in their operations and Metso Outotec has created new and improved designs for their wear parts in order to reduce the need for active take-back systems. Neste's reverse logistics is more active, and it is focused on the energy and waste recovery that is happening constantly. Finally, the take-back systems of Kesko are the most visible to the customers as customers can interact with them directly when, for example returning plastic bottles or other recyclable products to Kesko's service locations. The analysis is illustrated in Table 8.

Table 8: Cross-case comparison of case companies

BM Components	Regenerate	Share	Optimize	Loop	Virtualize	Exchange
Partners		Kone, Kesko, Neste, Metso Outotec		Kesko, Neste		
Activities	Neste, Metso Outotec		Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	
Resources	Kone, Kesko, Neste, Metso Outotec		Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	X	
Value proposition and Customer segments		Kone, Kesko, Neste, Metso Outotec		Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	
Customer relationships	-	-	-	-	-	
Channels					Kesko, Kone, Neste, Metso Outotec	
Cost structure	Kone, Kesko, Neste, Metso Outotec		Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec		Kone, Kesko, Neste, Metso Outotec
Revenue streams		Kone, Kesko, Neste, Metso Outotec		Kone, Kesko, Neste, Metso Outotec		

BM Components	Regenerate	Share	Optimize	Loop	Virtualize	Exchange
Take-back system				Kone, Kesko, Neste, Metso Outotec		
Adoption factors	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec	Kone, Kesko, Neste, Metso Outotec

As can be seen from the table 8 above all the case companies have introduced circular business actions into their operations, but there are some differences that distinguish the four case companies from each other. This is partly due to the fact that the companies operate in different industry sectors and therefore the existence of all the circular business actions in all the relevant components of the circular business model canvas was always considered highly unlikely. For example, the circular business action of regenerate was only present in Neste's and Metso Outotec's operations when looking at the key activities segment of the circular business model canvas. The energy recovery from non-recyclable waste is only applicable in Neste's business model and as such it is not suitable circular action for the other case companies. The only element presented in the table 8 that was not present in any of the case companies' operations was the virtualization of resources.

Based on the analysis of the companies it can be confirmed that the diversity and the number of circular actions corresponded the companies' order in the Knight's corporate ranking for most sustainable companies in 2020 with Neste at third place, Kone at 43rd and Kesko at 99th. Outotec was 18th while Metso was 66th and after the merger they reached 8th place in the following year (Corporate Knights 2021).

Neste had incorporated, to certain degree, all of the six circular actions of regeneration, sharing, optimizing, looping, virtualizing, and exchanging into its operations and their circular strategy was clearly the most mature of the case companies. From this it could be argued that Neste is a company from which other similar companies could learn how to transition their own company to more be sustainable and how to include circular practises and solutions into their business models.

5 Conclusions

5.1 Discussion

The purpose of this study was to discover how circular economy can create sustainable value. In this study, through the ReSOLVE framework 26 circular business models were identified that create sustainable value via the 6 circular business actions presented in chapter 2.3. Most of the circular economy related sustainable value creation opportunities are related to environmental value creations as some of the fundamental ideas behind circular economy are the reduce of material use and waste reduction, which both belong to the environmental dimension of the sustainable value. There were elements of social value forms like community development and economic value forms like long-term viability and business stability in the business models of the case companies, but as the link between circular economy and sustainable environmental value is the strongest, it was to be expected that the environmental value forms would be the primary form of sustainable value creation found in this study. As the definition of sustainable value states, a fully sustainable value does not decrease any of the three different value forms as one form is created. The conclusive argument that all of the environmental value created in circular business models by the circular business action is fully sustainable is not credible as there is no way to comprehensively analyse the full environmental, social and economic impact of a single circular model. A company would have to fully isolate the whole process of the circular business model in order to separate for example the economic impact that is caused by a specific circular business model to negate the impact of every other related company operation. As this is not a viable or even technically possible assessment to make, it cannot be said conclusively that any business action creates fully sustainable value. However, for the purpose of this study the environmental value created by the circular business actions is considered sustainable value as there are no evident reduces in the other value forms.

