The Sustainable Development Goals as Drivers of The Sustainability Revolution

Master thesis

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DISCLAIMER

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EXECUTIVE SUMMARY

This research aims to establish whether incumbent companies can potentially be the drivers of the urgently needed Sustainability Revolution and how the Sustainable Development Goals can play a role in driving this revolution. The Sustainability Revolution is a revolution that needs to solve the current global complex social and environmental issues and create a healthy balance between environmental, social and economic performance. The Sustainable Development Goals are leading the sustainable development agenda of the United Nations from 2015 till 2030. Combined, these goals are the vision of the world as it should be after The Sustainability Revolution is completed. Not only governments have to take responsibility to create a sustainable society but also it is extremely important that the private sector takes on responsibility and transform their practises.

Incumbent companies are the most important stakeholder in the currently mature paradigm. These companies were established in times of industrial development and are increasingly seen as causing many social, environmental and economic problems our society faces today. Although incumbent companies are not particularly known for their radical approaches, they do have the resources to create major change and are thus an important stakeholder in the paradigm switch. When they adopt sustainable business practices, with their global reach they can have a large positive impact on society and can contribute to solving many sustainability issues. For this reason, the potential of these companies to drive The Sustainability Revolution is examined.

According to existing literature the IT and energy businesses are determined to be from sectors that can be leading in a revolution for a sustainable society and achieving the Sustainable Development Goals. From each sector the largest companies (based on Global 500) per geographic region of origin (Asia, North-America and Europe) are selected as cases. The selected companies are: Accenture, Amazon.com, Apple, BP, Chevron, China National Petroleum Corporation, ExxonMobil, Glencore, Hon Hai Precision Corporation, HP, Phillips66, Royal Dutch Shell, Samsung Electronics, SAP, Siemens, Sinopec Group, Sony and State Grid Corporation of China. A qualitative content analysis is conducted to explore the views and strategies these companies have regarding characteristics that are determined to be important for the Sustainability Revolution. As this is mainly a forward-looking study where the current strategy is important, only the latest annual and sustainability reports are used as the main sources of data.

The companies are classified in three categories. The agents of stagnation are the companies that try to stop or slow down sustainable development. The agents of change are the companies that intent to drive sustainable development and shape a sustainable society. Finally, there is the group of hesitant companies, with business approaches that move between the two previously mentioned attitudes. Additionally, this study investigates in what way the companies that are determined as change agents for their sector embrace the Sustainable Development Goals.

This study shows that whereas incumbent companies have the ability and potential to become drivers of The Sustainability Revolution, the majority of them do not seem to take that approach. Three companies (Apple, Amazon and Phillips66) operate as agent of stagnation and one company (Chevron) as agent of stagnation/hesitant, which makes them the companies that are more likely to want to stop or slow down sustainable development. Nine companies (BP, China National Petroleum Corporation, ExxonMobil, Glencore, Hon Hai Precision Corporation, Royal Dutch Shell, Sinopec Group, Sony and State Grid Corporation of China) have a primarily hesitant approach, meaning they are not deliberately

trying to stop sustainable development but also not take the lead to drive for (radical) change towards a sustainable society. Two companies (Accenture and Siemens) have a hesitant/agent of change approach and three companies (HP, SAP and Samsung Electronics) are classified as agent of change, the latter being identified as the companies with the strategies that are best suited with driving the Sustainability Revolution. As this research focuses on the intentions of the companies, it shows the potential of the companies to be change agents. However, intentions are not enough to change the social and economic system radically and to create a sustainable society. The actions the companies take for sustainable development are still applied next to the business-as-usual operations seen by the result that only two companies integrated their annual and sustainability report in one document. To become a true pro-active agent of change, the words of intention need to be transformed into approaches that drastically reduce the negative impacts of the usual business and add radical positive impact for sustainable development. This way the potential to be the driver of the revolution can be transformed to be truly the agent of change that drives the Sustainability Revolution.

Additionally, the research on the strategies around the Sustainable Development Goals supports that not enough is done to create radical change of our society. At the first glance, it seems that the companies contribute in a major way by reporting on the SDGs but when one examines the contribution in more depth it appeared that the actions are more ad-on operations rather than integrated with the main business operations. The Sustainable Development Goals illustrate the desired sustainable society that needs to be created by 2030. The time span of the SDGs (from 2015 till 2030) theoretically is promising to guide the new paradigm towards a turning point. This is the point in time where the diffusion of the new paradigm is accelerated and takes over the main market share from the previous paradigm. The goals are a great tool for companies about what to focus on in their sustainability strategies but for companies to use the SDGs as the driving force behind the Sustainability Revolution more extensive contributions need to be made. The contributions need to be aligned with solving the global complex issues presented by the SDGs within the given time span. Although companies are not the only actors that are needed in achieving the SDGs, these incumbent companies are operating on a global scale which causes that their operations can have a major contribution to achieving the Sustainable Development Goals.

The value of the research is in the insights it brings to society as well as to managers of large Multi-National Companies (current incumbent companies) about the necessities to launch a Sustainability Revolution. A historic view on previous revolutions is presented which is connected to various theories around radical sustainability transitions. The SWOT-analysis that is conducted to analyse the behaviour of incumbent companies in times of radical transitions shows the main components these companies have to take into account. These components that can make the companies into agents of change and offer a warning as well with respect to their low adaptability which can cause a big threat in the transition to a sustainable society. The study shows that the awareness for the need of radical change of the current system is growing and that first steps are taken. Yet, it also shows that in order to create the radical change towards the sustainable society the approaches need to shift from intentions to actual changes in the business operations.

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LIST OF ABBREVIATIONS

GHG   Greenhouse gas

GICS®   Global Industry Classification Standard

GRI   Global Reporting Initiative

I(C)T   Information (and Communication) Technology

MDGs   Millennium Development Goals

MLP   Multi-Level Perspective

MNE   Multi-National Enterprise

SDGs   Sustainable Development Goals

SDJI   Sustainability Dow Jones Index

SMART   Specific, Measureable, Agreed upon, Realistic, Time-bound

SME   Small and Medium Enterprise

STEM   Science, Technology, Engineering, Mathematics

SWOT   Strengths, Weaknesses, Opportunities and Threats

TIS   Technical Innovation Systems

UN   United Nations

CNPC   China National Petroleum Corporation

SGCC   State Grid Corporation of China

1 INTRODUCTION

1.1 Introduction

Introducing the Sustainability Revolution

The earth is threatened by the effects of climate change and the depletion of natural resources due to the increasing consumption of humans in combination with the growth of the population (Hart, 2010; Pollard et al., 2010; Sachs, 2008). Furthermore, there are still over 4 billion people who live in extreme poverty and have less purchasing power (less than $1,500) than is determined to be needed for a decent life and thus cannot fully fulfil their social needs (Prahalad & Hart, 2002). These people currently have a relatively low impact on the environment in comparison with the excess consumption of the rich people. Worldwide, the richest 20% of the people consume 86% of all goods produced, use 58% of all the energy and produce 63% of the world's greenhouse gas emissions, while the poorest 20% consume just 1.3% of all goods produced, use less than 4% of all the energy and produce only 2% of the world's greenhouse gas emissions (NDP Steering Committee & Secretariat, 2013, p. 16). The consumption rate is not durable, especially in combination with the desired (social and economic) development to raise all people out of (extreme) poverty and have them fulfil their social needs. When the energy consumption of these now developing countries would become the same as the consumption of the current developed world countries, at least four times the equivalent of the earth's resources would be needed (Wackernagel & Rees, 1998).

The threats to the earth have been created due to the industrial development over the last centuries. For this, natural and social capital have been abused to create financial and productive capital (Senge & Carstedt, 2001). Continuous sequences of transitions have shaped the world as it is today. A transition is "a gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms (Rotmans, Kemp, & Van Asselt, 2001, p. 16)". These changes range from smaller incremental changes, to combinations of socio-cultural, economic, ecological and institutional change that have broken with the status quo and completely transformed society. The latter can also be seen as revolutions which are "a collective awakening to new possibilities that changes *everything* over time - how people see the world, what they value, how society defines progress and organises itself and how institutions operate (Senge, Smith, Kruschwitz, Laur, & Schley, 2008, p. 5)".

In order to prevent a catastrophe and the destruction of the earth, there is urgent need for radical change of the world's social and economic system. There is growing awareness that the current system is not durable for our planet. Without radical change, there is a large threat of complete extinction of the human race and our planet (Hopwood, Mellor, & O'Brien, 2005; Rifkin, 2011). This results into the wider acknowledgement for the urge for sustainable development, being: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). The basis of this research is that this means to have all people meet their social needs and that our planet is restored to keep durable living conditions. Although support for the need of sustainable development is growing, it has not led to the change of the system yet (Hopwood et al., 2005). Change does not occur easily since the system is in a lock-in phase, e.g. due to economies of scale and scope (Arthur, 1989). The economic practice and political leverage of many unsustainable industries are hindering the process of systematic sustainable development (Smink, Hekkert, & Negro, 2015).

To break through the lock-in of the system and create actual change, it is time for a next revolution. The world is in need of a Sustainability Revolution, a revolution that solves the current social and environmental issues and creates a healthy balance between environmental, social and economic performance. Scientific papers have not often mentioned this concept in particular. However, there are a few studies that describe the phenomenon, such as The Third Industrial Revolution (Rifkin, 2011), The Sustainability Revolution (Edwards, 2005) and The Necessary Revolution (Senge et al., 2008). Furthermore, much has been written on sustainable development and the need for a transition to a sustainable society. This research will link sustainable development to revolutionary transition theories and aims to present the conditions for The Sustainability Revolution.

The Sustainability Revolution & SDGs

To create the change that is necessary, a vision of the sustainable future is needed. With this goal in mind, the transition can be guided by using a back casting mechanism (Rotmans et al., 2001). This vision for the sustainable future illustrates what the world would look like after The Sustainability Revolution has occurred. The United Nations (UN) has created a list of seventeen Sustainable Development Goals (SDGs) that are a blueprint to bringing prosperity to all, while protecting the environment at the same time. These goals may serve as guidelines for The Sustainability Revolution. The global goals aim to illustrate the transformed sustainable future that is desired in 2030 (United Nations General Assembly, 2015). The SDGs are the successors of the Millennium Development Goals (MDGs) that have been the main development aims of the UN from 2000 until 2015 and mainly targeted the social development of developing countries (Sachs, 2012). The SDGs supplement these goals with goals based on the global planetary boundaries (Kanie et al., 2014). Furthermore, the social MDGs are extended and are made more rigorous, not only targeting the developing world, but also call for social action in the developed world (Fukuda-Parr, 2016). The SDGs are ambitious goals and to achieve them it is important that collective action is taken. Not only (national) governments have to take responsibility to achieve the goals, also the private sector is of significant importance to take responsibility and transform their practises to be in line with the SDGs.

The Sustainability Revolution & Business

Businesses are the biggest creators of the radical innovation that are at the core of revolutions. With paradigm changes following from radical innovations, there are two types of companies that play an important role: new entrants and incumbent companies. The new entrants, that are often led by an individual entrepreneur, have a fresh look at technology and want to break the status quo with their innovations. This often results in creative destruction or radical innovations that have the ability to disrupt a complete market (Christensen, 1997; Utterback, 1994). Next to that there are the incumbent companies, which are the ones that have been the most important stakeholder in the previous paradigm (Chandy & Tellis, 2000; Henderson, 1993; Mitchell, 1991). To create innovation, these Multi-National Enterprises (MNEs), that are the incumbent companies, have the advantages of their resources, size and global reach (Chandy & Tellis, 2000; Hockerts & Wüstenhagen, 2010). However, due to path dependencies they tend to innovate more incrementally than radical (Geels, 2004; Smink et al., 2015). In this context, Schumpeter's work on innovation is an important source of inspiration to clarify the power battle between the two types of companies. Early Schumpeter (1934) focused more on the role of small entrepreneurial firms to create breakthrough innovation based on competition and market dynamics. Where the older Schumpeter (e.g. 1942) acknowledged the important role of large firms to create innovation in the modern capitalist world.

This power battle between new entrants and incumbent companies can be translated to the field of sustainable development. This may show us that in the current start-up field, many new companies have a sustainable business model that aims to disturb the status quo. Consequently, the sustainable development trend is threatening the established companies in almost all industries (Nidumolu, Prahalad, & Rangaswami, 2009). New entrants have many advantages in the time of sustainable development, such as starting from scratch with sustainable practises, no history of harmful practises and a new reputation. The current established companies have to step up their game concerning sustainability to stay ahead of the threats in the market. However, the adjustments the incumbent companies need to make to become fully sustainable are hard due to the path dependencies. The efficient routines the business relies on today, where built when the concept of sustainability did not even exist.

In order to create a sustainable future, it is important that these incumbent companies change their business activities. Over the past centuries businesses have acted following the Milton Friedman (1970) paradigm 'the only business of businesses is business'. As a result, the incumbent companies are increasingly seen as the creator of many social, environmental and economic problems our society faces today (Porter & Kramer, 2011). Consequently, when they adopt sustainable business practices, they can have a large positive impact on society and can contribute to solving many sustainability issues. Yet, they need to change for themselves. It is only a matter of time before new entrant companies with sustainable business models threaten to take over the market and thus the current incumbent companies have to take on their role as innovators as acknowledged by older Schumpeter, to prevent this. Becoming proactive and take the risk to create radical innovations that will change the status quo, will give them the possibility of becoming leaders of The Sustainability Revolution. With the rising awareness for the responsibility of incumbent companies, next to the threat of new entrants, also between incumbent companies a battle will arise for the leading role in the paradigm switch.

1.2 Research aim & question

This research aims to establish whether incumbent companies can potentially be the drivers of an urgently needed Sustainability Revolution and how the Sustainable Development Goals can play a role in driving this revolution. If a revolution is desired a radical change to the current system is needed. Incumbent companies are not particularly known for their radical approaches; however, they do have the resources to create major change and are thus an important stakeholder in the paradigm switch. From the perspective of the incumbent company, they should not only apply radical innovations for the sake of the survival of the earth, but also for their own survival in the market. This research intents to provide understanding for current established Multi-National Enterprises (MNEs) with an insight in the process of The Sustainability Revolution and what is needed to create a sustainable society, e.g. by using the Sustainable Development Goals. Hence, the research question guiding the research is:

Can incumbent companies be the drivers of The Sustainability Revolution? And what patterns can be seen in their support for the Sustainable Development Goals?

To guide this research, a review of existing literature is conducted on the following sub-questions:
1. What does the desired sustainable future look like?
2. What factors cause systematic radical transitions?
3. What are existing theories of radical changes towards a sustainable society?
4. What are possible roles for incumbent companies within The Sustainability Revolution?

The findings from the literature review are used as input for the framework of analysis that is used for the empirical research. The performance of several incumbent companies is analysed based on this framework and with that knowledge this research aims to answer to the following sub-questions:

5. What attitudes do incumbent companies have towards The Sustainability Revolution?
6. How do context variables explain certain differences among attitudes of incumbent companies?
7. What can be expected of how the incumbent companies will embrace the SDGs?

1.3 Relevance
This study aims to make contributions on three areas: scientific, managerial and societal relevance.

Scientific relevance
This study aims to discover and understand the concepts behind and the interactions between revolution theories, sustainable development and the Sustainable Development Goals. Based on historical patterns of revolutions, a projection of this is made on the urgently needed Sustainability Revolution. Incumbent companies are analysed for the role they can potentially play in launching this revolution. As both The Sustainability Revolution and The Sustainable Development Goals are rather new research fields, this research functions as an exploration to identify further interesting research directions.

Managerial relevance
The research framework and theory of change model that will be created in this research will provide managers with a tool to create awareness about the current changes occurring in our system. With this, they can evaluate their own efforts and understand the position of their business in this process. Identifying the strategies of different attitudes towards The Sustainability Revolution will reveal best practises. The results can be used by managers to improve their efforts to increase chances of surviving The Sustainability Revolution. Additionally, it can give inspiration and offer guidelines to become the driver of this revolution. Yet, at the same time, it may provide a warning signal for the threats that incumbent companies face in such radical transitions.

Societal relevance
This research calls for radical societal change, solving a wide variety of pressing issues the world faces today, e.g. climate change and (social) inequality. After the Sustainability Revolution has occurred, the world enters in a new era that has a balance between economic, social and environmental performance that is beneficial for all people. This will not be done overnight, but as the SDGs (that in this study are connected to the desired sustainable future after the Sustainability Revolution has occurred) have a time span that lasts until 2030, the relevance will likely become obvious along the road to achieving the SDGs. The short-term societal relevance of this study is the information it gives to people about the urgently needed Sustainability Revolution. With awareness for the necessity of the revolution, radical actions can be taken that contribute to creating a sustainable society by a wide range of stakeholders.

1.4   Outline

This research is structured as presented in figure 1. First, the four sub-questions guide the literature review. In the research methodology section these findings are translated into a research design and theory of change model. The result section presents the data that will be used to provide answers to sub-questions 5 to 7. In the discussion and conclusion, the answers to the sub-questions are further elaborated upon. In the discussion explanations for the findings are tried to be given based on the prior conducted research. The conclusion presents an overview of the answers to the sub-questions and eventually answers the main research question.

Introduction			
Literature review			
Sub-question 1	Sub-question 2	Sub-question 3	Sub-question 4
Research methodology			
Results			
Sub-question 5	Sub-question 6		Sub-question 7
Discussion and Conclusion			
Main research question			
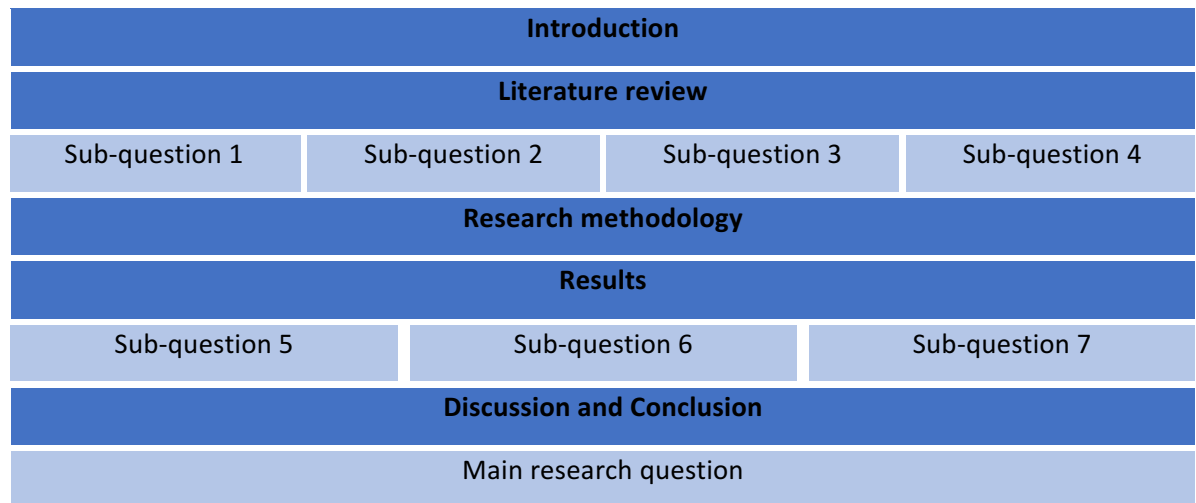
Figure 1 Research Structure

2 LITERATURE REVIEW

Predicting the future is difficult and although there are goals, it is unavoidable that the outcomes of a revolution is full of surprises (Kuran, 1995). In comparison to revolutions in the past, now it is crucial to implement The Sustainability Revolution in order to prevent a catastrophe. For that reason, this literature review starts with an explanation of sustainability and the desired sustainable future that is outlined by the UN's Sustainable Development Goals. From that, it continues with literature about transitions to a new (sustainable) social model and about the possible roles of incumbent companies in that revolution.

2.1 Sustainable society

To determine what aspects are important to create the desired sustainable society, this section elaborates on the meaning of sustainability and the Sustainable Development Goals.

Sustainability

The contemporary meaning of sustainability stems from the expansion of the environmentalism movement (Edwards, 2005). Where first the focus was mainly on preserving the environment, with four main concerns: "1) an awareness of the profound spiritual links between human beings and the natural world; 2) a deep understanding of the biological interconnection of all parts of nature, including human beings; 3) an abiding concern with the potential damage of human impact of the environment; and 4) a strongly held commitment to make ethics an integral part of all environmental activism" (Edwards, 2005, p. 20). Modern sustainability, overarches this. The concept emerged from the creation of the UN's commission *The World Commission on Environment and Development* (WCED) in 1983, headed by Gro Harlem Brundtland. The committee had the mission to create "A global agenda for change" and:

- "to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond;
- to recommend ways [to] concern for the environment may be translated into greater co-operation among developing countries and between countries at different stages of economic and social development and lead to the achievement of common and mutually supportive objectives that take account of the interrelationships between people, resources, environment, and development;
- to consider ways and means by which the international community can deal more effectively with environment concerns;
- and to help define shared perceptions of long-term environmental issues and the appropriate efforts needed to deal successfully with the problems of protecting and enhancing the environment, a long-term agenda for action during the coming decades, and aspirational goals for the world community. (Brundtland, 1987, p. 5)"

On the basis of these, in 1987 the Brundtland report *Our Common Future* was published. This report stated the most commonly used definition of sustainable development, the organising principle of sustainability, being: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). However, in the subsequent years, this definition is still found to be open to many different interpretations. Hopwood et al. (2005) have created a map that illustrates various interpretations of sustainable development (figure 2). The grey area represents the range of views that rate both environmental and socio- economic issues as

important for sustainability. The presented views outside of the grey area are more concentrated on either environmental or socio-economic issues.
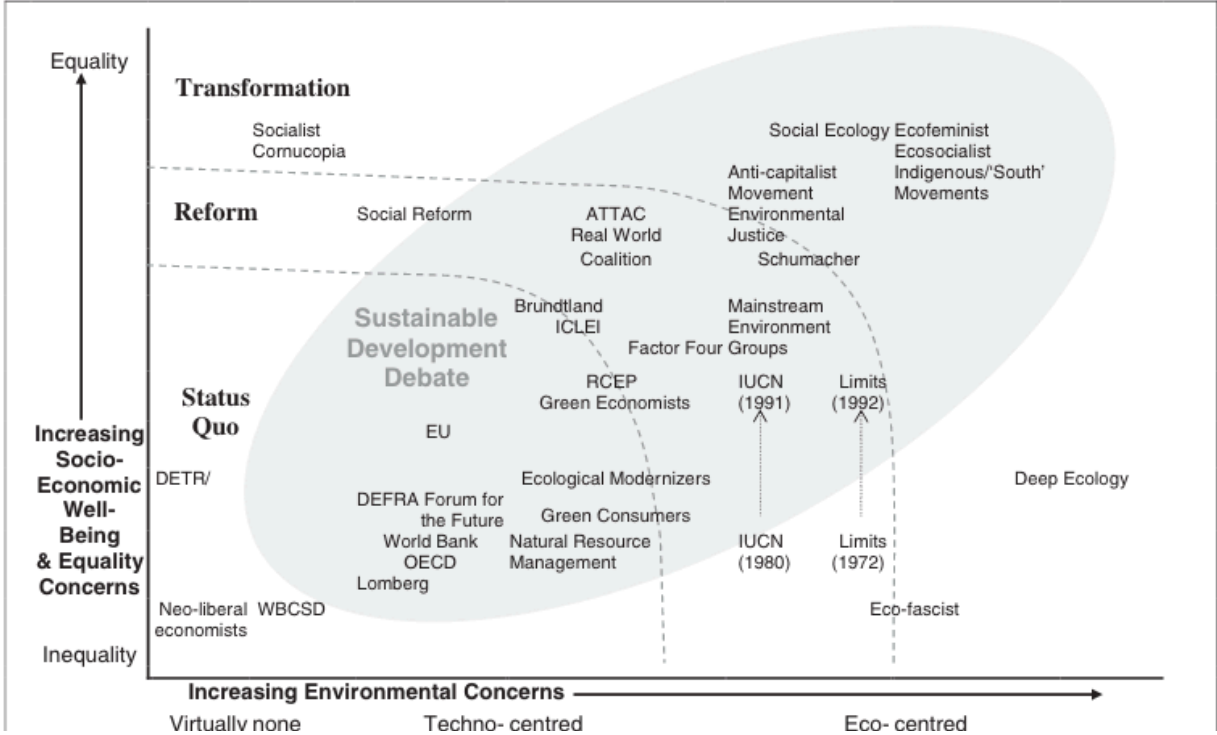
Figure 2 Mapping of views on sustainable development (Source: Hopwood et al., 2005, p. 41)

Due to the varying viewpoint, the necessary changes, tools and actors to create a sustainable society are under debate (Hopwood et al., 2005). On top of the trade-off between environmental and social importance, due to the capitalist world of today there is a third component that cannot be left out in this debate: economic growth. Together these aspects form the triptych: people, planet and profit, i.e. embrace economic development, social inclusion and environmental sustainability. For businesses, this is generally called; the triple bottom line, i.e. focus on having revenue streams as well as improving stakeholders' welfare and decrease environmental impact (Elkington, 2001; Lozano, 2012; Stubbs & Clocklin, 2008).

As a final remark the question needs to be raised whether 'sustainability' can ever be achieved. The needs of the current generation are constantly changing. Baker states that needs "change over time, across space and location and within different social, political, cultural and historical contexts (Baker, 2006, pp. 8–9)", which makes sustainability an on-going process of optimisation. Resulting, perfect 'sustainability' will be difficult to reach, however, the aim of a sustainable society is to reach at least a state that is durable for the environmental boundaries and the social needs of all human.

The Sustainable Development Goals
The UN uses a Development Agenda that is leading in the development of a better future. From 2015 until 2030 the focus is on The Sustainable Development Goals, which incorporate the thoughts discussed in the section about sustainability before.

Sustainable Development Goals: Background information
The Sustainable Development Goals are the successors for the Millennium Development Goals that were to come to an end in 2015. At the United Nations Conference on Sustainable Development Rio+20 ("The Future We Want") in 2012, governments agreed that the SDGs would become part of the

post-2015 Development Agenda. The overarching aims of the SDGs, as agreed by nations at Rio+20, can be summarized as poverty elimination, sustainable lifestyles for all, and a stable resilient planetary life-support system (Griggs et al., 2014). It was expected that governments, together with other stakeholders, such as business and civil society, would create and agree on the goals (Kanie et al., 2014). However, with these various interests, the negotiations to formulate the goals were not an easy task and took in total three years for its completion. Despite these intensive negotiations, the goals were heavily criticized when they were introduced in September 2015; mainly that the scope was too large and that they lacked coherence (Fukuda-Parr, 2016).

The MDGs were criticized by a wide spectrum of different groups such as people from civil society, human rights advocates and feminist activists, on being weak, under-ambitious, promoting inequality, non-transparent, overly technocratic, extraordinarily narrow and hierarchical (Fukuda-Parr, 2016). The SDGs are formulated with the intention of addressing the main shortcomings of the MDGs. According to Fukuda-Parr (Fukuda-Parr, 2016, p. 44) the MDGs and SDGs "differ not just in the number of goals and targets, but in their very purpose, conception, and the political process that drove their elaboration". Three key differences are distinguished; first, the SDGs are goals that are intended for every country to adopt sustainable development, in contrast to the MDGs – the North-South aid agenda – that were formulated to stimulate public support with only the developing countries at the core. Second, the MDGs were primarily focused on economic growth to improve living standards and the alleviation of poverty, while the SDGs are mainly focused on development through environmental, social, and economic sustainability. Third, the entire process and the formulation of the SDGs was based on the collaboration of a large number of different stakeholders (such as government officials, members of the private sector, academia and civil society) in contrast to the MDGs that were developed by a handful of UN staff, without the adequate knowledge and expertise, and behind closed doors.

The goals are universal and display a shared global vision of a sustainable habitat for all human beings on the planet (Osborn, Cutter, & Ullah, 2015). The SDGs "reflect the moral principles that no-one and no country should be left behind, and that everyone and every country should be regarded as having a common responsibility for playing their part in delivering the global vision" (Osborn et al., 2015, p. 2). This means that, in contrast with the MDGs, also the developed countries that currently have a more stable system need to take action to transform. Depending on the level of the development of the various countries and actors, the needs and priorities are different (Kanie et al., 2014).

The goals form a compromise of the wants and needs for a sustainable society and for the various stakeholders that collaborated in the formation and need to contribute to achieve the goals. The goals are statements of aspiration and are a non-binding voluntary agreement (Pogge & Sengupta, 2015). This is negative on the one hand, because nobody can be held responsible if they fail to follow the goals. However it also has a benefit; when the SDGs would be binding it is less likely that this many countries and companies would have signed the agreement (Pogge & Sengupta, 2015). Although they cannot legally be held responsible, agreeing to follow the SDGs pressures countries and companies to meet the targets of the SDGs.

Sustainable Development Goals: Overview of goals

The SDGs form a list of seventeen global goals that are a vision on what should be reached in society by 2030. Table 1 shows the goals as they are described in the UN document 'Transforming our world: The 2030 Agenda for Sustainable Development' (United Nations General Assembly, 2015, p.18).

Goal #	Goal	Explanation
SDG 1	No poverty	End poverty in all its forms everywhere
SDG 2	Zero hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
SDG 3	Good health & Well-being	Ensure healthy lives and promote well-being for all at all ages
SDG 4	Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
SDG 5	Gender equality	Achieve gender equality and empower all women and girls
SDG 6	Clean water & sanitation	Ensure availability and sustainable management of water and sanitation for all
SDG 7	Affordable & clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
SDG 8	Decent work & Economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG 9	Industry, Innovation & infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
SDG 10	Reduce inequalities	Reduce inequality within and among countries
SDG 11	Sustainable cities & communities	Make cities and human settlements inclusive, safe, resilient and sustainable
SDG 12	Responsible consumption & production	Ensure sustainable consumption and production patterns
SDG 13	Climate action	Take urgent action to combat climate change and its impacts
SDG 14	Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
SDG 15	Life on land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
SDG 16	Peace, Justice & Strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
SDG 17	Partnerships for the goals	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Table 1 Sustainable Development Goals (Source: United Nations General Assembly, 2015, p. 18)

Each of the main goals is broken down into different targets, resulting in a total 169 targets. As an example of the content of the targets, table 2 presents the targets for SDG1. Notable is that there is not a full overlap between the targets and the main SDG. When all of the targets of SDG1 are achieved, this does not mean that the world is without poverty, which is the main goal of SDG1. Another similar critique on the SDGs is that not all of the goals are made SMART (Specific, Measureable, Agreed upon, Realistic, Time-bound), or when they are SMART they are not ambitious (Loewe & Rippin, 2015). For this reason, it is hard to measure and determine whether a goal or target is achieved.

Target #	Targets SDG1
1.1	By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day
1.2	By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
1.3	Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
1.4	By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
1.a	Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions
1.b	Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions

Table 2 Targets for SDG1: no poverty (Source: United Nations General Assembly, 2015, p.19)

The goals and targets do not stand-alone, but can rather be seen as a network (Le Blanc, 2015). Figure 3 illustrates the links Le Blanc (2015) has found between the different SDGs through the number of linked targets.
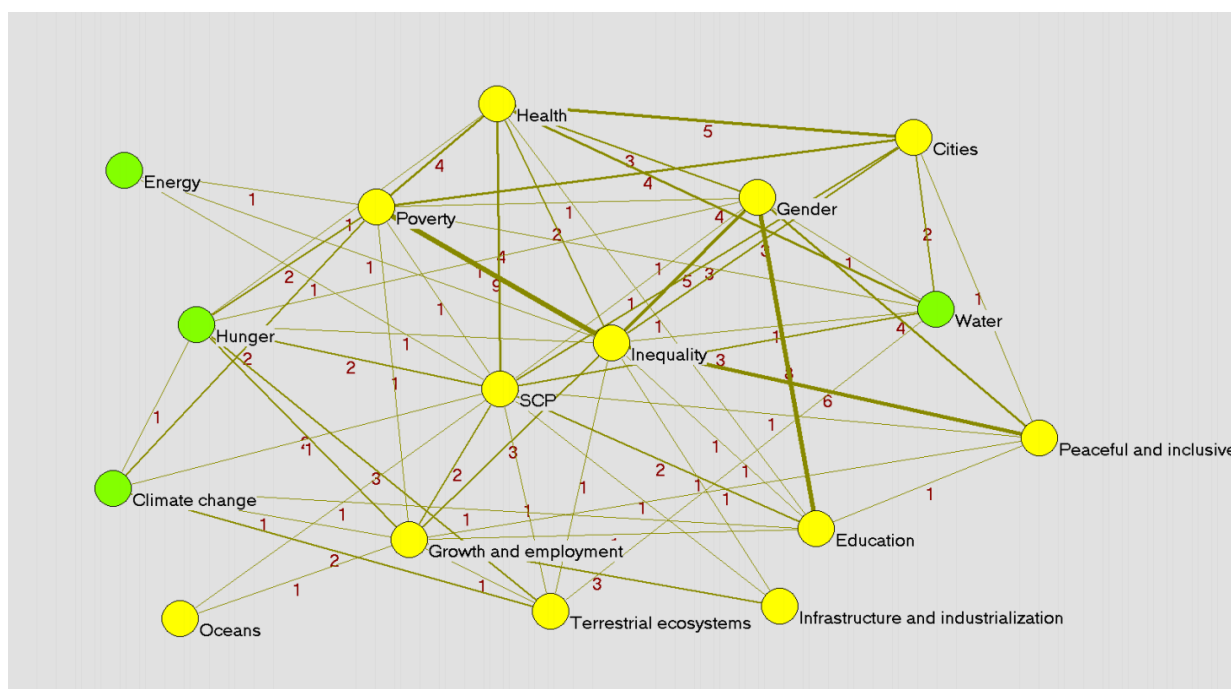
Source: Author's elaboration.

Note: the numbers on the map indicate the number of targets linking different goals. For example, SDG 16 on peaceful and inclusive societies is linked with SDG 5 on gender through four targets. The circles representing the goals on climate, land, energy and water have been singled out for purposes of comparison with other mappings (see below section 5)

Figure 3 Links between the SDGs through targets: an aggregated picture (Source: Le Blanc, 2015, p. 5)

Individual targets might serve multiple goals, which creates a connection between the goals. Furthermore, there can be interaction between the targets (Weitz, Huber-Lee, Nilsson, Davis, & Hoff, 2014). Some targets are interdependent; one target needs to be realized in order for another to be viable. In addition, there are targets that impose conditions or constraints on one another. Besides that, some targets reinforce each other showing potential synergies.

