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Incorporation of sustainable development into business strategy

Master's Thesis, 2020

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ABSTRACT

Sustainable development refers to addressing the present needs without compromising the needs of the future generation. In this context, business plays a crucial role. Despite the increase in demand from customers and key stakeholders, the progress has been slow, and the issue has remained topical. Such a trend indicates that businesses are required to act more strategically in a sustainable way to stay relevant in the market. Incorporating sustainability needs a wide range of decision-making and participation across all levels of the organization.

The purpose of this study is to explore the incorporation of sustainable development agenda into the business strategy and structure of companies. In order to perform such an investigation, a mixed-methods approach is used. The existing literature, along with the sustainability reports of the top ten companies in ICT, is critically reviewed. Furthermore, interviews with experts are conducted base on the literature's result. Then, interview outcomes will validate the findings and answer the formulated research questions. The results illustrate that the adaptation of integrated thinking is still in the initial phases. Thus, there is a lack of practical actions and measurements.

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

BM	Business Model
BMI	Business Model Innovation
CPCI-SSH	Conference Proceedings Citation Index- Social Science & Humanities
CS	Corporate Sustainability
CSMS	Corporate Sustainability Management System
CSS	Corporate Sustainability Strategy
DESD	Decade of Education for Sustainable Education
EBL	Extended Bottom Line
ESCI	Sources Citation Index
GRI	Global Reporting Initiative
ICT	Information and communication technology
ICT4S	ICT for Sustainability
IIRC	International Integrated Reporting Council
LCA	Life-Cycle Assessment
MDGs	Millennium Development Goals
NGOs	Non-Governmental Organizations
PDCA	Plan-Do-Check-Act

SCI-EXPANDED	Science Citation Index Expanded
SD	Sustainable Development
SDG	Sustainable Development Goals
SDGs	Sustainable Development Goals
UIT	Union of International Telecommunication
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development

1 INTRODUCTION

In this chapter, a brief introduction to the research topic and the need to conduct such research is given. Research gap, objective, and research questions are explained to establish a base of the study. Then, the employed research approach and research methodology throughout this study are highlighted. Finally, the thesis structure is explained and demonstrated.

1.1 Background

Information and communication technology (ICT) is growing expeditiously, and it is becoming an imperative part of our society (Plepys, 2002; Berkhout *et al.*, 2004; Sumantran *et al.*, 2015). Modern society is facing several issues regarding climate change and sustainability. The expectation of ICT technologies to facilitate the implementation and support of sustainable strategies is increasing every day (Hilty, 2008; Höjer *et al.*, 2015).

Researchers have accomplished several studies to explore the contribution of ICT to sustainable development and addressing the environmental problems (Mingay, 2007; Buttazoni, 2008; Hilty *et al.*, 2009; Mickoleit, 2010). ICT is recommended to play as an enabler in the implementation of sustainable development and decrease the environmental impacts in various ways, such as substitute products (Höjer *et al.*, 2015). The use of technology and ICT as an enabler has been noted 41 times in the 2030 agenda for sustainable development reports (United Nation, 2015).

In order to appropriately utilized ICT as an enabler of sustainable development goals without rebound effect or minimize it, we need to take into account the negative and positive effects as well as direct and indirect impacts of it. Some scholars argue that incentives or regulations may be required so that the reduction of the negative impact would be ensured (Berkhout *et al.*, 2004).

Countries, including Finland, have set goals for low-carbon and resource-efficient society and sustainable national economy(Brunila, 2017). Finnish national policy emphasis on the following EU policies and goals set for each country by the end of 2030 (Prime Minister's Office, 2010). In 2013, Finland's National Strategy was reformed, and Society's Commitment to Sustainable

Development – "The Finland we want by 2050" was established to provides national guidelines on sustainable development (Prime Minister's Office, 2010). Society's Commitment to Sustainable Development has eight objectives that aim to achieve by 2030: 1) Equal well-being 2) participatory society 3) sustainable work 4) Sustainable communities and society, 5) carbon-neutral society 6) resource-wise economy, 7) Lifestyle with respecting to nature capability, 8) Decision-making with respecting to nature. As a result, the ICT sectors in Finland need to adhere to energy efficiency and green technology development and in order to do so they are required to incorporate sustainability into their core business strategy.

1.2   Research Objectives and Questions

Adaptation of sustainable development in companies is becoming a public concern, involving various stakeholders. Such pressure from policymakers and the public put enormous stress on companies to integrate sustainability for economic success, environmental quality, and social equity. Additionally, customers and users' demand have increased significantly for sustainable products and services. Such rapid growth in the market creates new opportunities for companies to gain sustainable competitive advantages and ultimately capture those business values. However, it is not clear how companies successfully implement sustainable development and what are the initiatives and motives behind such adaptation.

Some researchers study the effect of sustainable development on ICT sectors (Hilty, 2008). The focus of this study is to investigate the integration of sustainability into the business strategy of ICT companies. Moreover, many scholars investigate the possibility of ICT as an "enabler" to achieve and maintain sustainable development goals, especially on the areas of education (e.g., Goni *et al.*, 2017) and supply chain (e.g., Bendul *et al.*, 2017); however, only a few consider the broader research on the effect that Sustainable Development (SD) as a whole may have on the business strategy of companies.

The primary objective of this research is to explore the incorporation of sustainable development agenda into the business strategy and structure of ICT companies in Finland. To be more precise, the SD phenomenon itself and the motives behind embedding sustainability will be investigated. In order to have a clear understanding of the subject, a holistic analysis of the practices,

processes, indicators, and barriers with their direct or indirect influence will be investigated with the help of scientific literature and company cases. Furthermore, the study makes a theoretical contribution to the literature on ICT sustainability by providing a comprehensive systematic state-of-art literature review. Therefore, empirical research questions (Table 1) are formulated as follows:

Table 1 Research questions

Research questions	Rationale	Means
Main RQ: How do ICT companies in Finland integrate and value SD in their business strategy?	Understanding the process of incorporating sustainable development in the core business of ICT companies and perceived value.	Using secondary data of literature review as well as data collection and analysis of interviews and companies's reports.
Sub-question 1: What are the practices and processes of Sustainable Development?	Determining commonly used practices and processes of sustainable development to understand the question better.	Via secondary data and literature review.
Sub-question 2: What are the assessments and indicators to measure sustainability?	Pinpointing frequent indicators to measure sustainability in ICT companies.	By data collection and analysis of interviews and company's sustainability report.

	Identification of obstacles and incentives in embedding sustainable development into the organization core business.	Through literature review as well as data analysis of interviews.
Sub-question 3: What are the barriers and drivers in the adaptation of Sustainable Development?		

1.3 The Research Approach and Delimitations

Before selecting an appropriate research approach, it is essential to acknowledge the assumption that formed the research question and choice of methodology (Clark *et al.*, 2008). A research paradigm is a set of essential guidelines that aid researchers (Guba *et al.*, 1994). Based on three taxonomies of Candy (1989) - positivist, interpretivism, and critical paradigms – critical realist belief has been utilized in this research. Additionally, in this study, a mixed research approach of deductive and inductive is adopted. The deductive approach is based on a set of statements to test the outcome in which a specific conclusion is formed general (true/correct) premise. And inductive approach is "making the generalized findings from propositions relating to particular instances"(Eysenck *et al.*, 2005).

Regarding the delimitations of the research, firstly, as mentioned above, not many studies have investigated the implementation of sustainable development in the ICT industry even though it is recognized as a critical enabler of many sustainable development goals. Secondly, the incorporation of sustainable development into the core business of companies has not yet been explored. Thirdly, the actual content of sustainable reports of companies has not been analyzed and studied.

1.4 Methods Summary

To develop a comprehensive understanding of the phenomena, a mixed methods approach (Figure 1) has been chosen for this thesis. First, a quantitative and qualitative literature review is undertaken to have a holistic understanding of the topic. Second, the results are used to

interpret the content of the ICT companies' reports and formulate expert interview questions. Third, a conclusion from all the findings is drawn to answer the research questions.

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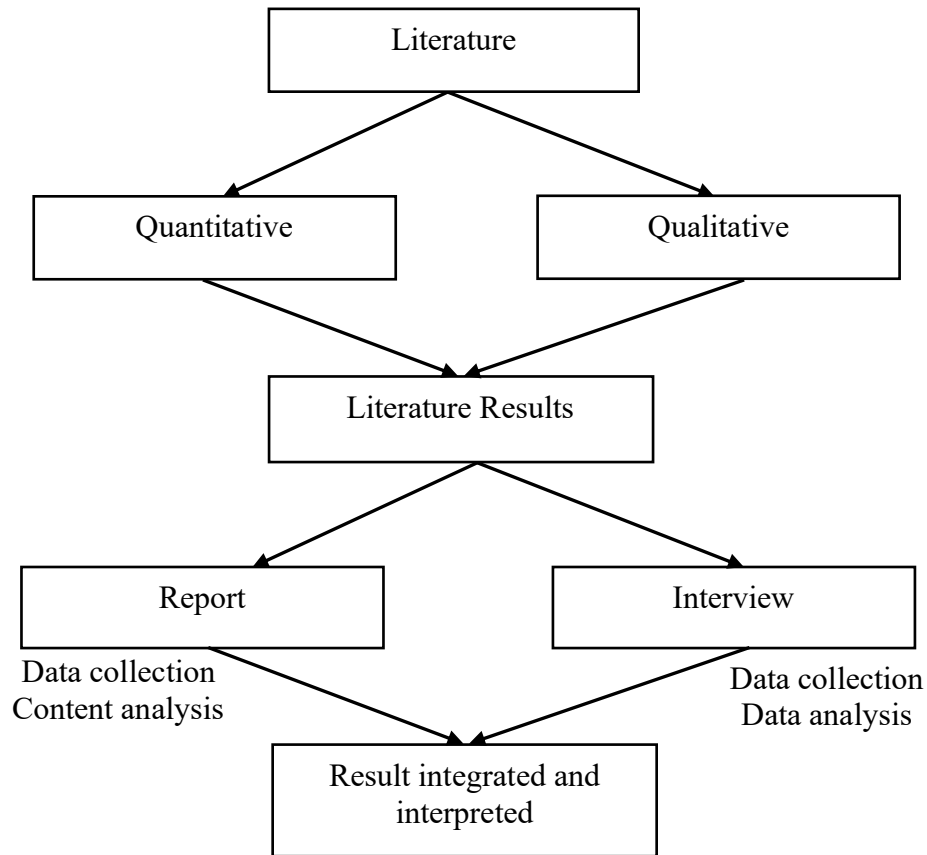
Figure 1 Diagram of the research method summary

1.5   Study Structure

As Figure 2 illustrates, the thesis starts with an introductory chapter devoted to objectives and the empirical research questions. Based on the focused topic as well as given theoretical direction, a literature review on the background is carried out. Next chapter, the secondary data of the top ten companies in the field of ICT in Finland are explored to understand their point of view of the problem. Afterward, a bibliometric literature data analysis of the topic is carried out to provide an in-depth insight into the field of study, and the results are presented. In the next chapter, the relevant areas and ways to integrate sustainable development into the core business are further studied to formulate interview questions. Next, the qualitative research methods of

data collection are explained, followed by analysis, and interpreting the results of the content analysis as well as conducted interviews. Finally, a summary of the main findings and conclusion of the work with its limitations is stated.

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Figure 2 The structure of the study

2 Background

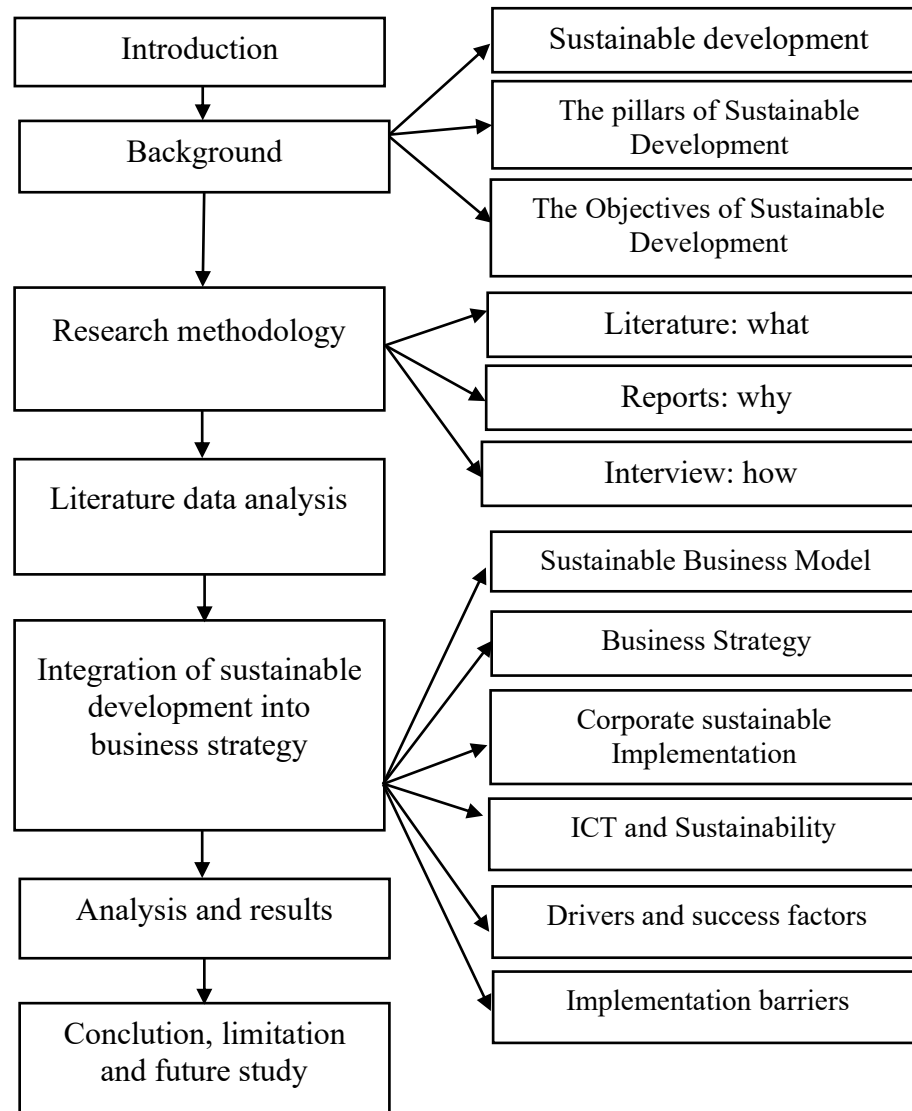In this chapter, Sustainable Development and its commonly used practices are studied to provide a holistic perspective. An overview of the Sustainable Development phenomena and its relevant studies are given outlining how the concept has been developed, defined, analyzed, and evolved in the past.

2.1 Sustainable development

The concept of sustainable development (SD) came to widespread acceptance after the Brundtland defined it as a development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Brundtland *et al.*, 1987, p.5). This definition is known as "Brundtland definition" which is widely used across multiple disciplines; thus, its definition is universally accepted but has been interpreted frequently (Kates *et al.*, 2005). The SD concept attempts to raise awareness on the issue of economic development and environmental stability. Moreover, Brundtland defection has a second element: distributive justice. M. Christen (2010) consider the SD as "…might best be conceptualized as an attempt to grant the right to a decent life to all living human beings without jeopardizing the opportunity to live decently in future".

Despite the effort of many scholars and organizations, various definitions are aiming to describe the concept. For instance, the "Forum for the Future organization" (2006) defines SD as "a dynamic process which enables all people to realize their potential and improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems". However, one of the most decisive definition is coined by UNESCO which defines SD as an international development that is "socially desirable, economically viable, culturally appropriate and ecologically sustainable" (Republic of Armenia, 2008).

The terms "Sustainability" and "Sustainable Development" are used interchangeable and plays a role as an interdisciplinary area of study between researchers and organization (Giddings *et al.*, 2002). Researchers, organizations, and governments formulated a wide range of proposals on how SD can influence various issues. In 1992, in Rio de Janeiro, the United Nations

Conference on Environment and Development (UNCED) published a report known as "Agenda 21" to provide a global plan to promote sustainability and social empowerment. The Agenda 21 emphasizes more on the social aspect of nations (Chappells *et al.*, 2015) and primarily aims to encourage the establishment of local Agenda 21 every local to accomplish the SD plan for the 21st century. However, sustainable debates are often focused on the environment and economic development (Campbell, 1996; Giddings *et al.*, 2002; Moldan *et al.*, 2012).

Back in the eighteenth and nineteenth centuries, approaches such as Malthusian and the Marxian already were concerned about the limitation of human development using natural resources, and its potential crisis caused by seeking happiness through consumerism (Malthus, 1798). Later on, a report by the name of "The Limits to Growth" (Meadows *et al.*, 1972), was published from a club called "Club of Rome". The report was a product of the environmental movement of the 1960s, which addressed the bleak effect of human activity patterns on the planet, which is known as one of the significant works highlighting this thinking. This report proposed a change of attitude towards taking responsibility and conscious decision-making regarding the exploitation of natural resources. In contrast, if precautions are not made to control the use of natural resources, pollution, food production, and population, it is believed that in 100-years timespan, we will reach the limit to growth (Meadows, 2004).