Several of the business models presented in the ReSOLVE framework were identified in the case companies' business operations and all of the circular business actions were in some form present in the operations of all of the case companies. Kone was using circular models like circular supplies, repair and maintenance, upgrading, remanufacturing and new technology. Kesko's main circular solutions were product leasing, dematerialized services and using circular supplies. Neste's main circular

solutions were energy recovery, virtualized services, recycling, use of circular supplies and waste reduction. With Metso Outotec the used circular models were efficient building, waste reduction, recycling, circular supplies and new technology. The main differences found in the cross-case analysis were industry related and based on collected results presented in Table 8, all of the case companies have circularity strongly imbedded into their business operations. The most noticeable difference in circular models between the companies was Neste's energy recovery, as this was only used by Neste. Apart from that, in terms of circular models, the case companies had similar models in use with small variation in how they had been adapted.

5.2 Theoretical contribution

This study used a ReSOLVE framework for circular business model analysis that can be used as an analysis tool when studying companies' engagement in sustainability in general, but more specifically engagement in circular economy. In order to perform a cross-case analysis a secondary framework was used that combined the coded categories of circular business model canvas and the circular business actions. The theoretical frameworks used in this study brought the existing literature about circular business models forward and by doing so contribute to the topic in a relevant manner. According to Lewandowski (2016, 2) the theme of circular business model framework has been studied to some extent, but the question of how the principles of circular economy can be applied to a business model still lacks a comprehensive and holistic answer. By discovering circular business models used by the companies and identifying the relevant circular business actions with the framework, this study validated to certain extent the usability of the frameworks used.

This study has attempted to bring this theoretical problem forward towards a general framework for analysing circular economy business models. Both the ReSOLVE framework and the framework for the cross-case analysis were used to reach the results of this study and combined use of the frameworks offers theoretical backing to future studies dealing with circular economy business models and their impact on a company's business model. This study also contributed to theories regarding sustainable business models, circular economy and sustainable value creation by adding to the literature. As the study discovered, the presented framework found differences in the circular business models of the case companies and therefore it can be concluded that this framework was suitable for the theoretical problem presented in the research questions. In order to

discover, analyse and compare circular solution of two or more companies, the theoretical framework of this thesis was suitable and can therefore be used in similar studies to reach similar discoveries. There is a lack of existing literature regarding circular economy and especially the topic of sustainable value creation (Evans et al. 2017, 605). This study contributes to this literature by focusing on the sustainable value creation by first defining the concept and then demonstrating how sustainable value can be created with different circular business models.

5.3 Managerial implications

As can be observed from the case studies, the entire value network of a company can be affected by the decisions of one company when it operates in a sustainable way. A company can affect through corporate collaborations, sustainable branding or by lobbying for policy changes that affect the other actors in the same business environment. Different companies value different elements of the business and have different motivations and needs to focus on. What kind of sustainability a company chooses can be determined by, for example, the size of the company, its business industry, whether the company operates internationally and if so, in which country or countries (Casadesus-Masanell & Ricart 2011, 104). This study focused on Finnish companies with multinational operations, and with different business areas and industries.

When a company engages in sustainable actions the resources to do this are often significant and the risk of failure is substantial. This can be a hurdle especially for smaller companies which do not have the ability to take short term losses that the transition might cause. However, this kind of experimentation to find, what is the optimal way for a specific company to operate sustainability, might be the only way, as the value chain and everything it includes varies from company to company and a universal solution which would work for every company still does not exist. However, the sustainable business actions presented in this study create a working frame for companies looking to adopt circular practises as it offers 6 distinct ways and 26 circular business models for a company to create sustainable value.

One of the more noticeable aspects of the analysis was that the set of future goals seemed to be bigger for all of the companies, than the actions already accomplished. This would confirm the notion that sustainability and its implementation and the use of circular economy model is still just gaining speed. New concepts and ideas of sustainability are

still being developed in the theoretical stage and academics and companies are just starting to find ways to implement them to reach true sustainability in business.