The interaction between the goals shows the need for a systematic approach on achieving them as they form a complex system. With the systematic view it can be analysed how "a set of individuals, institutions, and processes operates in a system involving a complex network of interrelationships, an array of individual and institutional actors with conflicting interests and goals, and a number of feedback loops (Werhane, 2008, p. 467)." The framing of a goal, can make a large difference in what is found the be important or neglected (Werhane, 2008). The more targets are focuses on, the more the system thinking approach is crucial to achieve the right successes. On top of this, the interconnectedness of the goals can cause unwanted indirect effects on non-primarily targeted goals.

Sustainable Development Goals & business
Business needs the SDGs and the SDGs need business. Companies in their CSR reports increasingly report on their contribution to sustainable development (Kolk, 2016). The SDGs can give these companies a better understanding of the sustainable development issues they need to focus on (Baumgartner, 2014). To achieve the SDGs, the private sector has an important role in tackling some of the most complex global challenges (Scheyvens, Banks, & Hughes, 2016). However, the complexity of the challenges behind the Global Goals (Costanza et al., 2016), create difficulties for the companies. As stated before, besides the direct effects the indirect effects need to be considered as well.

Sustainable Development Goals & technology
Technology is crucial to successfully accomplish the SDGs. Information (and Communication) Technology (I(C)T) is found to be able to have a large contribution in this development (Sachs & Modi, 2015). Previously for the MDGs, ICT has also been a great enabler based on the shared objective "the efficient, scalable, affordable and pervasive delivery of goods, services and information flows between people, governments and firms (Gilhooly, 2005, p. 1)". If ICT is used where it is relevant, appropriate and effective it can have a major effect on sustainable development in a short period of time. It can tighten the gap between the developed and underdeveloped economies (Henry, 2012).

ICT has the potential to increase the diffusion of many technologies, applications and platforms in our economy (Sachs & Modi, 2015). ICT solutions, such as mobile broadband, the Internet of Things (IoT)[1], robotics and artificial intelligence and 3-D printing are able to provide crucial tools to optimize whole sectors towards sustainability. The sectors healthcare, education, financial services, electrification, and high-yield agriculture are key sectors that can benefit from ICT (Sachs & Modi, 2015). When various stakeholders collaborate to achieve the SDGs, ICT based solutions can accelerate the diffusion of universal coverage of the goals. Ways ICT can support the SDGs are (Sachs & Modi, 2015, pp. 3–4):

- ICTs themselves diffuse with remarkable speed and at a global scale.
- ICT can reduce the cost of deploying new services.
- ICT can speed up public awareness of new services and technologies, and therefore the demand and readiness for these.
- National and global information networks can support the rapid upgrading of new applications.
- ICT can accelerate technology diffusion by providing low-cost online platforms for training workers in the new technologies.

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[1] Internet of Things: "a network of everyday devices, appliances, and other objects equipped with computer chips and sensors that can collect and transmit data though the Internet (Dictionary.com, n.d.)"

The data revolution (the fifth technical revolution) currently disrupts established sectors and business models. IT companies do not solely focus on the IT market, but are also competing in other markets with the use of big data ("Building with big data," 2011). Big data is a concept that represents the use of techniques to store and analyse large and complex data sets (Ward & Barker, 2013). By applying IT and big data, all sectors of the economy can be made more efficient which will contribute to achieving the SDGs (Sachs & Modi, 2015).

Besides the promising prospects of ICT based solutions, there are also some serious concerns to take into account. There is a risk of ICT taking over human aspects as communication, interactions, trust and brain development, displacing human work causing unemployment and the risks it brings with cyber-attacks and privacy (Sachs & Modi, 2015).

2.2   Radical transitions

This part presents various theories around radical transitions to a new paradigm. It starts with general literature about transitions and revolutions and continues with literature focused on radical changes towards a sustainable society. To clarify the meaning of radical changes, first a short explanation of radical innovation is given.

Radical innovation

The basis of the modern interpretation of innovation, comes from the term "neue kombinationen" that has been introduced by Schumpeter in 1934 (Schumpeter, 1934). It focuses on new or improved (combinations of) products, processes, markets or ways of organising. Radical innovation is the type of innovation that develops new products or services that did not exist before in a firm or a market (Sandberg & Aarikka-Stenroos, 2014). According to Chandy & Tellis (2000, p. 2)) "radical product innovation is a new product that incorporates a substantially different core technology and provides substantially higher customer benefits relative to previous products in the industry." As mentioned before, an innovation can also be radical when it is perceived as new to a certain market, i.e. when copied from another market and applied to the new market (Bessant, Von Stamm, & Moeslein, 2011). Figure 4 shows the S-curve of the innovation process of a radical innovation that competes with the existing technology in an industry (Chandy & Tellis, 2000).
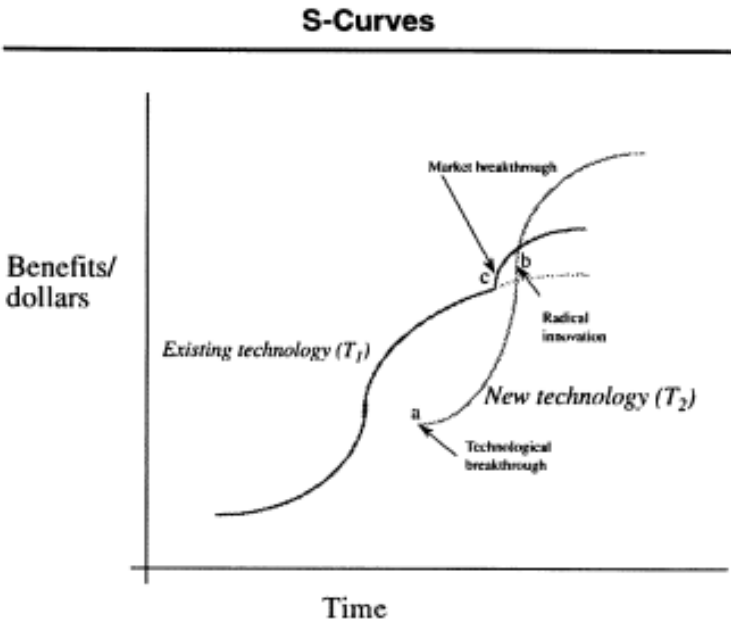
Figure 4 S-curve of radical innovation (source: Chandy & Tellis, 2000, p. 3)

Long waves and technological revolutions

Long waves are an economic principle that shows sinusoid cycles of about 50 years alternating between periods of economic growth and periods of relatively slow growth or declination (Kondratieff, 1935). Nikolai Kondratieff created the first international attention for the concept in his writings that were first published in the 1920s. In his honour, long waves are often called "Kondriatieff-waves" or in short K-waves (Freeman, 1982). However, in the period prior to Kondratieff's writings, other researchers, such as economists J. van Gelderen (in 1913), M. A. Buniatian (in 1915) and S. de Wolff (in 1924), have already argued the existence of 50-year waves (Korotayev & Tsirel, 2010; Tinbergen, 1981).

Table 3 and 4 show the cycles that have been identified by Kondriatieff and in later periods have been identified with the use of the Kondriatieff theory.

Long wave number	Long wave phase	Dates of the beginning	Dates of the end
One	A: upswing	"The end of the 1780s or the beginning of the 1790s"	1810-1817
	B: downswing	1810-1817	1844-1851
Two	A: upswing	1844-1851	1870-1875
	B: downswing	1870-1875	1890-1896
Three	A: upswing	1890-1896	1914-1920
	B: downswing	1914-1920	

Table 3 Long Waves and Their Phases Identified by Kondratieff (Source: Korotayev & Tsirel, 2010, p. 2)

Long wave number	Long wave phase	Dates of the beginning	Dates of the end
Three	A: upswing	1890-1896	1914-1920
	B: downswing	1914 to 1928/29	1939-1950
Four	A: upswing	1939-1950	1968-1974
	B: downswing	1968-1974	1984-1991
Five	A: upswing	1984-1991	2008-2010?
	B: downswing	2008-2010?	?

Table 4 "Post-Kondratieff" Long Waves and Their Phases (Source: Korotayev & Tsirel, 2010, p. 2)

Over the years, the long wave theory has received many supporters. Various researchers have built up on the K-wave theory and this has resulted in multiple versions of exact meaning and dates of the waves. Most of the followers of the long wave theory agree with the "Schumpeter-Freeman-Perez" version of five cycles starting with the First Industrial Revolution (Korotayev & Tsirel, 2010). The basis for this theory is the influential "Cluster-of-innovation" theory developed by Schumpeter (1939), which argued that K-waves are based on a leading sector or technological system. Following the Schumpeterian analysis, only one or a few innovators can make large profits within such clusters. Due to this, other (imitating) companies drop-out and are 'competed out of business', which eventually results in a (deep) recession. A period of depression will follow, before the start of a new wave of technological innovation (Freeman, 1982).

In modern literature the long wave theory is often connected to this description of waves of technological innovations (Korotayev & Tsirel, 2010). Table 5 shows an overview of the five cycles that are named technological revolutions by Perez (2003, 2009). Each revolution matches with the corresponding number of the long wave and is characterized by a technological innovation that initiated the revolution.

Technological revolution	Popular name for the Period	Big-bang initiating the revolution	Year	Core country or countries
First	First Industrial Revolution	Arkwright's mill opens in Cromford	1771	Britain
Second	Age of Steam and Railways	Test of the Rocket steam engine for the Liverpool-Manchester railway	1829	Britain (spreading to Europe and USA)
Third	Age of steel, Electricity, and heavy Engineering	The Carnegie Bessemer steel plant opens in Pittsburgh, PA	1875	USA and Germany forging ahead and overtaking Britain
Fourth	Age of oil, the Automobile and Mass Production	First Model-T comes out of Ford plant in Detroit, MI	1908	USA (with Germany at first vying for world leadership), later spreading to Europe
Fifth	Age of Information and Telecommunications	The Intel microprocessor is announced in Santa Clara, CA	1971	USA (spreading to Europe and Asia)

Table 5 Five successive technological revolutions: 1770s to 2000s (source: Perez, 2009, p. 190)

The importance of innovation for revolutions has been noted by Kondratieff already: "During the recession of the long waves, an especially large number of important discoveries and inventions in the technique of production and communication are made, which, however, are usually applied on a large scale only at the beginning of the next long upswing" (Kondratieff, 1935, p. 111). This can for example be seen with the second technological revolution that started in 1829, which is during the downswing of the first long wave. Figure 5 shows the diffusion of the technological potential of the dominant products and the overlap between the previous and the next wave (Perez, 2007).
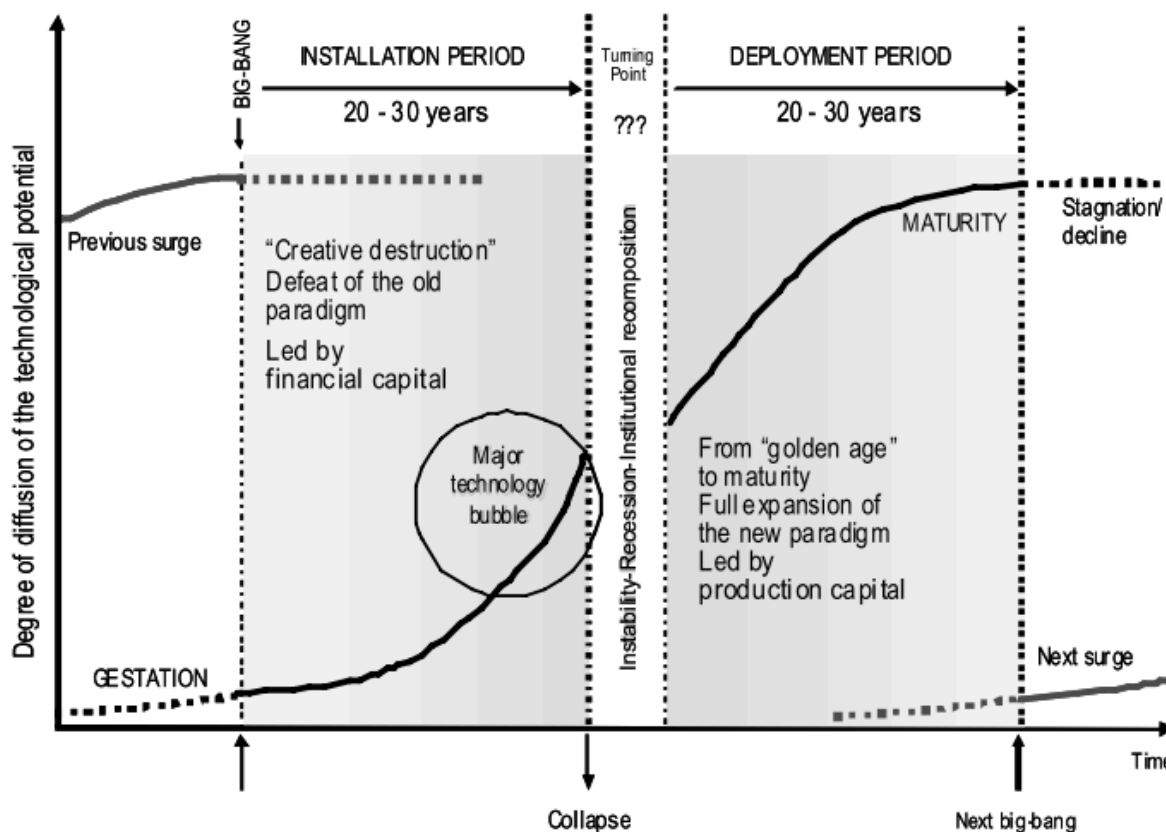
Figure 5 The social assimilation of technological revolutions (Source: Perez, 2007, p. 10)

The SDGs as drivers of The Sustainability Revolution

Technological revolutions are formed by a combination of interrelated radical breakthroughs, which are a system of individual radical innovations (Freeman, 1982; Perez, 2009). These individual radical innovations start on a rather primitive level and have to compete with the previous dominant product during the 'installation period'. Once the first group has accepted the new product in the market, it is optimised with multiple incremental innovations. In this process the feedback from various stakeholders, such as producers, designers and consumers are used to improve the product (Perez, 2009). This is done until a dominant design is created and the product is ready for the mainstream market (Utterback, 1994). A combination of multiple interconnected or interdependent of these radical innovations can completely disrupt a market. When such technology system has the ability to also transform the rest of the economy (and even society), it can be named a technological revolution (Perez, 2009).

Industrial Revolutions

Another type of revolution is an Industrial Revolution, which creates an even bigger economic transformation than technical revolutions. In the book *The Third Industrial revolution* Rifkin (2011) characterises an Industrial Revolution by the conversion of a new communication technology with a new energy system. The new forms of communication are needed and used to organise and manage the more complex civilisations of the new energy source (Rifkin, 2011). From this an infrastructure derives, that is more efficient than the previous, and brings together people and markets in more complex economic and social relationships. The infrastructure displays the connection between the new communication- and energy system, which together create a new economy.

The First Industrial Revolution was launched by the combination of using coal, iron and the development of the railway system together with the primary communication tool of printing and the generalisation of communication skills. The Second Industrial Revolution developed after the conversion of centralizing oil and electricity with mass communication, via telephones, radios and TV present at all homes. This Second Industrial Revolution has created the society that is based on mass consumption of food, mineral sources, and building materials and expanding road- and rail transport (Rifkin, 2011). The increase in productivity has led to a growing human population and urbanisation, which in combination with mass consumption is pushing the world's inhabitants to extinction. According to Rifkin (2011) a Third Industrial Revolution is about to emerge which focuses on the combination of computers and the internet (new communication technology) and renewable energy (new energy system). This combination promises to have a large contribution towards sustainable development and will be elaborated on further in this section, together with other literature about revolutions for a sustainable society.

Tipping Points

As seen in figure 5, an important moment for a revolution is the turning point, also called tipping point. A tipping point marks a critical moment after which everything is affected by change. It represents the moment where a new balance is achieved after a period of instability (van Tulder, van Tilburg, Francken, & da Rosa, 2013). Gladwell (2006) sees tipping points as part of an epidemic. Epidemics are usually connected with sickness, but in this case the term is used for mysterious changes in everyday life, such as the emergence of a fashion trend or the ebb and flow of crime waves (Gladwell, 2006). Epidemics have three principles: contagiousness, the fact that little causes can have big effects and that change happens not gradually but at one dramatic moment (Gladwell, 2006). The latter is the tipping point. As last statement Gladwell (2006, p. 259) says these words about the occurrence or Tipping Points:

"But if there is difficulty and volatility in the world of Tipping Points, there is a large measure of hopefulness as well. Merely by manipulating the size of the group, we can dramatically improve its receptivity to new ideas. By tinkering with the presentation of information, we can significantly improve its stickiness. Simply by finding and reaching those few special people who hold so much social power, we can shape the course of social epidemics. In the end, Tipping Points are a reaffirmation of the potential for change and the power of intelligent action. Look at the world around you. It may seem like an immovable, implacable place. It is not. With the slightest push – in just the right place – it can be tipped."

(Gladwell 2006, p. 259)

To create change, not many people, but the right people are needed. When a small number of influential people become adopters of an innovation and persuade others, the adoption rate rises. Gladwell (2006) describes these people as "mavens" (people who obsessively accumulate knowledge and like to share it), "connectors" (people who know everyone), and "salesmen," (people who are unusually persuasive and draw others into their way of thinking). From here the snowball effect becomes valid and with each person that embraces the change, more people are likely to do so as well. The Tipping Point occurs when a critical mass is reached (Ball, 2005). This critical mass is also of importance in Rogers' (2010) model for diffusion of innovation. "Diffusion is the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social System" (Rogers, 2010, p. 11). Figure 6 illustrates the process of the diffusion of an innovation in combination with the respective members of the social system that adopt the innovation at which point in time. The tipping point is reached when the majority starts to adopt an innovation, from where the adoption rate drastically increases in a short period of time (Rogers, 2010).
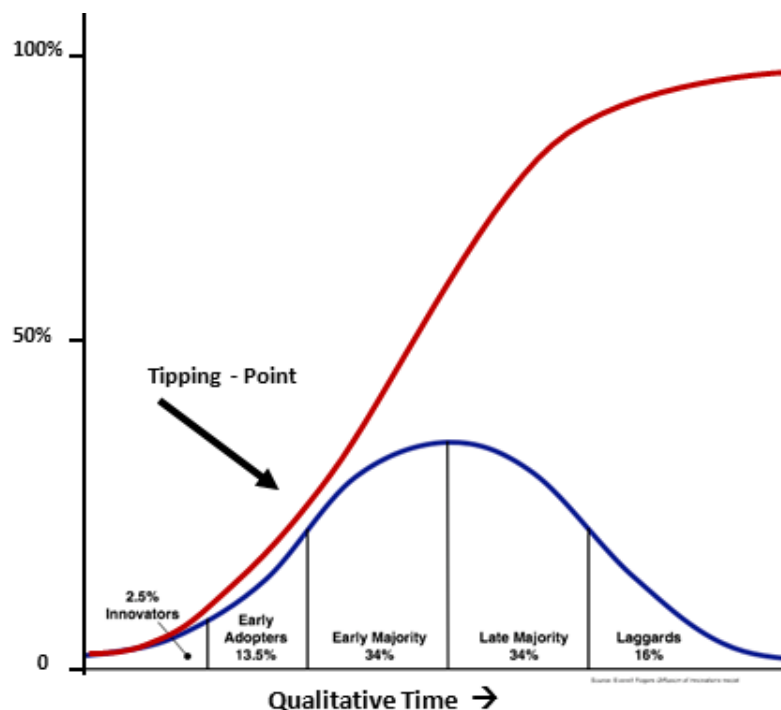
Figure 6 Model for the Diffusion of Innovation

Revolutions for a sustainable society

In this section, various theories around revolutions for a sustainable society will be elaborated on. They vary from authors that wrote about concrete characteristics of sustainability revolutions to the role of companies in this revolution.

Rifkin: The Third Industrial Revolution

As discussed in section 2.1, according to Rifkin (2011) a Third Industrial Revolution is about to emerge. This revolution will create a new economic paradigm that can completely transform the world to a post-carbon era and contributes to creating a more sustainable society.

The first criterion for this third Industrial Revolution, being the shift to a new communication tool, is reaching the maturity stage: The Age of Information and Telecommunication, i.e. the rise of personal computers and the Internet (the fifth technical revolution). This transition is changing the classic top-down media approach. The new energy system that is rising is renewable energy. The combination of Internet with renewable energy has the opportunity to create a new energy regime that is self-sufficient and disruptive (Rifkin, 2011). There are five pillars that are important for the technology shift:

1. "Shifting to renewable energy;
2. Transforming the building stock of every continent into green micro–power plants to collect renewable energies on-site;
3. Deploying hydrogen and other storage technologies in every building and throughout the infrastructure to store intermittent energies;
4. Using Internet technology to transform the power grid of every continent into an energy internet that acts just like the Internet (when millions of buildings are generating a small amount of renewable energy locally, on-site, they can sell surplus green electricity back to the grid and share it with their continental neighbours);
5. Transitioning the transport fleet to electric plug-in and fuel cell vehicles that can buy and sell green electricity on a smart, continental, interactive power grid (Rifkin, 2011, p. 37)"

These pillars need to be established simultaneously to create the desired change. Collaboration to create change is crucial, which has been understood by the leaders of previous Industrial Revolutions. The separate entities do not have the power that they can be created by reinforcing the opportunities of the others, creating economies of speed and scale that optimizes each other's business. It was the clusters of single enterprises, e.g. oil companies, telephone companies and real estate companies, that have emerged the Second Industrial Revolution (Rifkin, 2011). Pooling resources to create a strong lobby group is what seems self-interested, but with this the dots are connected that can melt forces into the creation of a new economic paradigm (Rifkin, 2011). Governments can be manipulated to help shape the new economy. In The Third Industrial Revolution the main companies that are rising, focus on technologies such as: clean energies, green construction, telecommunications, micro-generation, distributed grid IT, plug-in electric and fuel cell transport, sustainable chemistry, and zero-carbon logistics (Rifkin, 2011).

Active participation and responsibility by every member of society is required to be successful in emerging the Third Industrial Revolution. Only when no one is left behind the dream of a good quality of life can be collectively experienced. The Third Industrial Revolution embarks the moment between two periods of economic history: the previous individual behaviour and the new collective behaviour. In the transition to the new economy of the post-carbon era it is crucial that public capital, market capital and humans' social capital are utilized. The world should be seen as a global family that includes

all species in order to renew the planet for future generation to be able to enjoy their needs (Rifkin, 2011).

Edwards: The Sustainability Revolution

In 2005 Edwards wrote the book *The Sustainability Revolution,* which "presents an alternative that supports economic viability and healthy ecosystems by modifying consumption patterns and a more equitable social framework (Edwards, 2005, p. 4)" First three basic conditions for a social revolution are outlined: genesis, critical mass and diffusion.

- The genesis of the Sustainability Revolution lies in the creation of the before mentioned Brundtland report *Our Common Future*, addressing the protection of the environment while simultaneously concerning about economic and social justice (Edwards, 2005).
- The Sustainability Revolution's critical mass has not yet been reached, but there have been multiple critical milestones that contribute to the creation of the revolution, e.g. the 1992 Earth Summit in Rio de Janeiro where 182 world leaders were present which gave sustainability an international stage, and the rise of the personal computer and the Internet (the fifth technological revolution) that facilitates the spread of information (Edwards, 2005).
- The diffusion of The Sustainability Revolution is started, but has not yet reached the stage of a mainstream phenomenon. It is emerging the United States and European Union countries, where there were struggles with limited natural resources, and the awareness is spreading towards more developing countries. Awareness of the requirement of all countries to contribute is rising due to the international scope of the issues, such as climate change and ozone depletion (Edwards, 2005).

Next to these basic conditions of a revolution, five characteristics are proposed that are of importance for the success of The Sustainability Revolution:

- Similar intentions and objectives: although there is no consensus on the meaning of sustainability, the intentions and objectives have many similarities including: "concern for the environment, the economy and social equity; understanding of our dependence on the health and natural system (clean air, clean water, healthy soils and forests, biodiversity) for our survival and well-being; knowledge of the limits of the Earth's ecosystems and the detrimental impact of unchecked human activities (population, pollution, economic growth); and a long term, intergenerational perspective in actions and goals (Edwards, 2005, p.10)."
- Large and diverse: The Sustainability Revolution needs to occur on an international scope and a contribution is needed from all parts of society, where the revolution will affect also all parts of society.
- Range of issues: The Sustainability Revolution does not have one issue to solve, but is a collection of values that are concentrated around People, Planet and Profit.
- Decentralized leadership: The leadership for The Sustainability Revolution is widespread and consists of 'normal' citizens towards important community leaders. Due to the decentralized leadership, the movement can spread quick and effectively into diverse cultures worldwide.
- Oppositional and alternative actions: There are many different initiatives centred around the topics of The Sustainability Revolution.

By analysing principles for The Sustainability Revolution for the Community, Commerce, Natural Resources, Ecological Design and the Biosphere, there are seven overlapping themes determined (Edwards, 2005) that portrait The Sustainability Revolution:

Theme	Meaning
Stewardship	Importance of the establishment of an ecological ethic for managing and preserving ecosystems.
Respect for limits	Living within nature's means by preventing waste, pollution and unsustainable resource depletion.
Interdependence	Importance of the ecological relationship between species and nature as well as the economic and cultural ties at the local, regional and international level.
Economic restructuring	The need to expand employment opportunities and safeguard the ecosystems. The new economic model should depend on cooperation and optimal efficiency rather than competition and waste.
Fair distribution	Importance of social justice and equity. It involves a shift in social values via governmental policies and socially responsible corporate practices that focus on issues faced by low-income communities.
Intergenerational perspective	Need for long-term view to guide society when facing critical choices. Decisions need to be prioritized by placing them in the context of future generations.
Nature as a model and teacher	The living systems and nature 3.5 billion years of evolution are a pool of 'expertise'. Humans, as relative newcomers to the world, can benefit from learning from nature.

Table 6 Portrait of The Sustainable Revolution

Senge, Smith, Kruschwitz, Laur & Schley: The Necessary Revolution

Another book written about a sustainable future is *The Necessary Revolution* by Senge et al. (2008). The book explores the rising challenges and their following opportunities around three areas: energy and transportation, food and water, and material waste and toxicity. Strategies for individuals and organisation are revealed on how to tackle the greatest challenges of this time. According to Senge et al. (2008) the denial period is over and the most innovative leaders see the urge for revolutionary change for a sustainable world. However, there is not one answer to what the sustainable world would look like, but a shift in thinking is needed for such a revolution to emerge (Senge et al., 2008). Three guiding principles are determined:

- Society must consider generations to come: Humanity needs a sustainable strategy to ensure the next generations of a future.
- Institutions must work together: Group solutions are needed to solve the interconnected issues.
- People must generate new ideas: Albert Einstein said, 'We can't solve problems by using the same kind of thinking we used when we created them.' People, governments and institutions must develop novel solutions.

Policies and approaches need to be developed to ensure the health of the larger system, where all organisations and entities are part of. Collaborations across borders is needed to solve the global issues (Senge et al., 2008). Furthermore, Senge et al. (2008) highlights that there are many good reasons for business to take leadership to shape the new economy:

- Cut cost by reducing energy use and waste.
- Earn more money from waste than it would spent on disposal.
- Compete and stand out by showing customers the (financial) benefit of acting sustainable.
- Shaping the future of their own industry by shaping future regulations.
- Become the preferred supplier because of social and environmental standards.
- Change of image and brand by promoting social and environmental standards for public relation reasons.

Sachs: The Age of Sustainable Development

Sachs (2015) states that sustainable development is the main concept of this age. With the Sustainable Development Goals leading the development agenda from 2015 until 2030, there is a promising overlap (Sachs, 2015). The wold's nations have accepted the SDGs to guide the social and economic development. To create social inclusiveness and environmental sustainable economic growth, good governance is of importance. Governments have to take responsibility to create legislations that are in favour of reaching the SDGs. Additionally, Sachs (2015) states that good governance is not solely the government's responsibility, but also the multinational companies are powerful actors in this. Those companies obeying the legislations and those that treat the environment with respect support communities in need and can have much influence on the well-being of the world and its habitants (Sachs, 2015).

The book goes into detail about the meaning of the issues that need to be solved for a sustainable society, e.g. planetary boundaries, social inclusion and climate change. This in-depth analysis is important but not within the scope of this research and will for that reason not be included.

Grin, Rotmans & Schot: Transition to Sustainable Development

Another important book for sustainable transition is *Transitions to Sustainable Development* written by Grin, Rotmans & Schot (2010), which focuses on radical transformation towards a sustainable society. A sustainability transition is defined as a "radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies" (Grin et al., 2010). The book focuses on the systematic changes that need to occur from various levels.

Grin and others (2010) argue that the long wave theory, which has been discussed at the beginning of this section, has too much focus on food, transport and energy domains and for that reason does not provide enough insights in the more in-depth analysis of the general process of a transition. Nevertheless, the long wave theory is praised for its critical long-term perspective on transition. Furthermore, the use of the theory of Technical Innovation Systems (TIS) from Hekkert, Suurs, Negro, Kuhlmann & Smits (2007) is named for being a powerful tool to analyse internal strengths and weaknesses of specific socio-technical trajectories. However, it does not incorporate an extensive analysis of interactions between various time-scales. The flaws in these two theories, lead to the decision of Grin and others (2010) to focus on the Multi-Level Perspective (MLP) theory on transitions.

The Multi-Level Perspective theory states that interactions between processes at different levels shape transitions (see Figure 7). Wide breakthrough of a niche-innovation depends on external changes in the landscape that forces to open up existing regimes. Niche-innovations can diffuse more widely when they are sufficiently stabilized and have improved their price and/or performance. If the new innovation defeats the competition, socio-technical change can occur from the new standardized technology. This new socio-technological system can contribute to change landscape (Grin et al., 2010).

Increasing structuration
of activities in local practices

Socio-technical
landscape
(exogenous
context)

Landscape developments
put pressure on existing regime,
which opens up,
creating windows
of opportunity for novelties

New regime
influences
landscape

Socio-
technical
regime

Markets, user
preferences
Industry
Science
Policy
Culture
Technology

Socio-technical regime is 'dynamically stable'.
On different dimensions there are ongoing processes

New configuration breaks through, taking
advantage of 'windows of opportunity'.
Adjustments occur in socio-technical regime.

External influences on niches
(via expectations and networks)

Elements become aligned,
and stabilise in a dominant design.
Internal momentum increases.

Niche-
innovations

Small networks of actors support novelties on the basis of expectations and visions.
Learning processes take place on multiple dimensions (co-construction).
Efforts to link different elements in a seamless web.

Time

Figure 7 Multi-level perspective on transitions (Source: Geels, 2011, p. 28)

2.3   The role of Incumbent companies

This section discusses different customary roles of incumbent companies. However, to be a prime mover of a revolution a more radical approach is needed. For this reason, an analysis of the strengths, weaknesses, opportunities and threats (SWOT) is done for the radical innovation power of incumbent companies combined with what this means for sustainable development.

Incumbent companies & Paradigm switches

Incumbent companies are the companies that have been the most important stakeholder in the previous paradigm (Chandy & Tellis, 2000; Henderson, 1993; Mitchell, 1991). Within a sector there are incumbent companies that have been there from the beginning of the old era as well as incumbent companies that are relatively new and more suited to the new paradigm. In times of paradigm changes incumbent companies have various patterns they follow. Geels (2005) differentiates six usual firm patterns of incumbents when new innovations are created:

- Two (or more) incumbents in a race of innovation that can accelerate the diffusion of an innovation. One has to be the first mover where soon after another incumbent comes to the market with an improved version and so on.
- Diversifying to other markets and technologies when the existing market is at its saturation level.
- Sailing ship effect: by improving the incumbent technology, the diffusion of new technologies is reduced.
- Incumbents that are too late to recognize a new emerging technology 'miss the wave'.
- Regardless of another new dominant technology, the incumbent firms hold on to old technologies in particular market niches for a longer time.
- Using old technology to evade another market when they are replaced in the previous market.

Incumbent companies & Radical change: SWOT-analysis

To create radical change in a sector, the above-mentioned patterns are likely to not be sufficient. Radical innovations need to be created that can disrupt the market. Incumbent companies that create radical innovation defeat competitors as well as own products. The timing for marketing a new product is important; it is crucial to not introduce the innovation too late, but also not too soon. A SWOT-analysis is done to analyse the benefits and barriers of incumbent companies to create radical change.

Strengths

Being the market leaders in their segment from the old paradigm, incumbent companies have competitive advantage over newcomers due to their size, resources and global reach. These advantages could lead to successful processes of radical change (Chandy & Tellis, 2000; Hockerts & Wüstenhagen, 2010).

There are many capabilities that incumbent companies can rely on to support proactive behaviour for radical change, e.g. strategic and manufacturing proactivity (Sharma, Aragon-Correa, & Rueda-Manzanares, 2007), market orientation (Cambra-Fierro, Wilson, Polo-Redondo, Fuster-Mur, & Lopez-Perez, 2013), customer knowledge (Chandy & Tellis, 2000), alliance experience (Lin, 2012), stakeholder orientation (Sharma et al., 2007), organisational adoptability (Ghobadian, Viney, Liu, James, & Al, 1998), human resources (Ghobadian et al., 1998; Jabbour, Santos, & Nagano, 2010) and innovation experience (Lin, 2012; Sharma et al., 2007). Furthermore, the financial capital gives incumbent companies a large advantage. It functions as a buffer and gives them the possibility to take more risk. Also, it gives more space to use the best facilities and hire the best employees (Chandy & Tellis, 2000). These capabilities create a strong base of knowledge that is useful when seeking for radical innovation (Hockerts & Wüstenhagen, 2010; Kim & Min, 2015). Authors hail the power of business to innovate and create scalable solutions out of that, which is a great strength to optimise the companies' CSR approach to a more radical approach (Hart, 2010; Nidumolu et al., 2009; Porter & Kramer, 2011).