In 1972, the declaration of Stockholm was held with attendees from 113 countries and 250 non-governmental organizations (NGOs) to address the environmental and human development issues. The Conference of Stockholm reflected on the need to build an international perception and guideline and move towards environmental damage prevention. Thus, the "United Nations Environment Programme" (UNEP) was established to coordinate and promote sustainable development concepts and global protective actions of the environment. (United Nations, 1972)

Afterward, "Our Common Future" (World Commission on Environment and Development, 1987) and "World Conservation Strategy" (IUCN, 1980) contributed to "Sustainable Development" by approaching the question to provide answers and framework to integrate environmental policies and development strategies.

Nevertheless, Brundtland's framework appeared weak and unclear among many scholars, and they believed the report lacks the solid steps to gain SD (Klein-Rosenthal *et al.*, 2006). Additionally, Brundtland's report avoids conflicts between economic, environmental, and social equity so that it would emphasize the human aspect of SD (Giddings *et al.*, 2002). Despite all the critics on the Brundtland's report, her definition is the most frequently cited definition by international and local organizations and governments (Klein-Rosenthal *et al.*, 2006).

In 1992, UNCED was developed to institute new levels of fair international partnership and co-creation between states. This agreement also is known as the "Rio Summit", established with the objective of respecting all nations' interests and integrity of environment and development. Meanwhile, a Swiss businessperson, named Stephan Schmidheiny, established the "World Business Council for Sustainable Development" (WBCSD). Schmidheiny researched the possibility to involve leading businesses in a coalition to adopt sustainable development. (Lenssen *et al.*, 2013)

In 1994, John Elkington proposed the triple bottom line concept to provide a new aspect of sustainability from a corporate perspective. This concept includes environmental and social benefits along with a financial balance sheet stating that companies need to consider all stakeholder's needs, including the environment (2006, 2013).

Later in 1997, Global Reporting Initiative (GRI) was established to further aid the corporate perspective on sustainability by inviting companies, NGOs, consultants, and universities to work together and provide guidelines for companies to report their performance (Wiedmann *et al.*, 2009).

In 2005, UNESCO was nominated to become the leading agency of the "Decade of Education for Sustainable Education" 2005-2014 (DESD) by the United Nations General Assembly. The goal was enabling UNESCO to merge their values into sustainable development and promote changes for a fair and sustainable society for all (Lenssen *et al.*, 2013). Furthermore, Evandro Vieira Ouriques in 2005 developed an extension of the bottom-line concept. The Extended Bottom Line (EBL) claims that "social justice, economic equity, and environmental security" are results of sustainability (Ouriques, 2009).

The joint effort of various countries, organizations, and social groups after years of research to establish a guideline for companies to have a universal principle and understanding of social responsibility resulted in the creation of International Standard ISO 26000:2010. The standard is not a certificating that able companies to seals or certify their social responsibilities; it can be used as a guideline to follow in order to achieve necessary obligations. Again, in 2010, the ''Europe 2020 Strategy'' emerged in Lisbon to provide a holistic vision and milestone for Europe on the social market economy. It consisted of three interdependent areas (Lenssen *et al.*, 2013):

1. Intelligent growth: establishing an economy based on innovation and knowledge
2. Sustainable growth: advocating hypo carbonic
3. Inclusive growth: ensuring the social cohesion using a high rate of employment

In 2010, the International Integrated Reporting Council (IIRC) was built to develop a globally accepted framework to gather financial, environmental, social, and governance information in an integrated format (Flower, 2015). The framework aimed to provide a way so that companies would be able to make a better sustainable decision and aid the communicating of the company's performance to stakeholders (Lenssen *et al.*, 2013).

In June 2012, a conference called Rio +20 held in Rio de Janeiro 20 years after the Rio Summit to define a path greener and better world. The Rio +20 focused on two prime topics of green economy and eradication of poverty as well as an institutional framework for sustainable development. The result of the conference in documented on ''The Future We Want'' which includes practical ways to implement sustainable development for member-states (Lenssen *et al.*, 2013). Rio +20 is considered a historical conference that paved the path for future commitment to sustainable development.

In 2012, the United Nations Framework Convention on Climate Change (UNFCCC) gathered in Doha to decide concerning changing the Kyoto Protocol. Thus, an agreement to reduce GEE emissions was signed by developed countries. Later, in 2015, United Nations (UN) gathered the world's leaders to promote a new sustainability concept named Sustainable Development Goals

(SDGs). The concept consists of 17 goals to be achieved by 2030 (Saner *et al.*, 2019). A summary of the progress of the sustainable development concept is depicted in Figure 3.
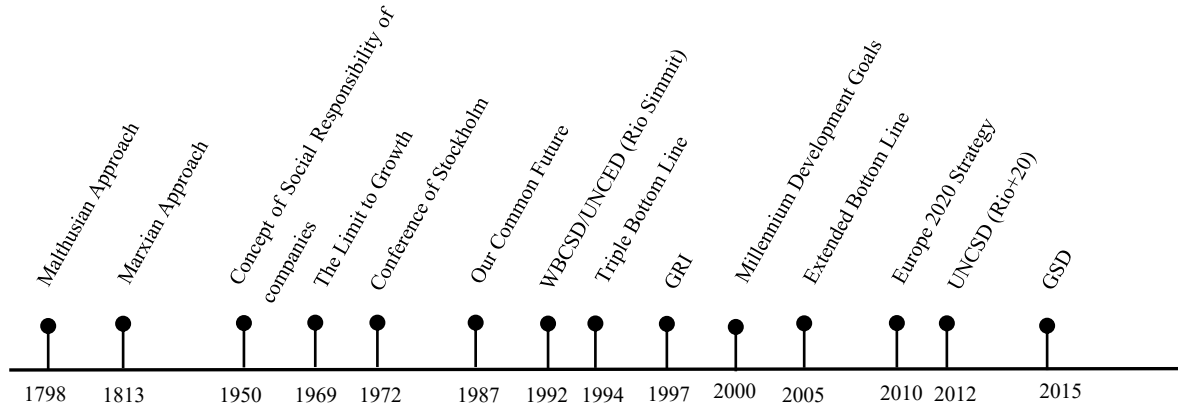
Figure 3: Extended evolution of sustainability (Lenssen et al., 2013)

2.2 The pillars of Sustainable Development

Since the concept of the triple bottom line introduced by John Elkington, many organizations used the new division of sustainable development: environment, society, and economy (Campbell, 1996; Hardi, 1997; Elkington, 1998; McKeown *et al.*, 2002). As it is demonstrated in Figure 4, the three pillars are often demonstrated in interconnected format (ICLEI, 1996; Brandon *et al.*, 2000; Giddings *et al.*, 2002). These inseparable pillars are known as the essence of sustainability and are needed to be balanced to achieve suitability. Additionally, the three pillars of SDGs attempt to facilitate the realization of societies to voluntarily embrace the equitable distribution of natural recourses, ecological limitation, economic potentials, and develop respect towards the environment.

Figure 4: Common three pillar of Sustainable Development (Elkington, 2006)

2.2.1   Social Sustainability

Social Sustainability, like suitability itself, does not have a single universal definition (Weingaertner *et al.*, 2014). Sachs states that social sustainability "must rest on basic values of equity and democracy" (Sachs, 1999, p. 27), whereas Barbier (1987) and Koning (2001) more emphasis on values such as culture, equi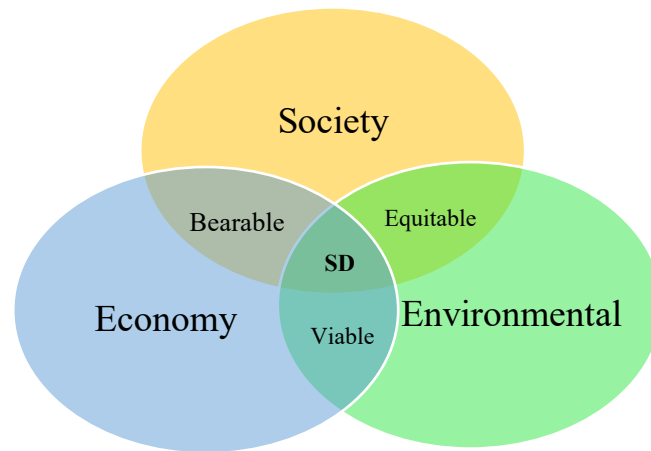ty, and justice. Additionally, from sociological perspective asserts that "Social sustainability is given if work within a society and the related institutional arrangements satisfy an extended set of human needs [and] are shaped in a way that nature and its reproductive capabilities are preserved over a long period of time, and the normative claims of social justice, human dignity, and participation are fulfilled" (Griessler *et al.*, 2005).

Despite diverse definitions, it is clear that the main objective of sustainable development is to balance fairness, especially those of poor, and recognize the capacity and balance resources distribution present and future generations (IUCN, 1980). In short, the social sustainability system should distribute social services such as increase political responsibility and participation, gender equity, and health and education. Furthermore, technology can have a positive and negative impact on social suitability. For example, on the one hand, ICT can ease access and retrieve information from different interest groups; on the other hand, the integrity and security of the user may be at risk (Weingaertner *et al.*, 2014).

2.2.2 Environmental Sustainability

Environmental sustainability encourages the prevention of waste and pollution as well as advocating responsible use of resources (IUCN, 1980). The prime objective here is to design a sustainable system that ensures the avoidance of over-using renewable resources, maintain the base of stable resources, and aids the utilization of non-renewable resources (Lenssen *et al.*, 2013). Environmental sustainability considers the measurement of both input and output impacts on living and non-living natural resources such as land, air, and ecosystem (Romeiro, 2012).

Some scholars believe that environmentally sustainable companies do not cause harmful emission and "use only natural resources that are consumed at a rate below natural reproduction or a rate below the developments of substitutes" (Dyllick *et al.*, 2002, p. 133). Such arguments put high stress on the investigation of the existing natural ecosystem in order to provide a greener future. Some positive initiatives have been made, such as reduction of the use of fossil fuel, reducing emissions, increasing sustainable agriculture, and renewable energy; however, from the technological optimist viewpoint, it is possible to surpass such obstacles and limitations by substitutability.

2.2.3 Economical Sustainability

Economic sustainability addresses economic growth in areas where basic needs are not meet, such as food, shelter, and other forms of living or profit. Economic growth will be the basis for development; therefore, it needs to become less destructive to the environment (IUCN, 1980). This is only possible by changing behaviors such as consumption and production. The "Enquete commission of the 13th German Bundestag" suggests that private and public interests should be reconciled to serve the present and future pullulation (Dannenberg *et al.*, 2016). In this report, they proposed an economic rule that each member of society should get benefit from the social systems and motivate them to initiate personal interest.

Recently, the market for sustainable products experienced significant increment faster than traditional products (Potts *et al.*, 2010). Such rapid growth of the market may declare that

sustainable development can yield momentums market penetration. Additionally, cost-saving is the last objective of SD, which is beneficial and achievable by energy conservation and waste reduction of sources (ICLEI, 1996).

2.3   The Objectives of Sustainable Development

In September 2015, leaders from all over the world joined together in New York City at the United Nations meeting to embrace the 2030 Agenda of Sustainable Development Goals (United Nations, 2015). The 2030 Agenda consists of 17 goals (Figure 5), 169 targets, and 232 indicators for the countries agreed upon social integration, economic development, and environmental preservation. To be more specific, there are 244 indicators in total; however, nine of them are repeated under two or three different targets. The new framework of SD, with its 17 goals, is built from the Millennium Development Goals (MDGs). MDGs were developed in 2000 and expired at the end of 2015. This new framework, 2030 Agenda, tries better to integrate economic and social development with environmental sustainability.

Figure 5: Sustainable Development Goals (United Nations, 2015)

The SDGs, also known as the Global Goals, aim to provide a series of objectives to face significant difficulties such as sustainable economic growth, poverty, and inequalities(United Nations, 2015). The critical difference of 2030 Agenda is calling all nations to adopt the 17 goals. For instance, all countries are responsible for performing their best to obtain a considerable reduction of inequalities in their society within one generation. The objective is to engage developed countries along with developing and middle-income countries (United Nations, 2015). In short, the goal of 2030 Agenda for Sustainable Development is to provide "a plan of action for people, planet and prosperity" intended to "shift the world onto a sustainable and resilient path" (United Nation, 2015).

The SDGs are indivisible to create a balance between the economic, social, and environmental pillars of Sustainable development (Kostoska *et al.*, 2019). Thus, as Figure 6 depicts, each goal of SDGs can fall into one of the three pillars/dimensions.

Figure 6: Connection between Sustainable Development Pillars and Goals (Kostoska et al., 2019)

Some believe that the objectives of SDGs are bold and far more ambitious than MDGs, consisting of end of poverty and hunger (SDG 1&2), good well-being and health for everyone (SDG3), universal access to secondary education (SDG 4), cost-efficient renewable energy (SDG 7), sustainable cities and communities (SDG 11), action to tackle climate change (SDG

13), promoting and protecting life underwater and on grand (SDG 14&15) (Ferranti, 2019). However, the goals comprise opportunities for various industries to contribute and engage in harnessing the necessary tools to implement, deliver, and maintain the required changes (Kostoska *et al.*, 2019). Additionally, the 2030 Agenda invites private and national governments to participate together and support the global goals of 2030 (United Nations, 2015).

3 RESEARCH METHODOLOGY

This section defines the research methodology in this research. We will first look at the methods used to perform the literature review analysis. Then, the evaluation criteria of the companies' sustainability report will be explained. Finally, the methodology used in the interview sessions will be enumerated.

3.1 Literature analysis: What

To answer the formulated research questions, a qualitative and quantitative analysis of the existing literature have been achieved. First, relevant keywords have been combined as a filter to narrow the search results from the Web of Science database. The results were further refined by filtering out non-English articles and excluding irrelevant citation indexes and topics. The title, abstract, keywords, and authors informed of the selected 1288 articles were extracted in the plain text format as an input for the bibliometric analysis.

The exported data was systematically organized, and several different files were extracted from the Web of Science database. Various OUT-files were developed using BibExcel[i] (Persson *et al.*, 2009) by converted the files into one single one and removed the signatures. Finally, the outputs of the previous step became an input for different open source tools such as HistCite[ii], CiteSpace[iii] (Chen, 2004, 2006, 2010), Bibliometrix R package[iv], Gephi[v], Pajek[vi], and VOSviewer[vii] to visualize or further analyze. In worth mentioning that some data cleaning and visualization are done using Microsoft Excel.

Ultimately, the implemented analysis helped to recognize the most suitable algorithm cluster the articles. Each cluster represents a focused topic, and according to their influence and relevance, some were selected to answer the research question. The rest of the articles are exploited as a base to create a holistic view of the importance of the topic and its development process.

3.2   Content analysis: Why

As defined in the scope of the research, this study aims to explore the incorporation of sustainable development into the business strategy of ICT companies. Thus, a list of top ten Finnish companies based on turnover is collected (Pehkonen, 2019). The sustainability reports of each company have been gathered. As a result, only seven companies out of the top ten companies had public reports related to sustainability.

To qualitatively analyze the relevance, credibility, and quality of the collected reports, a structured assessment tool by Hąbek (2016) was used. The collated reports are imported on ATLAS.ti software for easier and systematic qualitative analysis. In this step, as presented in Appendix B. 1 to assess the reports, seventeen variables are used. Each coded criteria were manually scanned throughout the report to evaluate and score between 0 and 4. It may be noted that the personal expertise of the author may have influenced the evaluation.

3.3   Interview: How

Based on accomplished literature research as well as content analysis of the sustainability report published by companies, an oral interview was used to deepen the assessment findings and collect new results.

The qualitative method applied in this section is semi-structured qualitative interviews. To carry out the interview, an expert interview guide is used (Flick, 2014). An expert as a person is who has competed in the designated field of study. "The expert has technical, procedural, and interpretational knowledge that relates to his specific professional or occupational field of action. In this respect, the expert knowledge does not consist solely of systematized, reflexively accessible specialist or special knowledge, but to a large extent has the character of practical or knowledge of action, into which various and quite disparate action maxims and individual rules of decision-making, collective orientations and social patterns of interpretation flow in." (Bogner *et al.*, 2002, p. 45).

Bogner and Menz (2002) suggest a typology for expert interviews that enable: exploitation of a new field, combining contextual information with other research methods, structure thematically, develop hypotheses, and interview guide with full usability.

The guild-oriented interview focuses on a particular topic within the knowledge pool of the expert. Pre-defined open interview questions can be asked in order or a sort necessary(Given, 2008).   The sequence of the interview questions is strongly dependent on the flow of the conversation, and often, some questions may be skipped (Atteslander, 2006). For instance, if the content of the answer or discussion already covered the question. The interview questions should be formulated in a way that they are easy to understand, short, neutral, and possible to respond negatively and positively (Atteslander, 2006). The issue with this method is to find the right expert to interview and convince the person to invest time to participate in your research. Moreover, the interviewer is required to have a high level of understanding of the topic as the interview is more similar to having an open discussion.

The author complied with the interview guide to narrow down the broad topic to the specific field of the research. Neither of the mentioned difficulties occurred; however, as the formulated questions are open-ended, some interviewees carried away and providing excessive information, which was challenging to handle the flow of the discussion.