5.4 Limitations of the study and future research

The research questions were answered as extensively as the research material allowed. For the purpose of this study, the cases companies analysed, were adequate to give a clear enough picture of the circular actions companies can have and the research design that was based on gathering information from the companies themselves was appropriate. This study used a specific tool to analyse the circularity of the companies and therefore might have omitted some of the actions related to circular economy, but the tool of the six circular actions resulted in multiple observations of circular behavior in the case companies and therefore was suitable for this study. As this study was limited into the circular economy solutions, there were many elements of sustainable value creation that was found during the empirical study but left out of this study as they were not directly linked to the topic of circular economy. Therefore, most of the elements of social sustainable value for example were not presented in this study as they were not considered to be linked to circular economy strong enough to be included in this study.

For future studies it would be useful to not only study across industries as was done with this study but to analyse companies of different sizes and different locations as the operating environment has substantial impact on the options for a company. Different governmental policies, different public opinion on sustainability and different possibilities for partnerships can all increase or diminish the possibilities for sustainable strategies. Culture and cultural values might also come in play in countries where certain values are held in higher regard. Therefore, a study that focuses on companies that represent companies not only from different industries but from different countries would give a more diverse view of the circular business model's sustainable value creation. Furthermore, a comprehensive country analysis of the business environments could be beneficial as the adoption factors come primarily from the business environment. This in mind a detailed PESTEL -analysis of different countries where companies attempt sustainable actions would provide valuable information about sustainable development opportunities and barriers.

6 Summary

Due to increasing raw material requirements caused by global consumerism and the resulting depletion of natural resources there is a need for an alternate solution for doing business. This alternate approach is sustainability. Sustainability relies on the idea that economic value, social value and environmental value should be equally balanced, and one should not be prioritised at expense of the other two. The concept of sustainability is not exactly a new one, but due to for example global warming, the interest to sustainable solutions has significantly increased. This study focuses on circular economy, on one of the sustainable solutions that have been created to enable companies to transition to more sustainable business practises. Circular economy's basic idea is the shift from linear production model to a production model where materials are looped back into production minimizing the waste output.

In circular business models like energy recovery, efficient buildings, PPS, maintenance and repair and dematerialized services sustainable value is created through circular business actions. These circular business actions are regenerate, share, optimize, loop, virtualize and exchange. This categorisation of circular business actions is not all-encompassing and there are other ways to introduce circularity and sustainability to a company's business model, but in this study this framework of six circular business actions was chosen and deemed suitable to identify circular business models used by the four case companies of Kone, Kesko, Neste and Metso Outotec.

The empirical study conducted in this thesis used a qualitative case study approach and a deductive structural coding to collect and analyse data from four case companies and their circular business models. The data for this study came from official sustainability reports of the case companies, which were Kone, Kesko, Neste and Metso Outotec. These companies were chosen based on their international recognition related to sustainable actions and achievements.

A theoretical framework ReSOLVE was used to analyse the individual companies and their circular operations. This framework introduced 26 individual circular business model that where categorised based on the circular business action they require. The circular business model canvas was used to combine the data and enable the comparison in a component-by-component based manor. This study found several of the circular business models, presented in the ReSOLVE framework, from all of the case companies and after the comparison an observation was made that all of the companies have

introduced all of the circular business actions into their operations and the main difference discovered where industry related.

In conclusion, this study argues that sustainable value can indeed be created with circular business model. This is based on the notion that successfully introducing for example a circular business model that creates environmental value, there are no clear indicators that this implementation reduced or destroyed the other value form of economic value and social value. However, in order to give a definite answer to a question of whether or not value created with circular business model is fully sustainable would require a comprehensive analysis of all the related effect of the specific circular model and given how vast global operations and business networks MNE's have, this would most likely be impossible or for the very least highly impractical and costly. For future studies, the inclusion of different sized companies and companies which are based in different countries would further increase the data of practical implementation of circular business models. The impact of the business environment diversity would likely provide more varied results in a future cross-case study.

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Appendix

Appendix 1 List of publications used in the empirical analysis

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