Next to their capabilities, the global reach of incumbent companies gives them much recognition and power. Customers are familiar with the brand, which makes it appear less risky to buy a radical product from an incumbent company (Chandy & Tellis, 2000). Furthermore, due to the large size of the companies, the current economic system relies heavily on the success of the incumbent companies. Due to globalisation, the power relation between politics and business is changing with business more on the winning side (Scherer & Palazzo, 2007). The power of the incumbent companies goes further than just the business environment. Their power can even lead to their management formulating economic policies of the national government (Dörrenbächer & Gammelgaard, 2011). Thus, the leading incumbent companies have much influence on shaping the new paradigm and be able to influence future rules and regulations, which gives them an advantage over other actors in the market. As the popularity of corporate responsibility is increasing (Halme & Laurila, 2009), MNE's can translate this to the political environment and use their power to shape favourable condition for a sustainable society.

Besides the strengths of incumbent companies to create radical innovations, there are also many barriers. Figure 8 illustrates the main internal barriers in different contexts and activities for Small and Medium-sized Enterprises (SMEs) and large firms, where the rest of this section will elaborate on the barriers of the large firms.
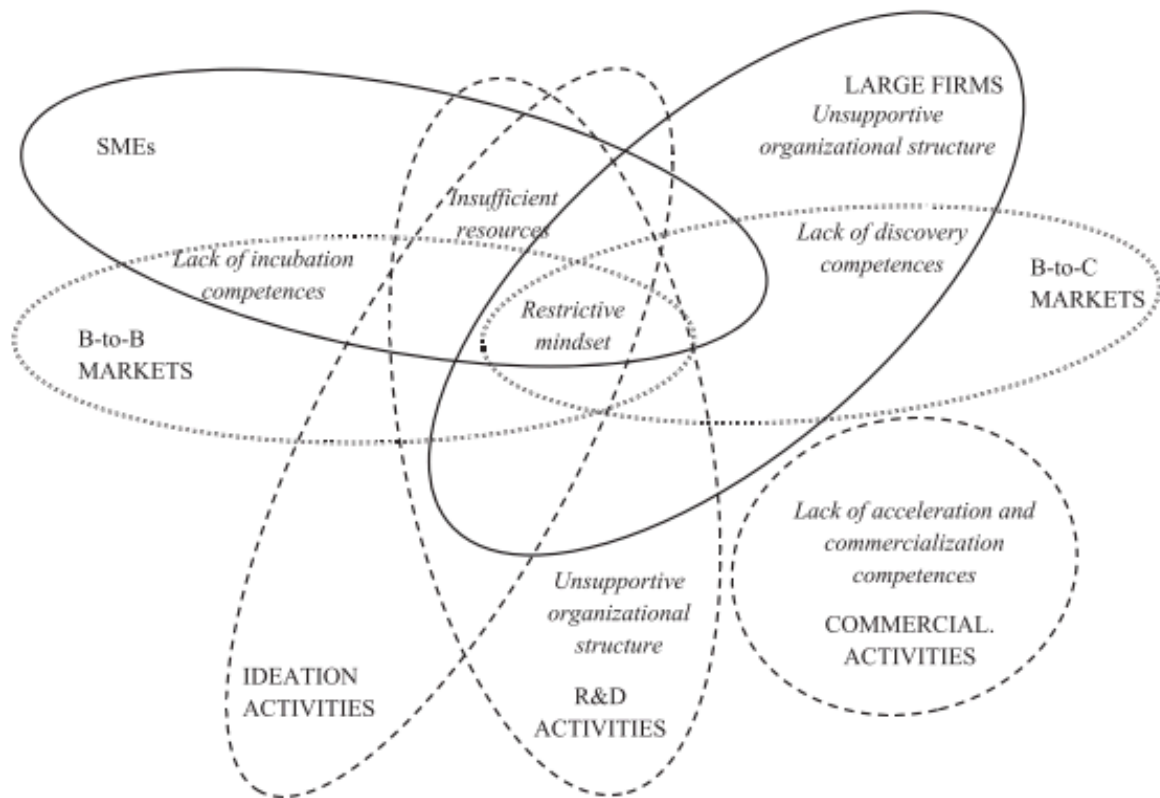
Figure 8 Accentuated internal barriers in different context and activities (source: Sandberg & Aarikka-Stenroos, 2014, p. 1302)

First of all, incumbents suffer from a restricted mind-set (O'connor & Rice, 2001; Sandberg & Aarikka-Stenroos, 2014). The routines are in a lock-in phase and due to path dependencies, the incumbent companies are less dynamic than start-ups. Accordingly, their innovating approach mainly consists of incremental innovation instead of radical innovations (Geels, 2004; Smink et al., 2015). Radical innovation obligates essential alterations to the existing practises, which makes the process more difficult for established companies (Sandberg & Aarikka-Stenroos, 2014). Following from the fixed state of the incumbent companies, the incumbent companies have a low willingness to radically change current business approaches (Christensen, 1993; Henderson & Clark, 1990). They are relying on the demands of the old paradigm which currently gives them their reason to be present. The same holds true for the employees that show resistance to radical change because this will challenge their skills and therefore job security (Wolfe, Wright, & Smart, 2006). The competitive advantage in the old paradigm and the corresponding strengths, such as their economic and political power, give them the possibility to resist or slow down the needed radical changes. Currently these companies use this power to slow down the transition to a sustainable society.

Next is the lack of discovery competencies of large companies (Sandberg & Aarikka-Stenroos, 2014). In the business-to-consumer market this is shown by the distance between the firm and its customers,

due to the many steps in the supply chain. This makes the market analyses harder (Lynn, Morone, & Paulson, 1996). The lack of direct contact with the consumer creates a bigger barrier for the success of radical innovation (Sandberg & Aarikka-Stenroos, 2014).

Furthermore, the organisational structure of incumbent companies is not beneficial for radical innovation. The often structure of incumbent companies where the various departments work more separately from each other, can cause difficulties to shift a product from the research & development (R&D) department to the communication and commercialization department (Wood & Brown, 1998).

Additionally, if one wants to focus on sustainability innovation, adjustments for the incumbents to become a fully sustainable company are hard due to these path dependencies. The efficient routines the businesses rely on today were built when the concept of sustainability did not even exist. Although the incumbent companies show their responsible behaviour in extensive CSR reports, the CSR strategies of these companies mainly show a shallow legitimisation of their unsustainable practises (Banerjee, 2012; Prieto-Carrón, Lund-Thomsen, Chan, Muro, & Bhushan, 2006).

Lastly, besides creating own radical innovations, incumbent companies also have difficulties adapting to radical transitions that create a new market. Literature gives various reasons for this: e.g. new economic structure (Christensen, 1997; Rothaermel, 2001), not able to quickly learn new competencies and change routines (Nelson & Winter, 1982; Rothaermel, 2001), not (want to) see the possibilities of the new technologies (Hamel & Ruben, 2000; Rothaermel, 2001).

Opportunities

As discussed in the strength section (page 23), incumbent companies have much power to create institutional change so they have a good fit with their practises. Studies on sustainable transition conceptualize this transition as a "socio-technical transition", with the emphasis on technical and institutional change evolving from competition (Geels & Schot, 2010; Kemp, 1994). For the necessary transition to a sustainable society, incumbent companies have the important role to create the institutional context that fits this society, from both the internal (individual and firm) level perspective as well as the external/interfirm level, being the public and regulatory pressures and industry-wide norms as discussed before (Oliver, 1997). Furthermore, by collaboration and co-creation with other incumbent firms, high barriers of entry can be created for new entrants (Dittrich & Duysters, 2007). Taking this role will be a great opportunity for incumbent companies to also in the new paradigm hold onto the competitive advantage they currently have.

Another opportunity for incumbent companies concerns radical Sustainable Oriented Innovation (SOI), which entails that sustainability is used as a strategic start condition in order to create sustainable value (Kennedy, Whiteman, & Van Den Ende, 2016). Figure 9 illustrates the innovation process of radical SOI. In practise, large companies still tend to experiment with incremental innovation prior to shifting to radical SOI (Nidumolu et al., 2009).
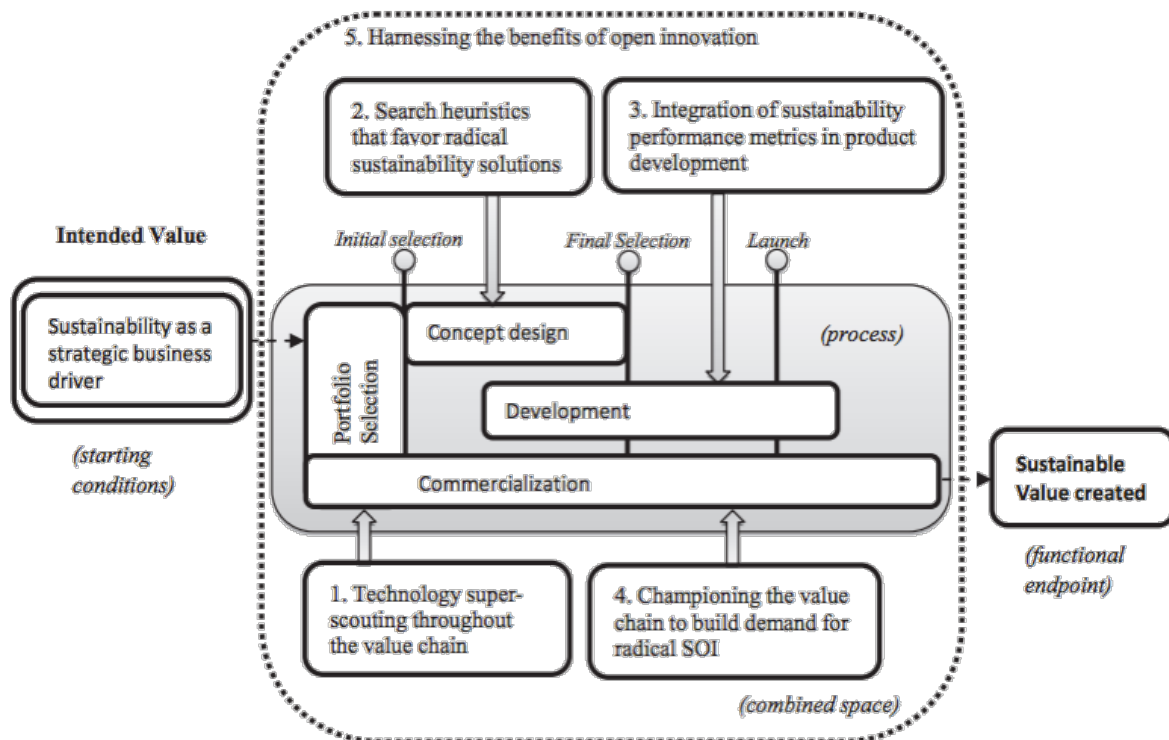
Figure 9 Critical organisational practices of the radical product SOI process influenced by firm strategic direction (source: Kennedy et al., 2016, p. 9)

Pro-active sustainability strategies are closely linked to the radical SOI theory (Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2015; Hart & Milstein, 2013). Having a pro-active CSR strategy is another opportunity for incumbent companies to create radical change. By adopting this strategy, they become drivers and frontrunners of the change to a sustainable society and have much influence in shaping this society to fit the business practises as well as the desired sustainable state. A firm with a pro-active CSR strategy takes the responsibility role to guide the transition to a more sustainable society (Nidumolu et al., 2009; van Tulder et al., 2013). A pro-active company understands that radical change is needed to create an economic system that is sustainable. They are aware that in order to reach that, they are also dependent on the practises of others. A pro-active company takes its responsibility to create change and for that focus on both internal and external actions. By changing their own operations as well as openly collaborating with other stakeholders to create the right context for change (van Tulder et al., 2013).

Threats

First of all, radical innovation per definition is much more uncertain and risky than incremental innovation since it requires more development time and higher investment returns in a short time (Green, Welsh, & Dehler, 2003).

An often mentioned theory with respect to radical innovation and incumbent companies, is the incumbent curse (Chandy & Tellis, 2000). As mentioned before, incumbent companies tend to innovate more incrementally than radical (Geels, 2004; Smink et al., 2015). The incumbent companies want to take advantage of the old paradigm for as long as possible (Geels, 2005). However, radical innovations are important for economic growth and leading in times of paradigm switches. Where the incumbent companies do not innovate radically, these radical changes in the market often come from new entrants. These smaller entrepreneurs have created a product or service that has the ability to

completely disrupt a market and thus form a big threat to the incumbent companies. As stated in the 'weakness' section (page 24), incumbent companies often fail to adopt to changes in the market, which results in losing their competitive advantage and the frontrunner position in the market.

A threat that is faced with the development of an radical innovation is the so-called "valley of death", as illustrated in figure 10 this is the moment between the opportunity discovery and product development (Markham, Ward, Aiman-Smith, & Kingon, 2010). For new entrants, the funding and resources are often a problem that can stop the business in the valley of death. As mentioned before this is often not a big issue for the incumbent companies. The threat for incumbent companies lies within the weakness of the communication between the research & development (R&D) unit and the commercial business units as explained before. To avoid the "valley of death" it is crucial to have synergy between the various departments (Markham et al., 2010). Large companies tend to buy start-ups that have gained legitimacy and are (almost) out of the threat of the "valley of death" to take away the threat of having them as competition. This way the incumbent companies skip the R&D and "valley of death" phase for their own innovation and can at the same time evolve to a better strategy for the new paradigm (Ghosh & Nanda, 2010).
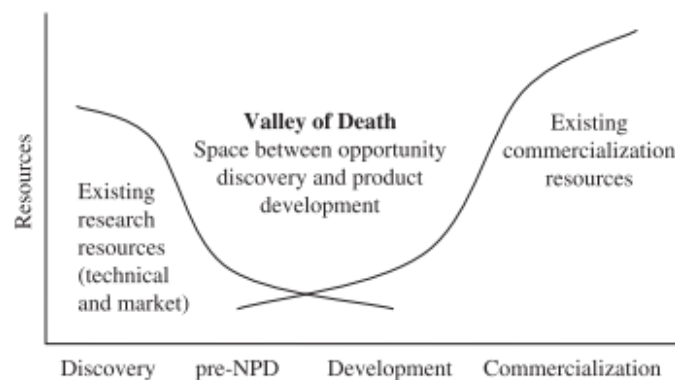
Figure 10 Valley of death (source: Markham et al., 2010, p.404)

Adding sustainability to the already threating environment, brings even more uncertainties for (incumbent) companies. On top of the normal unavoidable challenges that are faced with bringing innovations to the market, sustainable oriented adds more uncertainty e.g. due to the more questionable stakeholder demand for sustainable products and the trade-off between sustainability dimensions (ecological, social and economic) (Dangelico & Pujari, 2010).

2.4 Conclusion

The literature review has elaborated on the components of the desired sustainable future, radical (sustainability) transition theories and the role of incumbent companies in paradigm switches.

Desired sustainable future

The Sustainable Development Goals can be the guiding goals for The Sustainability Revolution, focussing on economic, social and environmental performance. The SDGs have been created and agreed upon by many stakeholders to be the "future we want". The goal of the SDGs is to create long-term prosperity for everybody while safeguarding the environment. Table 1 gives an overview of what the goals are. When accomplished, these goals sketch a desired sustainable future. The goals are all interconnected (see figure 3) and can improve each other, but also oppose each other. It is impossible to create a priority ranking, since all issues are pressing, but there are different views on what is more

important for sustainable development (see figure 2). The SDGs give a good guideline for what needs to be done, but the implementation also bring challenges. Due to the voluntary nature of the agreement, no organisation can be held responsible for the progress on the goals. The desired sustainable future that is presented by the SDGs is thus still up for own interpretation. Companies that use the SDGs as a tool to determine CSR strategies, are free to choose which goals they tackle and in which way. As the goals form a system, contributing to certain goals should be well thought off as this might influence the performance of other (connected) goals.

Characteristics of a revolution

A revolution occurs over a longer period of time. According to the longwave theory this takes approximately 50 years (Freeman, 1982; Korotayev & Tsirel, 2010; Perez, 2009). First the new paradigm is in competition with the previous paradigm and in this time. The new paradigm is shaped by a cluster of radical innovations, which go through an optimisation process to create a dominant design that is suited for the mainstream (Perez, 2009). To channel the diffusion of the innovations, "mavens" (people who obsessively accumulate knowledge and like to share it), "connectors" (people who know everyone), and "salesmen," (people who are unusually persuasive and draw others into their way of thinking), are needed among the group of first adopters of the radical innovation (Gladwell, 2006). This first adopters in the case of large revolutions can also be the companies that take the role of maven, connector or salesmen. The challenge for companies is to become a role model that inspires others to follow the movement. With the right first movers on board, the innovation is diffused to the next line of people (early adopters) and when after that the critical mass is reached, this marks the tipping point. From this point on the diffusion of the cluster of innovations is likely to be accelerated.

In figure 6 the model of diffusion of innovation is presented. In 2030, the SDGs are supposed to be achieved, which means that that is the moment when the 100% level of diffusion needs to be reached. With this in mind, it becomes clear that the tipping point for the process towards a sustainable society needs to be in the near future. If a critical look is taken at the stated goals, it can be seen that when all targets of a specific goal are reached, this does not immediately entail that the main goal is reached. This means that even after the timeframe of the Sustainable Development Goals (in 2030), there is still significant need for further improvements on the goals. The SDG targets can guide The Sustainability Revolution in the "installation period" towards a turning point, where after the end of the SDG time-frame, the main goals can still be guiding the revolution towards the maturity phase.

During the "installation period", the upcoming paradigm is competing with the previously dominant paradigm. As the tipping point for sustainable development has not occurred yet, the current system is in that phase. To be an inspiring leading innovator that will push the system to change, it is crucial that there is awareness for the failing previous system. In this time, there will be companies that take the role of change agents. However, there are also actors that try to prolong the stagnating paradigm. The time towards the tipping point will mark itself as a power battle between these agents of change and agents of stagnation.

The Sustainability Revolution

Sachs (2015) states that the SDGs form an important agenda to guide the era of sustainable development. Overall it is agreed that The Sustainability Revolution must create a world that is suitable for generations to come. Various environmental, social and economic issues (e.g. the ones highlighted by the SDGs) have to be solved.

In the era after the Sustainability revolution, unsustainable resources depletion, waste and pollution need to be prevented and an ecological ethic for preserving ecosystems needs to be established (Edwards, 2005). Clean and affordable energy needs to be accessible for humans. Rifkin (2011) argues that with combining the rise of the Internet and computer with renewable energy, a planet that is durable for future generations can be created. Human action is needed to achieve this and the lives of all species need to be taken into account. The book mainly focuses on solving direct environmental issues with Internet and renewable energy, but by having global coverage of this technologies, also social development is created. As stated by other authors, such as Edwards (2005) and Sachs (2015), social development should be at the core in the emergence of The Sustainability Revolution. No man is left behind in the desired sustainable future and for this, it is important that there is a fair distribution of social justice and equity (Edwards, 2005).

To create the needed change there, also the economic model needs to be restructured to a model that focuses on cooperation and optimal efficiency rather than competition and waste (Edwards, 2005). Rifkin (2011) supports this and states that the era after the Third Industrial Revolution must be marked by the collaborative aspect. The collaborative aspect is also mentioned by other authors as being important (e.g. Edwards, 2005; Grin et al., 2010; Senge et al., 2008). The Sustainability Revolution will not be created in isolation, but grouped solutions are needed to solve the interconnected issues. Next to governments creating policies that are pressing sustainable development, companies have to step away from individualism and have to improve their CSR practises. Additionally, collaboration between multiple incumbent companies to create radical sustainability oriented innovations, this can have a significantly large impact on emerging The Sustainability Revolution.

Information Technology solutions has been determined to be important to succeed in achieving the SDGs, and accordingly create a sustainable society. Rifkin (2011) argues that the combination between IT and renewable energy is crucial to create an infrastructure that is efficient and sustainable for the new economic paradigm. Global coverage of these technologies is important so no man is left behind in the transition to a sustainable society. IT can not only optimise its own sector, but also has a large impact on making other sectors more efficient. Global coverage of technology based innovation can have major impact on the social and economic development of the developed as well as of the now less developed world. However, this kind of innovation also brings the issue of energy demands where the demand in the less developed world is currently far lower. To prevent an energy crisis, the global diffusion of affordable renewable energy needs to be realised simultaneously. Furthermore, responsible consumption and production is important with the use of technologies. The life cycle of a product needs to be well thought to avoid massive amounts of technology waste. The IT and energy sector are thus both crucial to change towards more sustainable practises in order to launch The Sustainability Revolution.

Incumbent companies

Table 7 summarises the various components of the SWOT that have been listed about the radical innovation power of incumbent companies.

+		-	
Strengths		**Weaknesses**	

• Market leader with competitive advantage
 	
• Capabilities:
   o Strategic and manufacturing proactivity
   o Market orientation
   o Consumer knowledge
   o Alliance experience
   o Stakeholder orientation
   o Organisational adoptability
   o Human resources
   o Innovation experience
   o Financial capital
 	
• Global reach:
   o Recognition of brand
   o Power to shape (interfirm) institutional context
		• Restricted mind-set
		   o Lock-in and less dynamic due to path dependencies
		   o Changing existing practises is hard → lower willingness to change current business approaches
		   o Reason to exist is based on demand of old paradigm
		• Lack of discovery competencies
		   o E.g. distance between company and customer
		• Organisational structure is not beneficial
		   o Hierarchical
		   o Separate departments
		• Path dependencies:
		   o Not a sustainable basis
		• Difficult to adapt to radical transitions:
		   o New economic structure
		   o Not able to quickly learn new competencies + change routines
		   o Not see the possibilities of the new technologies	

Opportunities		**Threats**	

• Shape institutional context
• Co-creation of new markets to create barriers of entry for new entrants
• Radical SOI:
   o Technology super-scouting
   o Search heuristics that favour radical sustainability solutions
   o Integration of sustainability in product development
   o Build demand for radical SOI
   o Harnessing the benefits of open innovation
• Proactive CSR
   o Combine internal and external improvements
   o Take responsibility
		• Uncertainty of radical innovation
		• Radical innovation more risky than incremental innovation
		• Incumbent curse
		   o New entrants disrupting the market
		• Valley of Death
		   o Communication between departments
		• Complexity of sustainability
		   o Trade-off between dimensions
		   o Uncertain about demand	

Table 7 SWOT summary

Analysing the findings, various roles of incumbent companies within the radical transition towards a sustainable society become clear:

- Slow down sustainable development
- Be destroyed by new entrants, due to slow adaptability
- Adapt later on to the demand of new paradigm
- Shape the sustainable society

Incumbent companies are powerful to create the rules of the game. They have the power to lead a revolution, if wanted. However, due to the fact that incumbent companies' success relies on the needs

of the previous paradigm, they are also likely to use the power to slow down or even stop The Sustainability Revolution.

To be able to create change, it is crucial to recognize that the current system is failing and to be aware of what the issues are. Incumbent companies need to become aware that they are part of the problem and that their weaknesses and the threats they are facing have a significant influence on the possibilities to create a sustainable society.

To shape the new paradigm, incumbent companies need to create opportunities by making wise use of their strengths and overcome the weaknesses and threats. Incumbent companies have the capabilities and scope to create change in a market. This can be done by adopting a pro-active stance, as highlighted in the opportunity section. By having pro-active CSR strategies, the company does not only take responsibility for its own transformation but also inspires and pressures the rest of the players in the market to keep up with the sustainable standards. With the use of radical Sustainable Oriented Innovation (SOI) in the CSR strategy, new market opportunities can be created that create barriers for new entrants. Incumbent companies with that strategy need to disrupt themselves in order to prevent to be disrupted by other actors in the market. By adopting a proactive sustainability strategy like this, the weakness of the restricted mind-set is one that is compensated. Furthermore, by being one of the first movers and be the one that creates the radical innovation, the weaknesses around difficulties to adapt to radical transitions is diminished, i.e. an advantage is achieved over competitors.

Unfortunately, path dependencies cannot be changed and the incumbent company has to work with the basis that is built on. By changing the attitude and purposely creating a new organisation structure that is beneficial for radical sustainable innovation, the company can optimise the conditions for successful sustainability pro-activeness.

Externally there are also threats to overcome. The acceptance of a radical innovation by the market is more uncertain and brings more risk than with incremental innovations. However, the global reach brings brand recognition together with the (mostly) good reputation of incumbent companies, can lower the risk of bringing a radical innovation to the market because consumers have faith in the brand quality. Additionally, there is the threat of new entrants that move first and thus create a bigger market share. The phenomenon 'incumbent curse' exist because of this, which means that incumbents in times of radical transitions often do not survive the change and lose (part of) their competitive advantage. When incumbent companies be the radical changer themselves, they can avoid this incumbent curse. They do 'kill' the old competitive advantage they had within the previous paradigm, but safeguard this position in the next paradigm when they have been the ones shaping it.

As mentioned before, sustainability is complex and there is not one ultimate answer. This makes it a "wicked" problem that can be tackled from various angles. The company has to make a decision on what they want to actively contribute to. The SDGs offer a good overview on what are the most pressing issues. Companies adopting the SDGs in their pro-active CSR strategy can create a strategy that at least minimises the harm on the goals and create awareness for the company on the changes it has to make to belong to the sustainable future that is being created.

3 RESEARCH METHODOLOGY

3.1 Research design

The objective of this study is to identify the different roles of incumbent companies within The Sustainability Revolution and in how far the SDGs are embraced by these different companies. After the intensive review of the literature the IT and energy sectors have been identified as key in succeeding in the SDGs and a Sustainability Revolution. To analyse organisations within these sectors, a wide range of research methods are available (Yin, 2013). The applied approach in this research is a multiple-case study. Multiple incumbent companies in the IT and energy sector are analysed and contrasted. Comparing multiple incumbents provides the opportunity to compare the different strategies and behaviours they employ and to learn on the related outcomes. To reveal patterns that incumbent companies have in their attitudes towards The Sustainability Revolution and the SDGs, qualitative research is conducted. With qualitative research, real-life situations are approached to understand, describe and explain strategies 'from the inside' (Gibbs, 2007). The collected data is characterised as rich and broad (Saunders, Lewis, & Thornhill, 2007), which is favourable for this research.

To go beyond describing first-hand findings, this research combines descriptive and exploratory research. Descriptive research describes what can be observed and the exploratory research analyses patterns resulting from these observations. This research consists of two parts. First each company is analysed for its attitude towards The Sustainability Revolution and classified to a typology that matches this attitude (elaborated on in section 3.2). After the companies are classified, they are analysed based on context variables to discover differences among these results. This analysis is done with an exploratory nature. The second part of the research consists of an exploratory analysis of the SDG strategies of the companies. First general differences among the companies are analysed. The research continues with an analysis of some of the leading companies' adoption and performance on the SDGs.

The SDGs and The Sustainability Revolution are both rather new research fields and there is not much information on the topics and relation between the two. There are no strictly defined boundaries between phenomenon and context, which leads to the exploratory nature of this research of discovering patterns (Yin, 2013). This gives room for constructs to be revealed in the process, instead of being led by specific hypotheses (Myers, 2013). First narratives are given based on the typologies of the companies to see what companies state about the transition to a sustainable society and what action they take to drive societal change. Furthermore, the SDG performance is analysed to discover what goals and targets are contributed on by the companies. Data patterns that are found can be used as a basis for further research to test theories and hypotheses.

3.2 Research context

The companies will be analysed for the approach they take towards societal issues. There are different patterns and strategies used around a revolution that are currently unknown for The Sustainability Revolution. A taxonomy is created to classify the companies based on their attitude towards The Sustainability Revolution.

Van Tulder et al. (2013) created a model that differentiates company approaches towards societal issues. This model can be used to analyse the practises companies have for sustainable development and identify differences between approaches. These approaches are placed in the model based on the

societal responsiveness, being internally of externally oriented about societal issues, and the basic attitude towards societal issues, being a liability or responsibility for the company (van Tulder et al., 2013). Figure 11 presents the difference between the approaches and table 8 shows some of the main characteristics of the four approaches.
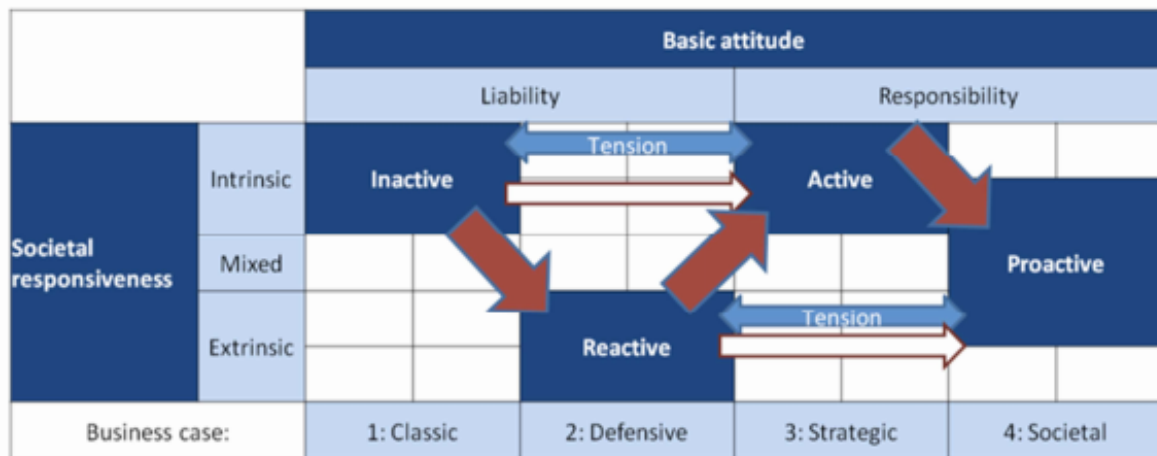
Figure 11 Phase model of company transitions towards sustainable development (Source: van Tulder et al., 2013)

	Inactive	Reactive	Active	Pro-active
Vision of sustainability	None	General statement	Focus on societal contribution	Holistic strategy: focus on solving issue
Orientation towards external development	None	External pressure, business operations, location	Affect the market and products or services	Cosmopolitan, society, system, secondary stakeholders
Business case-element	Costs, customer and law	Cost, customer, law and reputation	Cost, customer, law, reputation, identity	Costs, customer, law, reputation, identity, long-term continuity
Transparency	None	On request	Product and supply chain	Complete
Reporting	None or legally required annual environment report	Separate report on sustainability, focus on process	Sustainability report, focus on core theme and products	Integrated with strategy
Stakeholders	Government, important customers	Government, important customers, a few societal organisations	Government, important customers, a few societal organisations, own employees	Society as a whole
Approach to supply chain	No interest in sustainability	Narrow codes of conduct	Engagement and broad codes of conduct	Co-creation and co-production
Dominant business area	Operation, legal team	Public affairs	Corporate communication and HR	Management, leadership and strategy

Table 8 Main phase characteristics (source: van Tulder et al., 2013, p. 103)

Typologies

As identified in the conclusion of the literature review (section 2.4), in the transition to a new paradigm there are companies that take the role of change agents and companies that try to prolong the previous paradigm; the agents of stagnation. Additionally, there are companies that operate in between the two extreme typologies; the hesitant company. Relating this to the phase model presented in figure 11, the three roles incumbent companies take within transitions, can be connected to the red arrows shown in that figure. The agent of stagnation operates mainly as inactive, but could

have some reactive strategies. The hesitant companies operate between the reactive and active attitude. The agent of change aims to be a proactive company. With the knowledge from the four phases determined by van Tulder et al. (2013), the descriptions for the agent of stagnation, hesitant and agent of change can be made.

Agents of stagnation

The agents of stagnation are mainly the inactive companies. As elaborated upon in previous sections, incumbent companies are the main stakeholders from the previous paradigm and due to that frontrunner position, there are companies among the incumbent companies that want to slow down or stop the transition to new paradigm. These companies are in a state of denial to the urgent need for a changing system. They do not state failure of the system and definitely do not contribute to create radical change towards a sustainable society. Companies with an inactive stance towards societal responsibility work following the Milton Friedman (1970) paradigm of 'the only business of businesses is business' and have a rather egoistic business perspective.

Hesitant

The reactive and active attitude are both part of the hesitant classification, since these companies are focused on sustainable development, but do not see the role of being a leader for systematic change. Hesitant companies are likely to have mixed approaches. On some of the component that are needed to launch The Sustainability Revolution they are likely to have a leading position but this is rather irregular. On most points these companies contribute to not getting behind of competition and do not take the specific role of "beating" the previous paradigm. Hesitant companies react to changes in the market and try to optimise their CSR practises accordingly. Furthermore, the hesitant company can be focused inwards and only take responsibility for own practises, but do have the aspiration to change surrounding companies.

Agents of Change

The companies moving from active to the pro-active stance are classified as agents of change. As stated in the literature review, taking a pro-active stance can be a great opportunity for companies to innovate radically. The pro-active stance is the ideal strategy for companies to drive The Sustainability Revolution and change the entire sector (and beyond) towards a better fit with the sustainable society. The agent of change acknowledges that the current system is not working properly and clearly states that change is needed. The agent of change has both an inward- and outward-looking business perspective. A change agent perspective has much future perspectives with it. Companies of this typology have the aim to create changes and shape a better future, which has the result that many visionary statements are likely to be intentional rather than based on achieved results. With stating these intentions, the agent of change aspires to set the tone that changes the status quo. Companies reporting on these intentions are assumed to have the ability to drive change. However, in order for a company to be a fully pro-active agent of change and actually drive The Sustainability Revolution, a shift from only statements on intentions towards more reporting on results needs to be made.

Taxonomy

Table 9 presents the taxonomy to guide the classification of the selected cases. The explanation per indicator per typology is created via an iterative process, which caused several changes during the process until the most accurate description was found.