Based on the literature analysis and the content analysis of companies' reports, the questions were designed (Appendix C. 2). Due to the nature of the research approach, a set of more general research questions with five sections is developed. As interviewees are time-restricted and people usually are very busy, an interview invitation (Appendix C. 1) with information of the topic, the purpose of the study, and suggestion to hold the meeting online along with a promise to finish the interview within a one-hour time limit is sent to interviewees to ask them to participate in the research.

4   Literature data analysis

Literature review enables researchers to identify scientific contributions of a field of research or question; however, meta-analysis yields statistical methods to merge reliable results that are unavailable from any single study (Tranfield, Denyer and Smart, 2003). Rowley and Slack (2004) and Fahimnia, Sarkis, and Davarzani (2015) published a five-step methodology approach from data collection throughout the evaluation. The five-step methodology is applied to this research to select focused and essential papers on the topic.

During this study, bibliometric analysis is conducted from the Web of Science database to identify relevant articles. The initial search began by determining essential keywords as "Sustainable Development", "Value Chain", "Strategy Integration", and "ICT Sustainability". As one single keyword can result in a broad search, the query was narrowed to design a combination of keywords to reach the desired outcome. Generated keywords are used to search in titles, abstracts and authors' keywords in Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Conference Proceedings Citation Index-Science (CPCI-S), Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) and merging Sources Citation Index (ESCI). Furthermore, the language has been restricted to English with a time span of 10 years from 2010 to 2020. The search has been further refined by excluding materials such as "books review," and "editorial material". The irreverent categories, namely "Art" and "History" have been excluded from the search to refine the results better. Table 2 demonstrates the initial search's keyword and result. The software Mendeley is used to facilitate referencing, storing, and studying the results.

Table 2 Initial search

Database	Combination of keywords	Records
Web of Science	(Sustainability* OR "Sustainable Development") AND ("Value Chain")	447
	(Sustainability* OR "Sustainable Development") AND ("Integration") AND ("Company")	209
	(Sustainability* OR "Sustainable Development") AND ("ICT")	429
	(Sustainability* OR "Sustainable Development") AND ("Business Strategy")	203
Total		1288

The investigation began with examining the topic trend over the defined timespan. As the data is collected at the beginning of the year 2020, the value of the year 2020 is forecasted by period 2 moving average to avoid sudden fall from 256 number of articles to 32. Figure 7 depicts the topic trend is following a drastic geometric growth in the number of published articles per year. However, there is a slight decline after the year 2018, which may be due to the significant buzz between 2014 and 2018.
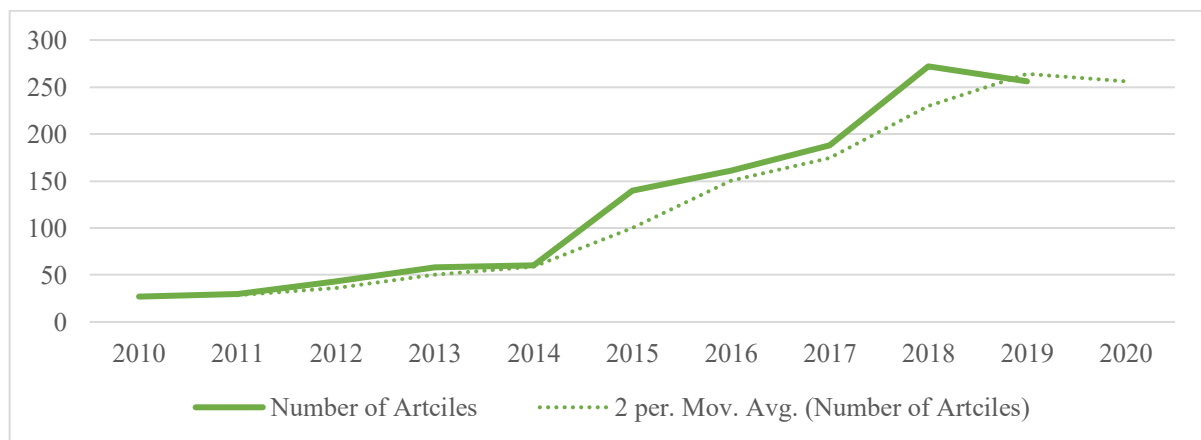
Figure 7 Annual scientific production trend between 2010-2020

According to the performed statistics, the collected records of 1251 articles (after duplications are removed) were published in more than 513 different scientific journals. Approximately 34% of the articles are published by the top 10 journals (Appendix A. 1). As Figure 8 depicts the

contribution of top 10 scientific journals in percentage (right axis) and the number of articles (left axis), it is evident that more than 70% of the published articles within the top 10 journals are issued in Journal of Cleaner Production, Sustainability, Business Strategy and the Environment.

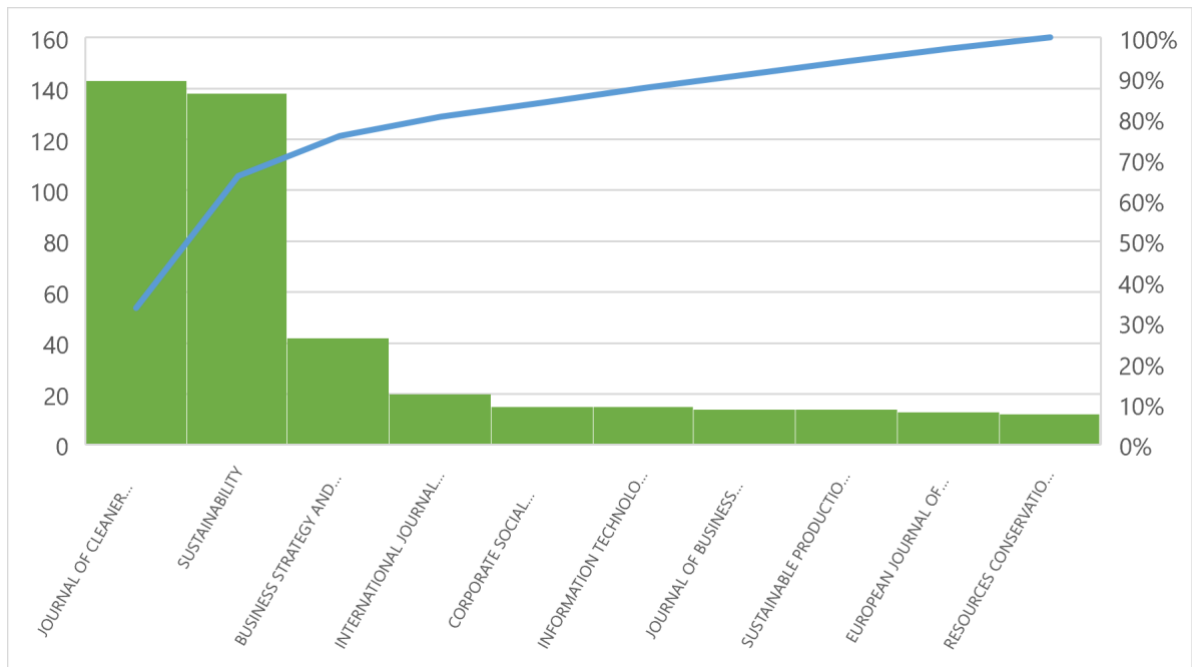**Figure 8** Most relevant sources

Figure 9 demonstrates the dynamic of the top nine journals between the years 2009 and 2019. It appears that the research devoted to the topic is growing in prestige publishers, and the Journal of Sustainability as well as Cleaner Production covers the more overtimes. Moreover, the journal of Sustainability has surpassed the Cleaner Production after the year of 2017.
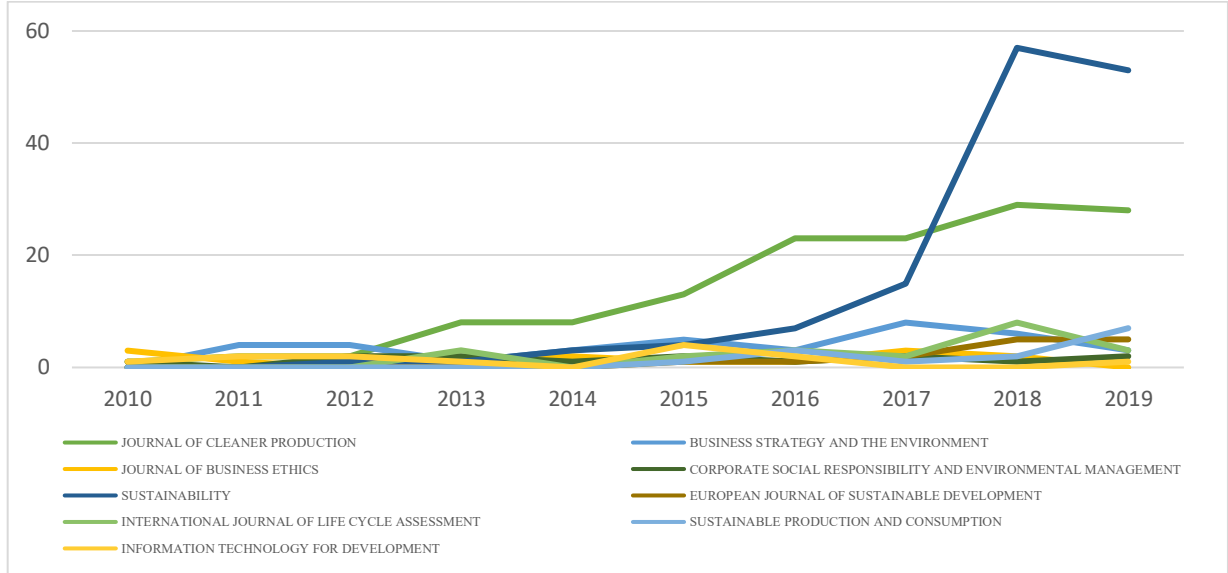
Figure 9 Source dynamic

The result of the initial analysis demonstrated the flow of the trend on the utilized keywords. The following subsections are devoted to bibliometric, network analysis, and content analysis aiming to draw co-occurrence relationships for various elements such as sources, authors, and papers as well as clustering cited documents. The database of Web of Science is structured to export records to perform such analysis. For the mentioned subsections, different open source tools are used; for instance, BibExcel, HistCite, CiteSpace, Bibliometrix R package, Gephi, Pajek, and VOSviewer.

4.1.1 Bibliometric analysis

In the following stage, the bibliometric analysis is carried out using the databases combined during the previous steps. The leading software on this process is BibExcel due to convenience of importing data from Web of Science, and compatibility to several tools to conduct extensive and in-depth data analysis. At first, the data was systematically organized, and a number of different OUT-files were created. The study began with accomplishing a primary analysis that investigated information on authors, documents, sources, and affiliations. Due to the complexity of BibExcel, a paper by Persson, Danell, and Schneider (2009) has been used as a manual.

As authors tend to focus on a particular field, identifying authors can lead to access focused articles with high impacts. Table 3 shows the top 20 authors as well as the top 20 authors by a fraction. In the first place by four articles and a fraction of 3.25, Ewa Ziemba is focused on Sustainable Information Society and ICT for Development. On second place, Sophie I.Hallstedt research on Sustainable Product Development and Eco-design. Furthermore, ultimately, Lorenz M. Hilty, with five articles on the third-place, studies ICT for Sustainability and Environmental Information Systems.

Table 3 Contribution of top 10 authors by the number of articles and fraction

Author	Record	Author	Record (fractionalized)
Chofreh A	7	Ziemba E	3.25
Goni F	7	Hallstedt S	2.33
Klemes J	7	Hilty L	2.33
Hilty L	5	Aluchna M	2.00
Mol A	5	Arnold M	2.00
Ahmed I	4	Chalemba L	2.00
Andreopoulou Z	4	Jnr B	2.00
Arai K	4	Lau K	2.00
Asselin A	4	Olson E	2.00
Canals L	4	Sanchez M	2.00
Hallstedt S	4	Vermeulen W	1.92
Ingram V	4	Mol A	1.90
Kern E	4	Kim S	1.83
Luthra S	4	Sangle S	1.83
Moreno O	4	Chofreh A	1.53
Mkumura H	4	Goni F	1.53
Swarr T	4	Klemes J	1.53
Tan R	4	Bibri S	1.50
Vermeulen W	4	Degato D	1.50
Ziemba E	4	Egels-zanden N	1.50

One common way to identify the distribution of knowledge is geographical analysis. The geographical analysis (Figure 10) enables us to determine the pioneers and incumbents in the topic. The distribution of the knowledge across the globe was systematized and is presented in Table 4; UK, USA, Italy, Spain, and Germany are top 5 pioneers in the fields with the most scientific production.

Table 4 Top 10 countries' scientific production (values represent the total fraction of 109 countries)

Country	Record	Percentage
UK	144	11.5%
USA	136	10.9%
Italy	114	9.1%
Spain	94	7.5%
Germany	89	7.1%
Netherlands	79	6.3%
Australia	76	6.1%
China	75	6%
Sweden	71	5.7%
India	56	4.5%
France	50	4%
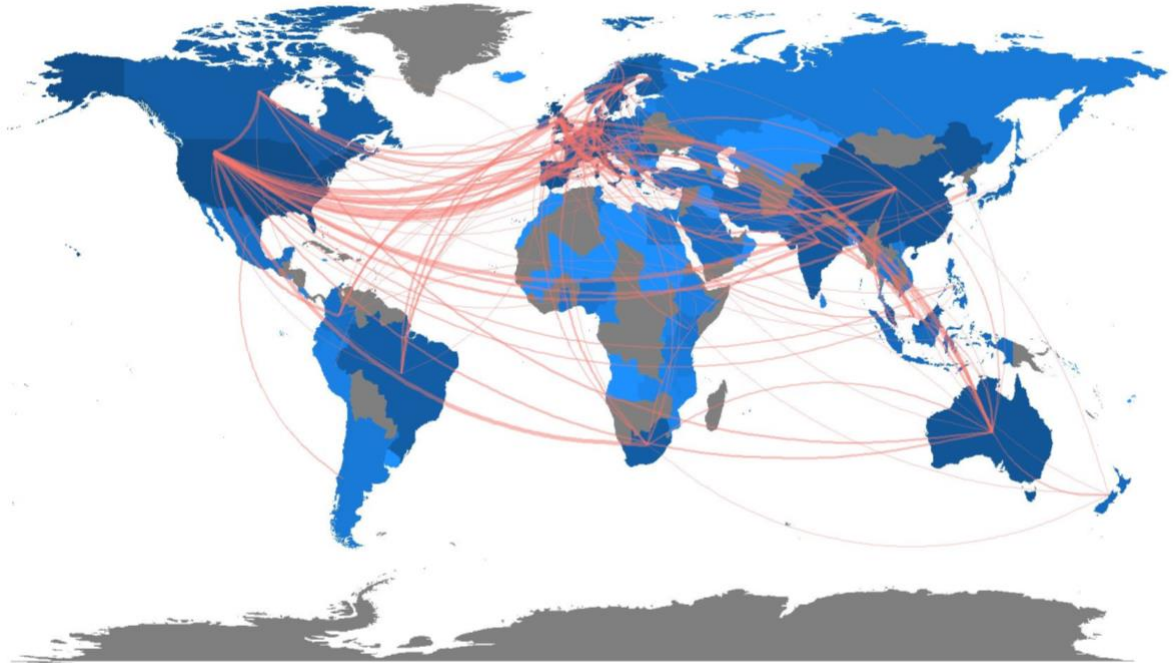
Figure 10 Country collaboration map

As seen in Table 4, most of the papers come from the United Kingdom, USA, and Italy, with approximately 32%. However, outcomes of research centers (Table 5) depicts that the KTH Royal Institute of Technology of Sweden, Lund University of Sweden, and the University of Pretoria of South Africa are the most productive affiliations.

Table 5 Institutions' production

Institution	Record	Percentage
KTH Royal Institute of Technology	14	1.1
Lund University	12	1
University of Pretoria	11	0.9
The University of Queensland	11	0.9
Utrecht University	11	0.9
Wageningen University & Research	11	0.9
University of São Paulo	10	0.8
Swiss Federal Institute of Technology	9	0.7
University of Amsterdam	9	0.7
Aalto University	8	0.6

Finally, the data were reviewed to investigate the keywords and authors' keywords. Identification of prime keywords can help to validate the initial keywords that are used to begin the study. Analysis of keywords can facilitate the classification of authors' keywords and determine new ones if needed. Therefore, the information has been evaluated using the frequency tools, and the list of the top 10 keywords are presented in Table 6. The most repeated words are "Sustainability", "Sustainable Development", "ICT" and "value chain".