Category	Type Indicator		Agent of stagnation	Hesitant	Agent of change
Revolution	View on current system		Not mention system failure	Acknowledge parts of the system are failing (e.g. climate change as global issue) / mention there are challenges	Mention the system is failing /acknowledge complexity of global issues (not in direct relation to company material issues)/ urgent need of change of todays' society
	Shaping the sustainable society		Not mention a transition, revolution or new value	Acknowledge a paradigm switch or transition (e.g. energy transition) / mention creating new value	Driving a revolution/ shaping a new future or sustainable society/ connect energy transition or digital revolution to societal development
The role of incumbent companies	Sustainable oriented Innovation		None	General innovation in relation to sustainability	Radical approach to innovation/ Invest in or have created radical, open innovation/ technological breakthrough innovation
	Shape institutional context		Not mention or only mention complying with some specific laws and regulations	Comply with all laws and regulations/ have own extra regimes to comply with	Shape institutional context
	Collaboration for sustainable development		No collaboration	Collaborate within industry/ collaborate with universities/ member of collaborative initiatives	Mention collaboration with other large MNE companies (outside of own industry)
Phase model indicators	Vision of sustainability		None	General	Holistic / value for society
	Report-ing	Appr-oach	None or legally required annual environment report	Separate report on sustainability, focus on process (and products)	Integrated with strategy
		GRI	No GRI	GRI Standard Core	GRI Standard Comprehensive
	Stakeholders		Government, important customers	Government, important customers, a few societal organisations (and own employees)	Society as a whole (local communities do not comply with this)
	Approach to supply chain		No interest in sustainability	Engagement and narrow to broad codes of conduct	Co-creation and co-production/proactive or close collaboration
	DJSI		Not listed	Listed on a sub-division list of the Dow Jones Sustainability Index 2016	Listed on the Dow Jones Sustainability World Index 2016
Sustainable Development Goals	Reporting on SDGs		Not mention SDGs/ Only mention SDGs exist but no performance	Contribute to some SDGs/ Some SDGs are addressed, but contribution not specified	Report contributing to at least 13 or more of the SDGs

Table 9 Classification model

The indicators are clustered in categories that all have their own function in determining whether incumbent companies can be the drivers of The Sustainability Revolution. The categories revolution and 'the role of incumbent companies' focus more on intentions that the company has in creating (radical) change. The phase model indicators and SDGs reporting are more focused on approved results and strategies. These categories compensate and control for the indicators that are more focused on intended strategies of the companies.

A qualitative taxonomy, as presented in table 9, is a method that gives room for researchers' interpretation of the companies' statements. For that reason, a more elaborate argumentation line per indicator is discussed to increase replicability of this study. By elaborating on the choices that are made, the reliability of the research is increased. When no statements can be connected to either the hesitant of agent of change approach, it is assigned as agent of stagnation.

The first two indicators are part of the revolution category and focus on the two paradigms that are competing with each other in The Sustainability Revolution. These indicators function as a check to see if the companies are aware of the changes that are occurring to the system. They represent 'why' a company uses a certain strategy. To become a true agent of change, it is important that both the failure of the current system is acknowledged as well as finding solutions for this and have a vision of the future sustainable society. In the classification, it is solely determined whether a company makes a statement on this. A company is appointed to the agent of change indicator when the view on the current system is based on recognizing the systems failure and global societal issues. These issues have to be mentioned in relation with words that indicate urgency, such as "complex" or "pressing". If only one part of the global challenges, such as climate change, is addressed, the company is classified as hesitant. Furthermore, only mentioning the world faces challenges, but not relate to the urge or societal change, classifies as hesitant. To shape the sustainable society, agents of change are expected to make statements that they take responsibility for this. Only stating to contribute to drive e.g. the energy transition, classifies as hesitant. However, if this transition is mentioned in relation to societal development it becomes part of the agent of change typology.

In the review of the literature, several opportunities for incumbent companies have been determined that are important to lead a radical transition. Radical Sustainable Oriented Innovation, shaping the institutional context and collaboration are three of the main practises that are found and these form the three indicators of the category 'the role of incumbent companies'. These indicators represent 'how' the company is planning on creating change. When radical SOIs, open/shared innovation and/or new disruptive technological breakthroughs are mentioned by a company, it is seen as agent of change. General innovation for sustainable development, that are not accompanied with words like "radical" or "disruptive", are classified as hesitant. Companies are assigned agent of change when they clearly state to lobby or advice governments to create beneficial institutional context for sustainable development. Complying with all laws and regulations or having own regimes that are stricter than the official laws, is seen as hesitant as it does not include the external responsiveness that is needed to create change beyond the scope of the own company. Collaboration is important to drive change. Especially collaboration between sectors is promising in realising systematic radical change. Companies stating to collaborate with other large MNEs are seen as agents of change, as these collaborations immediately may have large impacts. Any other type of collaboration, such as with universities or being part of collaborative initiatives, is seen as hesitant.

The next set of indicators are indicators that determine the general phase the company is in and displays the current attitude towards CSR. These are primarily based on the main characteristics of the phases as presented in table 8. The phase model indicators are based on results that the companies have achieved rather than intentions. These characteristics are selected based on being in line with the findings from the literature review, on best presenting the vision and goals, which leading companies in the field of sustainability are known to score good at (GlobeScan & SustainAbility, 2017). The vision of sustainability has to be holistic and have a societal view to be agent of change, meaning to focus on the environment as well as social development. For the indicator 'reporting', next to the approach indicator, an additional indicator has been added: GRI reporting. Global Reporting Initiative (GRI) is a global independent organisation that supports companies to understand and communicate the impact of business. The GRI Sustainability Reporting Standards are widely used standards in sustainability reporting. Companies following these standards are transparent about the impact of their business. Only when stating explicitly that a company uses the comprehensive method, this is assigned. Otherwise, in case using GRI Standards is mentioned, it is believed that the Core option is used. The next indicator that is part of the phase model category regards the stakeholders. Only when the company mentions society in direct relation to it being a stakeholder, the company is classified as agent of change. For the supply chain, engagement and normal collaboration classifies as hesitant. When co-creation or close (or other words relating to a strong connection) collaboration with the suppliers is mentioned, this is selected as agent of change. Additionally, the Dow Jones Sustainability Index is consulted as a verification tool as this list displays the companies with the best sustainability performance. The Dow Jones Sustainability Index (DJSI) is one of the most used tools that every year evaluates the sustainability performance of 2500 large companies. The index works with a best-in-class method where the top 10% leaders in sustainability from each industry are listed (Hawn, Chatterji, & Mitchell, 2014). These leaders can be seen as agents of change in their sector. The DJSI also publicises sub-division lists, on which listing is determined as hesitant. Only being listed on a DJSI 2016 is taken into account as the current stance towards sustainability is analysed in this research.

The attitude towards the Sustainable Development Goals is also taken into account in the classification. It is assumed that when a company reports on the performance of (almost) all of the SDGs, that they have a systematic view on contributing to the sustainable society that is aimed to be built by 2030. As not all goals are immediately connected to every company, reporting on the performance of at least thirteen goals has been determined as the border between hesitant and agent of change. This is over ¾ of the goals which is decided so companies are not "punished" for not contributing to all goals, but this shows commitment of going beyond primary responsibilities of core business practises. In this phase of the research, the content of the contribution on the SDGs is not taken into account. This indicator solely focuses on the extent of reporting on the SDGs. The performance on the SDGs of the companies that are seen as change agents for their sector will be further analysed in part two this research.

3.3 Case selection

The selection of the right cases that are in line with the theoretical aims determines the quality and generalizability of qualitative research (Yin, 2013). Cases are selected based on their relevance to develop or test a certain field of theory. The findings have to be linked back and show that the findings can be replicated to confirm the external validity. This research considers incumbent companies as leaders of radical transitions towards a sustainable society. The framework has been created according to this knowledge. For that reason, the findings cannot be generalised towards Small and medium

Enterprises (SME's) and new entrants that innovate radically. Furthermore, the findings are only partially usable for large companies that operate globally, but are not seen as the biggest and main stakeholders of the previous paradigm.

As this research focuses on incumbent companies, the selection of companies is based on their appearance in the Fortune Global 500, also known as the Global 500. These companies are the world's biggest corporations with the highest revenue (Fortune, 2017). The current biggest companies are benefitting the most from the current era, which makes them the incumbents that are the most important stakeholders in their sectors. From this list, the biggest companies active in the IT and energy sector are selected. The companies are assigned to a sector based on the definition presented in the Global Industry Classification Standard (GICS®) (Morgan Stanley Capital International, 2016). The selected companies are distributed based on geographic region (Asia, North-America and Europe) to diversify the selected cases. The 'country-of-origin effects' are often found to be significantly strong in studies on CSR and the CSR reporting (Fortanier, Kolk, & Pinkse, 2011). The reason to select these regions is based on their size and presence in the top Global 500 companies. Furthermore, as all parts of the world need to participate to create a sustainable society, the global spread of these regions was accounted for. Table 10 presents the largest companies per sector per geographic region.

Sector	IT sector		Energy sector	
Geographic region	#	Company	#	Company
Asia	13	Samsung Electronics	2	State grid Corporation of China
	25	Hon Hai Precision Industry	3	China National Petroleum Corporation
	113	Sony	4	Sinopec Group
North-America	9	Apple	6	ExxonMobil
	44	Amazon.com	31	Chevron
	48	HP	74	Philips 66
Europe	71	Siemens	5	Royal Dutch Shell
	312	Accenture	10	BP
	462	SAP	14	Glencore

Table 10 Largest companies (#ranking Global 500) per sector per geographic region

In order to create a sample of companies with divers typologies, a first round of inventory is done on the different approaches of the companies towards sustainability, the Sustainable Development Goals and the changing system. The research is started with the three highest ranked companies per box of table 10, as the box of European IT companies is limited to three companies. The results of this inventory are presented in Appendix A. From both sectors, there are companies assumed to be classified to all three typologies after the first inventory. Due to this, the eighteen companies presented in table 10 are selected as cases for this research. A description of the selected cases can be found in Appendix B.

3.4   Data collection

General

The data is collected via a qualitative content analysis method. Content analysis is a systematic technique to analyse informational contents of textual data and order the data to make sense of it (Mayring, 2000). Gathering information directly from the sources of the units of analysis is a method often used for exploratory research (Hesse-Biber & Leavy, 2011). In this research, Global 500 companies operating in the IT and energy sector are the unit of analyses. As text sources are the most common data sources for qualitative research (Gibbs, 2007), reports from the cases are used as data sources. Large Multi-National Enterprises have extensive reports publicly available with company

information, results and strategies. Annual reports, sustainability reports and extra information on the websites of the companies are used as sources of analysis for this research. These sources are primarily used by the companies to communicate about the CSR efforts (Du, Bhattacharya, & Sen, 2010), which is the primary information that needs to be gathered. By only using primary sources written by the company itself, it must be taken into account that there is a risk of exaggeration and concealing issues (Idowu & Towler, 2004). However, due to the pressure to receive external verification of the CSR reports they can be considered an accurate source of information for a companies' sustainability performance (Idowu & Towler, 2004). As website information is not part of this external verification and information on the website can easily be deleted or rewritten, this information is only used when it is referred to in an official report. An exemption is made for the exploratory analysis of the SDGs in part two. Here, statements about the SDGs found on the companies' websites are used to present the contribution these companies claim to have. Because this research focuses on an outlook to the future, only the most recent CSR and Annual Reports of the companies are analysed to guarantee that the statements currently still apply. An exemption is the first indicator (system failure) that does have a historic aspect in it. For this indicator, when not reported in the latest reports, reports from previous years are analysed. As the development of the SDGs has started in 2012 documents from that year on have been analysed. This marks a moment where it is pointed out to the private sector that their contribution to creating systematic change of the system is crucial to create a sustainable society.

Part I

For the first part of the qualitative content analysis, systematic codes are created to ensure reliability and validity is achieved. Assigning companies to a typology is guided by the search words per indicator as seen in table 11. Each code is searched for in the reporting of all of the companies. When a company uses American or British English spelling, the applicable spelling is used for the search words. Next to the key search words, the content pages of reports are scanned to ensure that interesting sections are not missed. When a company frames an action in a new matter, a new code is added to the code book and this information is also checked for the prior researched companies. Only when the information has a relation to the meaning of the indicator, it is used as an argument to assign the company to a typology for that indicator.

All relevant quotes are collected in an excel file, that is ordered per company and per indicator. Subsequently, the companies are classified as agent of stagnation, hesitant or agent of change for that indicator. The classification is based on the argumentation lines that have been elaborated on after the classification model in table 9. As there is the possibility that search words are missed or that various companies report different about their results, it is possible that information is missed. To increase reliability and replicability of the research, it is important to note that the data that are collected is solely based on information found in sections where one of the search words of table 11 are stated in.

Category	Indicator	Search words		
Revolution	System failing	• System • Fail • Flaw • Crisis/crises • Uncertain	• Issue • Recognis(e) • Challeng(e) • Decline • Aware	• Deny/denial • Root cause • Society • Risk • Complex
	Shaping the sustainable society	• Revolution • Era • Age • Transition • Transformation • Future	• Paradigm • Change • Tomorrow • (Next-)generation • New	• Economy • Post-carbon • Digital • Digitalisation • Shared value
The role of incumbent companies	Sustainable oriented innovation	• Innovat(ion) • innovative • Radical • Disrupt • Open (innovation) • Shared (innovation)	• Technical (innovation) • Technological (innovation) • Technolog(y) • Sustainable innovation	• Sustainable oriented innovation • Breakthrough (innovation) • R&D • Invest
	Institutional context	• Create institutional context • Shape institutions • Regimes	• Legislation • Compliance • Comply • Law • Surpass	• Regulation • Government collaborate • Politics • Lobby
	Collaboration for sustainable development	• Collaborate • Partner • Together	• Joint venture • Co-(create)	• Engage • Member
Phase model indicators	Vision of sustainability	• Vision • Mission	• Strategy • Approach	• CEO message • Promise
	Reporting	• Integrated (report) • Annual Report	• Sustainability Report • GRI	• Core • Comprehensive
	Stakeholders	• Stakeholder • Society • Society as a whole	• Global citizen • Employees • NGO	• Societal organisation • Government
	Approach to supply chain	• Suppl(ier) • Code of conduct	• Supply chain • Co-led	• Co-(creation) • Partnership
	DJSI	• Dow Jones Sustainability Index	• DJSI	
SDGs	Reporting on the SDGs	• Sustainable Development Goals	• SDG	• United Nation • UN

Table 11 Operationalisation of typology indicators

Part Ⅱ

The second part of the data collection consists of getting the information companies give about their performance on the SDGs. Table 12 presents the indicators that are analysed for the SDG performance of all companies.

Indicators	Operationalisation
Stance towards SDG reporting	S = Not mention SDGs/ Only mention SDGs exist but no performance H = Contribute to some SDGs/ Some SDGs are addressed, but contribution not specified C = Report contributing to at least 13 or more of the SDGs
Reporting style	1. Not report on SDGs 2. Only mention SDGs exist 3. Loose mentioning a contribution to an SDG 4. State to contribute to a number of SDGs, but no link to what the performance is 5. Connect sections of the report to certain SDGs to 6. Overview directly stating performance of the SDG 7. Separate document/website
Number of SDGs	• Number of SDGs it is claims to contribute on
SDG contribution	• Which goals are stated to contribute to

Table 12 Operationalisation table SDG performance

For the general analysis of SDG performance only information that is stated directly in relation to the SDGs is used. The claimed contribution as reported in the latest annual- or sustainability report is used for this research. Furthermore, the websites of the companies are analysed for more statements on the SDGs and special website sections about the goals are also accepted for claimed contribution.

For this first analysis, the amount of contribution per SDG is not taken into account. For example, a company stating to contribute to goals 2, 3 and 6 but does not give any further information on what contribution they have or where the contribution can be found, is taken into account as claiming to contribute to three goals. The second indicator, reporting style, is used as an indicator to show the extent of elaboration on the SDG performance.

After the general exploration of the SDGs, the companies that are seen as change agents for their sector are analysed in more depth as the goal is to find best practises. For this, the information given in the special sections about the SDGs are used. Companies have different reporting styles. When a company directly links a SDG to the performance (reporting style 6 and 7), this is used. However, there are also cases where a company states that the information in a section (e.g. link SDG1 no poverty to the section communities) contributes to one or a few SDGs, but does not specify which information. This is reporting style 5. In these cases, the sections that are referred to are analysed and quotes that relate to the goal are added as the contribution.

3.5 Data analysis

The data of qualitative content analysis can be analysed in different ways. Although some authors state that the data should be made quantitative by counting, others define the method broader and allow the technique to be used to analyse data solely qualitative (Foreman & Damschroder, 2015). This research uses both techniques, which will further be elaborated on per part.

The result section will present the important findings. The findings are presented in tables that are described and interpreted based on the most remarkable results. Explanations for the results are elaborated on in the discussion section. As this research is of a mainly of an exploratory nature, the

data analysis will not give straight forwards answers but rather tries to discover patterns that can function as input for further research.

Part I

For part one of this research, the number of indicators per typology are counted and analysed based on noticeable differences and patterns. In the results section, first the overall results are presented and analysed. From this, a division between company typologies can be made. It is assumed that all indicators have the same weight in determining the typology. The typology a company is assigned to is after that used an independent indicator. Furthermore, the overall results are analysed per category group (revolution, the role of incumbent companies, phase model indicators and SDGs). For categories that focus on intentions (revolution and the role of incumbent companies) narratives are presented to illustrate the different statements that companies make about the indicators of these categories. This increases the transparency of the classification. As the phase model indicators and reporting on SDGs are rather result based, for these indicators the most common findings are elaborated upon.

To increase validity of the results, an analysis to verify the classification of the typologies is done. An analysis is done that separates the companies that are listed on the Dow Jones Sustainability World Index 2016 from the ones that are not. As this is a list of the frontrunner companies in sustainability per sector, it verifies if the companies that are assigned as agent of change are leading companies.

Next, the results are separated based on context variables: sector, geographic region of origin and founding year. This is done to discover differences that in the discussion are analysed to find patterns on how these variables could influence the strategies of the companies.

Sector

This research focuses on the IT and energy sector. Both are crucial as well as promising to lead The Sustainability Revolution. According to Rifkin (2011) from a combination between the two sectors the Third Industrial Revolution will be emerged, a revolution closely connected to the principles of The Sustainability Revolution. Furthermore, ICT has been identified as a main technology to achieve the SDGs. The development of the IT sector cannot occur in a sustainable course without the wide diffusion of renewable energy. Likewise, the IT sector can be valuable to optimise the efficiency of renewable energy sources. Thus, these two sectors need each other and can complement each other's development. The performance of each sector is analysed as well as a comparison is made to determine if both are on the right track to create change in its own sector.

Geographic region of origin

The companies are divided according to the geographic region of origin. Asia, North-Amerika and Europe are the regions that are part of this sample. In previous studies on CSR and the CSR reporting the 'country-of-origin effects' are often found to be significantly strong (Fortanier et al., 2011). The country of origin has an effect on the degree and content of voluntary reporting (Meek, Roberts, & Gray, 1995). Reporting on the performance can differentiate companies from competition and enables stakeholder to properly rate the CSR performance. With better performance, a company is more likely to report on that performance (Sutantoputra, 2009). Among countries and regions, CSR practises can be extensively different and thus it is expected that this differs the attitude towards The Sustainability Revolution. According to previous research, North-American companies particularly have inactive or reactive approaches towards CSR, Asian CSR approaches are often inactive, but when applied they tend to be more active and the European CSR approach is in particular active, with outliers to more proactive attitudes (van Tulder & Fortanier, 2009).

The founding year is taken as a variable to analyse if there are differences between "older" and "younger" companies. As the youngest company from the selected cases was established in 2002, the term "young" is interpreted with a bit bigger timeframe as otherwise no companies would have been part of the group. The boundary between these companies for this analysis is set on 1980. In the 1980s the amount of new definitions of the concept of CSR dropped significantly, meaning academics were more satisfied with the existing literature and could start building on that (Carrol, 1999). This consensus leads to the expectation that companies founded after this time period could be more aware that making positive (social and environmental) impact would become part of business.

Overview

The overview of the companies' information on the context variables can be seen in table 13.

Company	Sector	Geographic region	Founding year	DJSI
Accenture	IT	Europe	2001	No
Amazon	IT	North-America	1994	No
Apple	IT	North-America	1977	No
BP	Energy	Europe	1908	No
Chevron	Energy	North-America	1879	No
China National Petroleum Corporation	Energy	Asia	1988	No
ExxonMobil	Energy	North-America	1870	No
Glencore	Energy	Europe	1974	No
Hon Hai Precision Industry	IT	Asia	1974	No
HP	IT	North-America	1939	Yes
Phillips66	Energy	North-America	1875	No
Royal Dutch Shell	Energy	Europe	1907	Yes
Samsung Electronic	IT	Asia	1969	Yes
SAP	IT	Europe	1972	Yes
Siemens	IT + Energy	Europe	1847	Yes
Sinopec Group	Energy	Asia	1999	No
Sony	IT	Asia	1946	No
State Grid Corporation of China	Energy	Asia	2002	No

Table 13 Overview context variables

Part II

The second part of the results focuses on the SDG performance. This analysis functions as a first exploration of the SDG performance of the various companies. The general results are analysed for differences between agent of stagnation, hesitant and agent of change companies. Patterns are tried to be discovered in the extent of SDG reporting and of the reporting style.

For the companies that are determined to be the most promising per sector to be change agents, a closer look is taken at their contribution to the Sustainable Development Goals. Only this group is taken because this research aims to find ways the SDGs can be used to drive The Sustainability Revolution and thus the agents of change companies are likely the ones to have SDG strategies that could drive this revolution. The analysis of this qualitative content is not quantified, but is analysed on overlapping practises between the companies.

3.6   Research model

As the conclusion of this methodology, figure 12 presents the research model that shows the process of the theory of change. Obviously, the starting point is the attempt to determine why change is necessary and create a stance towards the revolution. The next phase is to approach this revolution with the appropriate strengths, being the indicators under 'the role of incumbent companies'. This role of incumbent companies consists of the intentions these companies have to support the needed changes. The moderator variables are the indicators from the phase model. These indicators illustrate achieved results from the companies in their general CSR strategy and form the foundation of the CSR attitude of the companies. The companies are analysed on differences due to context variables, which can have an influence on how the company approaches the revolution.

The second part of the research explores the patterns that companies use concerning the SDGs. From the first part of the research, companies are assigned to a typology. This typology is taken as input of the exploratory research on SDGs adoption of the companies. With this model, it is assumed that a company with an agent of change approach in part one is more likely to contribute to the SDGs.
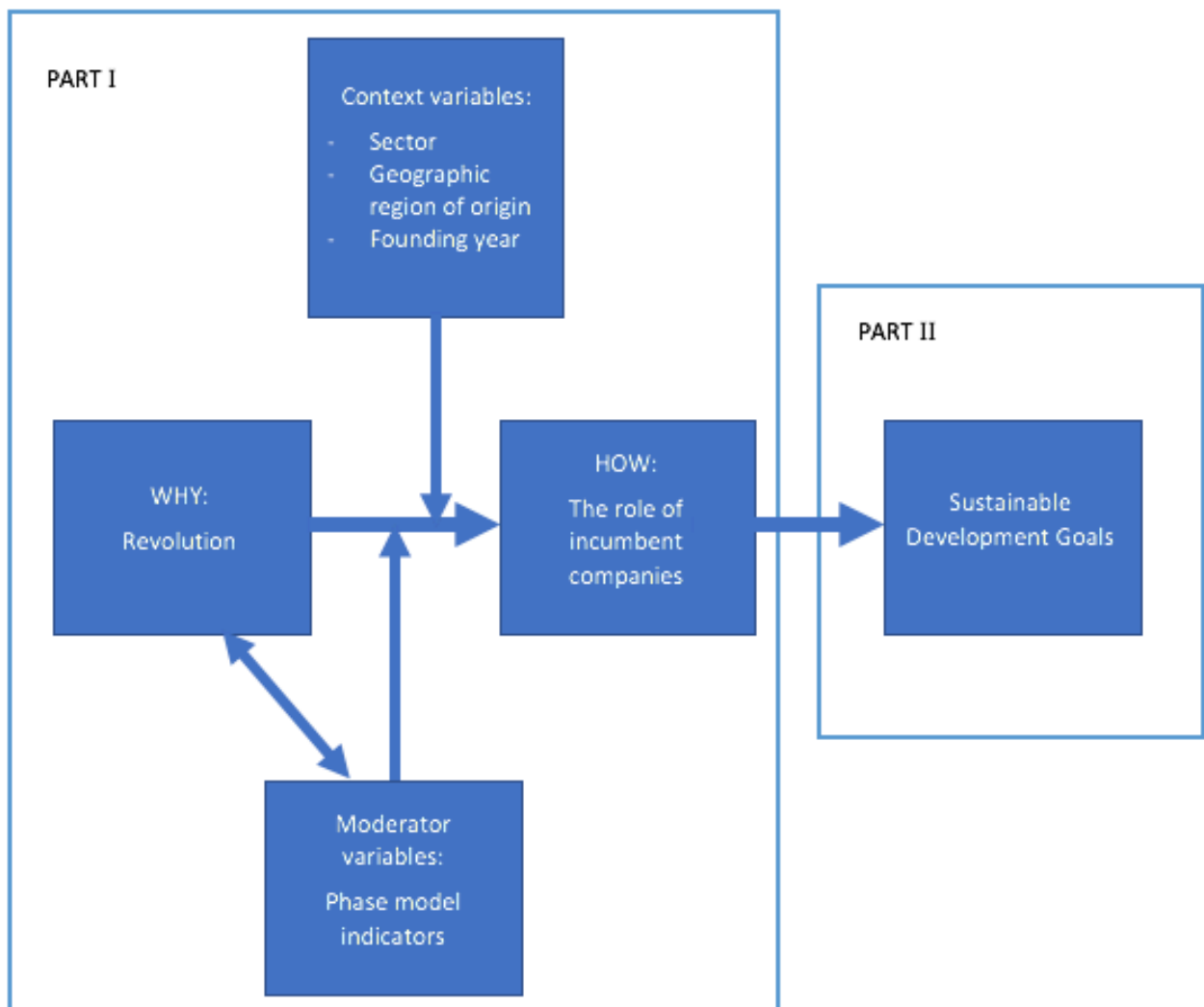
Figure 12 Research model: theory of change

4 RESULTS

The result section is divided in two part again. First the results based on the typology classification of the companies and second the contribution towards achieving the SDGs.

4.1 Part I

In part one, first the overall results are presented. The classification model is filled in for all selected cases and the scores of the companies for each indicator are presented. Next, the overall results are analysed based on what the main typology of each company is, which will function as an independent variable. Furthermore, the performance per category will be discussed. In the next part, the results are separated for the context variables. The most remarkable findings are elaborated on.

Results: Overall

Tables 14 and 15 are the overview of the filled in taxonomies for both the IT sector and energy sector. In the model the different typologies that are assigned per indicator are stated as "S" for agent of stagnation, "H" for hesitant, and "C" for agent of change.

Category	Indicator		Amazon	Apple	Accenture	Hon Hai	HP	Samsung	SAP	Siemens	Sony
Revolution	View on current system		S	S	C	H	C	C	C	H	H
	Shaping the sustainable society		S	S	C	S	C	C	C	H	C
The role of incumbent companies	Sustainable oriented Innovation		S	S	C	H	C	C	C	C	H
	Shape institutional context		S	H	C	S	C	H	C	H	S
	Collaboration for sustainable development		S	H	C	H	C	C	C	H	H
Phase model indicators	Vision of sustainability		S	S	H	H	C	C	C	C	H
	Rep-orting	Appr-oach	S	S	H	H	H	C	C	H	H
		GRI	S	S	H	H	H	H	H	C	H
	Stakeholders		S	H	C	H	H	H	H	H	C
	Approach to supply chain		S	H	H	C	C	C	C	C	H
	DJSI		S	S	H	S	C	C	C	C	S
SDGs	Reporting on SDGs		S	S	H	S	C	C	C	C	H

Table 14 IT sector: overall results

Category	Indicator		BP	Chevron	CNPC	ExxonMobil	Glencore	Philips 66	Shell	Siemens	Sinopec	SGCC
Revolution	View on current system		H	H	H	H	H	H	H	H	S	H
	Shaping the sustainable society		C	S	H	S	H	S	C	H	H	C
The role of incumbent companies	Sustainable oriented Innovation		C	S	C	C	S	S	H	C	C	C
	Shape institutional context		H	S	C	C	H	S	C	H	H	C
	Collaboration for sustainable development		H	H	H	H	H	S	H	H	C	H
Phase model indicators	Vision of sustainability		C	H	C	H	H	S	H	C	H	H
	Repo-rting	App-roach	H	H	H	H	H	S	H	H	H	H
		GRI	H	S	H	S	H	S	C	H	H	H
	Stakeholders		H	S	H	H	C	S	C	H	H	C
	Approach to supply chain		H	H	H	C	H	S	H	C	H	H
	DJSI		S	H	S	S	S	S	C	C	S	S
SDGs	Reporting on SDGs		H	S	S	H	H	S	H	C	C	C

Table 15 Energy sector: overall results

Typologies

Table 16 presents the distribution of number of times a typology is linked to a company. With this, the companies are assigned to the typology that appeared the most in their classification. The different typologies that are assigned per indicator are stated as "S" for agent of stagnation, "H" for hesitant, and "C" for agent of change. As there are companies that have an equal number of indicators for two typologies, these companies are assigned as a double attitude. Being assigned to "S/H" means an agent of stagnation/hesitant company and "H/C" means hesitant/agent of change.

	Accenture	Amazon	Apple	BP	Chevron	CNPC	ExxonMobil	Glencore	Hon Hai	HP	Philips66	Samsung	SAP	Shell	SGCC	Siemens	Sinopec	Sony
Agent of stagnation	0	12	8	1	6	2	3	2	4	0	11	0	0	0	1	0	2	2
Hesitant	6	0	4	8	6	7	6	9	7	3	1	3	2	8	6	6	7	8
Agent of change	6	0	0	3	0	3	3	1	1	9	0	9	10	4	5	6	3	2
Result	H/C	S	S	H	S/H	H	H	H	H	C	S	C	C	H	H	H/C	H	H

Table 16 Overall results (typology/company)

Amazon, Apple and Phillips66 are part of the agent of stagnation group. All of these companies have coherent results and are strong agents of stagnation. None of the companies have an agent of change mentality on any of the indicators. Only Apple has a few features of a hesitant company, because they state to shape the institutional context and collaborate for sustainable development. Amazon and Phillips66 do not have an official sustainability report and thus data could only be collected via annual reports, where in these cases not much sustainability information was given. Phillips66 does have a sustainability highlight 2016 report which they mentioned the energy challenge the world faces, which gives them one hesitant indicator for acknowledging part of the system is failing (Phillips66, 2016). Apple does have sustainability reporting, but not a full sustainability reports. Apple just released an "Environmental Responsibility Report" and a "Supplier Responsibility Report". Furthermore, the information given on the websites of these companies is rather minimal and is not respected as valid data for this research since website information can easily be changed. Consequently, these companies are all agents of stagnation for the shaping the sustainable society, sustainable oriented innovation, sustainability vision, reporting approach and reporting GRI indicators. Furthermore, they did not mention the SDGs and are not listed on the DJSI.

Chevron is on the transition between agent of stagnation and hesitant. Chevron only publicised an "Corporate Responsibility Report Highlights" and some "reports from around the world" where some information could be found, but not extensive. The strategy of Chevron is rather divers and for each category (with more than one indicator) they score agent of stagnation as well as hesitant. The coherency of Chevrons strategy is rather low, which might relate to confusion within the company as well. They try to have a view on sustainability, but the main business decisions are not yet accompanying this.

Hon Hai, Sony, BP, CNPC, ExxonMobil, Glencore, Shell, SGCC and Sinopec are part of the group of companies that have a hesitant approach towards The Sustainability Revolution. None of these companies acknowledged both the failure of the social and economic system and the associated need

for creating a sustainable society. Only Sony, BP, SGCC and Shell did state to drive the paradigm switch, but they did not show awareness of the system failure. Within the group of hesitant companies there are differences as well. Hon Hai and BP have a coherent pattern, where Hon Hai is leaning more towards the agent of stagnation side of the hesitant spectrum and BP more towards agent of change. Sony and ExxonMobil are right in the middle of the hesitant typology, with the same amount of stagnation and change indicators. BP, CNPC, Glencore and Sinopec are clear hesitant companies, that have less consistent patterns for their outliers towards the agent of stagnation or agent of change side of the spectrum. Shell and SGCC are hesitant companies that for some parts act as agents of change. Within the energy sector, these last two companies can be seen as frontrunners based on these results.

Accenture and Siemens are on the borderline between hesitant and agent of change. Both score hesitant on six indicators as well as six agent of change indicators. This makes their patterns coherent, as they do not have any agent of stagnation indicators. Accenture does score high on the revolution indicators. However, on the other indicators that show leadership for sustainability and a proactive approach towards CSR they score more on the hesitant approach. Siemens on the contrary is not an agent of change concerning the revolution theories, but does show pro-active behaviour for the phase model indicators as well as reporting on the SDGs and being listed on the World DJSI.

HP, Samsung and SAP are companies with a change agent attitude. All three companies recognize that both the system is failing and aim to drive to shape the future sustainable world. Also, for almost all 'role of incumbent companies in a revolution' indicators these companies score agent of change. They all report performance on (almost) all of the SDGs and are also acknowledge by the DJSI to be part of the leaders in sustainability. The indicators they score hesitant on, are mainly part of the phase model indicators.

Categories

Table 17 (next page) presents the distribution of the number of companies that are classified with a certain typology (agent of stagnation, hesitant or agent of change) for each indicator. It is seen that most indicators are classified with the hesitant typology, with 45,4%. The share of agent of stagnation and agent of change indicators come after that with an approximately equal share, respectively 25% and 29,6%. Clusters of indicators constitute a category, which will be discussed in more depth.

The majority of the agent of change indicators are part of the indicators of 'the role of incumbent companies', meaning the companies do have good performance on the needed skills for a revolution. Furthermore, many companies mention to drive the transition of the system or shape a sustainable future and apply the skills of radical SOI, shaping institutional context and collaboration to so do. However, recognizing the system failure (view on current system indicator) consist clearly of more hesitant statement of the companies. Thus, there is a lack in awareness for what exactly needed to be change to create the desired sustainable society.

The hesitant indicators are mainly the phase model indicators, which are the indicators that show the companies general stance towards CSR. Per indicator, more than 10 companies score hesitant, with the exception of being listed on the DJSI. These indicators show the basis of the sustainability strategy and by the overall hesitant classification of these results it is seen that companies are not yet at the full potential of integrating a holistic view on sustainability in their strategies.