Table 6 Keyword's frequency

Words	Occurrences
Sustainability	275
Sustainable Development	116
ICT	74
Value Chain	73
Business Strategy	47
Corporate Social Responsibility	43
Life Cycle Assessment	36
Supply Chain	29
Innovation	28
Circular Economy	27

Exploration of density (Appendix A. 2) of keywords is a way to observe the popularity of keywords among scholars. For instance, as shown in Table 6, the terminology of "Sustainability" is favored in the collected data sample. However, Figure 11 illustrates, namely, "Sustainability" has gained noticeable attraction just after 2014, and it is proliferating. Additionally, there is a steady growth in the usage of ICT and Sustainable Development.
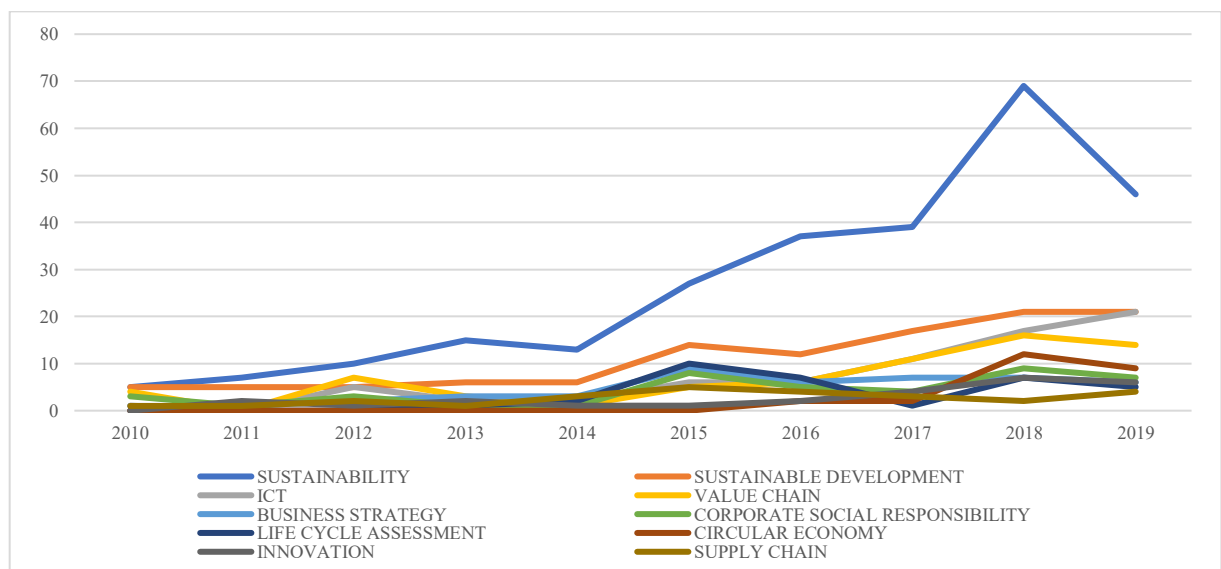
Figure 11 Word Dynamics

4.1.2 Network analysis

In the following part of the work, network analysis of the data sample is studied using the visualization tools. Network analysis allows researchers to study the relationship of actors and further analysis the structure emerged from the recurrence of actors' relation. In other words, it aids in visualizing the relationship between phenomena and understand their associations.

Network analysis is done on the occurrence and relation of keywords. Figure 12 demonstrates the co-occurrence of keywords; it consists of six clusters, Sustainability, Innovation, Sustainable Development, Value Chain, Social Sustainability, and governance. As a general analysis, there is a secure connection between Sustainability and Sustainable Development with the Value Chain. It appears that Sustainability and Sustainable Development clusters focus on practices such as business strategy, ICT, and Business Model. In contract, the Value chain address the Lifecycle Assessment, Circular Economy, and Innovation. The results of this network may not be surprising to anyone who studies Sustainability, yet it is needed for further analysis.
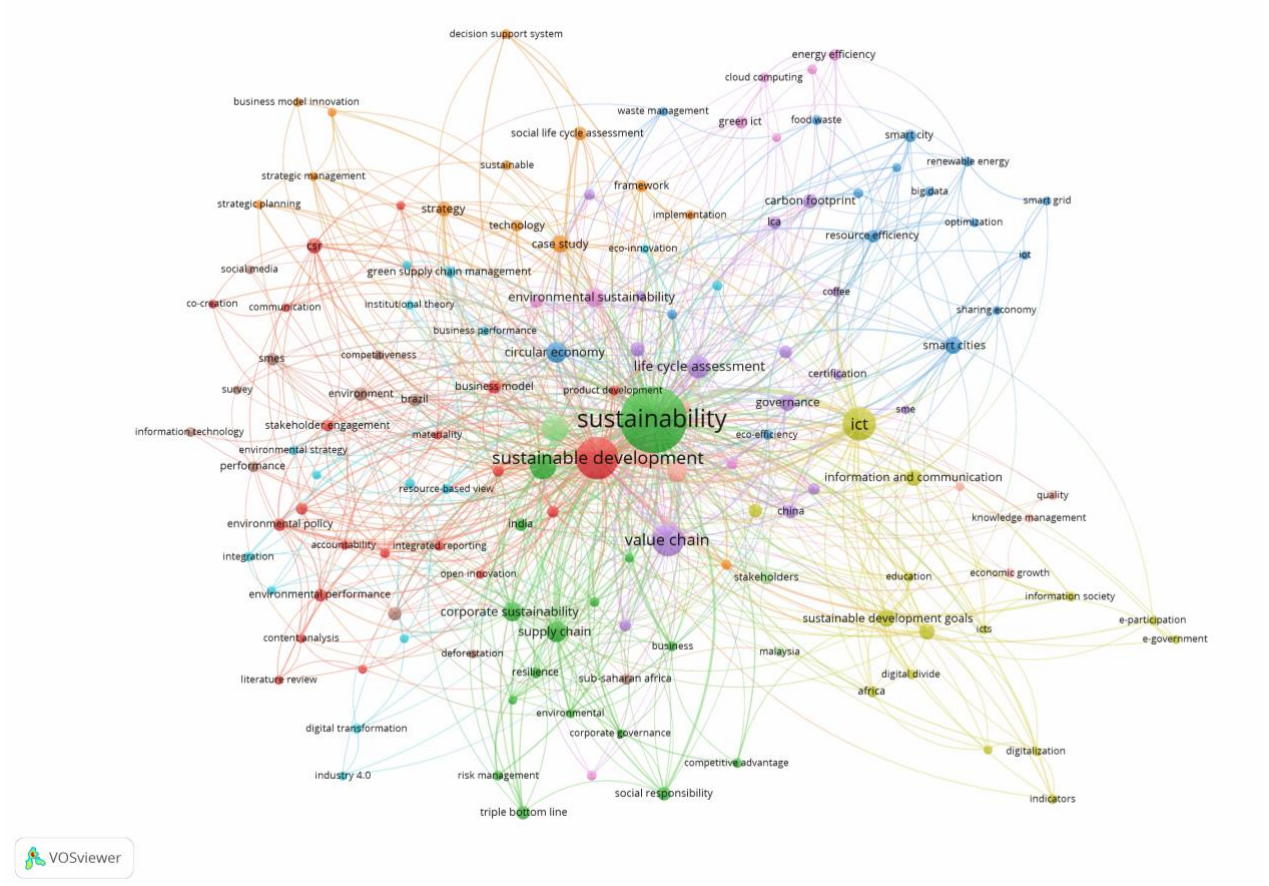
Figure 12 Authors' keyword co-occurrence network

Following the authors' keyword analysis, the network analysis of authors (Figure 13) is divided into seven clusters. The level of contribution of the scholars is demonstrated by the size of nodes displaying authors' names. Each cluster is color-coded to represent a specific topic, and the network between them illustrates the collaboration between each cluster and node. For instance, in cluster red, Porter has been cited the most by other authors within the data set, and there is a direct collaboration between cluster red to green.
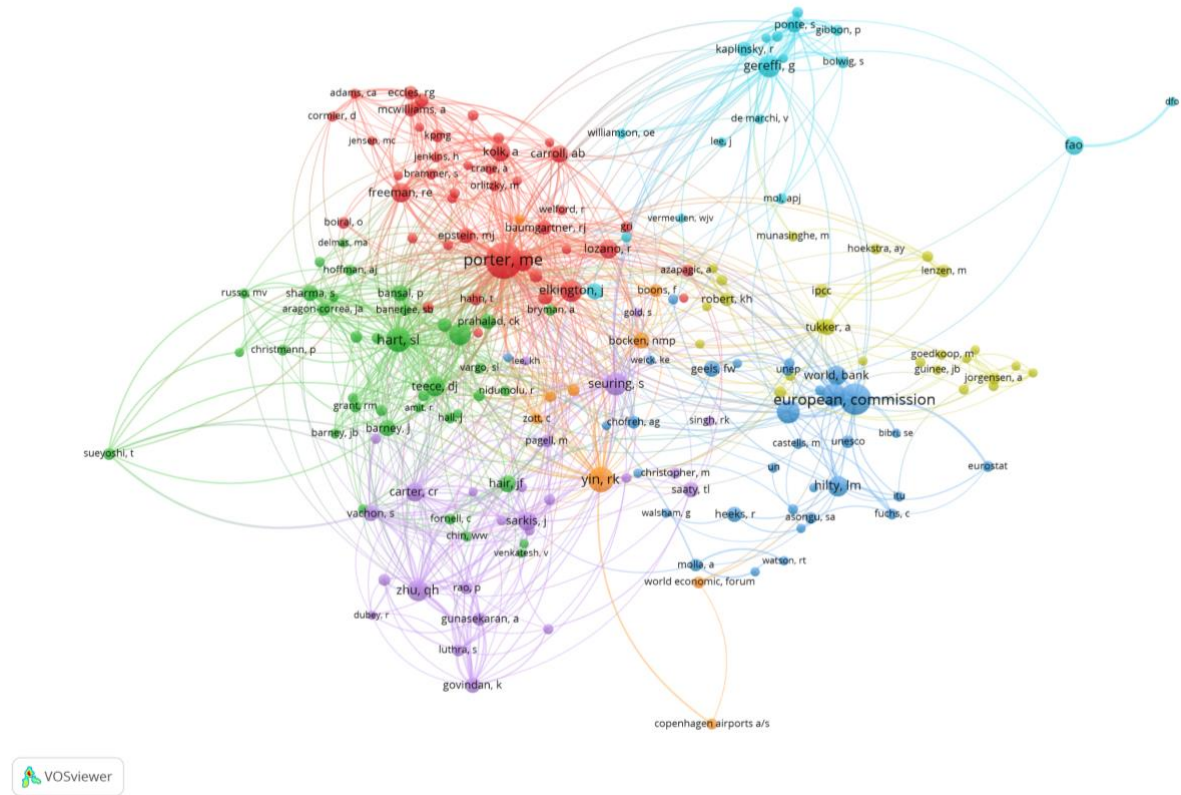
Figure 13 Network of authors

Such a complex network can be tiresome to follow, especially in a static format. Thus, a histography of the authors is made to represent the connection between authors as well as demonstrating the historical direction authors' network (Appendix A. 3). It worth mentioning that the data set used in this histograph is within the time-span of 2010 to 2020; thus, it does not represent the authors' work before the year 2010. Figure 14 shows the beginning of the contribution of the author on the topic and density of the focus. For instance, Hilty started its research on the ICT for Sustainability firmly from 2015 until 2018.
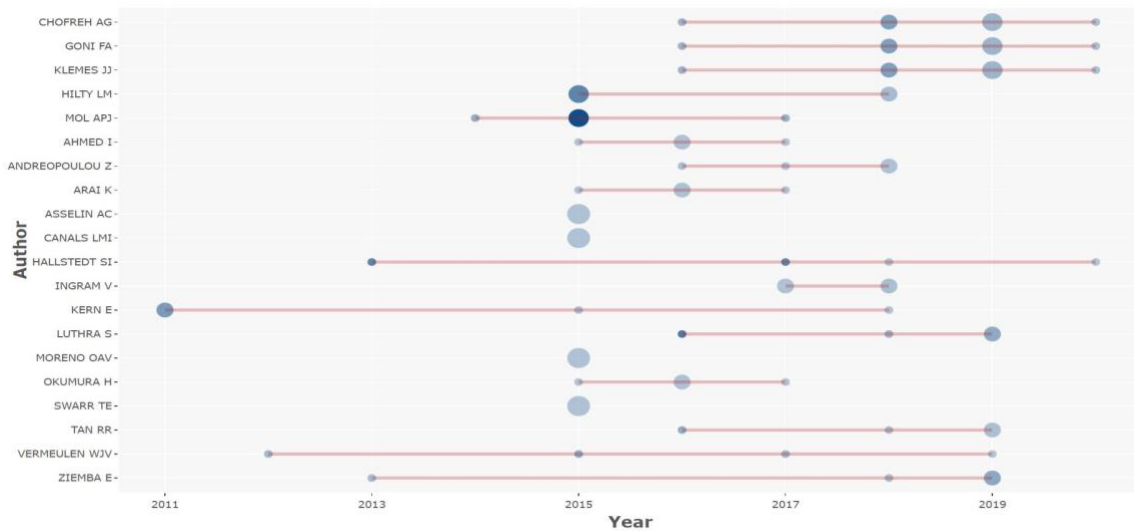
Figure 14 Authors' production over time

Furthermore, the source network analysis (Figure 15) of the data sample demonstrates three clusters. The green cluster with a high index impact is centralized on sustainable development in various industries. Similar to the authors' cluster, the journals are clustered by their internal citation, which means that the network illustrates the relationship between journals dependent on their internal citation within our data set. For example, the journal of Cleaner Production is the most-cited journal among all journals as well as in cluster green. Furthermore, it appears that the cluster red is the dominant one; the journal of Cleaner Production is still the center of the network.
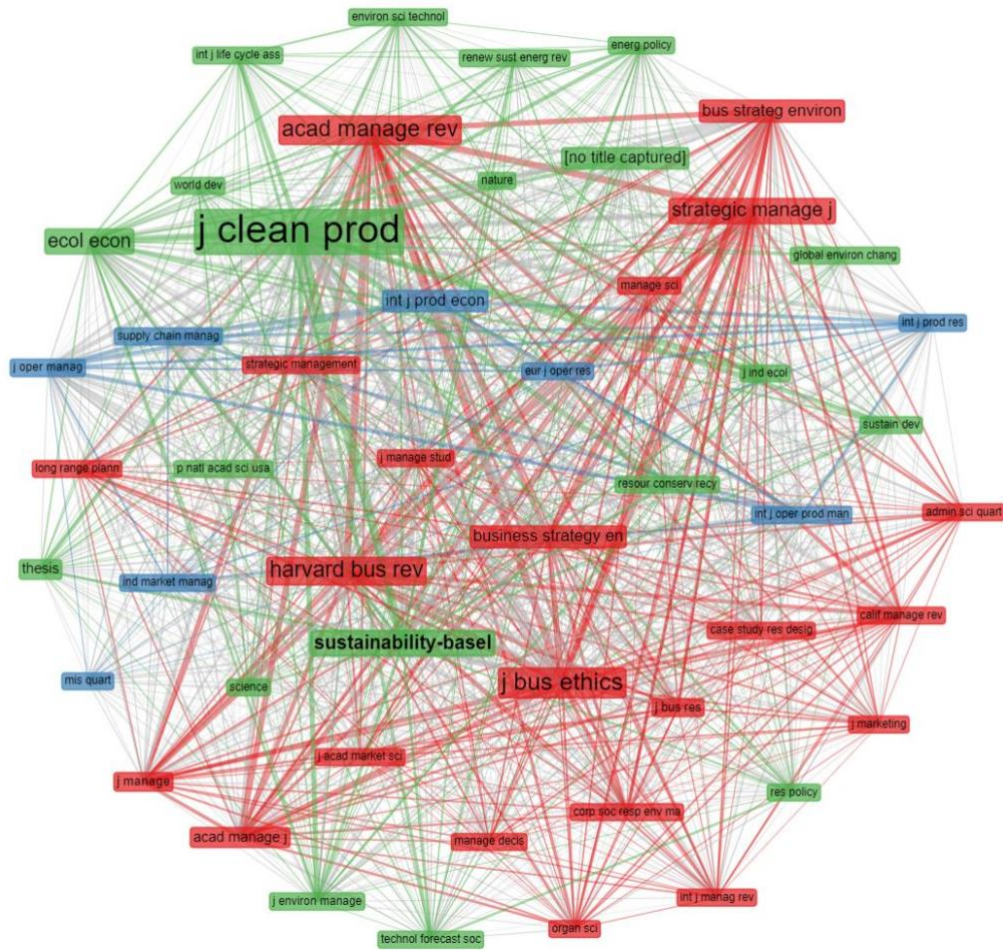
Figure 15 Network of Journals

Collectively, the results of the last three networks have been employed to create a three-fields plot to depict the relation and structure between journals, keywords, and authors. Three-fields plot can provide an overview of clustering and its associated documents and authors. According to Figure 16, it appears that Hilty is focused on sustainability Development and ICT. Also, he tends to publish his results on the Journal of Sustainability.
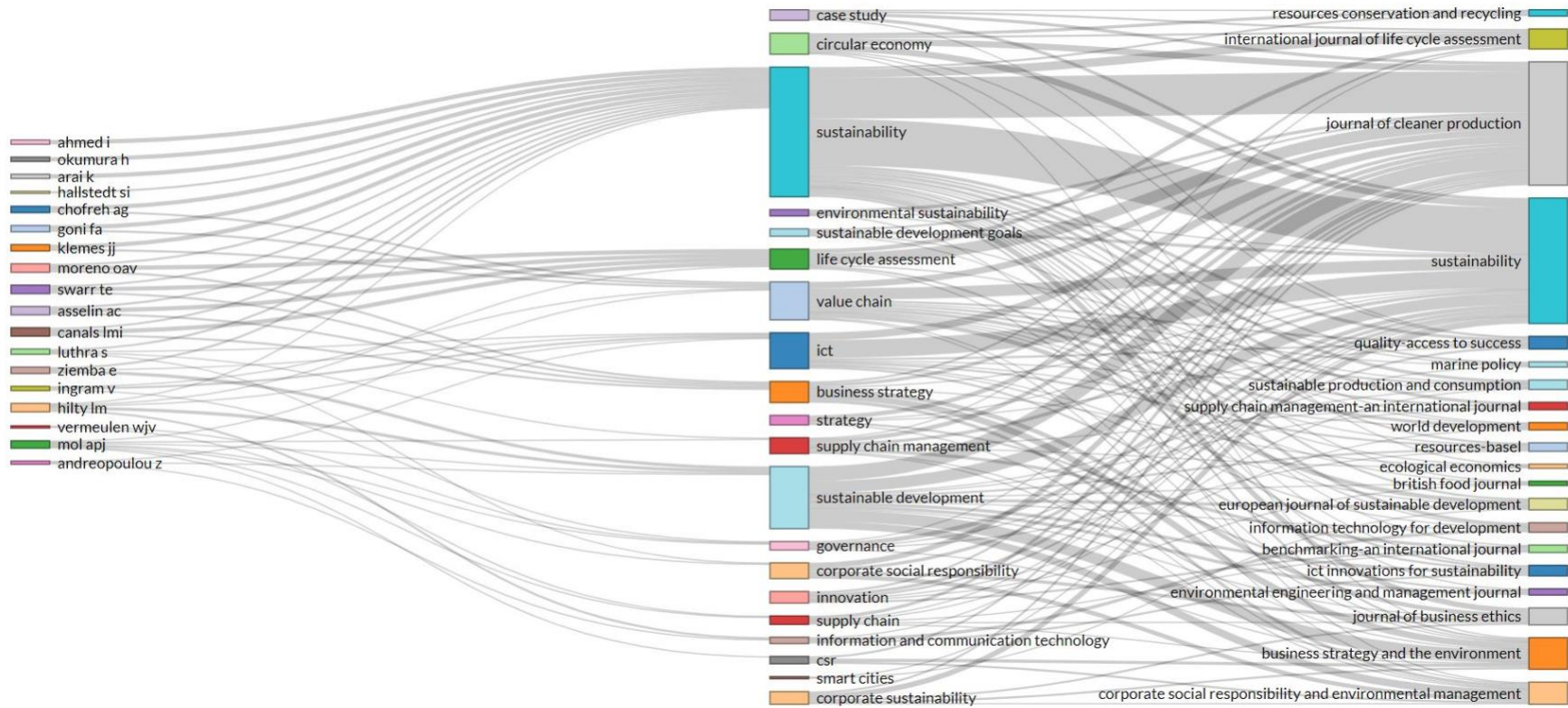
Figure 16 Author-keyword-source network

4.1.3 Content analysis

Ultimately, the data sample is converted to a .net file to feed to Gephi. The purpose is to investigate the patterns, trends, and structure of the data sample in more detail. Furthermore, Gephi can identify outliers and cluster the data sample (Gephi, 2018). The primary analysis shows that only 642 articles out of 1288 cited each other. The remaining nodes are connected through 1148 different links and explore the evolution of the topic over time.

The dataset has been classified by abstract content and analyzed by modularity statistics of 1.0, which resulted in the classification of records into eight clusters (Figure 17). Represented clusters are color-coded, and as it is visualized the cluster number 6 has the most considerable number of articles by 21,86%.

■	6	(21.86%)
■	2	(14.72%)
■	0	(14.37%)
■	4	(13.59%)
■	3	(13.24%)
■	5	(12.54%)
■	1	(9.49%)
■	7	(0.17%)
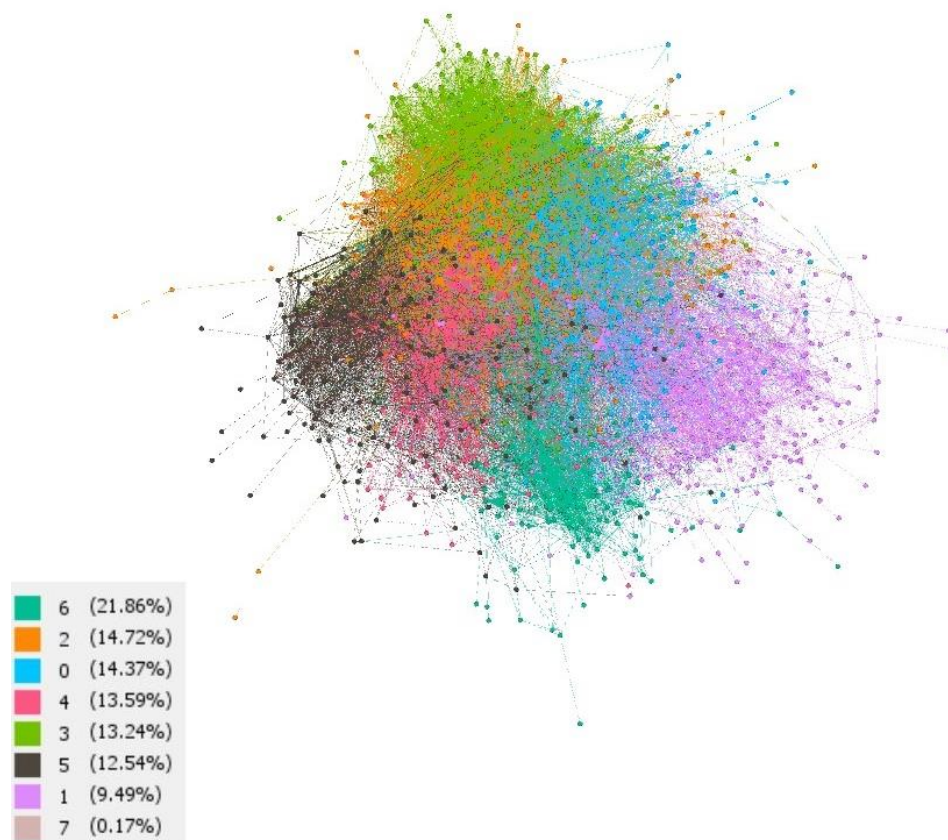
Figure 17 Map of the nodes in eight clusters

The dataset and its clusters require further analysis to find the most appropriate cluster for the topic of this study. The dataset and clusters have been investigated, and since the clusters are based on the abstract, the most cited articles on each cluster with a summary of abstracted in generated and only four clusters (Figure 18) are related to the topic. The list below depicts the four relevant clusters with its focus and highly cited articles, which will be utilized in the literature review section. It worth mentioning that bibliometric analysis can filter out new articles that had not yet a chance to gain attraction. In this case, reverse snowball methodology is undertaken.

| Cluster 2 (Environmental Performace)	Cluster 6 (Strategy)	Cluster 4 (Circular Economy)	Cluster 0 (Green Competitiveness)
• Albertini, Elisabeth (2017) • Papadas, Karolos-Konstantinos (2017) • Gabler, Colin B (2017) • Bui, Binh (2017) • Evans, Steve (2017)	• Veleva, Vesela (2018) • Johannsdottir, Lara (2018) • Upward, Antony (2016) • Sullivan, Kieran (2018) • Borland, Helen (2016)	• Sousa-Zomer, Thayla T (2018) • Veleva, Vesela (2018) • Cristoni, Nicol (2018) • Cosenz, Federico (2018) • Sajjad, Aymen (2018)	• McDougall, Natalie (2019) • Fernando, Yudi (2019) • Ukko, Juhani (2019) • Pham, Hai (2019) • Caldera, H T S (2019)

Figure 18 The map of clusters and top-ranked articles

Ultimately, the articles of each cluster are studied to identify the most influential ones and select the most relevant studies to the question. Most of the articles are used throughout this study and provided the ability to develop a better understanding of the research topic and flow of the existing researches. The rest are exploited as a base to create a holistic view of the importance of the topic and its development process as well as relevant topics that are used in the next chapter. A brief summary of the clusters are represented below (Table 7) was used throughout this study to develop a better understanding of the research topic and flow of the existing researches.

Table 7 Summary of Modularity classes

	Author (year)	Research focus	Method	Sustainability dimensions	Result
Cluster 2 (Environmental Performace)	Albertini (2017)	Content analysis of 151 articles related to measurement and management of environmental performance between the years of 1992 and 2014. The study resulted in the creation of four prime patterns of Strategic environmental management and reporting, Increasing awareness of the environmental issue, Environmental management and institutional pressures, and The relationship between environmental management and financial performance.	Inductive Typology	Environmental	Four themes of strategic environmental management
	Papadas *et al.* (2017)	Introduce the novel concept of green marketing and its three distinct dimensions (strategic, tactical, and internal). The study examined the reliability and validity of four studies.	Survey Interview	Economic, Environmental and Social	Three dimensions of green marketing
	Gabler *et al.* (2017)	Studies the barriers and bridges to embed environmental sustainability into business strategy. The study addressed the issue by representing the components and the flow of the environmentally sustainable business plan. The elements consist of: "unify the organizational vision, create visible leadership, address multiple stakeholders, focus on innovation, communicate the message, and implement the strategy."	Inductive Case study	Environmental	Six components of Sustainable business plan
	Bui *et al.* (2017)	The study interviewed 38 individuals from 30 organizations regarding their use of carbon management control systems. The research determined various internal and external use as well as types of carbon controls. The result of the research revealed that improving performance requires the integration of costs effectively into strategic and operational levels.	Survey Interview	Environmental	A framework to develop a carbon management system
	Evans *et al.* (2017)	Enhancing the understanding of the theoretical foundation of the field of sustainable business model innovations in order to gain more appropriate economic, environmental, and social performance within firms.	Literature review	Economic, Environmental and Social	Five propositions
Cluster 6 (Strategy)	Johannsdottir *et al.* (2018)	Understanding the way nordic insurance companies integrate environmental sustainability into their existing core business strategy. The study presents a framework consisting of five steps of commitment,	Case study Interview	Environmental	An incorporation framework

		configuration, core business, communication, and continuous improvement.			
	Upward *et al.* (2016)	Proposes a framework of a strongly sustainable business model based on a review of works of literature to identify weaknesses and essential relationships.	Literature review	Economic, Environmental and Social	A business model framework
	Sullivan *et al.* (2018)	Using Leximancer software to examine the relationship between industry ecology, business strategy, and sustainable development. The study showed that there is a connection between industry ecology principles and strategic management that can inline the organization with at least three sustainable development goals and provide competitive advantages.	Literature review	Environmental	A baseline of strategic benefits of industrial ecology principles
	Borland *et al.* (2016)	Propose a framework better to understand the relationship between ecological sustainability and business strategy.	Interview	Environmental	Ecological sustainability frameworks
Cluster 4 (Circular Economy)	Sousa-Zomer *et al.* (2018)	The paper examined the challenges and issues associated with adaptation of circular business strategy among manufacturers as well as common ways to face them.	Literature review Interview Observation	Economic, Environmental and Social	Theoretical and practical implications
	Veleva *et al.* (2018)	The paper examined how small entrepreneurial companies can help large organizations to cope with barriers and challenges of implementing the circular economy within their business strategy.	Secondary data analysis and Interview	Economic, Environmental and Social	A Circular Economy framework
	Cristoni *et al.* (2018)	Studies the unawareness of companies regarding best circular economy practices in the value chain process and identifies where in the value chain is the most appropriate area to integrate circular economy.	Survey	Economic, Environmental and Social	A Circular business strategy framework
	Cosenz *et al.* (2018)	The study attempted to combine dynamic system modeling with a business model to design a new tool of dynamic business model.	Case study	Economic	A dynamic business model framework
	Sajjad *et al.* (2018)	Examined the adoption of sustainable practices by the hotel industry in Pakistan. The results suggest that sustainability should be integrated into the business strategy.	Case study	Social and environmental	Theoretical and practical implications
Cluster 0 (Green	McDougall *et al.* (2019)	Utilize the four natural-resource based view to examine the concept of sustainability as a	Interview	Social and environmental	Theoretical implications

		competitive resource in the agricultural industry in the UK.				
	Fernando, Yudi (2019)	The article addresses the eco-innovation practice among 95 Malaysian companies that use green technology and its impact on service innovation business sustainability.	Survey	Environmental	Conceptual Research Framework
	Ukko *et al.* (2019)	Authors investigate the relationship between the sustainable strategy, digital business strategy, and financial performance. The study showed that sustainable strategy advocates and aid the connection between other phenomena.	Survey	Economic	Theoretical implications
	Pham *et al.* (2019)	Studied the linkage between sustainable practices, sustainability performance, and leadership competencies.	Survey	Economic, Environmental and Social	Theoretical and practical implications
	Caldera *et al.* (2019)	The article examines the potential benefits of employing lean and green thinking in the success of the implementation of sustainable practices.	Interview	Economic	Theoretical implications

5   Integration of sustainable development into business strategy

This chapter explored the concepts and theories related to the incorporation of sustainable development into the core business strategy. First, the concept of a sustainable business model, its elements and archetypes are explained. Then, a brief background of business strategy and its relation to sustainable development is provided. A review of available frameworks aiming to provide an integration process of sustainable development is presented. Ultimately, drivers and barriers of embedding sustainability into the business strategy are provided.

5.1   Sustainable Business Model

The sustainable development path of each company requires to reflect on its internal and external environment. Companies need to identify their objectives and values in order to have long-lasting success. These objectives and values require to be communicated well, embraced, and supported across the whole organization. Therefore, the companies' business model (BM) and their potential innovations should be explained explicitly as they can act as a complementary element to the business strategy. (Oertwig *et al.*, 2017)

Various components of a company collaborate to devise products or services, as well as define how the company operates. These combinations of an organization modules are used to design a business model (Figure 19) which would lead to value creation and capturing (Johnson *et al.*, 2008), value delivery (Magretta, 2002), and maintaining and supporting value proposition (Mitchell *et al.*, 2003; Johnson *et al.*, 2008; Osterwalder *et al.*, 2011).

Value proposition	Value creation & delivery	Value capture
1. Product/ service, 2. Customer segments and relationships, 3. Value for customer, society, and environment *What value is provided and to whom?*	4. Activities, 5. Resources, 6. Distribution channels, 7. Partners and suppliers, 8. Technology and product features *How is value provided?*	9. Cost structure & revenue streams, 10. Value capture for key actors incl. environment & society 11. Growth strategy/ ethos *How does the company make money and capture other forms of value?*

Figure 19 Value mapping for sustainable business thinking (Bocken *et al.*, 2015)

Furthermore, value creation has the potential to build competitive advantage and customer relationships (Wirtz, 2011). Figure 20 demonstrates several components of business model innovation (BMI).

Combination of elements of an enterprise → Creation of products and services → Generation of value for customers and partners → Differentiation from competitors & strenghthening of customer relationships → Achievement of competitive advantage and absorption of value
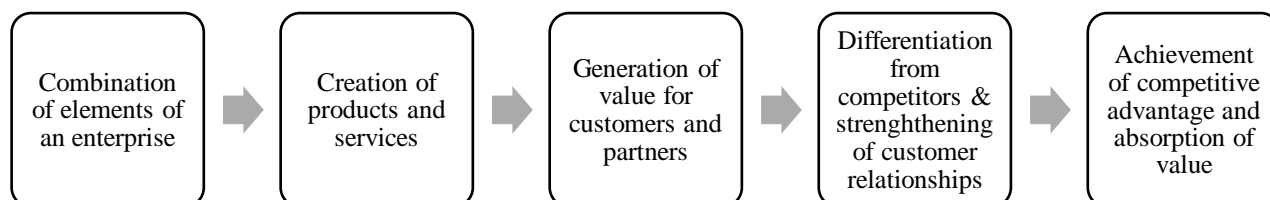
Figure 20 Components of BMI (Schallmo, 2013)

The definition of the term value differs depending on its context (De Reuver *et al.*, 2013). For example, Adam Smith introduced the word 'exchange value,' which is commonly used in our everyday business practices (Ueda *et al.*, 2009). Recently, the term 'value-in-use' is extensively in the manufacturing industry as the production is moving towards customer centralized business models (Vargo *et al.*, 2008). Moreover, Porter (2019) proposed a 'shared value' concept, which suggests that companies should also address value for society when creating economic value.

The value should not be seen only through the lens of economic. Looking at different angles - sociology, ecology, and psychology - can provide objective and subjective perspectives to our value, such as meaningfulness, sense of belonging, and eco-footprint (Den Ouden, 2011). If companies aim to join the movement of sustainability, they need to consider social and environmental goals in their value creation logic (Schaltegger *et al.*, 2011). Social entrepreneurs seek to bring social value while creating economic value (Acs *et al.*, 2013); whereas, eco-entrepreneurs focus on the environmental issues in addition to economic value (Schaltegger *et al.*, 2011). Thus, sustainable value can be perceived as an accumulation of economic, social, and environmental values.