Category	Indicator		Agent of stagnation	Hesitant	Agent of change
Revolution	View on current system		3	11	4
	Shaping the sustainable society		6	4	8
The role of incumbent companies	Sustainable oriented Innovation		5	3	10
	Shape institutional context		5	6	7
	Collaboration for sustainable development		2	11	5
Phase model indicators	Vision of sustainability		3	10	5
	Repo-rting	Approach	3	13	2
		GRI	5	12	1
	Stakeholders		3	10	5
	Approach to supply chain		2	10	6
	DJSI listed		11	2	5
SDGs	Reporting on SDGs		6	6	6
Total			54	98	64
Percentage			25%	45,4%	29,6%

Table 17 Overall result (indicator/typology)

Revolution

The category revolution consists of two indicators: view on the current system and shaping the sustainable society. To identify the nature of the strategies of the companies, narratives as stated by the companies concerning The Sustainability Revolution are presented. These narratives consist of quotes acknowledging the system is failing as well as a future perspective on creating a new society. Where possible, the strategy to create the new society is given. The companies are separated based on their overall typology, as been determined in table 17.

Agent of stagnation

All the agents of stagnation (Amazon, Apple and Phillips66) do not report that they contribute to shaping a sustainable society and do not mention a revolution is coming/needs to occur. Phillips did score hesitant for that indicator as they mention there are on-going energy challenges that they aim to solve (Phillips66, 2016).

Agent of stagnation/hesitant

Chevron, as an agent of stagnation/hesitant company acknowledges the climate change challenges that the world faces (Chevron, 2017a) which makes it a hesitant statement. However, for the shaping the sustainable society they lean more towards the agent of stagnation part of their typology. They do state to take action to address climate change risks, but not connect this to a transition theory or future perspective, but because they are committed to run their business in the right way (Chevron, 2017a).

Hesitant

Table 18 gives the narratives around The Sustainability Revolution for a few companies that are part of the hesitant typology. Almost all companies of this group have a hesitant view on the system failure, apart from Sinopec. Shaping the future has a mix of companies' approaches classifying as agents of stagnation, hesitant as well as agents of change. From each combination, one example will be given.

Company	View on current system	Shape the sustainable society
SGCC	Hesitant	Agent of change
	"As an emerging industry of strategic significance and an important channel to realize a new round of economic growth and solve **energy and environmental crisis,** new energy cars have been under spotlight (SGCC, 2017, p. 26)"	"New requirements have been brought forward at the Central Economic Working Conference to adapt to **the new economic normal** and advance the supply-side structural reform. Under the strong leadership of CPC Central Committee and President Xi Jinping, State Grid will make stable and firm progress to develop with the current times and **break new grounds for the future** (SGCC, 2017, p. 3)". "The **development of the society cannot be realized without advanced energy technologies** as clean energy is the core of future energy transition (SGCC, 2017, p. 22)".
Glencore	Hesitant	Hesitant
	"**Responding to climate change** is a strategic focus for our company (Glencore, 2017b, p. 31)". "As a group, **Glencore recognises the science of global climate change** as laid out by the Intergovernmental Panel on Climate Change and acknowledges the need to continue reducing global carbon emissions (Glencore, 2017b, p. 91)".	"As a major fossil fuel producer and consumer, we recognise our responsibility to understand and manage our greenhouse gas emissions, and to **support the global transition to a low carbon economy** (Glencore, 2017b, p. 31)".
Hon Hai	Hesitant	Agent of stagnation
	"Foxconn (trading name of Hon Hai) attaches significant importance to **global climate change challenges** (Foxconn, 2016, p. 52)"	"Foxconn is committed to driving the application of green technologies and improving all aspects of manufacturing while also **achieving sustainable growth** (Foxconn, 2016, p. 11)". "Environmental sustainability is a priority for Foxconn and we take a **systematic approach towards integrating green and sustainable practices in our operations**, implementing measures in the areas of environmentally-friendly product design, carbon emission reduction, process management, energy and resource management, and supply chain management, to **minimize the negative impact of our operations on the environment** (Foxconn, 2016, p. 11)".
Sinopec	Agent of stagnation	Hesitant
	-	As the ancient Chinese saying goes, "The world moves on in a never-ending process of the new replacing the old." Looking to the **future**, Sinopec Corp. has formulated the 13th Five-Year Development Plan and has set up development goals and key tasks for the next five years. (…) While developing approach to the enterprise's sustainable development, the Company commits to providing cleaner oil products and better services, contributing to the society to safeguard and improve people's livelihood, implementing Green Enterprise Action Plan to develop green development advantage and to construct a green and efficient energy enterprise, and working together with partners, aiming to build a highly responsible and respectable enterprise. We will always **undertake responsibility of our era and promote sustainability together with our shareholders** (Sinopec, 2017b, p. 47)".

Table 18 Narratives revolution indicators – hesitant

SGCC, BP, Shell and Sony have a hesitant view on the system failure, but are agents of change for creating a sustainable society. SGCC is solely addressing energy and environmental issues which makes them hesitant towards the system failure. Connecting the energy transition to the overall development of society and stating to break new grounds for the future just made them fit the agent of change typology as it indicates to create a different future, although this is not the strongest agent of change statement.

Glencore and CNCP score hesitant on both indicators. Glencore addresses the climate change problems and recognises its responsibility to support the transition to a low carbon economy, making them hesitant for both indicators.

Hon Hai and ExxonMobil have a hesitant view on the system failure, but are agents of stagnation if you look at the sustainable society indicator. Hon Hai, having a hesitant view on the failure of the system, does address the climate change challenge. As seen in table 18, they do state to achieve sustainable growth and creating environmental friendly products, however there is no sign of a transition or outlook on a sustainable society, making them agents of stagnation for this indicator.

Sinopec is the only hesitant company that scores an agent of stagnation for recognising the system failure as they do not mention anything related to this when analysing the reports with the search words that are part of this indicator. Sinopec does clearly take a look at the future. They have a five-year plan for sustainable development on a variety of topics and state to take responsibility for our era, leading them towards the hesitant attitude.

Hesitant/agent of change

Company	View on current system	Shape the sustainable society
Accenture	Agent of change	Agent of change
	"As a company, we believe we have a responsibility to respond to **today's most pressing challenges** and **improve the way the world works and lives**. To do this, we use our global capabilities and digital experience to help drive innovative solutions that address a **wide range of societal issues** (Accenture, 2017, p. 2)".	"To this end, we have created a social innovation architecture that allows us to **develop sustainable, disruptive and scalable solutions to address a wide range of complex societal issues across multiple sectors and geographies** (Accenture, 2017, p. 39)".
Siemens	Hesitant	Hesitant
	"The Siemens Environmental Portfolio is part of Siemens' response to global challenges such as climate change, scarcity of natural resources and environmental pollution (Siemens, 2016b, p. 24)".	"For us at Siemens, sustainable development is the means to achieve profitable and long-term growth. We have a clear commitment to think and act in the interest of future generations, achieving a balance between Profit, Planet and People (Siemens, 2016b, p. 6)". ""Ingenuity for life" describes our unrelenting drive and promise to create value for customers, employees and societies. "For life" relates to our role in society: to make real what matters. We deliver on this promise by combining our innovation with our knowhow – in the areas of electrification and automation, enhanced by digitalization – aiming at improving the lives of people today and creating lasting value for future generations (Siemens, 2016b, p. 6)".

Table 19 Narratives revolution indicators - hesitant/agent of change

Accenture and Siemens are the only companies that are hesitant/agent of change. Solely taking the revolution indicators into account (see table 19 for narratives), Accenture can be seen as an agent of change as both indicators are part of this typology. Accenture states the challenges are pressing, showing an urgency. Furthermore, they want to improve how the world works, indirectly saying that the world as it works now is not the right way. To create these changes Accenture develops disruptive solutions that are not bind to only the IT sector, but will create change in many different sectors and all over the world. Siemens on the contrary is more a hesitant company concerning both revolution indicators. It mentions global challenges, but does not call it urgent and as examples solely focus on environmental issues. The same problem is seen in the shaping the sustainable future. They do clearly aim to create value for society, however, they do not address any urge for this or mention to shape a sustainable future.

Agent of change

All the narratives in table 20 are considered to present an agent of change attitude towards the revolution. They acknowledge the challenges are pressing and dismiss the old assumptions. The issues are acknowledged to be societal and global problems. Although there are only IT companies part of the group not only focus on digital issues, but take a more societal approach. The issues are mainly tackled with digitalisation, but these companies are well aware to link the digitisation movement to a next industrial revolution that will create a sustainable society.

Company	View on current system	Shape the sustainable society
HP	Agent of change	Agent of change
	"We recognize and embrace the opportunity and **responsibility to address some of the greatest shared challenges facing society today**, including resource scarcity, the shift to cleaner energy, access to quality education and economic opportunity, human rights protection throughout the supply chain, and data security and privacy (HP, 2016, p. 10)".	"Research and development (R&D) is a key driver of our business success and our promise to customers to invent and reinvent technology that can change the world. In 2016, we spent $1.2 billion on ongoing product development and creating **the transformative and disruptive technologies of the future.** We invest in areas where we can make the greatest impact, and integrate sustainability into our research agenda. Taking into account global socioeconomic, demographic, environmental, and technological trends, we work **to predict and shape tomorrow's markets** (HP, 2016, p. 41)". "Our commercial and industrial graphics printing solutions are **driving the analog-to-digital revolution**, transforming our customers' supply chains and better matching supply with demand across the 2D printing and publishing industries, as well as other commercial and industrial sectors such as packaging and labelling (HP, 2016, p. 40)". "3D printing is ushering in what is being called the '**fourth industrial revolution**,' whereby mass digitization will reinvent how we design, manufacture, distribute, and maintain products. **HP is at the heart of this transformation** (HP, 2016, p. 63)".
SAP	Agent of change	Agent of change
	"We strive to make our world a better, more sustainable place and **help solve some of its most complex problems** (SAP, 2017c, p. 51)**."** "We believe that digital technologies will enable companies and organizations **to tackle some of the world's most complex,** intractable problems. These include issues that are highlighted within the United Nations' 17 SDGs, such as abolishing poverty and reducing global carbon emissions (SAP, 2017c, p. 225)".	"**We strive to make our world a better, more sustainable place** (SAP, 2017c, p. 51)**."** "We believe that digital technologies will enable companies and organizations **to tackle some of the world's most complex,** intractable problems. … Through our solutions, **we provide customers, partners, and consumers with the tools that help them make a difference** (SAP, 2017b, p.225)". SAP drives changes, not only in their own company but expands their impact also to other stakeholders. "We believe when the digital revolution is shaped the right way, it can build a digital economy, ensure the future of work, and improve life for all – like the Industrial Revolution did 200 years ago (SAP, 2017b)".
Samsung	Agent of change	Agent of change
	"We are living through **challenging times**. … we are seeing a paradigm shift in both economic and social terms as we experience a fourth industrial revolution, **sweeping away old assumptions** and subjecting us all - both as individuals and businesses - to a new intensity of competition (Samsung, 2017, p. 4)".	"we are seeing a **paradigm shift** in both economic and social terms as we **experience a fourth industrial revolution** … Given the current rhythm of change, sustainability has never been more vital to us all (Samsung, 2017, p. 4)".

Table 20 Narratives revolution indicators - agent of change

Almost all companies from the sample score relatively good on the indicators that check the opportunities of the incumbent companies to drive transitions. Radical sustainable oriented innovation is part of the strategy of ten companies, making it the indicator with the most agent of change classifications. The companies that scored agent of change have all reported on their aim to create radical breakthrough innovations that can transform the market. Table 21 presents some examples of the narratives for companies with an agent of change view on innovation. The narratives display that the intention to create disruptive innovations is large, where large investments are made to do create the best circumstances to let an innovation thrive.

Company	Narrative
HP	"In 2015, we spent $1.2 billion on ongoing product development and creating the transformative and **disruptive technologies of the future**. We invest in areas where we can make the greatest impact, and integrate sustainability into our research agenda (HP, 2016, p. 41)"
Siemens	"Technological innovation plays a key role in meeting many Sustainable Development Goals. To foster new **disruptive ideas**, we have bundled our start-up activities in a separate unit called "next47". It will receive funding of €1 billion over the next five years and focus on Distributed Electrification, Artificial Intelligence, Connected (E)-Mobility, Autonomous Machines, Block-Chain Applications, and E-Aircraft (Siemens, 2016b, p. 3)
Accenture	"At Accenture, we take an innovation-led approach to helping our clients, people and communities "**imagine and invent**" the future. To this end, we have created a social innovation architecture that allows us to **develop sustainable, disruptive and scalable solutions** to address a wide range of complex societal issues across multiple sectors and geographies (Accenture, 2016a, p. 39)"
Sinopec	"We seek new advantages in innovation. In recent years, we have made **breakthroughs** in five areas including inventing a series of shale gas exploration and extraction technologies, developing and integrating low-cost technologies for exploiting clean oil products, qualifying the National V emission standards, developing a series of new coal chemical technologies for the industry chain, and industrialising a complete set of in-house-technology on ethylene facilities at the million tonnage level, which has reached advanced world level. We have also established world-class industrial unit applying high efficient and environmental friendly Aromatics Package Technology which is of independent intellectual property rights, reaching the top level in the world (Sinopec, 2017b, p. 3)"
CNPC	"Thanks to **continuous technological breakthroughs**, CNPC increases enhances the recovery of existing resources, explores new areas of energy development through **cutting-edge technologies**, and develops green production technology to provide energy for society in a more responsible way (CNPC, 2017b, p. 18)".

Table 21 Sustainable oriented innovation: narratives classified as agent of change

Shaping the institutional context is also scored more on the agent of change side. All but five companies state that they at least comply with all laws and regulations. From these companies that do not specifically state to comply with all the laws and regulation, making them agents of stagnation for this indicator, Hon Hai and Chevron do state to comply with some specific laws or say they respect the law, but do not give full clarification that they comply with all legislations. Seven companies are seen as agents of change for this indicator and have active communication with the government to create a better institutional context: HP, Accenture, SAP, CNPC, ExxonMobil, Shell and SGCC. Some of their narratives are shared in table 22. The formulation of energy policies and creating save conditions for new technologies are main topics these companies lobby for.

Company	Narrative
HP	"To improve regulation and management of e-waste across the sector, we collaborate with governments and industry stakeholders.(HP, 2016, p. 66)" "Technology's transformative potential is limitless. HP **advocates for public policies** that enable our business to grow by unleashing this potential—in ways that create jobs, spur growth, and promote innovation and sustainability. We work to remove barriers to, and accelerate development of, revolutionary technologies that can blend the physical and digital worlds, transform manufacturing through advances such as 3D printing, expand access to key services including healthcare and education, and protect privacy (HP, 2016, p. 120)".
SAP	"SAP has developed trusting relationships with governments worldwide by exploring the potential for information and communications technology (ICT) to spur economic growth, create jobs, and address societal challenges. **SAP engages with governments** around the globe on a number of public policy issues, including the creation of reasonable framework conditions for new technologies or business models such as cloud computing, the Internet of Things, and Big Data. (SAP, 2017c, p. 241)".
SGCC	"**Assist governments to introduce policies**. State Grid strengthened its communication to governments at different levels, and organized field research and policy research to offer advice and suggestions. It assisted 8 ministries and bureaus such as the NEA to introduce Guidelines on Electricity Replacement, taking electricity replacement as an important measure to promote the revolution in energy consumption, implement the national energy strategies and boost air pollution governance. The targets and supporting policies of electricity replacement have been clarified.(SGCC, 2017, p. 68)
CNPC	"**Contribute to the formulation of energy policies**, **laws and regulations and industry standards** (CNPC, 2017b, p. 14)".
ExxonMobil	"Because public policy decisions made at all levels of government can have significant effects on our current and future operations, ExxonMobil communicates its positions to the U.S. Congress, state legislatures and governments around the world. In the United States, lobbying activities include direct communication with members of Congress, state legislators, administration and regulatory officials, as well as support for trade associations and other groups that engage in lobbying activities. We fully comply with registration and reporting regulations related to our lobbying activities. (…) As shown on the right, **ExxonMobil engaged last year on a variety of issues in support of responsible economic, energy and environmental policies**. (ExxonMobil, 2017a, p. 45)".

Table 22 Shape institutional context: narratives classified as agent of change

Collaboration for sustainable development is widely done by the sample companies. Almost all companies state they are members of large associations or initiatives that connect companies to collaborate for change. Examples of these initiatives are: Conflict-Free Sourcing Initiative (e.g. Siemens and Samsung), Partnering against Corruption' initiative (e.g. Accenture and BP) and the Electronic Industry Citizenship Coalition (e.g. HP and Sony). Furthermore, collaborations with universities and NGOs are very common. These collaborations rate a company as a hesitant company, because only when specific collaborations with other large companies was reported on the company is classified as agent of change. Narratives of companies for this are presented in table 23.

Company	Narrative
Accenture	"We partner with more than three-quarters of the FORTUNE Global 500, driving innovation to improve the way the world works and lives (Accenture, 2017, p. 3)"
SAP	"In 2016, we also extended our social sabbatical portfolio to joint projects with SAP customers. In July, a joint team of volunteers from SAP and GlaxoSmithKline plc designed and implemented an integrated database for Partners in Health (SAP, 2017a, p. 78)"
Samsung	"Strategic Collaboration: At the Mobile World Congress 2017, Samsung and Peugeot unveiled the 'instinct', an autonomous driving concept car with Samsung's IoT platform 'ARTIK Cloud' onboard. As part of the Instinct's DNA, our ARTIK Cloud is capable of anticipating various driving preferences and fine-tuning them before one even gets behind the wheel (Samsung, 2017, p. 59)"
HP	"BMW Group has a track record of applying additive manufacturing processes to produce prototypes or custom parts that can be built into select designs for its premium vehicles. Looking for new technologies to shorten car development times and improve manufacturing efficiencies, the company was a natural fit as an early collaborator in developing HP's Multi Jet Fusion technology. (…), the BMW Group was one of the initial companies to test our 3D printing solution. (…) To build on this collaboration, HP and BMW Group are conducting a life cycle assessment that will compare 3D manufacturing with traditional injection molding for the production of automobile parts (HP, 2016, p. 64)"

Table 23 Collaboration for sustainable development: narratives classified as agent of change

Phase model indicators

All phase model indicators score overall most as hesitant. Notable here is that the companies could have operated more as an agent of change, but did not report clearly enough about it. For example, not all companies had clear vision/strategy statements. Furthermore, in naming the stakeholders few mentioned society as a stakeholder although they did mention society to be taken into account throughout the reports. The approach towards the supply chain appeared to be more imposing rules to the suppliers and, in some cases, help them meet the requirements than clear collaboration and co-creation with the suppliers. Samsung is one of the exemptions as they "build mid-/long-term partnerships with key suppliers through win-win cooperation programs (Samsung, 2017, p. 77)".

It is especially remarkable to see that the reporting approach is very hesitant. No company, besides Samsung and SAP, publicises there reports integrated with the annual report. Furthermore, only Siemens uses the Comprehensive GRI approach. This lack in full transparent integrated reporting shows that companies do not yet see sustainable development as a fully core value of the companies practises and also that they are reluctant to show full transparency about their impact.

From the phase model indicators, the indicator verification for being a sustainability leader through the Dow Jones Sustainability Index is the only phase model indicator that does not score hesitant. It even is the only indicator that solely scores 'agent of stagnation' as a most common assigned typology. However, this is not surprising as the DJSI selects only the top companies per industry. As the sample of this research does not include all MNEs from the IT and energy sector, it is logical that only a few of the selected companies are listed on a DJSI list. HP, Samsung and SAP are the companies that are found to be agents of change and they are all listed on the DJSI. Furthermore, Siemens (hesitant/agent of change) and Shell (hesitant) are listed on the DJSI. Accenture, as the hesitant/agent of change typology is not listed on the World DJSI, but is part of a sub-division of the DJSI.

Sustainable Development Goals

The reporting on the SDGs is divided equally among agent of stagnation, hesitant and agent of change typologies. HP, Samsung and SAP as overall agents of change also score as agent of change for the SDG indicator by fully reporting on their contribution to the SDGs. Siemens, Sinopec and SGCC are the other companies that are agents of change based on their SDG reporting. Siemens is a hesitant/agent of change company and Sinopec and SGCC are hesitant but lean more towards the agent of change side of the spectrum. Furthermore, all (partly) agent of stagnation companies (Amazon, Apple, Chevron and Phillips66) do not report about the existence of the SDGs in their annual- or sustainability reports. Other companies that score agent of stagnation for the SDGs are CNPC and Hon Hai. CNCP, as a hesitant company that goes more in the direction of agent of change, does mention that 2017 will be an important year to achieve the SDGs (CNPC, 2017b), but does not further reports on the goals. Hon Hai as a hesitant company that operates more towards the agent of stagnation side does not mention anything about the goals.

Results: validity check

Table 24 presents the results that separates companies based on whether they are listed on the Dow Jones Sustainability World Index 2016 or not. This separation is done to validate the results and verify if the companies that are classified as agent of change are also acknowledged by another sustainability ranking as leaders in sustainability.

Category	Indicator		Listed on DJSI World				Not listed on DJSI World		
			Agent of stagnation	Hesitant	Agent of change		Agent of stagnation	Hesitant	Agent of Change
Revolution	View on current system		0	2	3		3	9	1
	Shaping the sustainable society		0	1	4		6	3	4
The role of incumbent companies	Sustainable oriented Innovation		0	1	4		5	2	6
	Shape institutional context		0	2	3		5	4	4
	Collaboration for sustainable development		0	2	3		2	9	2
Phase model indicators	Vision of sustainability		0	1	4		3	8	2
	Repo-rting	Appr-oach	0	3	2		3	10	0
		GRI	0	4	1		5	8	0
	Stakeholders		0	4	1		3	6	4
	Approach to supply chain		0	1	4		2	9	2
	DJSI		0	0	5		11	2	0
SDGs	Reporting on SDGs		0	1	4		6	5	2
Total			**0**	**23**	**37**		**54**	**75**	**27**
Percentage			**0%**	**36,7%**	**63,3%**		**34,6%**	**48,1%**	**17,3%**

Table 24 Results - Dow Jones Sustainability World Index 2016

The listed companies do not have an agent of stagnation attitude towards any of the indicators. Their score on agent of change indicators is high except for reporting and the stakeholder. This result verifies that the created taxonomy and collected data are in line with the analysis that the DJSI has done on the companies when they listed them as leading companies in their sector. Siemens and Shell were the only energy companies that is listed on the DJSI. These companies are not assigned as agent of change, but are respectively classified as a hesitant/agent of change company and a hesitant company.

The companies that are not listed on the DJSI on their matter have a more agent of stagnation and hesitant strategy. The only agent of change indicator that is dominant is the one of sustainable oriented innovation, but this score has to be shared with the same number of companies that score agent of stagnation which lowers the overall change agent mentality for this indicator.

Results: Context variables

In this section, the overall results are separated based on the following independent variables: sector, geographic region and founding year.

Sector

The two sectors that are promising to be leading in The Sustainability Revolution are the IT and energy sector. In the overall results that are discussed before, both sectors have been used next to each other. Table 25 shows the results when the two sectors are separated. Siemens, because they operate in both sectors, is part of both the IT and energy sector results.

Category	Indicator		IT Sector Agent of stagnation	IT Sector Hesitant	IT Sector Agent of change		Energy sector Agent of stagnation	Energy sector Hesitant	Energy sector Agent of Change
Revolution	View on current system		2	3	4		1	9	0
	Shaping the sustainable society		3	1	5		3	4	3
The role of incumbent companies	Sustainable oriented Innovation		2	2	5		3	1	6
	Shape institutional context		3	3	3		2	4	4
	Collaboration for sustainable development		1	4	4		1	8	1
Phase model indicators	Vision of sustainability		2	3	4		1	7	2
	Repo-rting	Appr-oach	2	5	2		1	9	0
		GRI	2	6	1		3	6	1
	Stakeholders		1	6	2		2	5	3
	Approach to supply chain		1	3	5		1	7	2
	DJSI		4	1	4		7	1	2
SDGs	Reporting on SDGs		3	2	4		3	4	3
Total			26	40	42		28	65	27
Percentage			24,1%	36,1%	39,8%		23,3%	54,2%	22,5%

Table 25 Results - Sector

Both sectors have about the same share of agent of stagnation companies, approximately 23-24%. In the energy sector, more than half of the indicators fall under the hesitant typology, making that the main typology of this sector. 22,5% of the indicators are left for the agent of change indicators of the energy sector. The most agent of change indicators are found in the category 'the role of incumbent companies'. For the IT sector this hesitant and agent of change typologies are almost equal to each

other: 36,1 and 39,8%. Overall the IT companies have adopted more agent of change attitudes than companies in the energy sector.

This distribution is not surprising as all agent of change companies (HP, Samsung and SAP) and all hesitant/agent of change companies (Accenture and Siemens) are operating in the IT sector. These companies are leading companies in the field of sustainability and have a view that can create societal change. From table 25 can be seen that the IT companies have 'high' scores on almost all revolution and 'the role of incumbent companies' indicators. This is very promising with respect to driving The Sustainability Revolution guided by IT solutions such as artificial intelligence and Internet of Things. However, one of the important roles of incumbent companies shaping a sustainable society is facilitating the institutional context. This is also important for the IT sector and in this sample only three companies (Accenture, HP, SAP) did lobby for this. Three companies did not even state that they comply with all rules and regulations which is a surprising number when looking at the rest of the results on category 'the role of incumbent companies'. The IT companies fall behind on their sustainability reporting and stakeholders. Integrating the CSR reports and make them more transparent will be the next step. Taking the stakeholders into account, only Sony goes beyond the general stakeholders and adds the global environment as a key stakeholder which in combination with the stakeholder 'community' leads to the decision to mark this as agent of change.

Looking at the energy companies, there are no companies classified as agent of change. Only Siemens (being an IT and energy company) is classified as hesitant/agent of change. For the rest, all but Chevron and Phillips66 are hesitant companies, where Chevron is even half hesitant. Interesting to see is that none of the energy companies acknowledge the full societal system failure. In their statements, they refer to the climate change problems, which is not surprising as this is the main issue where these companies are the creator of, but also are important in solving the issue. However, they do not link this low carbon future to the also pressing social issues that the world faces, which keeps them away from the agent of change indicator.

Geographic region

Table 26 presents the results separated by geographic region of origin. Overall it can be seen that North-American companies operate primarily with an agent of stagnation attitude. Asian companies are already operating more hesitantly, but still have quite some stagnating attitudes. The European companies, although primarily hesitant, have the best agent of change mentality compared to the other regions.

Category	Indicator		Asia			North-America			Europe	
		Agent of stagnation	Hesitant	Agent of change	Agent of stagnation	Hesitant	Agent of Change	Agent of stagnation	Hesitant	Agent of change
Revolution	View on current system	4	1	1	2	3	1	0	4	2
	Shaping the sustainable society	1	2	3	5	0	1	0	3	3
The role of incumbent companies	Sustainable oriented Innovation	0	2	4	4	0	2	1	1	4
	Shape institutional context	2	2	2	3	1	2	0	3	3
	Collaboration for sustainable development	0	4	2	2	3	1	0	4	2
Phase model indicators	Vision of sustainability	0	3	3	3	2	1	0	3	3
	Reporting — Approach	0	5	1	3	3	0	0	5	1
	Reporting — GRI	0	6	0	5	1	0	0	5	1
	Stakeholders	0	4	2	3	3	0	0	3	3
	Approach to supply chain	0	4	2	2	2	2	0	4	2
	DJSI	5	0	1	4	1	1	2	1	3
SDGs	Reporting on SDGs	2	1	3	4	1	1	0	4	2
	Total	14	34	24	40	20	12	3	40	29
	Percentage	19,4 %	47,2 %	33,3 %	55,6 %	27,8 %	16,7 %	4,2 %	55,6 %	40,3%

Table 26 Results - Geographic region

The North-American companies are primarily agents of stagnation. As Amazon, Apple, Phillips66 and Chevron, overall (partly) agents of stagnation, are all North-American companies, this is not surprising. Furthermore, it is seen that all but one of the North-American companies do not mention to contribute to create the sustainable future. Only HP, as the only agent of change from North-America, mentions to contribute to the sustainable transition.

Compared to the others, the European companies have the most agent of change strategies, but it is still not the dominant typology as there are more hesitant indicators. Four out of six European companies are listed on a DJSI list with three out of five on the DJSI World, corresponding with their leading position in sustainability. Next to two not DJSI listed companies, only for the indicator 'sustainable oriented innovation' there was one company that scores agent of stagnation; Glencore does not report on their own innovative power for sustainable development. It does state to have intentions to innovate (in industry consortia) or requesting for radical new designs or for e.g. energy efficiency and CO_2 emission reduction because of vessels from a new technology (Glencore, 2017b).

Asian companies also have primarily hesitant indicators, but have a larger percentage of agent of stagnation indicators than European companies. Half of the Asian companies state to contribute to shape the sustainable society, but the view on the current system is noticeably more agent of stagnation. Thus, hesitant companies have the dominance in the Asian samples. Only Samsung is not hesitant, but part of the agent of change typology.

Founding year

Table 27 presents the results separated by founding year before or after 1980. The sample contained only five companies younger than 1980, over thirteen from before 1980. As seen at the bottom of the table, the distribution between typologies is approximately the same for both samples. Both have about 45% hesitant indicators. The younger companies for the rest of the indicators are equally distributed between agent of stagnation and agent of change. The older companies are slightly more agent of change (30,8%) than agent of stagnation (23,7%).

Category	Indicator		<1980 Agent of stagnation	<1980 Hesitant	<1980 Agent of change	>1980 Agent of stagnation	>1980 Hesitant	>1980 Agent of Change
Revolution	View on current system		1	9	3	2	2	1
	Shaping the sustainable society		5	2	6	1	2	2
The role of incumbent companies	Sustainable oriented Innovation		4	3	6	1	0	4
	Shape institutional context		4	5	4	1	1	3
	Collaboration for sustainable development		1	9	3	1	2	2
Phase model indicators	Vision of sustainability		2	6	5	1	3	1
	Repo-rting	Appr-oach	2	9	2	1	4	0
		GRI	4	8	1	1	4	0
	Stakeholders		2	8	3	1	2	2
	Approach to supply chain		1	6	6	1	4	0
	DJSI		7	1	5	4	1	0
SDGs	Reporting on SDGs		4	5	4	2	1	2
	Total		37	71	48	17	26	17
	Percentage		23,7%	45,5%	30,8%	28,3%	43,3%	28,3%

Table 27 Results - Founding year

The companies were established before 1980 have six agent of change indicators for shaping the sustainable society, but also five companies with an agent of stagnation attitude. The view on the current system is approached rather hesitant, with nine companies. It is striking to see that all of the DJSI World 2016 listed companies are older than 1980.

Companies set up after 1980 did so in the period where sustainable development and CSR became more popular. However, based on the results, no leading role in sustainability is shown. The strategies applied by these companies are mainly hesitant. Noticeable is that these companies do have an agent of change mentality for sustainable oriented innovation.

4.2   Part II

Sustainable Development Goals: General

Table 28 and 29 show the contribution the energy and IT companies claim to have on achieving the SDGs. The stances towards the SDG reporting are taken from the overall result section and are stated as "S" for agent of stagnation, "H" for hesitant, and "C" for agent of change. The reporting style is guided by the following numbers: 1 = 'not report on SDGs', 2 = 'only mention SDGs exist', 3 = 'loose mentioning a contribution to an SDG', 4 = 'state to contribute to a number of SDGs, but no link to what the performance is', 5 = 'connect sections of the report to certain SDGs to', 6 = 'overview directly stating performance of the SDG' and 7 = 'separate document/website'.

Indicators	Amazon	Apple	Accenture	Hon Hai	HP	Samsung	SAP	Siemens	Sony
Stance towards SDG reporting	S	S	H	S	C	C	C	C	H
Reporting style	1	1	6	1	5	6	6 + 7	6 +7	4
Number of SDGs	0	0	9	0	15	13	17	14	8
SDG contribution (grey=contribute to)	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1
	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2
	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3
	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4
	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5
	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6
	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7
	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8
	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9
	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10
	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11
	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12
	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13
	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14
	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15
	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16
	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17

Table 28 SDG reporting: IT companies

Indicators	BP	Chevron	CNPC	ExxonMobil	Glencore	Philips 66	Shell	Sinopec	SGCC
Stance towards SDG reporting	H	S	S	H	H	S	H	C	C
Reporting style	7	1	3	5 + 7	5	1	6	5	6
Number of SDGs	0	0	2	16	10	0	11	16	17
SDG contribution (grey=contribute to)	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1	SDG1
	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2	SDG 2
	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3	SDG 3
	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4	SDG 4
	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5	SDG 5
	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6	SDG 6
	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7	SDG 7
	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8	SDG 8
	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9	SDG 9
	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10	SDG 10
	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11	SDG 11
	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12	SDG 12
	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13	SDG 13
	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14	SDG 14
	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15	SDG 15
	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16	SDG 16
	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17	SDG 17

Table 29 SDG reporting: Energy companies

It is noticeable than when a company reports on the SDGs this is generally on more than half of the goals, with CNPC and BP as an exemption. All of the agent of change companies report on more than 13 of the SDGs, classifying them as agent of change for this indicator as well. From this, there are even two companies that report on all 17 goals; SAP and SGCC.

Amazon, Apple and Phillips66 as agents of stagnation, all not report on the SDGs or even mention them. Hon Hai, the other company not mentioning the SDGs, is a hesitant company. CNPC, just loosely mentioning contribution to two goals, is a hesitant company as well.

The companies that directly link performance to an SDG (reporting style 6), overall state to contribute to most goals. Also, reporting style 5 scores a high number of goals per company. In this group, with an exemption of Glencore, all companies have more than 15 goals they claim to contribute on.

Goals 2 is a goal that is often skipped; only SAP, Sinopec and SGCC report to contribute to this goal. Furthermore, goals 10, 11 and 14 avoided more often than other goals. IT companies reporting on the SDGs, all state to contribute to goals 4, 5, 8, 12, 13 and 17. Energy companies reporting on the SDGs, all state to contribute to goal 7, apart from Glencore. When CNPC is removed from that, as they only report on two SDGs, the energy companies contribute to goals 8, 12, 13, 14, 15, 16 and 17. Interesting here is that Glencore, as a company in the energy sector does not state to contribute to goal 7 'clean and affordable energy' which is striking to see.