Customers demand innovative products and services while losing efficiency is not an option; thus, the company's need to innovate in order to sustain in the market. As a result, a new field of BMI has been born to provide frameworks and guidelines so companies would be able to obtain long-term competitive advantage (Oertwig *et al.*, 2017). Sustainable business model (Figure 21) can be an excellent tool for companies to cope with challenges such as moving towards sustainable value creation.

Value proposition	Value creation & delivery	Value capture
The concept of 'waste' is eliminated by turning existing waste streams into useful and valuable input to other production.	Activities and partnerships to eliminate life cycle waste, close material loops and make best use of under-utilised capacity. Introduction of new partnerships (e.g. recycling firms), potentially across industries, to capture and transfer waste streams.	Economic and environmental costs are reduced through reusing material, and turning waste into value. Positive contribution to society and environment through reduced footprint, reduced waste and reduced virgin materials use.

Figure 21 Sustainable business model 'Create value from 'waste'' (Bocken *et al.*, 2014)

Additionally, Bocken et al. (2014) designed a series of archetypes (Figure 22) of a sustainable business model that can be used to alter BMI towards sustainability. This archetype is categorized into technological, social, and organizational clusters which aim to integrate sustainability into existing business model.
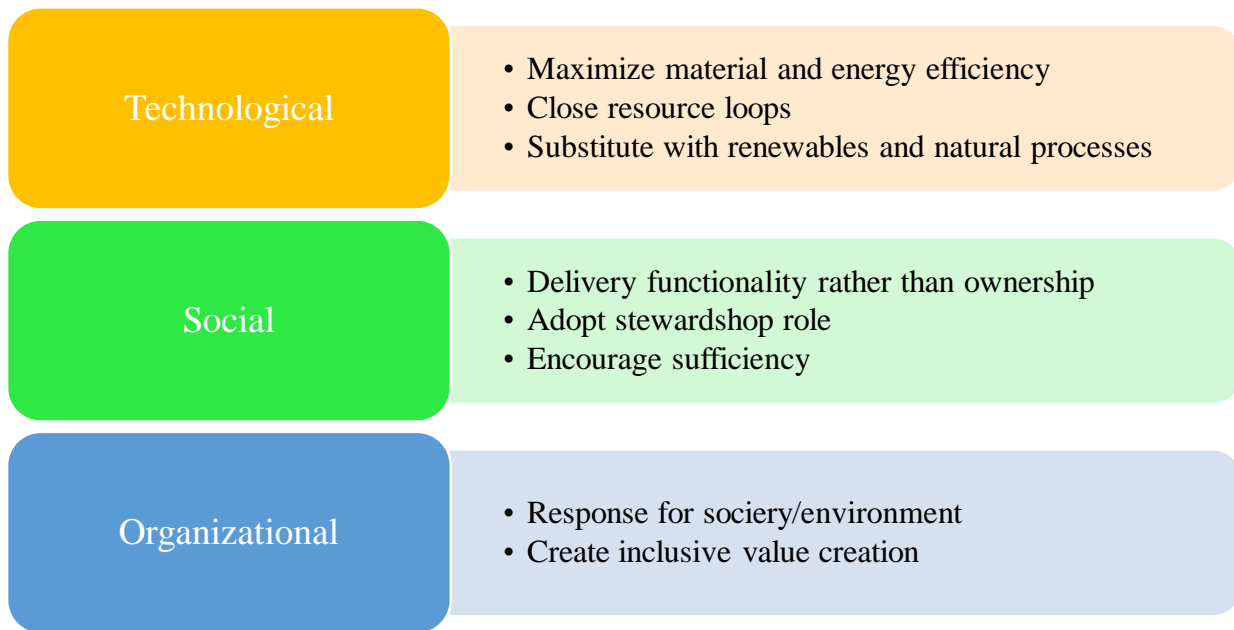
Figure 22 Sustainable Business Model archetypes (Bocken *et al.*, 2014)

5.2 Business Strategy

Every company defines a strategy that later will be centralized in all decision makings within the organization, such as product/market scope, competitive advantage, and synergy (Ansoff, 1987).

Mintzberg et al. define strategy as ''a pattern in a flow of decisions''. They further classified strategy into two main types, deliberate and emerging. The deliberate strategy is the one that the company intended and planned to implement, and the emerging strategy is what has actually been carried out. Comparing these two strategies demonstrated a pattern developed in the absence of an intended/deliberate strategy (Mintzberg *et al.*, 1985). They have identified eight types of strategies, as follows:

- Planned: Here, a precise intention plan by central leadership is formulated and articulated. This plan is supported by formal control to assure the implementation without any interruption. Primary associated with formal plans and referred to deliberate strategy.
- Entrepreneurial: An intentional plan by a single leader is formulated but not necessarily articulated; thus, there is room for modification. The plan is located in a protected

environment and under the leader control and usually associated with central vision and quite a deliberate strategy.

- Ideology: A collective perspective of all possible intervenient. In essence, it is encouraging and, to some degree, unchangeable. It is usually controlled through doctrinarians and/or socialization. Creation of shared beliefs, and it is quite deliberate.

- Umbrella: Defined strategic limits and targets by leadership, which follows the organization's policy, and others need to respond accordingly. Driven from limits and is partially deliberate, practically emerging, and deliberately emerging.

- Process: Agents are responsible for the content of the strategy, and the leader leads the strategy process, such as hiring and structure. Develop in the process, and as an umbrella, it is partially deliberate, practically emerging, and deliberately emerging.

- Disconnected: There is no pattern in actors' behaviors and are weakly linked by collective intentions. It is formed in enclaves and is organizationally emerging.

- Consensus: In the absence of central intentions, actors approach each other's through mutual adjustments and become dominant. It is driven in consensus, and the strategy is highly emerging.

- Imposed: The pattern is dictated by the environment directly or indirectly by limitation of choices or predictions. An external environment drives it, and the strategy is emerging one despite the fact that it will be internalized and done deliberately.

As it is evident, strategies can be underpinned by deliberate and emerging elements, and it can be challenging to recognize an emerging from deliberate strategy (Mintzberg *et al.*, 1985). For instance, the intention of executives to plan, formulate, and implement a strategy will be a deliberate strategy if only no interruption nor change is performed. Thus, the external environment forces companies to rethink their strategy (Lenssen *et al.*, 2013). Consequently, emerging strategies will be developed from a range of decisions or patterns that will clarify more by time (Johnson *et al.*, 2014).

The concept of strategy has been studied quite extensively in the literature. The commonly aggreged business strategy pyramid (Figure 23) consists of three levels - strategic, tactical, and program – involving different hierarchic levels in the decision-making progress. The strategic level

is at the top of the pyramid and engages top managers in complicated and long-term policy decisions. The tactical level involves middle managers and experts to plan the execution of the policies, and the program or operational level involves production managers to execute them.
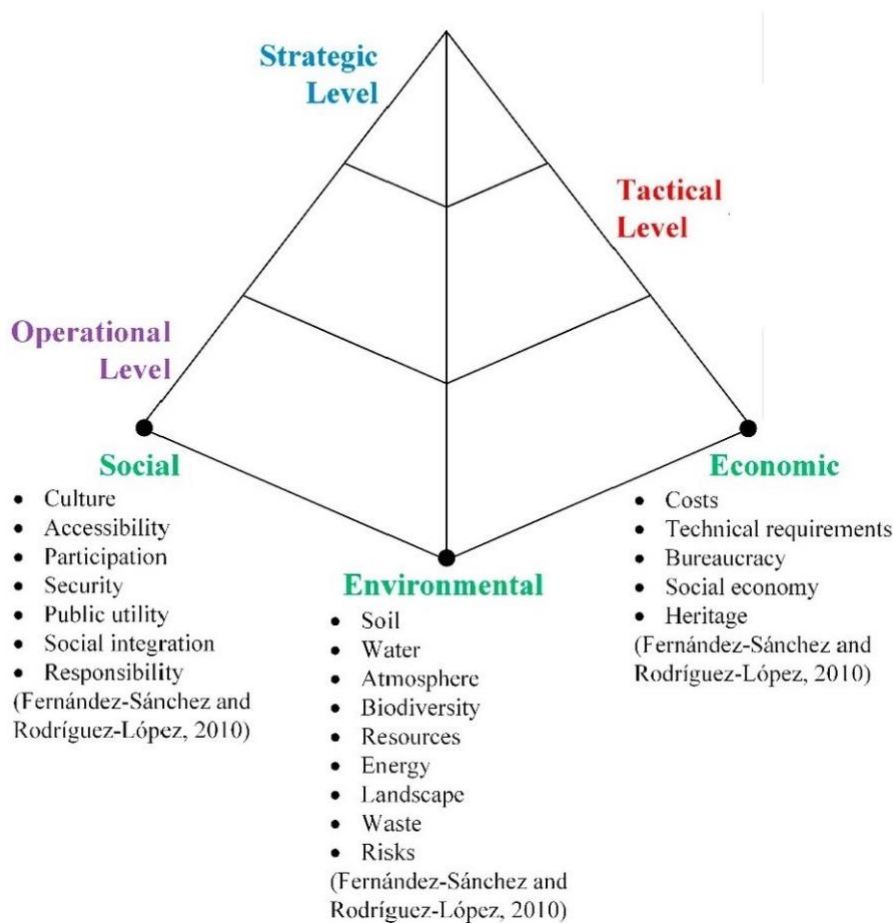
Figure 23 Sustainable decision making hierarchic (Chofreh *et al.*, 2018)

Companies need to have good leadership in order to develop and implement an appropriate strategy. Strategies are based on stakeholders' expectations and needs or based on the product or service characteristic. Thus, strategies may be along-term but should also be flexible and improve continuously. Porter argues that having a strategy and effective operation is vital for companies to perform their best in the competitive market. Additionally, he believes that companies reach their

best performance when strategies are accomplished innovatively and operations repetitively without change. (Porter, 1996)

Since the advent of strategy management, various definitions have been developed (Bracker, 1980; Jemison, 1981; Smircich *et al.*, 1985; Rumelt *et al.*, 1995; Bowman *et al.*, 2002; Nag *et al.*, 2007). However, it is commonly agreed that strategic managers are responsible for the formulation of a strategy that prepares the company to enter the competition and leadership and coordination with companies' employees.

Spulber (2009) believes that strategic managers should consciously improve and modify the strategy according to market needs. He also mentioned that the emerging strategies should be followed and adopted. Spulber introduced five main steps in the management strategy:

- Selecting companies' objectives and starting strategic analysis
- Initiate analysis of the external market condition and internal capability of the company. An excellent strategic manger could adjust the objectives of the company by given information about the potential market as well as its capacity.
- Achieving a competitive advantage over competitors by studying them and identifying elements that distinguish the company in the market.
- Formulating a competitive strategy that outweighs competitors' strategies by predicting their strategies.
- Designing an organizational structure that reflects the global strategy of the company.
- Sustainable Development, Leadership, and strategy

Leadership is fundamental for any successful implementation of strategy as leaders have the responsibility to plan and execute the organization strategy. A leader should identify and tailor demands based on the organization's capability and strategy to support the value proposition. (Zyngier *et al.*, 2006)

Companies need to address stakeholders' expectations while developing and implementing competitive advantages (António, 2003). Freeman (2010) defines stakeholders as "individuals or groups that are directly or indirectly affected by the organization's mission and objective". Bryson

(2004) believes that unable to meet stakeholders' expectations can decrease the performance of an organization. Identification and analysis of key stakeholders and their needs and expectation is vital for an organization in order to succeed. Understanding stakeholder's importance and required attention can help to centralize the effort needed to involve and engage them in the organization's project or program (Olander *et al.*, 2005). Power/interest matrix is one of the tools to distinguish stakeholders by taking into account the power and expectation they impose on the strategy of the company (Eden *et al.*, 2013).

Taking stakeholder's power and interest over the company strategy into account is essential; however, it should not impact the company in a way that it would lose its singularity. Freeman (Freeman, 2010, p. 44) argues that leaders should keep in mind some key question when designing a strategic management model to avoid sacrifice their characteristic:

- What is the strategic direction of the company?
- What are the ways to achieve the strategy?
- What resources and budgets are needed to implement the strategy?
- How to monitor and control the strategy?
- How to implement the strategy (structure and systems)?

In today's world, more and more companies are involving in raising awareness regarding sustainability; however, they tend to concentrate only on one of the triple bottom lines (Lenssen *et al.*, 2013). Involving organizations to deal with fast-growing needs for sustainable development can be dangerous as they attempt to comply with the guidelines in order to publish a sustainability report (Tregidga *et al.*, 2006).

Operating Corporate Sustainability Strategy (CSS) and integrate it into business context requires to have a promising strategy (Eccles *et al.*, 2012). Corporate Sustainability (CS) is generally perceived as a continuous process and not a specific objective to gain. Hence, CSS can be defined as a plan or a method that assists the development process toward a desired future with the incorporation of historical data and necessary customization (Bagheri *et al.*, 2007). As mentioned in section 5.1, the business strategy pyramid is very prominent, and generally, a basic strategy pyramid consists (Figure 24) of strategy at the top, tactical in the middle, and at the bottom

operational level. Thus, CSS can compromise five levels as follows: 1) Values, 2) Vision, 3) Mission, 4) Strategic Objective, 5) Actions & KPIs.

Figure 24 Corporate Sustainability Strategy Pyramid (Visions for Ireland, 2013)

Many scholars (Azapagic *et al.*, 2003; Bivona *et al.*, 2009) believe that CSS should be integrated into the company's business strategy and not perceived as an "add-on" feature to the product/service; thus, in order to successfully carry out sustainable activities, it should be perceived as a part of the core business.

The process of defining a business strategy and integrating CSS into the core business requires a clear definition of the strategic goals that easy to understand at every level of the organization. If strategic goals are not communicated adequately, then it is possible that there would be a misinterpretation between top, middle, and junior managers. Accordingly, Burke & Gaughran (2007) suggest following the SMART rule (Specific, Measurable, Attainable, Relevant/Realistic, and Time-bound/tangible) to set strategic objectives. Moreover, a transparent and well-defined CSS includes resilience and integrates risk reduction approaches (Galloway Jr *et al.*, 2010).

5.3 Corporate Sustainability Implementation

The effort to implement Corporate Sustainability and to integrate CS into the core business is proliferating. Currently, companies understand the enormous impacts and benefits of implementation of CS more than ever, and such motives are accelerating rather than slowing down (Ameer *et al.*, 2012; Barnett *et al.*, 2012). Braungard (2007) stated that the days for companies to profit from "low hanging fruits" are over, and the need to view sustainable strategies as a holistic approach is increasing. However, to anchor sustainability into the core business and the culture of an organization, outstanding efforts and long-term management must be made (Azapagic *et al.*, 2003).

Embedding CS deeply into a corporate strategy and business requires a proper understanding of its impact on the business, and convincing involved parties of its benefits, this level of integration and involvement of stakeholders carries immense challenges. Researchers in the CS community often quote that a 'one-fit-all' solution does not exist, and companies should tailor appropriate sustainable approaches (Van Marrewijk, 2003). However, telling companies to find their way without providing any standardized guidelines would not help them in achieving a successful implementation. A holistic CSS framework with "vision, commitment, and leadership" can significantly aid the companies on their journey (Azapagic *et al.*, 2003).

From the beginning of the advent of CSS, researchers attempted to provide guidelines and frameworks for companies to implement it. These guidelines substantially vary in scope and depth; thus, not all available guidelines are precise. In 2003, Azapagic designed a framework called "Corporate Sustainability Management System" (CSMS), which was inspired by the Plan-Do-Check-Act (PDCA) cycle from the ISO management systems. The framework (Figure 25) consists of five main steps: 1) Policy development, 2) Planning, 3) Implementation, 4) Communication, and 5) Review and corrective action. Afterward, each stage is further detailed to provide suggestive actions that companies can carry out in order to have a successful CS implementation. Azapagic (2003) claims that her framework is a tool to obtain long-term sustainable development fully, and companies need to commit to the framework to guarantee success.
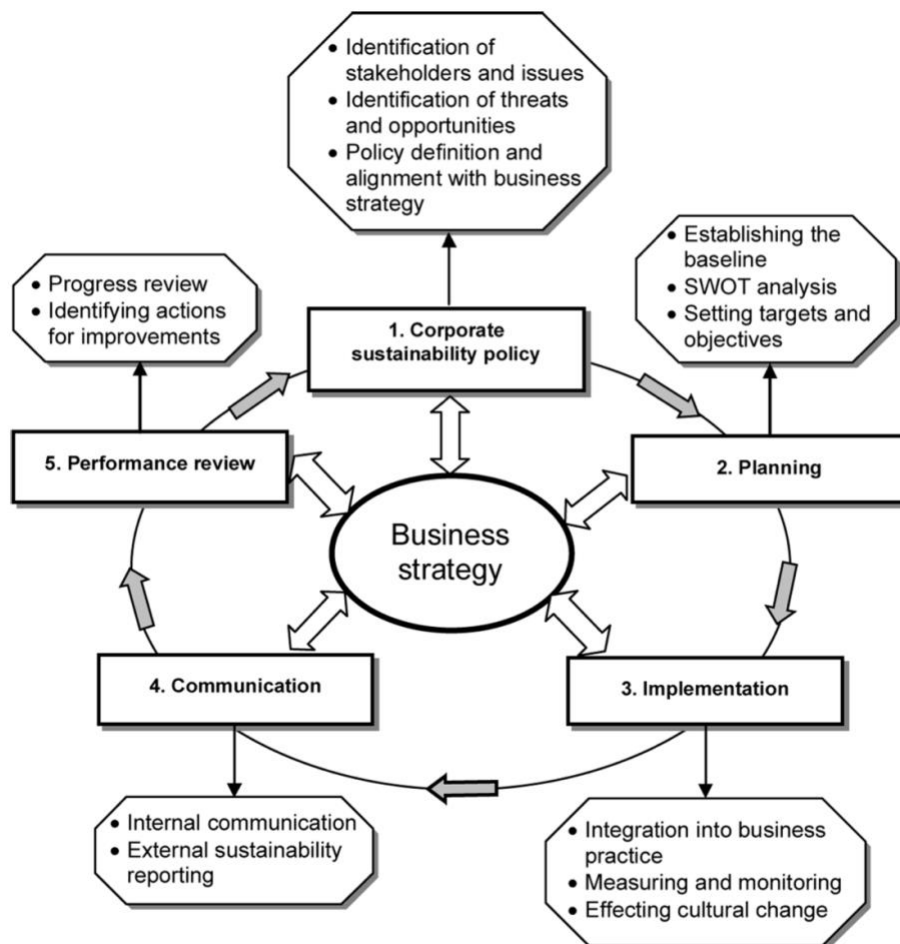
Figure 25 - Corporate Sustainability Management System (Azapagic, 2003)

A more detailed and strategic oriented framework is developed by Adams (2017) to assist the company to understand better the connection between value creation in strategic level and SD. This framework (Figure 26) is based on the multi-capital International Framework developed by the International Integrated Reporting Council (International Integrated Reporting Council, 2013), which does not refer to value creation as financial capital only. The results of the implementation of this framework showed that board members of companies coordinated their social activities, their strategy, and value creation. This framework (Figure 26) encourages companies to engage and understand the connection between SDGs by:

- Perceive external threats and opportunities
- Incorporate multi-capital approach

- Understand social and environmental value creation require a proper management system
- Help high-level involvement and integrated thinking by focusing on involvement and networking

The prime aim to develop such a framework was to increase the awareness of stakeholders of the impact of SD on value creation. The objective was to create a possibility for companies to identify and respond to SDG in order to integrate them into their business strategy and to report them. The framework emphasizes the effect of external threats and opportunities such as social, environmental, and economical on the company's strategical success. Furthermore, it assumes that harmonizing corporate strategy with SDGs creates transparency of the company's SD outcomes. Thus, it focuses on developing a report that would be able to communicate the value creation process clearly. It addresses:

- The SDGs advantages to stakeholders
- Maintenance and capturing value
- The impact of social and environmental to grow or decline value creation
- The need to have proper management of multiple capitals
- The linkage between trade-offs and the multiple capitals
- Increase the awareness of resource shortages
- The need to input a continues multi-capitals to obtain strategic objectives and value creation
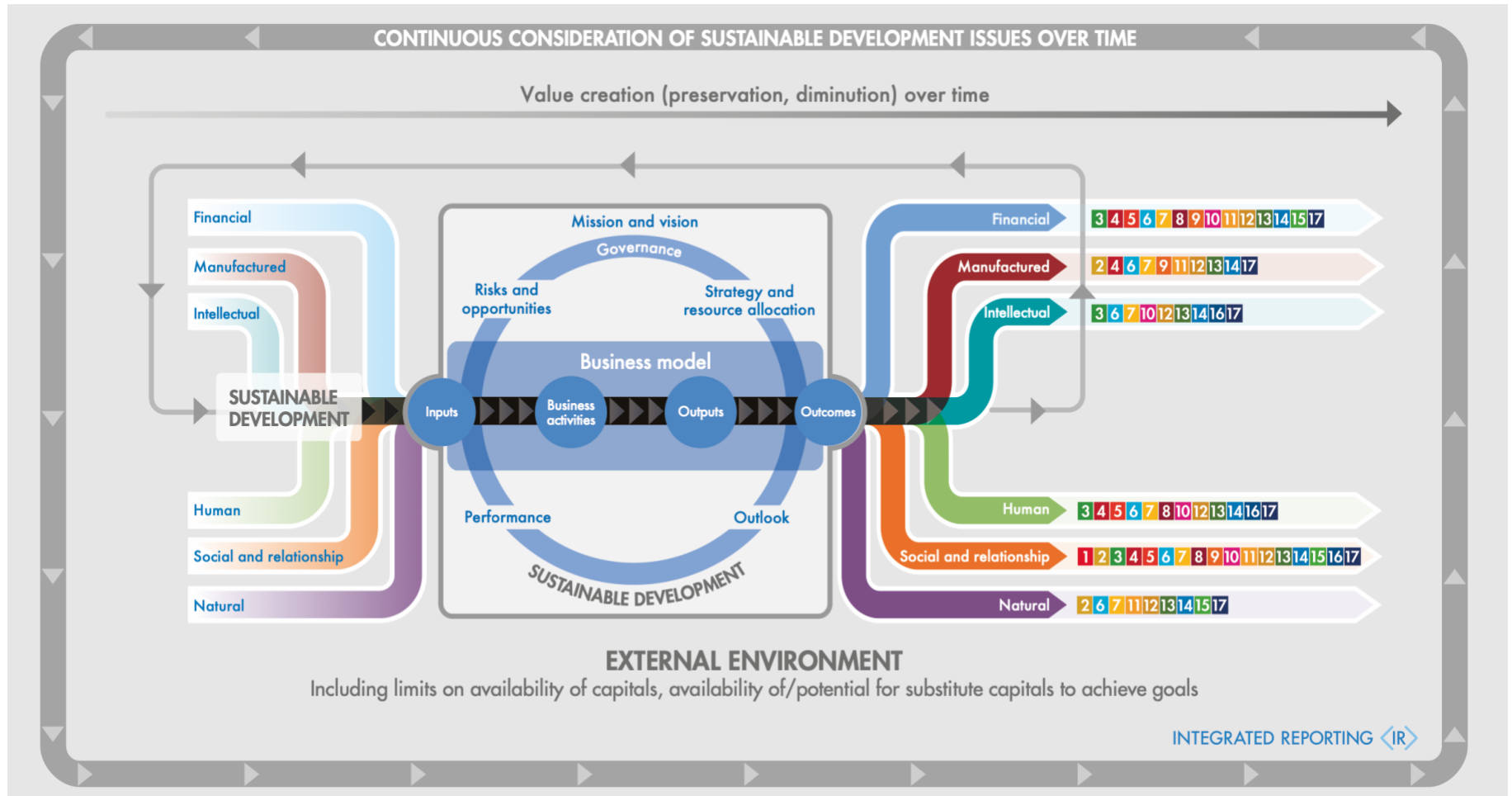
Figure 26 Alignment of SDGs with value creation (International Integrated Reporting Council, 2013)

Figure 27 illustrates five steps required to take in order to align SDGs with business strategy and value creation process. This model emphasizes on continuous and agile iteration process and expects better improvement after each new cycle.
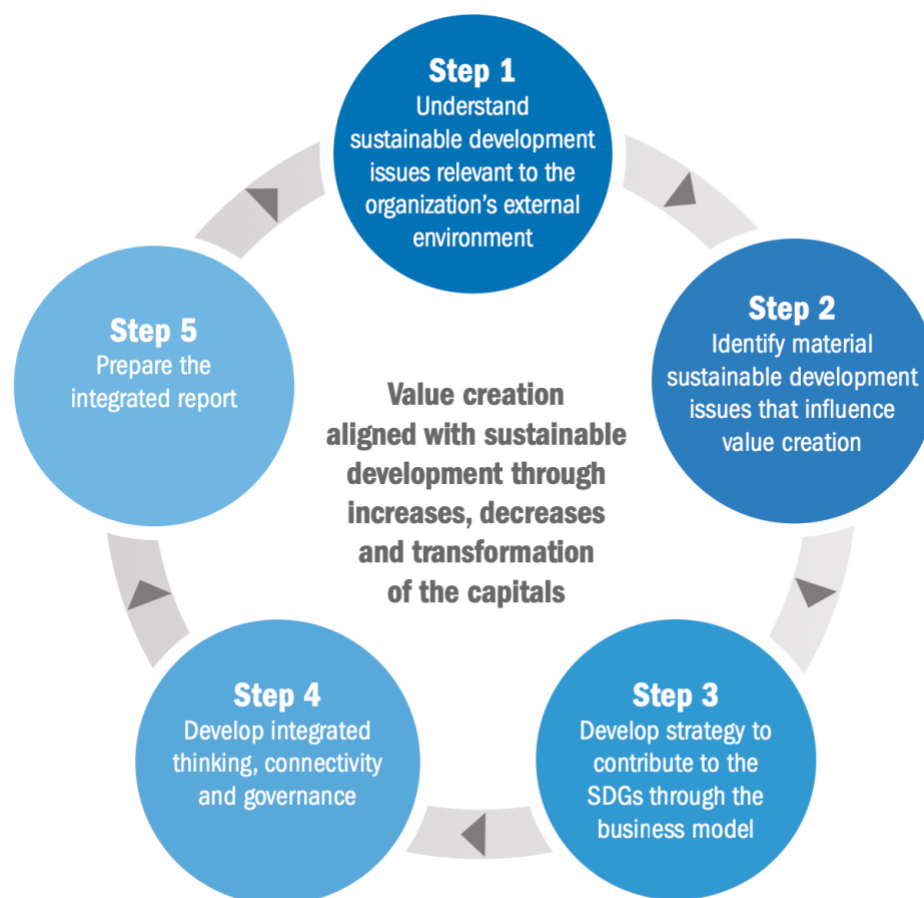
Figure 27 Aligning the SDGs to the value creation process (International Integrated Reporting Council, 2013)

Step 1: Understanding the impact of SDGs issues on the organization

SDGs can have a significant impact on the organization's value creation and strategy. It can enhance or reduce value creation directly (e.g., generating new business opportunities) or indirectly (e.g., increase the communication of the quality of relationships with stakeholders). Ergo, SDGs, and their relevant issues should be identified.

Step 2: Understanding the impact of SDGs issues on the value creation

This step includes identification, evaluation, and prioritization of short, medium, or long term effects of SDGs on value creation. Increasing, decreasing, or transforming capitals creates value for stakeholders. So, when embedding SDGs into value creation, companies need to rethink their mission and vision; thus, such adaptation would not create unexpected risks. Identification, evaluation, and prioritization of SDGs issues increase the chance of proper outcome from inputting the six capitals into the mainstream.

Step 3: Contributing to SDGs by creating a strategy via business model

Companies need to set strategic objectives in a way that supports SDGs and, at the same time, determine how to mitigate risks in order to take advantage of potential opportunities. This set of strategic objectives are possible by developing a strategy and implementing it by BM.

Step 4: Establishing network, administration, and integrated thinking

The framework encourages companies to connect their strategy to aware societies of the scarcity of natural resources to lower their expectations. It also highlights the importance of meeting the needs and interests of stakeholders, as relationships create value. These interests create conflict, which requires mitigation to overcome the issue. People responsible for the governance need to acknowledge engagement and obligations by ensuring that:

- Relationship with stakeholders aids the identification of SDGs, and proper strategy and objectives have been created and adopted.
- The company maintains and enhances the quality of the relationship between stakeholders.
- The business model addresses all SDGs impact on the input and output of the capitals.
- The strategy and business model of the company reflect and evolve by recognizing the former performance of SDGs integration.

Step 5: Conduct the incorporation report

Main sustainable development problems should be reported by organizations so that stakeholders would be aware of value creation in different periods and duration. Regarding six capitals, the organization's reports should contain their contribution to SDG goals in parallel to their results.

5.4   ICT and Sustainability

Information and communication technology (ICT) is considered as the greatest invention of modern days development. ICT is a generic word to characterize different forms of the digital transformation of information and communication means. Nonetheless, a pertinent definition is: "an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and more as well as the various services and applications associated with them, such as video conferencing and distance learning" (Kleine *et al.*, 2009, p. 1045).

ICT can be the key catalysts and crucial to establishing and maintaining sustainable development goals. Although none of the 17 SDGs explicitly mentioned ICT, the reports claim that ICT stimulate sustainable development progress and close the gaps to compose knowledge communities (United Nations, 2015). Therefore, an established Union of International Telecommunication (UIT) was formed as an associated organization of the UN devoted to orchestrating telecommunication services around the globe. UIT has actively participated in the role of ICT in achieving the SDGs and determining metrics to measure the SDGs (Wu *et al.*, 2018).

The characteristic of ICT in sustainability can be divided into two main distinctions of sustainability in ICT and sustainability by ICT. Sustainability in ICT refers to the attempt to make goods and services more sustainable throughout their life cycle. Such actions can be the reduction of energy consumption or and material flows. On the contrary, sustainability by ICT addresses the solutions to create, enable, and motivate sustainable patterns of production and usage. Often researchers focused on the technological challenges, such as computing capabilities and speeds as well as networks (i.e., 5G). (Lorenz M. Hilty *et al.*, 2015; Wu *et al.*, 2018)

Nowadays, ICT impact almost every aspect of our lives, from production to consumption of each one of us. Such universality and ubiquity of ICT require extra attention when it serves as a facilitator of SDGs; ergo, it is necessary to have a conceptual framework in the context of

sustainability. Berkhout and Hertin (2001) formulated a framework for the environmental impact of ICT technologies, where the effects are divided into three direct, indirect, and structural/behavioral effects.

- First-order effects: Includes the effect of manufacturing, use, and e-waste of ICT equipment, which are often recognized as negative.
- Second-order effects: The influence of ICT applications on other processes such as dematerialization, traffic. It can be positive and negative.
- Third-order effects: The effect of ICT applications associated with lifestyle, behavioral, and structural changes such as moving from a material economy to a service economy. It can be positive and negative (rebound effect).

Hilty (2008) believes that the environment of ICT may not be significant, but it has a substantial negative and positive impact on specific areas. The dynamic impact of ICT is complex and cannot be seen as simplistic as good or bad. For this reason, the reduction of environmental impact (second-order effect) of an ICT application (usually by increasing its efficiency) may be outweighed by the increase of demand, such action and reaction are called rebound effect (Hilty, 2008). For instance, applications of ICT made freight transport more efficient, faster, and cheaper, which is responding to the demand for transport increased considerably (Hilty *et al.*, 2004). As a result, the impact of ICT on the environment is not binary and in order to realize the true potential of ICT "It is […] essential to design policies that encourage environmentally advantageous areas of ICT application while inhibiting applications that tend to increase the speed of resource consumption" (Hilty *et al.*, 2004, p. 61). It is worthy of mentioning that there are other types of rebound effects; for instance, Håkansson and Finnveden (2015) introduced the "Reverse Rebound Effect," where they claim that increase of ICT consumption decrease the consumption of other goods which lead to the reduction of environmental impact.