Another surprising result is that Chevron in their 2015 sustainability report did report that many of their corporate responsibility activities support the SDGs. Goals 3, 4, 7, 8, 15 and 17 are addressed in this report (Chevron, 2016). However, in the 2016 report these is no notice of contribution towards these (or other) goals and thus Chevron is assumed to currently not embrace the SDGs in their strategy.

Sustainable Development Goals: Best practises

There are three companies that are seen as agents of change: HP, Samsung and SAP. All these companies are part of the IT sector. For that reason, also the energy companies that operate mostly towards being agent of change are added. Based on the results from table 16, Siemens (both IT and energy sector) and Shell and SGCC are added. Siemens operates as hesitant/agent of change and Shell and SGCC lean towards the agent of change side of the hesitant approach. As these companies have a strategy that is promising to create change, the contribution they have towards achieving the SDGs will be analysed. Other (MNE) companies can learn from this and follow the best practises from the leading companies.

The contribution of these five companies on all of the seventeen goals is presented in appendix C and is summarized in this section. These are the statements the companies connect to the goals. Only for HP, as using reporting style 5 'connect sections of the report to certain SDGs to', the contribution is collected from the sections in the report that they state the goals are part of. The other companies had a reporting style that directly stated the contribution per SDG. After the seventeen goals are elaborated upon, an overall analysis is done.

SDG1: No poverty

HP, Samsung, SAP and SGCC state to contribute to SDG1. From the IT companies the main focus is on giving access to information and technology from all levels and backgrounds (HP, 2016; Samsung, 2017; SAP, 2017a). Furthermore, digital skill education is given to increase employment possibilities for underprivileged people (HP, 2014; Samsung, 2017). SGCC takes poverty alleviation efforts to eliminate poverty in rural areas in China, e.g. by opening a poverty-relief PV station (SGCC, 2017).

SDG2: Zero hunger

Overall SDG2 was a less addresses goal. Only SAP and SGCC report a contribution. Both make statements on supporting the agriculture sector with digital technology to manage the supply chain (SAP, 2017a) or with ensuring electricity access for small-scale grain producers in townships (SGCC, 2017).

SDG3: Good health & Well-being

HP, SAP, Siemens and SGCC make a contribution to SDG3. Both HP and SAP make statements on creating a healthy workforce and take care of the well-being of their employees (HP, 2016; SAP, 2017a). Siemens also mentions the well-being of their employees but they connect this effort to SDG4 and SDG8 and not to SDG3 in specific. SAP, Siemens and SGCC support the medical sector by aiming to prevent diseases. SAP states to deliver insights about simplifying medicines, e.g. SAP technologies are used for cancer diagnosis and treatment (SAP, 2017a). Siemens states that their medical devices and lab tests threated patients with the most threatening diseases and also they have enabled an increase in accessibility and quality of essential goods, e.g. individualised cancer vaccines (Siemens, 2017b). SGCC supports the rural medicine infrastructure and support prevention and control for regional AIDS and other epidemic diseases (SAP, 2017c).

SDG4: Quality education

HP, Samsung, SAP, Siemens and SGCC contribute to SDG4. HP and Samsung provide online business courses for free (HP, 2016; Samsung, 2017). Furthermore, as also has been stated at SDG1, increasing the access and knowledge on IT technologies in rural areas is contributing to achieving the SDGs (Samsung, 2017; SAP, 2017a). This is not limited to the IT companies, as SGCC also state to give skill training to underdeveloped groups (SGCC, 2017). Siemens mainly focused on training of stakeholders.

It promotes employee skill development and technology related trainings to customers, suppliers and partners (Siemens, 2017b).

SDG5: Gender equality
Again HP, Samsung, SAP, Siemens and SGCC are the companies contributing to the SDG. Gender diversity in the own workforce is addressed by HP and SAP (HP, 2016; SAP, 2017a). Both HP, Samsung and Siemens operate in the STEM (Science, Technology, Engineering, Mathematics) education program that among other things focuses on education for girls and minorities (HP, 2016; Samsung, 2017; Siemens, 2017b). SGCC and Samsung mention special regulations related to women in pregnancy (Samsung, 2017; SGCC, 2017).

SDG6: Clean water & sanitation
All companies address the SDG around clean water & sanitation. However, Siemens contribution has not been clearly connected to goal 7 as they combine SDGs with the efforts they take. HP and SAP both mention to reduce their water use, e.g. by using grey water where possible (HP, 2016; SAP, 2017a). Samsung and SGCC manage and protect the sustainable use of water resources (Samsung, 2017; SGCC, 2017).

SDG7: Affordable & clean energy
All companies address SDG7. IT companies HP, SAP and Siemens are shifting towards using renewable energy and make efforts to reduce their GHG-emissions (HP, 2016; SAP, 2017c; Siemens, 2017b). Further efforts from IT companies are in creating more efficient products that use less energy, e.g. reducing the energy consumption of consumer printers (HP, 2016) and highly efficient smart homes (Samsung, 2017). Siemens also focuses on making the clean energy technologies more efficient and boost the accessibility to energy, e.g. with a power generation project in Egypt (Siemens, 2017b). Shell states to develop cleaner energy solutions (Shell, 2017) and SGCC is creating better accommodation for clean energy solutions (SGCC, 2017). Creating access to energy in rural areas by off-grid energy solutions is done by both Shell and SGCC (SGCC, 2017; Shell, 2017).

SDG8: Decent work & Economic growth
All six companies contribute to SDG8: decent work & economic growth. Creating jobs is the main effort that is claimed to improve this goal (HP, 2016; SGCC, 2017; Shell, 2017; Siemens, 2017b). HP again uses the IT education for unemployed as their contribution (HP, 2016) and Samsung is ensuring a safe environment and assist local communities in economic development (Samsung, 2017). SAP states a more indirect support on this goal. It states their technologies help other organisations creating an environment for better jobs and economic development (SAP, 2017a). Siemens relates their contribution to local economies and the generation of economic value to SDG8 (Siemens, 2017b).

SDG9: Industry, Innovation & infrastructure
On SDG9 all companies have statements on their contribution, but they are rather divers. HP is using innovation to create a circular, low-carbon economy (HP, 2016). Samsung supports underprivileged areas by engaging economic activities through ICT development (Samsung, 2017). SAP is supporting other organisations that make impact on this matter, e.g. the entrepreneurial spirit in Africa and better infrastructure in Europe (SAP, 2017a). Siemens invests in R&D with which they aim to shape the digital transformation and enabling infrastructure projects through financing solutions. Furthermore, they collaborate with both start-ups and academic partners for practical applications of innovations (Siemens, 2017b). Shell collaborates to encourage innovation around meeting the growing energy demands (Shell, 2017). SGCC is working on the upgrade of the rural power grids (SGCC, 2017).

SDG10: Reduce inequalities

Contributing to SDG10 is done by HP and SGCC through promoting the representation of (ethnic) minorities (HP, 2016; SGCC, 2017). Samsung connects this goal to reducing poverty (SDG1) and creating jobs (SDG8) and reduce income inequalities with that (Samsung, 2017). SAP offers technology to help other companies expand business and improve services to reach new communities. Furthermore, its open-data initiatives provide governments with public data that can be used to eliminate inequalities (SAP, 2017a). Siemens states to promote equality by having a diverse workforce with over 170 nationalities (Siemens, 2017b).

SDG11: Sustainable cities & communities

HP, SAP and Siemens contribute to creating sustainable (smart) cities by providing real time transparency (HP, 2016; SAP, 2017a; Siemens, 2017b). Shell has partnered with authorities of three Asian cities to improve these cities to become more resilient (Shell, 2017). SGCC contributes by upgrading the reliable power supply and support the construction of smart cities (SGCC, 2017).

SDG12: Responsible consumption & production

All six companies again contribute to achieve this SDG. IT companies ensure the sustainable use of products across the value chain, recycle themselves and promote recycling (HP, 2016; Samsung, 2017) and support suppliers to improve their sustainable efforts (HP, 2016; SAP, 2017a). Both HP and Siemens highlight their aim to create a circular economy (HP, 2016; Siemens, 2017b). The energy companies contribute by having (and following) policies to protect the environment and make efforts to increase energy efficiency (SGCC, 2017; Shell, 2017).

SDG13: Climate action

Climate action is taken by all six companies. IT companies focus on efficient energy use, reducing GHG-emissions and use renewable energy (HP, 2016; Samsung, 2017; SAP, 2017a; Siemens, 2017b). Shell and SGCC both claim to tackle climate change challenges. Shell manages GHG-emissions and collaborates in the transition towards a low-carbon future (Shell, 2017). SGCC takes efforts to solve issues created by climate change, such as enhancing the grid to withstand extreme weather conditions (SGCC, 2017).

SDG14: Life below water

Efforts around the life below water are only addresses by Shell and SGCC. SAP has storyline about this goal and Siemens mentions the goals as well, but both do not state any contributions they make in relation to SDG14. Shell protects the marine biodiversity and SGCC has operations that develop renewable energy sources related to water, such as tidal energy (SGCC, 2017; Shell, 2017).

SDG15: Life on land

All companies contribute to the life on land SDG. However, Siemens contribution has not been clearly connected to goal 15 as they combine SDGs with the efforts they take. HP develops sustainable printing technologies and has goals to reach zero-deforestation (HP, 2016). The other four companies mainly focus on the development and living by biodiversity guidelines (Samsung, 2017; SAP, 2017a; SGCC, 2017; Shell, 2017).

SDG16: Peace, Justice & Strong institutions

All companies contribute to SDG16. Complying with codes of conduct are states as contribution by HP, Samsung and SGCC (HP, 2016; Samsung, 2017; SGCC, 2017) where Siemens highlights the supplier code of conduct where suppliers have to comply with (Siemens, 2017b). Human rights are addresses by HP and Samsung (HP, 2016; Samsung, 2017). HP and SAP state responsible mining sourcing from their

supply chain (HP, 2016; SAP, 2017a). Anti-corruption and bribery and monitoring corporate transparency are mentioned by SGCC and Siemens as contribution (SGCC, 2017; Siemens, 2017b).

SDG17: Partnerships for the goals

All companies report on partnerships for the SDGs. Relating to partnerships, HP support the UN SDGs, the UN Global Compact and GRI (HP, 2016). Collaboration with the government is mentioned by Samsung, SAP and Shell (Samsung, 2017; SAP, 2017a; Shell, 2017). SGCC and Shell mention sharing knowledge to achieve the SDGs (SGCC, 2017; Shell, 2017).

Analysis of the findings

In general, it is noticeable that contribution to goal two and fourteen is hardly mentioned. Only SAP and SGCC report on both of these goals, as they report performance on all of the SDGs, and Shell reports contribution to goal fourteen. For the rest, all of the goals are well represented.

From analysing the contributions, it became obvious that many efforts to contribute to the SDGs are not integrated in the core business. Many statements relate to smaller project that are executed in a specific area or can better be seen as ad-on activities to be able to contribute to a goal. Taking into account the global reach of these incumbent companies, the share of the impact is much lower than it could be. Relating to this, SAP states contributions to almost all of the goals, but the contribution is often indirect. Their technologies and software are used by other organisation that are aiming to target the development related to the SDGs.

5 DISCUSSION

The main objective of this research was to establish whether incumbent companies can be the drivers of The Sustainability Revolution and find out what the role of the SDGs in this can be. This revolution is a necessary one for creating a new balance between economic, environmental and social performance and it will create a sustainable society that is beneficial for all species. In the results section differences among some of the largest companies in the IT and energy sector have been found. To get a deeper understanding of the results this discussion will try to find the reasoning behind the outcome of the results by interpreting differences that occurred and connect them to existing literature.

5.1 Part I

Part one of this discussion focuses on the first part of the research question: *Can incumbent companies be the drivers of The Sustainability Revolution?* The sub-questions of this question are: *What attitudes do incumbent companies have towards The Sustainability Revolution?* And *How do context variables explain certain differences among attitudes of incumbent companies?*

Interpretation of the findings

From the sub-question focussing on the various attitudes of incumbent companies towards The Sustainability Revolution, several interesting findings have come to light in the results section.

Overall it can be stated that the majority of these incumbent companies have a hesitant approach. Eight are fully hesitant and three more are partly hesitant. The agents of stagnation and agents of change are equally divided as there are three each. The dominance of hesitant approaches supports the fact that there is growing awareness that change is needed to prevent the earth from extinction. However, it also supports that this growing awareness did not lead to radical changes in business approaches yet (Hopwood et al., 2005; Rifkin, 2011). The incumbent companies are in the middle of the paradigm switch battle. There are some companies that have the intention to be agents of change, but because there are also companies that operate as agents of stagnation, which makes it seem like a game of rope pulls is going on. Due to the business practice of these companies with a stagnating attitude, who are still primarily focussing on increasing shareholder's benefits, the companies that have the intention to create change are held back. The competition for the market share is brutal in this phase of the paradigm transition and moving too quickly can lead to major losses (or even bankruptcy), but also waiting too long can lead to missing out on the opportunities of the new paradigm. Being too late with making the transition could infect the incumbent companies with the incumbent curse (Chandy & Tellis, 2000), which can potentially completely destroy the company.

Elaborating on further findings, first the companies' perspectives on why change is necessary and their viewpoints towards the revolution are discussed. This is done by discussing the first box of the theory of change model: 'WHY: Revolution' (figure 12). After that general discussion, each company will be discussed based on their overall typology and their performance on the various category boxes in the theory of change model.

View on the revolution

All companies that are determined to be agents of stagnation (Amazon, Apple, Phillips66) do not (explicitly in a report) state anything relating to The Sustainability Revolution. Also, Chevron, as an agent of stagnation/hesitant company, is not acknowledging societal issues. Sustainable development is not yet a priority. As the incumbent companies are the most important stakeholder in the previous

paradigm (Chandy & Tellis, 2000), they are likely to want to keep this position. The agent of stagnation companies can be seen as the companies that try to slow down or stop the sustainable development movement. Yet, the awareness of the importance of CSR is increasing (Halme & Laurila, 2009; Kolk, 2016) and the companies do make statements on their websites about sustainability or have minor sustainability related reports. This makes it likely that internally they are preparing for the changes that are about to occur. However, companies with this attitude try to exploit the benefits they have from the previous paradigm as long as possible (Geels, 2005). The low willingness to radical change is an often seen characteristic at incumbent companies (Christensen, 1993; Henderson & Clark, 1990). The concept of sustainable development is touched, but more as a mandatory act. Radical changes as urgently needed for the Sustainability Revolution are not likely to come from these still stagnating companies.

The next group of companies fall under the hesitant typology. These companies have rather mixed approaches towards the revolution. Apart from Sinopec that has an agent of stagnation view on the current system, these companies are aware that the system is at least partly failing and some form of change is needed. Being aware of this, it is likely that these companies started making efforts to change their business towards a better link with the sustainable future. These companies are not yet in the phase in which they are expected to drive the revolution, but rather are able to easier adapt their business later on to be in line with the demand of the new paradigm. However, waiting too long with increasing their efforts, can be brutal for these companies and can lead to being destroyed (Chandy & Tellis, 2000).

Opposite to the agent of stagnation companies, there are several companies (HP, Samsung, SAP and Accenture) that are found to understand the inevitability of The Sustainability revolution. These companies acknowledge the current system is failing and connect that to the needed changes and transition to a sustainable society. As these companies overall also have an agent of change mentality (with Accenture as hesitant/agent of change), based on the results of this research, these companies are most likely to be the incumbent companies that have the right attitude to drive The Sustainability Revolution. To create change, being aware of the process is crucial. According to literature (e.g. Gladwell, 2006; Perez, 2007) the breakthrough of a (technological) revolution occurs when a tipping point is reached. This is the moment that sets the new paradigm apart from the previous paradigm. In the 'installation period' (time before the tipping point), the previous (mature) paradigm competes with the upcoming paradigm for its market share (Perez, 2007). Being aware that the current system, which still primarily relates to the previous paradigm, is not durable gives these incumbent companies a head start to start initiating processes to adapt the business to fit in the sustainable society and have them keep their leading position. As these agents of change also have the intention to drive the revolution and shape the sustainable future, they can create circumstances where they set high standards that eventually need to be followed by their peers.

A more general result that is remarkable in the revolution indicators is that not all companies that want to shape a sustainable future acknowledge the current system is failing. Eight companies mention to drive the transition of the entire system or shape a sustainable future. However, only four companies state that there are urgent global societal challenges that the current system faces (classified as agent of change). This discrepancy possibly occurs because some companies claiming to create a new future are using this more as a marketing tool than truly understand the current paradigm switch the world is in. These companies do acknowledge change is coming and that they need to contribute to the changes in order to keep their leading position, but are still bound by the circumstances from the

previous paradigm, so not thoroughly criticise this system. Another explanation of the difference could be that the companies do not have the same definition of a sustainable society as used in this research. As eleven companies do state that a part of the system is failing (classified as hesitant), e.g. climate change issues, it is possible that for those companies solving the issues around this component will create a sustainable future. As illustrated in figure 2, a model constructed by Hopwood et al. (2005), there are various interpretations of the concept sustainable development. Companies' view in that model can differ widely, however, this can also be used as an excuse for not taking responsibility for the impact of their business.

Company attitudes
Examining the further approaches the companies take towards driving The Sustainability Revolution, gives insights in the first part of the theory of change model (figure 12). For each company, the efforts will be discussed by taking the relation between the categories into account as shown in figure 13.
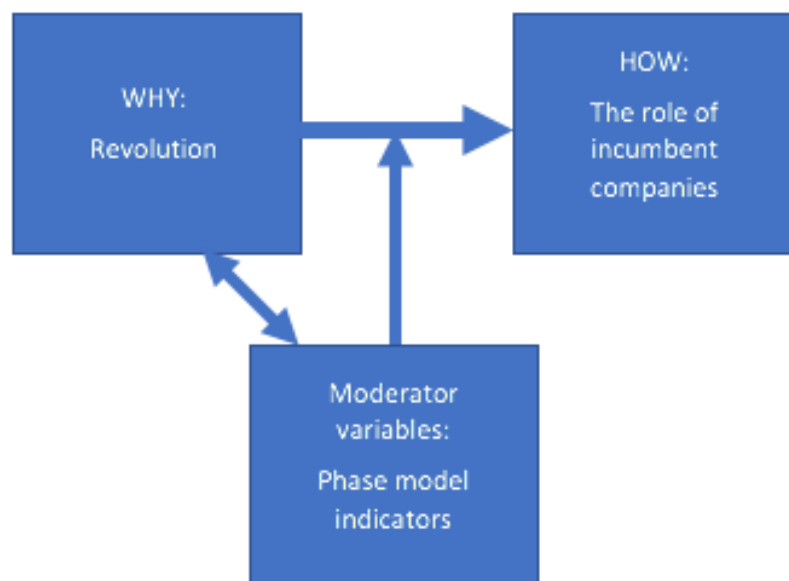

Figure 13 Theory of change: part one

Agent of stagnation
Apple, Amazon and Phillips 66 have an agent of stagnation view on The Sustainability Revolution. Amazon and Phillips66 also do not report (extensively) on their sustainability efforts in general. As a result, their efforts on 'the role incumbent companies' indicators and the phase model indicators are also agent of stagnation. This rather inactive approach results in an attitude towards The Sustainability Revolution that is slowing down the process and is low in probability of driving the revolution.

Agent of stagnation/hesitant
Chevron is a company that has a rather mixed approach between agent of stagnation and hesitant approach. As elaborated on in the previous section, Chevron has a mixed attitude on the revolution indicators, mentioning the system partly fails yet lacking to state intentions to create change. This lack of intention in creating change is also seen regarding the indicators from 'the role of incumbent companies'. For this category, Chevron scores two out of three indicators as agents of stagnation. With the phase model indicators Chevron has four out of six as hesitant, which clarifies the slight hesitant approach. With this approach, Chevron is building a solid foundation for CSR practises. However, this is still too minimal to become a driver of The Sustainability Revolution.

Hesitant
BP, Glencore, Shell, Hon Hai and Sony all have an overall hesitant approach towards both 'the role of the incumbent companies' indicators and the phase model indicators. Due to these hesitant approaches the potential of driving The Sustainability Revolution is not (much) increased by these categories when following the theory of change model. The starting point of these hesitant companies are different however. Hon Hai has an agent of stagnation/hesitant approach towards the revolution and thus has a lower starting point than the others. The hesitant 'the role of the incumbent companies' indicators and the phase model indicators show that Hon Hai contributes to sustainable development, but is not driving the revolution. Glencore has a hesitant approach towards the revolution which gives them an overall hesitant attitude towards The Sustainability Revolution. Glencore basically operates as trading company within the energy sector (see appendix B) which gives them much influence over the entire supply chain. Although they did score 'hesitant' for this indicator as they do not state to co-create with their supply chain (which would make them agent of change), this broad influence on the supply chain can be important in driving change when Glencore overall adopts a more agent of change mentality. BP and Shell have a hesitant/agent of change mentality towards the revolution. These companies are aware that change has to occur and there is some urgency, but it is not likely (yet) that these companies will create change in a major way as their efforts overall are more hesitant. However, the contribution of these companies on the energy transition, an important transition within The Sustainability Revolution, is valuable.

CNPC, ExxonMobil, Sinopec and SGCC have, with two out of three indicators, an agent of change approach for 'the role of incumbent companies', but they have a more hesitant approach with respect to the phase model indicators. This hesitant approach is reducing the strength of the relation between the view on the revolution and the efforts of incumbent companies in that revolution. From these hesitant companies, ExxonMobil and Sinopec start with an agent of stagnation/hesitant view on the revolution, Sinopec has a hesitant approach and SGCC a hesitant/agent of change approach. Going through the theory of change model, from these companies SGCC has the best intentions to be part of the Sustainability Revolution.

Hesitant/agent of change
Accenture has an agent of change attitude towards the revolution indicators. Also, they approach their responsibility of being an incumbent company in a revolution as agent of change. However, almost all phase model indicators are hesitant, apart from the indicator 'stakeholders' that does take society as a whole into account classifying it as an agent of change approach. This hesitant phase model attitude is reducing the strength of Accenture's intentions of being a change agent and drive the Sustainability Revolution.

Siemens on the other hand shows less awareness about the revolution and also does not excel in 'the role of incumbent companies' indicators, but according to the phase model indicators it can be seen more as an agent of change. The CSR strategy foundation for Siemens is strong, which is promising. The mentality and incumbent companies' roles for creating a sustainable future have to be improved when they want to become a leader of driving The Sustainability Revolution.

Agent of change
HP, Samsung and SAP have an agent of change vision on the revolution category and also for the most indicators of 'the role of incumbent companies' and phase model indicators. The indicators they have a hesitant approach to are mostly part of the phase model indicators. Regarding the theory of change model from figure 13, this result slightly reduces the strength of the agent of change mentality for the

revolution (WHY: revolution indicators) towards the strategy for this revolution (HOW: 'the role of incumbent companies' indicators). On paper, these companies have the suited attitude to potentially be able to drive The Sustainability Revolution.

Interpretation of the findings: context variables

The next question the research aims to answer is whether the context variables can explain differences in strategies. In this part, first possible explanations are tried to be found taking a more exploratory approach. As of the size of the sample being already quite small for the overall results, this issue is only increased when separating the results based on context variables. However, there are some interesting differences found. The context variables that are discussed are: sector, geographic region of origin and founding year. The visual differences of the classifications of the indicators can be seen in tables 25 until 27.

Sector

Overall it can be seen from figure 25 that the IT companies have a more agent of change attitude, whereas the energy companies are more hesitant towards The Sustainability Revolution. This difference in attitude can be explained by the fact that the IT companies with their core business have large potential to influence society at large as the IT is promising to improve and diffuse innovations in their own industry as well as beyond this as well as creating social inclusion. On the other hand, the energy companies have less focus on creating a holistic sustainable society, but rather focus on creating a low(/zero)-carbon future, which can be achieved when they change their core business practices to be more sustainable. This can lead to the results being biased, where if the focus would have been on contributing to creating the sustainable society in any form, the energy companies would likely have had a higher score in intention to contribute to (a part of) The Sustainability Revolution.

The companies operating in the IT sector have high scores on the revolution indicators as well as on the indicators from 'the role of incumbent companies', making them promising companies to create change. This promise is supported by the statements that are made about IT as the technology that is expected to have a large contribution in the development of the SDGs (Sachs & Modi, 2015). Statements from IT companies aiming to become more sustainable almost immediately entail societal change. The IT solutions that are created can increase the diffusion of many technologies, applications and platforms in our economy (Sachs & Modi, 2015). Furthermore, it has the possibility to create a more inclusive society where the inequalities between the developed and the underdeveloped world are decreased (Henry, 2012). Looking at the indicators that explain how the companies can best contribute to launch The Sustainability Revolution, the IT companies are most likely to be the change agents. However, taking the narratives into account these are mainly intentions and statements of contribution, but no clear results are presented yet.

Examining the energy sector, it is become obvious that no energy companies were classified as agent of change. However, Siemens, as company operating in the IT and energy sector, and Shell are listed on the Dow Jones Sustainability World Index 2016 and can according to this list call themselves sustainability frontrunners. Siemens and Shell both are companies that are leaning towards the agent of change attitude. This implies that from the energy sector, Shell and Siemens can be part of the leading sustainability companies. As the DJSI lists the frontrunners per industry (Hawn et al., 2014), the listed companies are not the most sustainable companies in the world but are scored relatively sustainable in comparison to their peers. The energy companies might have a more hesitant attitude

towards The Sustainability Revolution, in contributing to the energy transition, which is an important change that needs to occur, they are crucial to succeed in the transition.

Regarding the sector performance, an additional element has to be discussed concerning the link between the IT and energy sector. According to Rifkin (2011) to drive the next Industrial Revolution, the rise of personal computers and the Internet as the new communication tool and renewable energy as the new energy system need to be combined. The combination between these two technologies is promising to disrupt the entire market and create a sustainable society. Furthermore, without the transition of the energy sector to renewable energy, the development of the IT sector can have a negative effect on sustainable development and create more issues as the digitalisation movement is demanding more energy use. From the sample, Siemens is a hybrid company active in both the IT and energy sector, which both are promising as well as needed for succeeding in creating a sustainable society. From this sample, a full agent of change approach of Siemens would thus be promising to increase efforts on IT an energy within one company. However, Siemens did not have an agent of change view on the revolution indicators, but takes a more hesitant approach. Although they do state to take the future generations into account, which is an important theme in The Sustainability Revolution (Edwards, 2005; Senge et al., 2008), statements on driving change are not given. Rifkin (2011) praises collaboration to be important to start the next industrial revolution. Possibly, Siemens' role in the IT and energy sector is too much that of a business on its own which is more which is more a characteristic of companies that rose in the times of previous industrial development. Siemens scores hesitant for the indicators shaping the institutional context and collaboration for sustainable development, which also stresses this less outward looking mentality of Siemens. According to the model of van Tulder et al. (2013) shown in figure 11, to be a proactive company the external societal responsiveness needs to be added to the internal attitude.

Geographic region of origin

As determined by previous research (e.g. Fortanier et al., 2011) the region and country of origin have influence on the degree of commitment to CSR. From the data analysis, it appeared that there are indeed differences among the geographic regions of origin and the attitude towards The Sustainability Revolution. Overall the North-American companies operate primarily with an agent of stagnation attitude. Asian companies operate more hesitantly, but still have quite some stagnating attitudes. The European companies, although primarily hesitant, have the best agent of change mentality in comparison to the other regions.

North-American companies in this research appeared to be mostly agents of stagnation. As three of these companies did not have an extensive sustainability report it is possible that this result is biased due to the small sample. However, this result is in fact in line with previous research that showed that US companies particularly have inactive or reactive approaches towards CSR (van Tulder & Fortanier, 2009). The CSR regime in which they operate in has a large influence on this. US regimes are shaped around anti-trust regulations (van Tulder & van Der Zwart, 2005) which can be the reason that North-American companies generally report the required minimum, but do not elaborate on this so they cannot be held accountable for voluntary reported statements.

In comparison with others, European companies are more reaching towards the agent of change mentality but they are primarily still hesitant towards the components of The Sustainability Revolution. This is supported by the research that shows the European CSR approach is in particular active, with outliers to more proactive attitudes (van Tulder & Fortanier, 2009). Furthermore, European CSR

regimes are more centred around social control (van Tulder & van Der Zwart, 2005) meaning that these companies want to comply with the group norms. European companies do not want to diverge from the average, but also do not want to lag behind, which is shown by the fact that only 4% of the indicators is classified as agent of stagnation.

The Asian companies in this research take hesitant approaches towards The Sustainability Revolution but they also have quite some indicators classified as agent of stagnation (19%) and agent of change (33%). This is not supported by the general view on Asian companies which classifies Asian CSR regimes as often inactive (van Tulder & Fortanier, 2009). Research states that once Asian companies adopt CSR approaches, they pursue these actively (van Tulder & van Der Zwart, 2005). As the Asian companies from this sample at least all had a CSR report, this could explain the relatively more hesitant approach, as this approach is the transition phase between the reactive and active approach.

<u>Founding year</u>
The founding year was the context variable that showed least differences between the separated sample groups (see table 27). The indicators per typology are rather equally distributed. One has to keep in mind that with only five out of eighteen companies established before 1980, it is more difficult to make definite statements about the results. As the sample only consists of Global500 companies, which are the largest companies of the world with extremely large annual revenues, it is harder for even younger companies to get a high rank on this list. To have at least a few companies within the group op younger companies, 1980 has been chosen as a separation year. However, it is assumed that a smaller time range for the younger companies would likely be better. In the last decade, the awareness of CSR importance has only increased and more companies have become MNEs that started as companies with the focus on contributing to a sustainable society.

Noticeable is that four out of five younger companies state they innovate radically and thus have an agent of change mentality concerning sustainable oriented innovation. The younger the company, the less path dependencies are in place. Path dependencies lead to lock-in of routines and are often a reason limiting incumbent companies to innovate radically (Geels, 2004; Smink et al., 2015). The organisational structure is not developed for radical change and it is harder to change existing practises (Sandberg & Aarikka-Stenroos, 2014). These younger companies are likely to have a higher adaptability of the business operation and thus have a better structure to implement radical innovations.

Six of the older companies state to contribute to shaping the sustainable future. Three of them are the overall agents of change (HP, Samsung and SAP). Furthermore, it is striking that all of the Dow Jones Sustainability World Index listed companies are companies founded before 1980. The older companies have witnessed and survived earlier transitions or were set up during a revolution. Shown in figure 5 are the five technological revolutions that have occurred so far, established by Perez, (2007) based on the input of Kondratieff (1935). As the oldest company (Siemens) is a successor of a company founded in 1847, this implies that this company has made transition though already three technological revolutions, being: The Age of Steel, electricity and heavy Engineering, the Age of Oil, the Automobile and Mass Production and the Age Information and Telecommunications. Although incumbent companies are not expected to easily adapt their business approach, they do have much knowledge and practice from experiencing earlier transitions from which they might have learned to adapt to changing surroundings. However, there are also three older companies that are agents of stagnation or partly agent of stagnation and five companies assigned to the hesitant attitude. These companies represent the group that has a more restricted mind-set, together with the consequences this

restricted mind-set entails. Taking into account that the current paradigm switch is currently in the 'installation', this is not surprising. The previous paradigm is still the dominant paradigm and thus a large amount of companies is operating based on the principles of that paradigm.

5.2   Part II

The final question of this research targets the SDGs. With the question *what can be expected of how the incumbent companies will embrace the SDGs?* It was aimed to explore in how far patterns can be found in the adoption of the SDGs.

Interpretation of the SDG general findings

No agent of stagnation companies (Amazon, Apple and Phillips66) report on the SDGs. This is not surprising as these companies did not adopt extensive CSR practises. Reporting on the SDGs asks for more transparency, which these companies are reluctant to offer.

All agent of change companies (SAP, HP and Samsung) report on more than thirteen of the SDGs. Taking the theory of change into account, this relation was expected. The SDGs are part of the global development agenda and aim for systematic change. These goals give guidelines for companies on what to focus on in their CSR strategies (Baumgartner, 2014). Companies with an agent of change mentality towards The Sustainability Revolution show they are aware that drastic changes need to occur on many different societal issues and show efforts that can support their ability to drive these changes. These efforts can be translated into the SDGs which leads to reporting on the contribution to the goals.

Goal 2 (zero hunger) is least addressed by the companies analysed in this research. After that, also goals 10 (reduce inequalities), 11 (sustainable cities & communities) and 14 (life below water) are hardly addressed. Looking at figure 3, the map showing the interactions between the goals, it can be seen that goals 2 and 10 are quite central in the map, but goal 11 and 14 are more on the outside, with less connections (Le Blanc, 2015). The position of the latter two (goal 11 and 14) can explain the lower popularity of the goals. However, goal 2 and 10 are rather central goals, making them important to contribute to in order to achieve the SDGs. This central spot with many interactions also means that contribution on another goal can have much influence on increasing (or decreasing) development of goals 2 and 10. Companies are thus often indirectly making impact on these goals.

An interesting result is to see that Glencore, as a company in the energy sector, is reporting to contribute to some of the SDGs, but not to goal 7 clean and affordable energy'. An explanation for this can be that Glencore is more operating as a commodity producer and trader (see appendix B), with some efforts concerning oil products. This operations do assign Glencore to the energy sector, but gives them more distance to providing energy.

Interpretation of the SDG best practises

Overall the contributions to the SDGs of the most promising change agent companies per sector look impressive as they claim to take efforts on many goals. However, analysing their actual contribution per goal brought to light that many efforts are not integrated with the core business, but are rather small ad-on business operations. This is an unfortunate finding and questions the attitude of the companies of being a true agent of change. It again questions the intentions of the companies to create a sustainable society as these intentions appear not to be not translated to major results. Although the SDGs are a non-binding voluntary agreement (Pogge & Sengupta, 2015), they do ask for a common responsibility to do one's part in delivering a global vision of a sustainable society (Osborn et al., 2015).

Companies have an important role of tackling some of the most complex global challenges (Scheyvens et al., 2016) and with the current efforts displayed they are more focussing on damage control rather than solving complex issues. The goals form a system where all goals are (indirectly) affecting each other's development. The relation between the goals is not specifically addressed by the companies, which indicates that they are not having a systems thinking view (Werhane, 2008) on how they contribute to the SDGs.

5.3   Limitations

The biggest limitations of this research are in the method part. With content analysis, the research is dependent on the documents that are made available by the companies. The reliability of these sources to collect data collection can be criticised. The annual and sustainability reports are written and publicised by the companies themselves, which gives room for exaggeration or leaving out certain practises that might be harmful. So, it can never be certain that the information in the reports is exactly representing the sustainability performance of the companies. One of the indicators from the research was the reporting style the company uses. GRI is a respected standard for reporting and thus this has been used a check for reporting transparency. From this it appeared that only one company reports through the comprehensive method, twelve used the core option and five do not use the GRI standard at all. Because so many companies do not use the comprehensive reporting standard, it is likely that many companies still have information to hide. However, using the core GRI option is already a sign that the company is to a certain extent transparent about their performance. As the indicators from this research are formulated in a way that adding positive statements determines the classification, instead of punishing negative statements, being more transparent and clear is rewarded. This research takes the intentions of the companies into account to research their possibility to become the driver of The Sustainability Revolution. As a result, the possibly exaggerated based outcomes that are found can be used as results as they do present the intentions of a company in the transition towards a sustainable society.

Another limitation follows from the interpretation of the different indicators from the taxonomy. The data is collected by only one researcher and this might lead to 'bias selectivity' in the data collection. By creating the taxonomy and explain the reasoning behind the made choices in the result section, it is tried to give supporting arguments for the decisions so the research can be replicated. Furthermore, there is the possibility that search words were missing from the operationalisation table which leads to missing information and a potential lower classification of a company. In further, less exploratory, research about The Sustainability Revolution, more in depth analysis should be done on the indicators that relate to the revolution and the role of the incumbent companies. When this is done a more elaborated classification can be made.

Furthermore, the sample of the companies could be larger. With a bigger sample, an even better understanding and separation between typologies could be made. With a small sample as used in this research, generalisability of the results is not possible. The found patterns have to be checked in further research to make more bold statements on them. As this research is exploratory of nature, this was the goal and thus is not a big limitation.

6   CONCLUSION

6.1   Conclusion

This research was conducted to explore the role of incumbent companies within The Sustainability Revolution and to identify whether or not they could be the drivers of this revolution. Besides that, the study aimed to discover patterns for the implementation of the Sustainable Development Goals by these incumbent companies. Both the Sustainability Revolution and the Sustainable Development Goals are rather new field of research, which explains the exploratory nature of this research. The research question that was intended to answer was:

Can incumbent companies be the drivers of The Sustainability Revolution? And what patterns can be seen in their support for the Sustainable Development Goals?

To reveal an answer to this main research question, seven sub-question have guided the research process. The first question aimed to identify what the desired sustainable future looks like. The UN Sustainable Development Goals are a blueprint for bringing prosperity to all, while protecting the environment at the same time and when achieved, they illustrate the transformed sustainable future that is desired in 2030. As the Sustainability Revolution needs to be launched rapidly, the actions taken to achieve the SDGs in time are well in line with that of the Sustainability Revolution.

To discover ways how The Sustainability Revolution can be driven, the factors that cause systematic radical transitions as well as existing theories of radical change towards a sustainable society are analysed. Innovation is the key to drive a revolution and have an important role in the long wave theories of Kondratieff. This theory suggests that about every 50 years a period of economic growth is altered for a period of slow growth or declination. The start of a new wave is caused by a new (cluster of) technological innovation. As suggested in table 4, the world has just been through a downswing, giving room for The Sustainability Revolution to lead the next upswing. Overall it is agreed that The Sustainability Revolution must create a world that is a suitable one to live in for generations to come. Various environmental, social and economic issues (e.g. the ones highlighted by the SDGs) have to be solved. Solving these complex issues cannot be done in isolation and thus collaboration between various stakeholders is crucial in creating an environment that is beneficial for all species.

To discover if incumbent companies can drive The Sustainability Revolution, first their roles in previous (radical) transitions have been analysed. Incumbent companies are the main stakeholders from the previous paradigm which brings them Strengths and Weaknesses and also Opportunities and Threats (SWOT) regarding radical changes. From the conducted SWOT-analysis, a summary is presented in table 7. The opportunities display the roles that incumbent companies should take to increase their chances of driving The Sustainability Revolution, being: shaping the institutional context, co-create, create radical sustainable oriented innovations and take a proactive stance. To thrive the opportunities, the weaknesses of the companies need to be overcome by wise use of their strengths. Due to having a restricted mind-set and path dependencies, large companies will probably never be extremely high adaptability to change. However, with taking the lead in shaping the business environment of the future incumbent companies have the option to take matters in their own hands instead of having to adapt by external pressure. From the analysis, patterns have been identified for incumbent companies in a revolution. They can either slow down the development, adapt later on to the demand of the new paradigm, be destroyed due to slow adaptability, or shape the sustainable society.

From the findings in the literature review, a framework has been developed to determine the attitudes of incumbent companies towards The Sustainability Revolution. Three attitudes are distinguished: agent of stagnation, hesitant and agent of change. The agent of stagnation companies can be seen as the companies that try to slow down or stop the sustainable development movement. They report the bare minimum about their CSR efforts and are not likely to drive The Sustainability Revolution. The biggest group of incumbent companies is expected to have a hesitant approach. These companies are currently balancing the agent of stagnation and the agents of change, which indicates the current battle between the previous and the new paradigms. Hesitant companies have a wide variety of attitudes towards The Sustainability Revolution, but are mainly expected to be building a foundation for adaption to the new paradigm when this is required. However, these companies should be warned about increasing efforts too slow, as this might lead to being destroyed by the competition. Hesitant companies could be the driver of The Sustainability Revolution, but are generally not taking a systematic approach towards creating a sustainable society. These companies rather focus on contributing to create change on a part of this transition, e.g. creating a low-carbon future. Companies classified as agent of change are aware of the changes occurring to the system and acknowledge the urge for these changes. They have the intention to take responsibility for creating the needed changes and they report on CSR efforts that correspond with this. These companies are the most likely to drive The Sustainability Revolution. However, the difference between intention and actual performance can be an obstacle to actually be an agent of change. On paper a company can be a change agent; however, to truly become an agent of change words must be translated into actions that give prove for the company to be seen as driving radical change.

Among the attitudes of incumbent companies there are differences that could be explained by certain context variables. IT and energy companies have been analysed in this research as these are essential sectors to increase efforts to create a sustainable society. IT companies have a more agent of change attitude, whereas the energy companies are more hesitant towards The Sustainability Revolution. However, companies in the energy sector do have clear statements concerning the energy transition, which is a considerately important transition within The Sustainability Revolution. In order to launch The Sustainability Revolution both sectors are crucial to contribute in order to succeed. Furthermore, the geographic region of origin has an influence on the efforts of the companies. The CSR regimes from the regions of origin cause a more agent of stagnation attitude for the North-American companies as this regime is more based on anti-trust. The social control CSR regime of European companies creates an environment for these companies in which they at least not want to be lagging behind and where possible see options to take a step further and become proactive. The founding year variable did not find further explanations for the previous results.

Last is the sub-question regarding incumbent companies embracing the SDGs. Overall, the agents of stagnation do not embrace the goals. Among the companies classified as hesitant companies the SDGs are partly embraced. However, these companies mainly report less extensive or explicit on the goals. The agent of change companies all embrace the SDGs and report to contribute to almost all of the goals. Zooming in on the claimed contribution on the separate SDGs teaches us that many stated contributions are not integrated in the core business approaches. The approaches the companies take show a more incremental attitude instead of the radical approaches that are needed to achieve the Sustainable Development Goals by 2030. This pattern contradicts the expected support for the SDGs by agent of change companies. However, it does support the perceived difference between intention and actual contribution to creating a sustainable society.

Taking into consideration all of the findings regarding the sub-questions leads to an attempt to answer of the main research question: Incumbent companies have the ability to become the drivers of The Sustainability Revolution. However, there are quite some challenges and issues to overcome before they can truly be agents of change. To drive The Sustainability Revolution a systematic approach is needed. Change will not happen by just contributing to sustainable development as an ad-on business operation, or worse when just reporting empty intentions. The operations that are needed to drive a radical transition (e.g. radical SOI, shape institutional context and collaboration) are present in most of the incumbent companies that were classified with the agent of change typology as well as with some of the hesitant companies. However, as all of the companies are also continuing with their business-as-usual practises, there are no results of disruptive change to the system seen yet. This research has identified companies that have the intention to contribute to shaping the future sustainable society. Yet, these companies do not have full disclosure and transparency in their business operations which leads to questions about their sincerity. Being aware of the changes that are needed to occur in the current system and report on the aim to contribute is the first step, but to drive the actual revolution these likely agent of change companies need to show actions that support their intentions. This lack of contribution is also supported by the examination of the companies' contribution on the Sustainable Development Goals. As mentioned in the answer to the last sub-question, the SDGs are not yet integrated in the core business operations of the incumbent companies of this research. The companies classified as change agents had a promising pattern as they all reported contribution on the majority of the goals. However, exploring the stated contributions in more depth, revealed that most of them do not entail extensive changes and impact on achieving the SDG. For an incumbent company to be a driver of The Sustainability Revolution it is essential to make drastic changes to the business approach, integrate efforts to solve societal issues (e.g. the ones addressed by the SDGs) into their core operations and be fully dedicated to create a sustainable society. Only then, incumbent companies can be the true drivers of The Sustainability Revolution.

6.2 Recommendations for further research

To address the limitation of this study and develop a more in depth understanding of The Sustainability Revolution, directions for further research are recommended.

The concept of The Sustainability Revolution is not widely accepted yet. Due to that, companies, if they even report on a revolution, do not get into detail about how they will execute their intentions contribute to drive the transition. This research, as a first exploration of the topics, did take the intentions to shape a sustainable future into account. However, for further research it is recommended to diversify the typologies based on intentions and actual contribution the companies make to shape the sustainable society. Besides the positive intentions the companies report on, also the 'business-as-usual' practises can be taken into account. To do this, it might be useful to use a method that goes beyond analysing reports. An in-depth analysis of a company where the researcher has access to information that is not public (yet) will likely provide more understanding of the companies' strategies.

Further, as shortly touched upon in the discussion, the founding year did not give varying results between the for in this research established older and younger companies. As this research analysed the largest Global 500 companies in the IT and energy sector, the sample is influenced by this. The youngest company was founded in 2002, which is still fifteen years ago. For further research, it is recommended to expand the scope of the case selection and analyse companies that are selected as leading in sustainability, e.g. by being listed on the DJSI. These companies have a higher likelihood to be agents of change which might lead to better best practises.

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8 APPENDICES

8.1 Appendix A

The first round of inventory is done by exploring the information found after using search words based on the indicators from table 9. The used searched words (or parts of words) were:

- Sustainable Development Goals
- SDG
- United nations
- UN
- Leader
- Future
- Sustainable future
- System
- Fail
- Proactive
- Leader of change
- Disruptive innovation
- Radical innovation
- Technical innovation
- Transformation
- Transition
- Society as a whole

- Revolution
- Collaborate
- Collaborate with government/institutional context
- Government
- Institutions
- Institutional
- Legislation
- Lobby
- (Radical) sustainability oriented innovation
- Shared value (creation)
- Responsibility
- Transparency
- (Sustainability) vision

Table 30 presents the results of the first rough classification of the selected companies.

Type	IT	Energy
Agent of stagnation	• Hon Hai Precision Industry • Apple • Amazon.com	• Chevron • Philips66
Hesitant	• HP • Siemens • Sony	• China National Petroleum Corporation • Sinopec • BP • Glencore
Agent of change	• Samsung electronics • SAP	• State Grid Corporation of China • Royal Dutch Shell

Table 30 Inventory overview classification

8.2 Appendix B

This appendix presents a short description of the selected cases.

Accenture

Accenture is a leading service company. After a series of partnerships, in 2001 the company made the transition to the corporate structure with the name Accenture. In 2009 Accenture was incorporated in Ireland, as a public limited company. The services and solutions that Accenture brings to its clients are on strategy, consulting, digital, technology including application services, and operations. Digital-, cloud- and security-related services get increasingly more importance in the business operations. Due to this close connection to the IT sector, Accenture as a IT service company, deserves it spot in the IT sector sample. Accenture operates under one brand and business model. By combining experiences from several industries Accenture creates differentiated value for its customers (Accenture, 2016b).

Amazon.com

Amazon.com (hereafter referred to as: Amazon) was incorporated in the state of Washington in 1994. In 1996, there has been a reincorporation to the state of Delaware. The head office is located in Seattle, Washington. Amazon is listed on the NASDAQ stock market. Amazon is a technology company focused on internet services. The main business is serving customer though the retail website. Hundreds of millions of products from a wide variety of categories are sold on the online platform. Furthermore, Amazon manufactures electronic devices and sells them, e.g. Kindle e-readers, tablets and televisions. This supports the selection for Amazon in the IT sector and Amazon will only increase its efforts on these operations. The core value of Amazon is to provide the customer with the lowest price (Amazon, 2017).

Apple

Apple is in 1977 established information technology company that "designs, manufactures and markets mobile communication and media devices, personal computers and portable digital music players, and sells a variety of related software, services, accessories, networking solutions and third-party digital content and applications (Apple, 2017, p. 1)". Main products include for example the iPhone®, iPad® and Mac®. Apple has a wide variety of software applications, such as iOS.

BP

BP is a global energy company established in 1908. The company's head quarter is located in London, UK. With the discovery of oil in Persia, the journey of BP started. BP has gone through multiple transitions; from coal to gas, from onshore to deep-water, and currently the focus is on the transition to the lower carbon future (BP, 2017b). BP delivers energy products and services to people. These customers are provided with "fuel for transport, energy for heat and light, lubricants to keep engines moving and the petrochemicals products [that are] used to make everyday items as diverse as paints, clothes and packaging (BP, 2017a, p. 10)". BP operates in the upstream and downstream business as well as in trading which mitigates the impact the increasing lower oil and gas prices have on the performance of the company (BP, 2017a).

Chevron

Chevron is an energy company. The earliest predecessor of Chevron, Pacific Coast Oil Co., was incorporated in 1879 in San Francisco. Chevron "explore for, produce and transport crude oil and natural gas; refine, market and distribute transportation fuels and lubricants; manufacture and sell petrochemicals and additives; and develop and deploy technologies that enhance business value in every aspect of the company's operations (Chevron, 2017b, p. 5)."

China National Petroleum Corporation

China National Petroleum Corporation (hereafter referred to as: CNPC) is state-owned integrated international energy company that is based in China. It is incorporated in 1988 in charge of oil and gas upstream operations. It took over the business from the Ministry of Petroleum Industry of the People's Republic of China, which was founded in July 1955. However, as this is not an official company, 1988 is used as the founding year. CNPC is an oil and gas supplier, a major oilfield service provider and a contractor in engineering contractions. CNPC businesses cover petroleum exploration and production, natural gas and pipelines, refining and marketing, oilfield services, engineering construction, petroleum equipment manufacturing and new energy development. Furthermore, CNPC operates in capital management, finance and insurance services (CNPC, 2017a).

ExxonMobil

ExxonMobil is an internationally operating oil and gas company. The first start of the company stems from 1859 when the first oil was drilled in Pennsylvania and in 1870 the first company that is the predecessor of ExxonMobil was created. After many mergers and acquisitions, in 1999 Exxon and Mobil joint forces and became ExxonMobil. The best-known brands of ExxonMobil are: Exxon, Esso and Mobil, known from the gas stations. ExxonMobil is industry-leader of inventory of resources and are large refiners, marketers of petroleum products and chemical manufacturers (ExxonMobil, 2017b).

Glencore

Glencore is a commodity producer and trader, operating worldwide. The company was founded in 1974 as March Rich + Co AG and at that time focused on marketing of (non)-ferrous metals and materials and crude oil. Not long after that the company expanded into oil products. Glencore is a divers company that operates as a natural resource company, producing and marketing many types of commodities. Glencore, as a producer and marketer of commodities, has much influence over the entire supply chain (Glencore, 2017a).

Hon Hai Precision Corporation

Hon Hai Precision Corporation (hereafter referred to as: Hon Hai) is a technology company founded in 1974 by Terry Gou, who at that time expected that electronics will be part of everyday life. The head office is currently in New Taipei City. Hon Hai is trading under the name of Foxconn Technology Group. This group is a valuable partner for in design, manufacturing and services to leading companies in Computer, Communication and Consumer electronic (Foxconn, 2013). A final note about Hon Hai for this research is that sustainability report that is found online is publicised under the name of Foxconn.

HP

HP is an information technology company that provides products, technologies, software, solutions and services. William R. Hewlett and David Packard founded the company in 1939 and officially incorporated the company in 1947 in the state of California. In 1998, this was changed to incorporation in Delaware. HP serves individual customers as well as SMEs and large companies (HP, 2017). HP is a global provider of "personal computing and other access devices, imaging and printing products, and related technologies, solutions and services (HP, 2017, p. 4)". Their customers are individuals, SMEs and large enterprises, including government, education and health sectors.

Phillips66

Phillips66 is an energy manufacturing and logistics company that is headquartered in Houston. Phillips66 debuted as an independent downstream energy company in 2012. They operate in refining, marketing, midstream and chemical businesses across the globe. However, the history of Phillips66

goes back to 1875 when the Continental Oil and Transportation Co. was one of the first petroleum marketers in the West of USA. The business operations Phillips66 is active in are: midstream, Chemicals, Refining, and Marketing and Specialties businesses, the company processes, transports, stores and markets fuels and products globally. Phillips66 trades its stock on the New York Stock Exchange. With 14,800 employees, Phillips66 strives to "maintain strong operating excellence, deliver profitable growth, enhance returns on capital, grow shareholder distributions and develop its employees to sustain a high-performing organization." (Phillips66, n.d.).

Royal Dutch Shell

Royal Dutch Shell (hereafter referred to as: Shell) is company active in the oil and gas industry. The company was officially incorporated in 1907, but historically dates back to the beginning of the 19th century. The headquarters are in The Hague, The Netherlands. The parents company of Shell is incorporated in England and Wales. The strategy of Shell aims to keep the position as a leader in the industry and at the same time help to meet the global energy demand (Royal Dutch Shell, n.d.).

Samsung Electronics

Samsung Electronics (hereafter referred to as: Samsung) is an information technology company that has been established in 1969 in Suwon, Korea. Currently it has over 200 daughter companies worldwide. Historically Samsung is a leading company in home-appliances, such as televisions, fridges and washing machines. Currently Samsung is increasingly operating in the information business, being information, telecommunication, audio and video. This includes mobile communication appliances, like smartphones and tablets. Also, electronic elements are part of Samsung's portfolio. Samsung aims to enable its customers to a 'smarter' life with their products and services in the IT industry (Samsung, 2017).

SAP

SAP is an information technology company leading in application software. The company is founded in 1972 and is headquartered in Walldorf, Germany. SAP is growing as a major database company. Over 75% of all business transactions worldwide get in contact with a SAP software system (SAP, 2017c). SAP derives its revenue from charging their customers for their software services, e.g. licensing of on premise software products and solutions and the use of cloud solutions (SAP, 2017c).

Siemens

Siemens is a technology company that receives its foundations from the in 1847 designed pointer telegraph by Werner von Siemens (Siemens, 2017a). The current headquarters of Siemens are in Munich, Germany. The core activities of Siemens are in the fields of electrification, automation and digitisation. Siemens has many divisions they do work in; the Power and Gas Division, the Wind Power and Renewables Division, the Power Generation Services Division, the Energy Management Division, the Building Technologies Division, the Mobility Division, the Process Industries and Drives Division, the Healthineers ("Healthcare") Division and the Financial Services (SFS) Division (Siemens, 2016a). Clear from this is that Siemens, next to being an (information) technology company, also operates widely in the energy field. For that reason, Siemens in this sample is looked at from both sectors. However, the IT sector is the main sector as this is the primary focus of the company.

Sinopec Group

Sinopec Group (Hereafter referred to as: Sinopec) is a Chinese energy and chemical company. In 1999 Sinopec Group transferred its core business together with China Petroleum & Chemical Corporation. The headquarters is in Beijing, the People's Republic of China. The core business is in the "exploration

and production, pipeline transportation and sale of petroleum and natural gas; the production, sale, storage and transportation of refinery products, petrochemical products, coal chemical products, synthetic fibre, and other chemical products; the import and export, including an import and export agency business, of petroleum, natural gas, petroleum products, petrochemical and chemical products, and other commodities and technologies; and research, development and application of technologies and information (Sinopec, 2017a, p. 2).

Sony

Sony is a Japanese multinational conglomerate company. The company has been established in May 1946 as Tokyo Tsushin Kogyo Kabushiki Kaisha. In 1958, this was changed to Sony Kabushiki Kaisha ("Sony Corporation" in English). Sony is listed on the Tokyo Stock Exchange in 1958 and on the New York Stock Exchange in 1970. The wide range of business operations are for a large part of the information technology sector as Sony "engages in the development, design, production, manufacture, offer and sale of various kinds of electronic equipment, instruments and devices for consumer, professional and industrial markets such as mobile phones, game hardware and software, network services, still and video cameras, televisions, audio and video recorders and players, and semiconductors (Sony, 2017, p. 25)". Furthermore, Sony operates in television and digital networks as well as in the field of music.

State Grid Corporation of China

State Grid Corporation of China (Hereafter referred to as: SGCC) operates in the energy sector since 2002. The core business of SGCC is to constructs and operate power grids. The company is a state-owned company that delivers national energy security with the mission to provide safer and cleaner power supply in an economic and sustainable matter. Over 1.1 billion people are served by SGCC, covering 88% of national territory (SGCC, n.d.).

8.3 Appendix C

For each SDG, the contribution of the sectors' companies with a change agent mentality are presented.

Results: The Sustainability Goals

SDG1: no poverty

Company	Contribution
HP	"Enable people at all levels to build skills to improve their employability (HP, 2016, p. 98)". "Enable better learning outcomes for 100 million people by 2025, since the beginning of 2015 (HP, 2016, p. 98)". "In low-income, displaced, and often remote communities, many people lack the technology and training to access the benefits of the global economy. By reinventing job-skills training, and providing educational opportunities, HP helps students, the unemployed, small businesses, and would-be entrepreneurs gain practical business and IT skills and connect to new economic opportunities (HP, 2016, p. 99)". "About 2.5 billion people in developing countries, many of whom dream of opening a small business, lack access to mainstream banking services. Kiva is a nonprofit microlender that connects low-income entrepreneurs to capital to buy business essentials such as tools, supplies, and livestock. Through Matter to a Million, a global engagement program, the HP Foundation provides each HP employee a $25 credit annually to loan to Kiva borrowers. In 2016, 46% of HP employees took part, generating more than 45,300 loans totalling $1.1 million (HP, 2016, p. 100)".
Samsung	"Improve access through technology, information and communication services. • Develop products that guarantee access to information to all regardless of abilities or economic status • Operate the Tech Institute digital skills program to offer employment training to underprivileged/marginalized populations so that they become economically independent (Samsung, 2017, p. 19)"
SAP	"As part of our vision and purpose, SAP is proud to help companies like UBank, National Bank of South Africa, and Juhudi Kilimo, an agricultural microfinancing initiative, and give people the means to improve their lives. We believe when the digital revolution is shaped the right way, it can build a digital economy, ensure the future of work, and improve life for all – like the Industrial Revolution did 200 years ago. • With SAP® Mobile Platform, Ardash Credit is able to provide banking services to remote and unbanked areas. Based on real-time processing of banking transactions, lower operational costs, and increased advisor productivity, Ardash can now empower new customers who otherwise would not have had access to basic financial services. • SAP fosters social entrepreneurship and enables young entrepreneurs to use innovative business models and technology to help farmers in Africa to escape from poverty. (SAP, 2017a)"
Siemens	State to contribute, however it is in combination with goal 2, 3, 9, 11. None of the contributions they mention are specifically targeting poverty so no contribution is mentioned here.
Shell	-
SGCC	"Help Chinese poverty-stricken population in rural areas out of poverty by 2020 under current standards by targeted poverty alleviation efforts through point-to-point assistance or fixed point assistance. Eliminate all poor counties and solve the overall poverty of the region. • Poverty-relief PV station at Maduo County, Qinghai Province (P51) • Innovate sustainable targeted poverty-relief models in Maibian Yi Autonomous County, Sichuan Province (SGCC, 2017, p. 101)"

Table 31 Contribution to SDG1

SDG2: Zero hunger

Company	Contribution
HP	-
Samsung	-
SAP	"There is no easy way to provide food security, but with careful management across the entire supply chain and the help of digital technologies, we can ensure enough food for everyone by 2050. As part of our vision and purpose, SAP is proud to be helping food manufacturers and farmers so that everyone can eat and live better. • Easing hunger is what Brazilian startup Aegro is aiming to achieve with smart farming. Partnering with SAP, Aegro built a platform and user-friendly app to give Brazilian farmers the power to make better decisions and address erosion and productivity loss – earning them second place on SAP's 2016 SAP HANA® Innovation Awards. • Edesia is harnessing the power of peanuts to feed children and end malnourishment for 220 million worldwide. SAP funded a project to deploy the SAP® Business One application to incorporate all of Edesia's business operations and data under one main umbrella, making the whole production process more efficient and effective and enabling Edesia to reach even more people than ever before. (SAP, 2017a)"
Siemens	State to contribute, however it is in combination with goal 1, 3, 9, 11. None of the contributions they mention are specifically targeting poverty so no contribution is mentioned here.
Shell	-
SGCC	"Ensure electricity for spring and autumn and guarantee power for small-scale grain producers' agricultural production. • Upgrade the power grids in small townships and carry out "electricity for every well" (P48) • Set up a service team to ensure power use for shermen (SGCC, 2017, p. 101)"

Table 32 Contribution to SDG2

SDG3: Good health & Well-being

Company	Contribution
HP	"Taking a holistic approach to employee wellness. The physical, emotional, and financial well-being of our employees is vital to HP's success. (…) • Physical health: Working in teams, 15,000 employees around the world walked nearly 5 billion steps in our annual Global Wellness Challenge. (…) • Stress management and emotional resilience: To help employees manage stress we launched our Reset. Rethink. Resilient. online electronic campaign and resources. • Financial wellness: In summer 2016, we hosted a virtual Q&A with an expert panel of financial advisors and investors attended by 1,470 employees.(HP, 2016, pp. 96–97)". "HP's offices, production facilities, warehouses, and labs are designed to keep employees safe, healthy, and productive. We focus on the challenges most relevant to our business operations—slips, trips, and falls, and ergonomic issues (HP, 2016, p. 97)".
Samsung	-
SAP	"SAP cares deeply about delivering insights and simplifying medicine to help diagnose, treat, cure – and ultimately prevent – diseases. It's part of our vision and purpose, which is to help the world run better and improve people's lives. As an example, our technology is effectively used to help address cancer diagnosis and treatment. We also truly believe that our long-term success as a company is founded on a healthy work culture. For instance, we continually offer our employees health programs that can help our workforce balance and protect personal health and performance. • The American Red Cross provides disaster relief and delivery of life-saving blood donations but also first-aid training to prevent and relieve suffering in the United States and around the world. By minimizing effort and money spend on administrative tasks, Concur® solutions free up time and resources, making them available for the American Red Cross to take care of the ones in need. • 350 million people worldwide suffer from diabetes. There is an emerging global epidemic of diabetes that can be traced back to rapid increases in overweight, including obesity and physical inactivity. But diabetes is not inevitable. Roche Diagnostics uses SAP® technology to create transparency about blood sugar and activity levels to support its personalized preventative care solution for diabetics. Doctors can follow their patients' progress in real time. If indicators and parameters change, the health expert receives an alert. They can then send messages or set new goals for the patient. (SAP, 2017a)"
Siemens	"**Providing access to healthcare**: In 2016, about 1''270 patients from emerging countries had access to Siemens imaging systems (Siemens, 2017b, p. 2)" "**Fighting the most threatening diseases**: More than 90' patients were treated worldwide using Siemens medical devices and lab tests (Siemens, 2017b, p. 2)". "**Enabling accessibility and quality of essential goods**: Siemens production technologies increase accessibility and quality of essential goods, allowing for individualization down to a lot size of 1, e.g. individualized cancer vaccines (Siemens, 2017b, p. 2)"
Shell	
SGCC	"Support rural medical infrastructure. Support regional AIDS and other epidemic diseases prevention and control. • Establish "Love Red Ribbon" Party Member service team to send power to AIDS patients for 13 years (SGCC, 2017, p. 101)"

Table 33 Contribution to SDG3

SDG4: Quality education

Company	Contribution
HP	• "Provide free, self-paced online business and technology skills courses (…) • Reinvent the classroom to engage students, empower educators, and build vibrant communities • Deliver connected learning solutions to people who are displaced, isolated, or living in underserved communities (HP, 2016, p. 98)" • "We bring quality learning and digital literacy to people of all levels and abilities, to improve their skills and employability (HP, 2016, p. 99)".
Samsung	"Increase access to education by using ICT • Operate the Smart School program to offer ICT-enabled education to vulnerable groups • Provide career development programs aligned with the life cycle needs of employees (Samsung, 2017, p. 19)"
SAP	"SAP takes ensuring inclusive and quality education seriously as part of its vision and purpose, which is to help the world run better and improve people's lives. In addition to being a co-sponsor of Africa Code Week, SAP opened up digital literacy centers in 12 cities across India in partnership with the Nasscom Foundation. This is part of the government's Digital India program, which hopes to educate and empower citizens with IT skills, such as how to use e-mail, social media, and the Internet to access government services. Over the next 15 years and beyond, SAP will continue to advance the achievement of each and every global goal as we improve people's lives with our dedication, technology, and services. To join us, you can see how digitalization is enabling the global goals by listening to our free podcasts and signing up for a free open SAP MOOC on Sustainability Through Digital Transformation. • In close cooperation with UNHCR, SAP organizes coding workshops in refugee camps in Jordan, Lebanon, Turkey, and Egypt. These "Refugee Code Weeks" aim to provide basic programming skills to 10,000 kids and youth, opening up new perspectives to potential employment opportunities in the local IT industry that is short of trained specialists. • As part of the 2016 Africa Code Week, SAP is helping kLab, an innovation and entrepreneurship lab in Kigali, accelerate education in computer sciences and entrepreneurship for Rwanda to become the next digital hotspot in Africa. The resource-deprived country is on its way to transforming its economy from one dependent on agriculture into a knowledge-based one that will secure future prosperity. • Together with other technology companies, SAP supports and collaborates in the White House's "Computer Science for All" initiative, to help America's young people develop the technology and business skills they need to succeed in the digital economy. This initiative focuses on the scientific and technical education of K–12 students across the United States. (SAP, 2017a)"
Siemens	"**Promoting employee skills development**: Siemens fosters lifelong learning and employability through quality education, with >850,000 participations at learning events in FY16; **Facilitating customer and supplier trainings**: Siemens promoted technology- related trainings to >200,000 people from customers, suppliers, and partners; **Supporting education**: 1' students from 3,000 educational institutions in >70 countries reached through GO PLM Program (Siemens, 2017b, p. 2)"
Shell	-
SGCC	"Include education in the public welfare as an important action. Avail education to teenagers in remote areas by building Hope primary schools and setting up scholarships. Support employment skill training for the disadvantaged people. • Help high school students from poverty-stricken families in three counties and one district in Hubei Province (P50) • Establish an exchange platform of teachers and educational resources between Zhejiang Province and Yushu (P56) • Conduct trainings on electrician and mason according to local conditions so as to enhance the villagers' capacity of finding a job (P58) (SGCC, 2017, p. 101)"

Table 34 Contribution to SDG4

SDG5: Gender equality

Company	Contribution
HP	"We aim to make HP the destination for women and underrepresented groups in technology. (…) - Raising gender equity in management: During the year, we increased representation of women in top marketing positions at HP to 50% (HP, 2016, p. 91)". "Women in IT: • We engage our communities to further STEM education for girls and minorities through our partnerships with Anita Borg Institute, Black Women and Girls in Computing, the National Action Council for Minorities in Engineering (NACME), the National Center for Women and Information Technology (NCWIT), ReBoot Career Accelerator for Women, and the Silicon Valley Young Women's Leadership Summit (HP, 2016, p. 93)".
Samsung	"Strengthen female leadership in the workplace and support female-led businesses • Operate the STEM training program for female students and the female electronics maintenance technician training program • Operate work programs that ensure maternity protection (Samsung, 2017, p. 19)"
SAP	"SAP is also doing its part in eliminating gender inequality in support of its vision and purpose, which is to help the world run better and improve people's lives. For instance, SAP played a key role in the above-mentioned StarShea network. We teamed up with Positive Planet (formerly PlaNet Finance) to form the network in an effort to improve living conditions and make the supply chain more transparent and efficient for the women in the federation. SAP is also committed to drive gender diversity within its own workforce. Our CEO, Bill McDermott, signed the Women's Empowerment Principles CEO Statement and the Paradigm for Parity Pledge. Our company has a multitude of programs and activities aimed at supporting female talents. We are increasing the number of women in leadership positions through initiatives such as a Web-based virtual women's professional growth series. To date, the programs in this series have reached almost 12,000 employees in 43 countries and been expanded externally for partners and customers as well. We are committed, and we hope you are too. • To target inequity in workplaces around the world, SAP is using text mining and machine learning to detect and help eliminate bias in every decision point, from hiring through succession. • SAP has hosted the "Called to Lead Summit on Leadership and the Power of Diversity," with more than 900 customers, prospects, and third-party influencers, and became the first multinational technology company to be awarded the worldwide Economic Dividends for Gender Equality (EDGE) certificate. (SAP, 2017a)"
Siemens	"**Siemens foundations spark transformation**: Siemens Stiftung supports 100 proven, simple technical solutions and social initiatives and reaches 640,000 young people through the STEM program Experimento (Siemens, 2017b, p. 2)"
Shell	-
SGCC	"Provide a corresponding welfare system for lactate female workers to support their career development. • Support the career development for female employees (P63) • "10 square meters" maternal love holds up the care for children (SGCC, 2017, p. 101)"

Table 35 Contribution to SDG5

SDG6: Clean water & sanitation

Company	Contribution
HP	"Many of our suppliers operate in regions around the world where water stress is a growing threat. We work with our supplier base to improve water management in their operations and drive responsible withdrawal and discharge (HP, 2016, p. 30)". "Although our operations are not water intensive, we do all we can to reduce our consumption, especially in water-stressed locations. In 2016, HP consumed 3,224,000 cubic meters of water, mainly for use in buildings, cooling, landscaping, and production of high-purity water for manufacturing. Water use decreased globally by 1% compared to 2015. At our four largest consuming sites in water-stressed areas, consumption decreased by 1% year over year. HP recycled and/or reused 75,000 cubic meters of water globally in 2016 (…) To reduce and recycle water used at our facilities, we employ smart building practices, sustainable landscaping, infrastructure upgrades, and grey water reuse, among other approaches (HP, 2016, p. 38)"
Samsung	"Ensure the sustainable use and management of water resources • Manage water resource risks in the workplace and monitor the quality of effluent (Samsung, 2017, p. 19)"
SAP	"SAP is proud to help companies like Anglian Water address the world's water and sanitation challenges as part of our vision and purpose to help the world run better and improve people's lives. We're also proud to say we are reducing our water footprint in facilities around the world through the adoption of waterless bathroom fixtures and the use of grey water where possible. Together, we can ensure safe water for everyone on earth. (SAP, 2017a)"
Siemens	State to contribute, however it is in combination with goal 7, 12, 13, 14, 15. None of the contributions they mention are specifically targeting poverty so no contribution is mentioned here.
Shell	"We work to protect and preserve water and manage its use in a responsible and sustainable way. We invest in new technologies to use this valuable resource more efficiently. Fresh water is an important part of our environmental standards. (See Natural gas, Oil sands, Environment). (Shell, 2017, p. 12)"
SGCC	"Protect natural water resources during project engineering. • Construct rural safe drinking water project to solve this problem in 24 villages in three countries and one district of Hubei Province (P51) (SGCC, 2017, p. 101)"

Table 36 Contribution to SDG6

SDG7: Affordable & clean energy

Company	Contribution
HP	"By shifting toward renewable, carbon-neutral energy, we can stabilize our energy costs and dramatically reduce GHG emissions from our operations. We currently operate five sites in four countries with 2.5 MW of combined installed solar capacity. In 2016, renewable electricity purchased and generated on-site accounted for 105 million kWh of electricity globally, 14% of our total consumption and making progress toward our goal of 40% by 2020. Our year-over-year renewable energy use decreased 18% from 2015, largely due to decreased electricity consumption at sites that use 100% renewable electricity (HP, 2016, p. 36)". "Since 2010, the energy consumption of our personal systems products dropped by 34% on average. During that timeframe, we have reduced energy consumption of our HP LaserJet portfolio by 56% on average, and the energy consumption of our HP inkjet portfolio by 20%, on average (HP, 2016, p. 51)".
Samsung	"Develop highly energy-efficient products by using IoT technology (e.g. smart home) • Research technology that reduces energy use and adopt such technology for products • Implement energy use reduction projects at overseas subsidiaries (Samsung, 2017, p. 19)"
SAP	"At SAP, our vision and purpose is to help the world run better and improve people's lives. We shifted to 100% renewable energy in all of our data centers and facilities in 2014, as compared with 43% in 2013. This is one of our most significant actions to date to make our operations more sustainable. But our impact on energy conservation and sustainability is even bigger when you consider the efforts of customers like these here: • Our industry-specific utility solutions are supporting Ethiopia on its way to grow to a regional powerhouse. • Utility companies like Centrica use our smart meter solutions to closely engage with their customers for conscious energy usage. • Alliander, a large Dutch power distribution company, uses the SAP HANA® platform to analyze 1.5 billion grid sensor measurements and forecast the required asset substitutions or maintenance at continuously reduced time cycles. • United Energy in Melbourne, Australia, is reducing overloads and providing fair energy homes and businesses with SAP HANA. Real-time insight has allowed United Energy to identify previously undetected patterns and respond quickly. • Energie Steiermark is partnering with SAP to reliably deliver green energy to its customers. The jointly built internal solution called "Info Mobil" enables technicians to work more efficiently and all staff to reach customers with excellent service more quickly • Energy provider RheinEnergie, based in Cologne, Germany, initiated a lighthouse advanced metering infrastructure (AMI) pilot project that is expected to set a precedent for other energy suppliers across the country. Using SAP® AMI Integration for Utilities software, it paved the way for greater transparency, empowering 25,000 households around Cologne to conserve energy, make a positive contribution to the environment, and cut costs. (SAP, 2017a)"
Siemens	"**Providing access to energy**: Egypt Megaproject will boost the country's power generation capacity by 50% through 3 combined cycle power plants, 600 wind turbines, and intelligent power distribution (Siemens, 2017b, p. 2)" "**Delivering on decarbonisation:** 521' metric tons of CO2 saved at customers through Siemens Environmental Portfolio - equalling to more than 60% of Germany's total annual CO2 emissions; **Increasing competitiveness of clean energy:** Siemens committed to achieving cost reduction of offshore wind electricity by over 1/3 by 2025, compared to current costs; **Increasing energy efficiency:** >7,400 buildings were energy optimized, achieving >€2'' guaranteed energy cost savings for our customers; **Reducing our CO2 footprint:** Siemens is committed to become carbon neutral in its own operations by 2030 and invests €100' in energy efficiency measures in the next 5 years (Siemens, 2017b, p. 2)"
Shell	"Shell's purpose is to provide more and cleaner energy solutions. We do this by investing in the production and distribution of oil and natural gas, as well as in lower- carbon technology and sources of energy. We also invest in local projects to help communities gain access to energy. In the Philippines, for example, we are using hydro and solar power to provide energy to an off-grid community. (Shell, 2017, p. 12)"
SGCC	"Support the development of distributed generation. Develop technologies to satisfy the power needs for people living in sparsely populated areas such as small islands. Increase the accommodation of the renewables. • Develop the micro-grid project on Nanyi Island of Zhejiang Province to use smart grid technologies to solve the problem of power consumption on the island (SGCC, 2017, p. 101)"

Table 37 Contribution to SDG7

SDG8: Decent work & Economic growth

Company	Contribution
HP	"1,250+ jobs generated based on skills gained in the first three years of the Mashrou3i project in Tunisia (HP, 2016, p. 98)". "We bring quality learning and digital literacy to people of all levels and abilities, to improve their skills and employability (HP, 2016, p. 99)".
Samsung	"Ensure a safe work environment and assist in the economic development of local communities - Offer innovation support programs for domestic/overseas suppliers and help them build Smart Factories - Policy commitment and due diligence work to protect human rights in our operations and supply chain (Samsung, 2017, p. 19)"
SAP	"At SAP, our vision and purpose is to help the world run better and improve people's lives. Our technology is helping organizations like MIAFW tackle the challenges of modern-day slavery in supply chains. For instance, Ariba, an SAP company, is teaming up with MIAFW to leverage its powerful community of more than 2 million companies. These organizations, which drive nearly US$1 trillion in commerce on an annual basis, will in the future be able to identify businesses that use slave labor in their supply chains. We also promote the education of youth as part of our social initiatives. - For many refugees in Germany, landing a job means more than just a pay package. Work means integration, acceptance, recognition, and self-confidence. Due to language struggles and missing paperwork, this is often hard to achieve though. SAP joined in with other German businesses and offered 100 internships for refugees, to break down employment barriers and integrate them into the German job market. - Internet-of-Things technology from SAP provides safety for mining workers of Lukoil. Daily mandatory, automated, pre-shift health checks that measure blood pressure or temperature can be conducted much faster and help identify medical problems of workers proactively, reduce risk at work, and avoid tragic accidents. - In close collaboration, NTT and SAP® technology enable Keifuku bus to ensure safety of its drivers and passengers by continuously monitoring the drivers' working conditions based on weather data and traffic situation as well as the biometric data of bus drivers – all combined in a connected transportation safety system in the city of Fukui. In case of medical issues with the driver, the bus stops automatically. (SAP, 2017a)"
Siemens	"**Creating jobs**: Globally, Siemens employs 351,000 people, 95% in skilled positions, and has enabled 4'3 jobs, of which 2'2 are in developing countries; **Driving diversity globally:** We recruited 35,000 talents in FY 16 from >100 countries, 25% of them were female; **Providing decent jobs and fostering employee wellbeing:** Siemens provides decent jobs, offering €1''2 worldwide in pensions contributions, in addition to localized benefits, e.g. healthcare, to our employees; **Promoting employee skills development:** Siemens fosters lifelong learning and employability through quality education, with >850,000 participations at learning events in FY16 **Facilitating customer and supplier trainings:** Siemens promoted technology- related trainings to >200,000 people from customers, suppliers, and partners (Siemens, 2017b, p. 2)" "**Generating economic value:** Operating in >200 countries, Siemens in FY16 generated a revenue of €79''6 globally contributing to about €250'' in GDP creation; **Contributing to local economies:** In 2016 Siemens had a global effective tax rate of 27% and paid in total €1"7 in corporate income tax, of which around €600' was in developing countries (Siemens, 2017b, p. 2)"
Shell	"Our activities create jobs, use local suppliers and support local businesses. We contribute to economic growth by paying taxes and royalties to local governments. Our projects create demand for a range of goods and services, such as construction. We assess those we work with to ensure they adhere to principles supporting the eradication of forced labour and modern slavery and the protection of labour rights. We have social investment projects to help create opportunities for individuals. Shell LiveWIRE, for example, helps young people start their own businesses. These local programmes operate in 15 countries including Oman, Brazil, Nigeria, Indonesia, Saudi Arabia and Pakistan. (See Living by our principles, Contractors and suppliers) (Shell, 2017, p. 12)"
SGCC	"Upgrade rural power grids in small townships and key villagers. Implement "Dynamic power for every village" program to increase job opportunities. Guide suppliers to strengthen labor rights protection through supplier management. To meet the power needs of local residents and businesses in orchard management, irrigation and fruit storage and reservation in Luoning National Key Apple Production Area, bene ting 17,000 fruit growers (P48) (SGCC, 2017, p. 101)"

Table 38 Contribution to SDG8

SDG9: Industry, Innovation & Infrastructure

Company	Contribution
HP	"HP has a long history of driving more sustainable practices across our value chain and beyond. Leading our industry and customers toward a circular and low-carbon economy at scale is the next step in that journey. Our efforts cut across customer segments, from home users to the largest enterprises. Through innovative design, we are transforming every part of our product and services portfolio, to keep products and materials in use for longer, reducing environmental impact while providing customers increased value (HP, 2016, p. 18)".
Samsung	"Support underprivileged areas in establishing communication connections and engaging in economic activities through the development of ICT infrastructure • Assist India, Malaysia, and other emerging markets in building and improving their communications network • Support the development of disaster safety communications network technology (Samsung, 2017, p. 19)"
SAP	"Empowering entrepreneurs with the tools and support to make their dreams a reality takes nonprofits like Endeavor, private enterprises like Compartamos Banco, and companies like SAP. Together, we are making it our vision and purpose to raise up a new generation of innovators for Africa and the rest of the developing world. • Fostering the spirit of innovation and entrepreneurship, SAP has teamed up with AdVenture Capital (AdCap) to enable today's students to become tomorrow's entrepreneurs. Focused on driving change to improve nutrition and physical activity in their schools and communities, the students acquire the confidence and leadership skills that are crucial to become a bold entrepreneur. • Reliable, efficient, and clean mobility infrastructures continue to be and are becoming ever more relevant for societies and economies. Especially in Europe, the well-established railway system offers an attractive commuting alternative to overcrowded roads and continuously congested cities. In Italy a predictive maintenance solution from SAP enables TrenItalia to provide affordable, reliable, sustainable, and safe mobility for 2 million passengers per day while reducing annual maintenance cost by 8%–10%. (SAP, 2017a)"
Siemens	"**Enabling accessibility and quality of essential goods**: Siemens production technologies increase accessibility and quality of essential goods, allowing for individualization down to a lot size of 1, e.g. individualized cancer vaccines (Siemens, 2017b, p. 2)" "**Investing in research and development**: With R&D investments of almost €5", 33,000 R&D employees worldwide, and close to 60,000 patents globally, we drive innovations that make real what matters; **Fostering innovation**: Siemens invested €800' in >130 collaborations with startups in the past 15 years. With next47 we will invest €1'' over the next five years in innovative ventures; **Shaping digitalization**: Siemens is shaping the digital transformation with groundbreaking innovations in software, digital services and through the IoT operating system MindSphere. With digital services, Siemens creates data-based customer value with >820,000 connected systems from gas turbines to commercial buildings; **Connecting science and business**: Siemens collaborates with ~25 strategic academic partners to transfer academic research into practical applications (Siemens, 2017b, p. 2)" "**Enabling infrastructure and technology through financing**: Siemens helps to enable infrastructure projects and new technologies around the world through financing solutions totaling €26'' in FY16. We also support projects and new technologies through a broad set of financial advisory and insurance solutions (Siemens, 2017b, p. 2)"
Shell	"We work with governments, academics and industry specialists, and partner with companies and organisations to help meet the world's growing energy needs. We share ideas and expertise with partners inside and beyond the energy sector to help encourage innovation. We have programmes in various countries to support small- and medium-sized businesses. (See Our business partners) (Shell, 2017, p. 13)"
SGCC	"Build strong grid and strengthen the upgrade of rural power grids. Increase R&D input. • Construct National Wind/PV/Energy Storage and Transmission Joint Demonstration Project, which won China Industry Award of the fourth session (P37) (SGCC, 2017, p. 101)"

Table 39 Contribution to SDG9

SDG10: Reduce inequalities

Company	Contribution
HP	"At HP, diversity is a business imperative. We invest in improving representation by minorities and women within our supply chain and encourage diversity in suppliers' own workforces (…) In 2016, we also gave every advertising and PR agency we work with one year to increase minority and female representation in creative leadership and key strategy positions that serve HP. (…) HP encourages small businesses and companies owned by women, minorities, veterans, aboriginal or indigenous people, and lesbian, gay, bisexual, and transgender (LGBTQ) individuals to compete for our business. (…) Moving forward, HP will focus on driving more business to small and diverse suppliers in the United States, as well as businesses that support black empowerment in South Africa (HP, 2016, p. 89)".
Samsung	"Contribute to addressing income inequality by reducing poverty in local communities through job creation, etc. • Offer customized services for vulnerable groups • Implement policies to protect the rights of vulnerable groups (children, apprentices, migrant workers) (Samsung, 2017, p. 19)"
SAP	"As part of our vision and purpose to improve people's lives, SAP is proud to help Compartamos Banco use technology to expand access to its services and to reach new communities. Technology in the hands of organizations committed to eliminating inequality can help make a difference. And so can data. Open-data initiatives are pushing governments around the world to provide the public with data that can help improve accountability. This is the kind of accountability that is required if leaders are to take very real steps to eliminate inequality. • SAP is an inaugural signatory of the White House Tech Inclusion Pledge, a commitment to fuel American innovation and economic growth by increasing the diversity of the U.S. technology workforce. • Human Rights Campaign (HRC) is America's largest organization dedicated to gay, lesbian, bisexual, and gender equality. Concur solutions help HRC simplify finance processes and efficiently send staff members across the nation, allowing HRC to celebrate what was one of the biggest achievements in its movement and in history: the marriage equality act for all 50 states in the United States in June 2016. (SAP, 2017a)"
Siemens	"**Promoting equality**: We unite 171 nationalities in our company and 130 in management Siemens (Siemens, 2017b, p. 2)"
Shell	
SGCC	"Promote the integrated cultural and economic development in ethnic minority areas relying on the operating network in 27 provinces • Conduct the activity "safe power use in temples" • Bring electricity to 20,000 herdsmen in Qinghai that had no access to electricity (SGCC, 2017, p. 101)"

Table 40 Contribution to SDG10

SDG11: Sustainable cities & communities

Company	Contribution
HP	• "Respond to disasters when they strike • Share time and skills to build community resilience (HP, 2016, p. 98)"
Samsung	-
SAP	"SAP is proud to be helping cities and local governments to improve people's lives. • Real-time transparency of traffic movement ensures smooth traffic flow for 1 million cars in the city of Nanjing, China. SAP® technology helps collect, analyze, and combine billions of Internet-of-Things sensor data with individual traffic behavior, road conditions, or fare prices to recommend resource-efficient and convenient mobility options in an area of 8 million inhabitants. • The crowdsourced initiative to Improve One Billion Lives (1BLives)seeks to unlock innovation and talent by using SAP technology for social good, aiming to address gaps in education, health, and disaster management. The close collaboration with the seismometer manufacturer Hakusan Corporation focuses on disaster preparedness in Japan. The innovative app "My Seismic Safety" transforms smartphones into seismometers and analyzes the potential impact of earthquakes on the stability of buildings in the event of an earthquake. (SAP, 2017a)"
Siemens	"**Developing sustainable cities and smart infrastructure**: Siemens is a trusted partner to over 200 cities globally, improving the lives of millions - be it through our rail systems that improve connectivity and transport over 50' people daily or through infrastructure that increases safety, air quality and resilience in urban environments (Siemens, 2017b, p. 2)"
Shell	"The Shell Scenarios team has partnered with local authorities in three emerging Asian cities to help them explore new approaches to urban development and to help make these cities more resilient (Shell, 2017, p. 13)"
SGCC	"Construct Strong and Smart Grid, and ensure safe and reliable power supply and the safe and stable operation of the power system. Support the construction of smart city. • Propel rigid management on equipment power failure to successfully respond to extreme weathers including cold spell, flood and typhoon (P35) (SGCC, 2017, p. 101)"

Table 41 Contribution to SDG11

SDG12: Responsible consumption & production

Company	Contribution
HP	• "HP has a long history of driving more sustainable practices across our value chain and beyond. Leading our industry and customers toward a circular and low-carbon economy at scale is the next step in that journey. Our efforts cut across customer segments, from home users to the largest enterprises. Through innovative design, we are transforming every part of our product and services portfolio, to keep products and materials in use for longer, reducing environmental impact while providing customers increased value (HP, 2016, p. 18)". • "Our suppliers play an essential role in our circular economy strategy. We work closely with them to use materials, energy, and water more efficiently and to remove substances of concern from our products and manufacturing processes. (…) • Customers are also critical to achieving circular systems and maintaining the value of products and materials. HP offers several services that can prolong the time a product can be used, such as repair service or replacement of accessories (HP, 2016, p. 18)".
Samsung	"Ensure the sustainable use and management of resources. • Adopt the Eco-design process and the in-house eco product rating system at product developing phase • Operate the Samsung Re+ program to recover and recycle waste products across the globe (Samsung, 2017, p. 19)"
SAP	"As part of fulfilling our vision and purpose to improve people's lives, SAP provides technology that supports companies in conducting survey-based assessments of their suppliers to improve the sustainability of their products. For content, our technology is based on category assessments that were developed by The Sustainability Consortium (TSC). In addition, SAP seeks to buy products and services from suppliers who meet high environmental and social standards. Such procurement practices help us create a positive impact and provide levers through which we can reduce our emissions. Working with suppliers who demonstrate a commitment to sustainability furthermore enables us to comply with the requirements of our own customers. That closes the loop. After all, the way to go is circular. • At Barry Callebaut, the world's leading manufacturer of high-quality chocolate and cocoa products, SAP® technology enables sustainable cocoa farming by combining mobile and desktop access to track produce from farm to factory. The close engagement with the farmers allows Barry Callebaut to provide the right advice, drive adoption of best practices, and improve yields and livelihoods in order to sustain professional cocoa farming into the future. • Replacing paper-based processes by digitizing their business, PTT ICT Solutions improves customer service, eliminates errors, and even saves trees by using the Ariba® Network. Creating transparency, increased process automization, and dematerialization are still simple but very effective results from using information technology to drive responsible consumption and production. (SAP, 2017a)"
Siemens	"**Striving for a circular economy:** 90% share of total waste is recycled (Siemens, 2017b, p. 2)"
Shell	"We have codes, policies and assurance processes to help define how we can protect the environment, respect our neighbours and cause no harm to people. We have voluntarily reported on our environmental and social performance since 1997. Energy efficiency is carefully considered in the life cycle of our fuels and lubricants, from managing energy consumption in their production to providing customer advice on optimum fuel efficiency. (See Environment) (Shell, 2017, p. 13)"
SGCC	"Implement green development strategy. Promote resource conservation and ecological protection during the operation and production of State Grid and its clients. Promote energy transition and supply-side structural reform via electricity replacement to serve the green development. • Release the first White Paper on Green Development among Chinese enterprises (SGCC, 2017, p. 101)"

Table 42 Contribution to SDG12

SDG13: Climate action

Company	Contribution
HP	• "By reinventing the way we design, produce, and deliver our products, we are working to decouple our growth from consumption and transition toward a low-carbon, resource-efficient circular economy (HP, 2016, p. 40)" • "In 2016, HP's global operations produced 383,700 tonnes of Scope 1 and Scope 2 carbon dioxide equivalent (CO_2e) emissions, 5% less than our 2015 baseline. The vast majority of GHG emissions from operations are related to the energy used to power our facilities. To save money, drive progress toward our goals, and reduce our climate impacts, HP focuses on efficient energy use and a greater reliance on renewable electricity (HP, 2016, p. 34)". • "We also incentivize suppliers to set and take steps to meet their own goals, helping us reduce the carbon footprint of our supply chain (HP, 2016, p. 21)".
Samsung	"Reduce CO2 emissions generated from the extraction of resources and product manufacturing • Reduce GHG emissions in the workplace and increase the use of renewable energy • Implement pilot climate change adaptation projects with the Graduate School of Environmental Studies, Seoul National University (Samsung, 2017, p. 19)".
SAP	"At SAP, our vision and purpose is to help the world run better and improve people's lives. Our technology is helping organizations like the government of Buenos Aires and the FRNSW improve the lives of the people they serve. In addition, we also work with our customers to help them increase their overall resource productivity and transform their businesses to reduce carbon outputs. Within SAP, sustainable practices are embedded in everything we do – from running our data centers to reporting our results to stakeholders. For example, one goal in our holistic sustainability strategy is to reduce our greenhouse gas emissions from our operations back to the levels of the year 2000 by 2020. In 2014, we shifted to 100% renewable energy in all of our data centers and facilities to support a more sustainable energy market. This – together with a variety of carbon-reducing measures – helped our company decrease greenhouse gas emissions from 28.4 grams CO2 per euro of total revenue in 2014 to 21.9 grams CO2 per euro in 2015. Our carbon emissions per employee also decreased by about 18% in 2015. And since 2008, our energy efficiency measures have generated a cumulative cost avoidance of €346 million, with €39.8 million of that amount created in 2015. • Meteo Protect provides companies around the globe with customized insurance solutions to help offset the punitive financial impact of climate change. It is part of the SAP® Startup Focus program and leverages the SAP HANA® platform to monitor weather, analyze its history, and address its risks. (SAP, 2017a)"
Siemens	"**Providing access to energy**: Egypt Megaproject will boost the country's power generation capacity by 50% through 3 combined cycle power plants, 600 wind turbines, and intelligent power distribution (Siemens, 2017b, p. 2)" "**Delivering on decarbonisation:** 521' metric tons of CO2 saved at customers through Siemens Environmental Portfolio - equalling to more than 60% of Germany's total annual CO2 emissions; **Increasing competitiveness of clean energy:** Siemens committed to achieving cost reduction of offshore wind electricity by over 1/3 by 2025, compared to current costs; **Increasing energy efficiency:** >7,400 buildings were energy optimized, achieving >€2'' guaranteed energy cost savings for our customers; **Reducing our CO2 footprint:** Siemens is committed to become carbon neutral in its own operations by 2030 and invests €100' in energy efficiency measures in the next 5 years; **Striving for a circular economy:** 90% share of total waste is recycled (Siemens, 2017b, p. 2)"
Shell	"We continue to work to manage greenhouse gas emissions from our operations and have signed up to the World Bank's "Zero Routine Flaring by 2030" initiative. Our major projects have energy management plans and we monitor and manage our emissions using, for example, methane emissions detection technology. We work with governments, other companies and international organisations to help advance the transition to a low- carbon future. In 2016, in its first operating year, our Quest carbon capture and storage project in Alberta, Canada, captured and safely stored more than 1 million tonnes of carbon dioxide. (See Our greenhouse gas emissions, Managing methane emissions, Carbon capture and storage) (Shell, 2017, p. 13)"
SGCC	"Enhance grid's ability to withstand extreme weather caused by climate change. Address challenge and opportunity brought by climate change as an important consideration in the development of State Grid's development strategy. • Carry out emergency repair to resume power supply after heavy rains and oods as well as Typhoon Meranti (P35) (SGCC, 2017, p. 101)"

SDG14: Life below water

Company	Contribution
HP	-
Samsung	-
SAP	No clear contribution states by SAP
Siemens	State to contribute, however it is in combination with goal 6, 7, 12, 13, 15. None of the contributions they mention are specifically targeting poverty so no contribution is mentioned here.
Shell	"Shell is working with governments, non-governmental organisations and other experts to find ways to protect marine biodiversity. We aim to avoid impacts on biodiversity when developing new projects. We carry out impact assessments to minimise the extent to which local biodiversity and communities might be affected by operations. Shell is also involved in research programmes to help increase understanding of marine mammals. One example is our collaboration with the International Union for Conservation of Nature off the east coast of Russia. (See Environment, Environmental partners) (Shell, 2017, p. 13)"
SGCC	"Support, participate in the development of renewable energies such as tidal energy. Develop micro-grid and serve ocean economic development. • Build China's first marine power transmission engineering and technical lab in Zhoushan, Zhejiang Province (SGCC, 2017, p. 101)"

Table 44 Contribution to SDG14

SDG15: Life on land

Company	Contribution
HP	"As the global market leader in digital printing, HP takes seriously its responsibility to reduce related environmental impacts, including paper use by our customers. We help our customers print more sustainably by sourcing the paper we sell responsibly, facilitating more efficient paper use, and collaborating across the paper industry to encourage best practices. In our own operations, we apply these same principles through our recently updated Environmentally Preferable Paper Policy. This defines how we buy, sell, and use paper and paper-based packaging, and states our commitment to source from suppliers that demonstrate responsible forestry practices. Healthy, well-managed forests play a critical role in absorbing carbon dioxide and supporting biodiversity and local livelihoods. To help protect forests, in 2016 HP set a goal to achieve zero deforestation associated with HP brand paper and paper-based product packaging by 2020. (HP, 2016, p. 47)"
Samsung	"Restore/recover ecosystems and ensure their sustainable management. • Develop biodiversity preservation guidelines and identify and improve our impact on the aquatic ecosystem and the habitats of endangered species (Samsung, 2017, p. 19)"
SAP	"As part of fulfilling our vision and purpose to improve people's lives, SAP provides technology that helps with the achievement of each and every UN Global Goal. For this goal, our technology is helping the DOC, Barcode of Life, and LifeScanner as they enable others to do their part in the world's biodiversity efforts. SAP® solutions and technology empower further partners to address biodiversity with urgent action: • The Amazon rainforest is the largest, most diverse bio-system on our planet. It supplies a significant proportion of the world's natural resources, including 20% of the planet's oxygen. But deforestation is threatening the Amazon's role as the "lungs of the world." Indigenous communities safeguard the Amazon jungle, but reaching them can be extremely challenging. SAP partners with Fundação Amazonas Sustentável to ensure conservationists have the right tools to succeed. (SAP, 2017a)"
Siemens	State to contribute, however it is in combination with goal 6, 7, 12, 13, 14. None of the contributions they mention are specifically targeting poverty so no contribution is mentioned here.
Shell	"We aim to minimise the impact our operations may have on natural environments and on people near our projects. This includes any impacts on local communities' health, safety and access to fresh water, food or income. Our standards help reduce any impact our operations may have in areas that are rich in biodiversity or under environmental protection. We work with conservation organisations to restore natural habitats and ecosystems close to our operations. We also support rigorous sustainability standards to help ensure that our biofuels come from sustainable sources. (Shell, 2017, p. 13)"
SGCC	"In the construction of large-scale projects, include biodiversity as an important part of the project engineering management. Support various research on the ecosystem. • Eco-Environmental protection of Qinghai -Tibet Interconnection Project • Ecological Protection of Sichuan - Tibet Interconnection Project (SGCC, 2017, p. 101)"

Table 45 Contribution to SDG15

SDG16: Peace, Justice & Strong institutions

Company	Contribution
HP	"With our brand comes a promise—that HP products are engineered and manufactured with integrity and respect for the people who help make them. Respecting human rights is a core value at HP, shaping how we do business worldwide. We work closely with our suppliers to protect and empower their workers and improve labor standards, so that workers and communities in our supply chain can thrive. In our own operations, we promote a welcoming, diverse, and inclusive culture and do not tolerate discrimination of any kind. We consider privacy a human right, and prioritize protecting customer information. (HP, 2016, p. 117)". "Everyone at HP is expected to meet the highest ethical standards and to treat others with integrity, respect, and fairness. Our Standards of Business Conduct (SBC), updated in 2016 using simpler, clearer language, outlines expected employee behaviors, and is supported by comprehensive training and communication, additional targeted policies, and robust governance at every level (HP, 2016, p. 109)". "HP shares global concern over the need for responsible mineral sourcing. Any possibility that the sourcing of materials used in our products might be connected to human rights abuses and armed violence is unacceptable. To ensure that our products are made responsibly, in ways that protect workers and communities, we have adopted industry- leading policies and monitoring practices. (HP, 2016, p. 85)". "For more than a decade, HP has demonstrated industry leadership by developing innovative ways to strengthen social and environmental conditions in our supplier factories. (HP, 2016, p. 76)"
Samsung	"Monitor and combat human rights violations and corruptive practices. • Systematically manage our compliance and ethical risks based on Samsung Code of Conduct and Business Conduct Guidelines (Samsung, 2017, p. 19)"
SAP	"With the help of online collaboration platforms like SAP® Product Stewardship Network, companies can ensure their supply chain is using responsibly sourced materials. Stopping the purchase of minerals from conflict zones stops the funding of rebel groups and the destruction they cause. SAP technology is helping governments to analyze and use data to improve people's lives: • The State of Indiana has implemented comprehensive data management solutions by SAP to analyze massive volumes of information that held clues to answers that can save people's lives. The state's government has about 92 state agencies that were running in silos, so they had no effective way of sharing information and working together to quickly solve issues affecting the health, safety, and quality of life of their citizens. Now they have the tools at hand to better collaborate and identify ways to, for example, lower infant mortality or prevent fatal traffic accidents. (SAP, 2017a)"
Siemens	"**Driving sustainability in the supply chain**: Siemens sources from ~90,000 suppliers from >150 countries - all required to comply with Siemens code of conduct for suppliers (Siemens, 2017b, p. 2)" "**Fostering integrity and fair business practices**: Siemens combats corruption through Collective Action and the Siemens Integrity Initiative with ~55 projects in >25 countries (Siemens, 2017b, p. 2)".
Shell	"Our core values of honesty, integrity and respect for people underpin how we work. We promote inclusion, fairness and sustainability through our corporate governance structure, which is designed to support the responsibilities and commitments set out in the Shell General Business Principles. Through Shell's own activities, including support for employee networks, and by collaborating with communities, we work to strengthen mechanisms that uphold human rights, the rule of law, accountability and transparency. (Shell, 2017, p. 13)"
SGCC	"Comprehensively disclose financial and non-financial information to enhance corporate transparency. Include anti- corruption and anti-bribery as the core content of corporate governance. • Release Behavior Guidelines for Corporate Governance by the Rule of Law. Merge the laws and regulations into the code of conducts of the enterprise (P59) • Discuss integrity construction and anti-corruption (SGCC, 2017, p. 101)"

Table 46 Contribution to SDG16

SDG17: Partnerships for the goals

Company	Contribution
HP	"HP proudly supports the UN Sustainable Development Goals, the UN Global Compact, the Global Reporting Initiative, and other global efforts to advance sustainable development (HP, 2016, p. 11)"
Samsung	"Support developing nations with technology transfer/ distribution and capacity-building. • Collaborate with global/local community organizations to educate our locally-hired staff at overseas worksites • Undertake localized corporate citizenship initiatives through our global partnerships with international institutions and NGOs (Samsung, 2017, p. 19)"
SAP	"SAP is working hard to revitalize the partnerships needed to achieve the UN's Global Goals: • In line with its tradition of civic engagement, SAP partners with governments, others in its industry, and the broader business community to advocate for public policies that support the SDGs. At the forefront of the transformation to the digital economy, SAP has the ambition to work hand-in-hand with global policymakers to improve the economy, the environment, and society through technology. • A goal of UN Industrial Development Organization (UNIDO) is to help expand the industrial and economic capacity in developing countries and improve the livelihood of billions in the process. As part of SAP's cooperation with UNIDO and its membership in the Global Partnership for Sustainable Development Data, we are using our analytics expertise and technology to help UNIDO engage in guiding governments around the world through data-driven discussions. • As a founding member of IMPACT 2030, SAP is also collaborating across industries and agencies to align its employee volunteering efforts in support of the sustainable development agenda. The company is piloting a local version of the acclaimed SAP® Social Sabbatical program to foster the collaborative volunteering model. The SAP Social Sabbatical for local engagement pilot in Madrid will bring teams of employees from SAP as well as other private and nonprofit organizations in that city to deliver pro bono support. (SAP, 2017a)"
Siemens	Siemens claims that all their contributions that are mentioned in relation to the SDGs are connected to the partnership SDG. However, no clear partnership action is reported on.
Shell	"We collaborate and work in partnership in many areas, for example, to deliver more and cleaner energy and to help us reduce our environmental impact. We share our knowledge, experience and understanding of the energy system with policymakers. (See Environmental partners, Social partners). (Shell, 2017, p. 13)"
SGCC	"Creatively bring up Global Energy Interconnection as a sustainable solution to meet global power demands. Share grid operation experience around the globe. Carry out commercial cooperation in many countries and serve their local socio- economic development. • Construct Ethiopian power transmission project (P78) • Build Brazil's Belo Monte Hydropower UHV Transmission Project (SGCC, 2017, p. 101)"

Table 47 Contribution to SDG17