5.4.1 Three-level concept

The model of three-level (Figure 28) has adopted the three-order effects of Berkhout and Hertin (2001) and combined it with two dimensions that characterize the ICT impacts by negative and positive. The negative impact is referred to as "ICT as part of the problem" and a positive impact

as "ICT as part of the solution". This matrix has been revised, re-used, interpreted numerous times, and it is commonly used by researchers (Hilty et al., 2013). The matrix includes three categories of ICT effects:

- Level 1 known as a direct effect (first-order effect) of production and use of ICT. During this level, Life-Cycle Assessment (LCA) approach is carried on assessing the effects. The assessment focus on demand for materials and energy in particular. This level does not have a positive effect as it addresses the costs of providing ICT services.
- Level 2 knows as enabling effect (second-order effect) of applying ICT services. This level can have a positive and negative impact.
    - Induction effects: ICT as a tool to replicate a resource; for example, development of printer to stimulate typewriter, which, as a result, increased the speed and use of paper.
    - Obsolescence effect: decrease the usefulness of a resource due to incompatibility; for instance, the death of a device due to lack of software update.
    - Substitution effects: ICT as a tool to replace a resource. E.g., the advent of E-book readers to replace physical books.
    - Optimization effects: ICT as a tool to reduce the use of a resource. IoT to reduce energy waste in households.
- Level 3 known as a systemic effect (third-order effect) of ICT services and their long-term effect on the socio-economical system such as economic structure change and consumer behavioral change.
    - Rebound effect: prevent the effort to reduce the resource usage
    - Emergence risks: creating additional consumption from the effort to improve efficiency. (e.g., the vulnerability of ICT networks)
    - Transitioning effect: moving towards sustainable consumption and production.
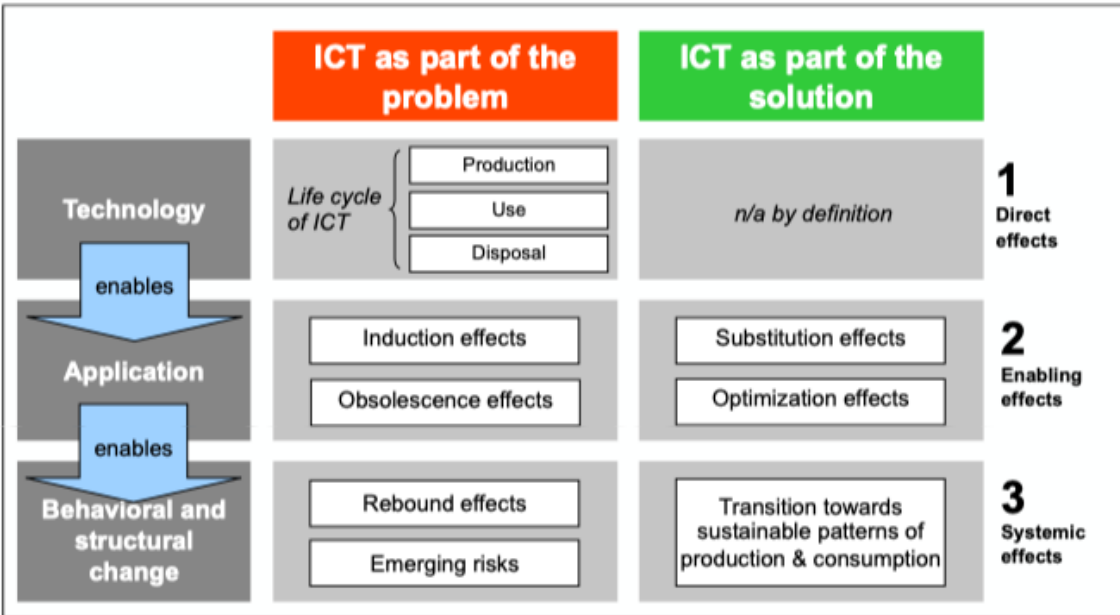
Figure 28 Three-level ICT effects matrix (Hilty, 2008)

5.4.2 Additional Research Fields

The convergence of ICT and sustainability established several related research fields. The advent of such interdisciplinary fields can be traced back to combinations of methods of social or environmental science with computing or communication (Lorenz M Hilty *et al.*, 2015). Transforming computer power to find a sustainable production and consumption pattern is not a new phenomenon. For instance, a proceeding published in 1970 by the title of "Cybernetics, Artificial Intelligence, and Ecology" aimed to adjust environmental maladies by automating the air quality control system (Robinson *et al.*, 1972). ICT for Sustainability (ICT4S), Green IT, Computational Sustainability, Sustainable HCI, and Environmental Informatics are the most known fields in ICT Sustainability.

5.5 Sustainable Development drivers and success factors

Companies often define, operate, and incorporate CS in a tailored and customized way; however, it appears that many companies have similar drivers to execute their strategy (UNEP, 2002). An empirical study by Holton el a. (2010) shows that many companies initiate their sustainability by conforming to ISO 14001. ISO 14001 is a management system that aims to reduce negative operational effects on the environment continuously. Following such standards can yield an immense bias towards eco-efficiency and abandonment of socio-efficiency. Moreover, this scarcity of socio-efficiency was addressed in later phases.

In this study, each case company attempted to close the gap by expanding its focus on human resources and needs. The results illustrated that the commitment of top managers to CS, introducing, and gradual implementing of change to all levels of the organization were some of the critical success factors. Such a gradual process enabled managers to analyze and manage appropriately, but for a point on further advancement required "transformation change and strategic repositioning.

Table 8 depicts some common success factors categorized by the environment, employees, supply chain (B2B), and society. As it appears, companies are improving their sustainability strategy in various areas by moving from natural to implement activities such as volunteering or be part of the environmental organizations to more complex ones like material/resource consumption or changes of management structures.

Table 8 Common used CS activities in SMEs (Russo *et al.*, 2009; Holton *et al.*, 2010)

Environment	Employees	Supply chain (B2B)	Society
Implementation of ISO14001	Investments in people and training program	Open house policy for customers, suppliers, and competitors to look around	Work with local schools on projects, e.g., working with children with learning difficulties
Waste minimization reuse and recycling schemes	Flat management structures	Directors of business associations	Donate a percentage of profits to charity
Reduction in the use of harmful chemicals	Creation of right work-life balance and family-friendly employment	Seeking to develop long-term partnerships with customers and suppliers	Supporting local homeless people
Reduction in atmospheric emissions	Employee newsletters	Supplier learning schemes	Sponsorship of local sports team
Use energy from renewable sources	Social events for staff	Measurement of key performance indicators and feedback to staff, customers and suppliers	Involvement in awards schemes for young people
Membership of environmental organizations	Employees sent to developing countries to undertake community projects	Winners of industry awards, e.g., world-class manufacturing or service industry excellence	Timebanks for employees to work in the community
Investment in new technology	Award-winning training and development programs for employee	Support and encouragement for suppliers to become more socially responsible	Social auditing
Environmental reporting	Employment of older and disabled people	Take part in industry best practice program	Employ people from the local community
Award-winning environmental schemes	One to one mentoring of employees	Inside the U.K enterprise scheme	Working on community projects in developing countries
Reduction of material and resource consumption	360° appraisal schemes	Implementation of the ISO 9001 Quality Standard	Work experience placements
Pollution reduction	Integrative medical care		Award-winning community engagement programs
Noise reduction	Flexible working time		Cause-related marketing
Packaging recovery	Employee training		Volunteering

Martinuzzi et al. (Martinuzzi *et al.*, 2010) presented a different categorization of success factors. The results of this study are classified into three main competitiveness concepts of Market-Based View, Resource-Based View, and Relational View. Table 9 summarized the characteristics that may aid companies to succeed in the market with their CSS. For instance, a company with environmentally friendly products can take advantage of market entry barriers where consumers demand more 'sustainable products'.

Table 9 Strategic Sucess Factors (Martinuzzi et al., 2010)

Market-Based View	Resource-Based View	Relational View
• Market entry barriers	• Financial resources	• Strategic alliances and networks
• High product quality	• Human resources and organizational culture	• Efficient supply chain management
• Cost leadership strategies	• Efficient processes	
• Low production costs and low labor costs	• Technologies and machines	• Free-trade areas
• Brand value and reputation	• Research & development	• Good relations to policy markers and
• Good value for money	• Access to raw materials	• Skateholder group
• Differentiation strategy	• Location	• Customer relations
• Niche market strategies	• Information, control system, and effective risk management	• Excellent customer service
• Flexibility and fast response to market changes		

Evans (2017) proposed a model from the accumulation of various historical literature reviews and designed sustainability drivers. This model (Figure 29) is influenced by three pillars and distinguished the drivers of CS adaptation into three categories of Environmental value forms, Social value forms, and Economic value forms. Each pillar is associated with one of the business strategies and its sustainable activities (Hart and Milstein, 2003), such as footprint reduction, poverty alleviation, fair distribution.
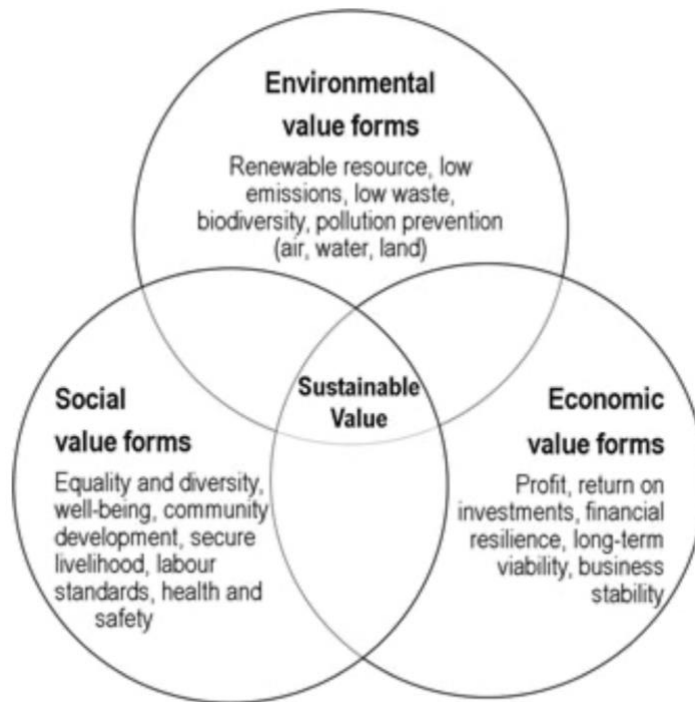
Figure 29 Sustainable Value (Evans et al., 2017)

5.6 Sustainable Development Implementation Barriers

Many challenges and barriers may occur during CS implementation processes; these challenges and issues may be partially general barriers or specific to a company's obstacles. Therefore, the overview of such challenges or barriers presented in this sub-chapter.

One of the main challenges in CS implementation is to disclose the non-economic benefits of CSS that may not be possible measured in financial terms (Lankoski, 2008). Another challenge would be to educate the CEO and senior manager about actual value and importance of CS implementation, where it leads alternate agents to execute proper processes (Griffiths *et al.*, 2007). Common barriers occur during sub-sequential phases (Table 10) of CS implementation, explains as follows:

Table 10 Common barriers and challenges encountered in different phases of CS implementation (Griffiths et al., 2007)

Phase	Description
Rejection	Sustainability is rejected due to short term gains in other fields, often resulting from the externalization of costs
Non-responsiveness	Often a result of a lack of awareness or ignorance. Importance of sustainability is ignored
Compliance	Most changes are reactive due to external expectations or requirements
Efficiency	Realization phase of further advantages and direct representation in the financial performance
Strategic proactivity	Ambitions to benefit from further gains and moving beyond the business as usual scenarios
The sustaining corporation	The 'ultimate' goal. Just a few companies have made it that far. All three pillars of sustainability are fully embedded in the corporate culture and basis of the value system

Many Organizational face many challenges in a continually changing environment. Therefore, government roles will be reconsidered and impact the clarity of responsibilities. Regarding these changes, a continuous adaptation in companies' activities and strategies are required (D'Amato et al., 2009). The company not only needs to comply with internal and external rules and regulations, but they are required to address the stakeholders' expectations as well. Stakeholders' demands, such as consumers, employees, NGOs, should also be considered (Hatcher, 2002). These changes require a new form of leadership corresponding to create positive modifications in such a sustainable global society (McGaw, 2005).

However, it is worth mentioning that companies have difficulties in developing and defining sustainable strategies, and it is not a matter of questioning their willingness for strategy implementation. Searcy (2011) identifies pluralistic and ambiguous of sustainable goals as the most applicable reasons. Hence, it results in misreading the initiative contents and generates confusion. The following list is summed up common challenges, according to Azapagic (2003), Bivona & Daza (2009) and Paramanathan et al. (2004):

- Convincing senior manager

- Required resources and time

- Financial priorities

- Expressing/measuring the monetary benefits of sustainability

- Increases in pay-back times

- Realization of the sustainable development concept and what to do on the practical level

- Employees and customers attitudes

Further barriers have been identified during the implementation of sustainable innovations by Vasilenko & Arbačiauskas (2012). Although, some of these barriers are similar to general CS strategy. The following Figure 30 concludes significant development obstacles and implementation of sustainable innovation rely on human factors such as personnel, information, examples, and points out that not all obstacles necessarily are technical.
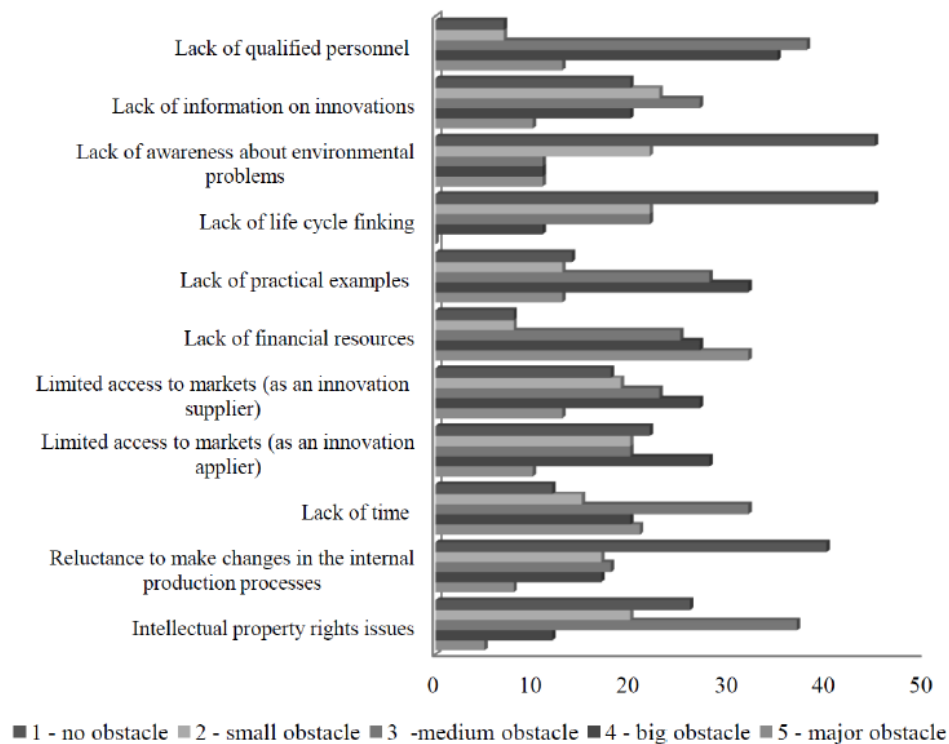

Figure 30 Development and implementation barriers to sustainable innovation (Vasilenko et al., 2013)

6 ANALYSIS AND RESULTS

This chapter is devoted to analyzing the result of the study. First, we look at the content analysis of the top ten companies in the ICT sector by turn over. Second, the result of the interview of three companies is interpreted and presented. Third, the result findings and personal view of the results will be briefly reflected.

6.1 Report Review

As mentioned in chapter 3, the sustainability report of the top ten companies (Pehkonen, 2019) in the ICT sector in Finland is used to review and find a pattern to answer the formulated research questions. In order to systematically review the reports, certain variables are defined, such as usage Global Reporting Initiative (GRI) standard, the industry of the company, dimensions employed on the report as well as sustainable development goals. Second, the companies' reports were carefully analyzed to evaluate the credibility and reliability of the report based on the assessment criteria defined in Appendix B. 1, for each variable, a score between 0 to 4 is given. To estimate the credibility and reliability, Equation 1 and Equation 2 are used, and the results are applied to calculate the quality of the report using Equation 3. Finally, the outcomes are described.

Equation 1 R indicator for a particular sustainability report (Hąbek *et al.*, 2016)

$$Rr = \frac{R1 + R2 + \cdots + R11}{11}$$

Equation 2 C indicator for a particular sustainability report (Hąbek *et al.*, 2016)

$$Cr = \frac{C1 + C2 + \cdots + C6}{6}$$

Equation 3 Q indicator (Hąbek *et al.*, 2016)

$$Q = \frac{Rr + Cr}{2}$$

Out of ten companies, only seven companies have published any report related to corporate responsibility or sustainability. As depicted in Table 11, it appears that three companies' DNA, Elisa, and Telia have combined their sustainability report with their annual report. The reason behind such incorporation will be discussed in the next sub-section with experts in the industry.

Among the sample group, three companies used the Global Reporting Initiative (GRI) standard to communicate their impact on issues such as climate change. Although standards claim to provide a framework and guidance to help businesses and organizations to present their improvement and impacts, only three companies tend to follow standards. It worth mentioning that companies may present their sustainability strategy in a free format to be able to achieve or maintain the acquired awards. In this regard, in the expert interview discussion, one company also explained the reason behind the free format reporting of the sustainability data.

In this data sample, the industry of the companies has not influenced the manner of reporting, and no relationship has appeared regarding the industry of the companies and other variables. However, in the telecommunication industry, companies tend to develop an extended version of the three pillars. The dimensions defined in the reports seem to cover new areas such as technology and individuals, which can be seen from Nokia's people and planet report. Moreover, three companies only present the traditional three pillars (social, environmental, financial), and four other companies have either interpreted new dimensions or extended the dimensions.

The SDGs developed by the United Nations is one of the easiest approaches to understand and present the impact of the companies, which was reflected in five reports. DNA and 3Step IT Group are the only ones that did not utilize SDGs. Among the SDGs, number thirteen (Climate Action) with five occurrences is the most admired one. In the second place, SDGs number nine (Industry, innovation, and infrastructure) has emerged four times. Nevertheless, due to the industry of the data sample, it may not be very surprising. In the third place, SDGs sixteen (peace, justice, and strong institution) has also appeared four times.

Additionally, SDGs number one, six, fourteen, and fifteen are the ones with the least number of occurrences of 1. The Accenture is the only company that claims to cover all the seventeen SDGs. Telia also stated that the company has indirectly influenced all SDGs.

Table 11 Summary of companies' report

ID	Company name	Report title	Annual report Joined	GRI report	Industry	Dimensions	SDGs
1	Nokia	People & Planet Report 2019	No	No	Telecommunications	Connectivity, Environment, Integrity, People, Together	9,13,8,17
2	HMD global	n/a	n/a	n/a	Consumer electronics	n/a	n/a
3	Elisa	Elisa Responsibility Report 2019	Yes	Yes	Telecommunications	Digital, Social, Financial, Environmental	3,4,5,9,13,16
4	Tieto	Sustainability report 2018	No	Yes	IT services and consulting	Social, Financial, Environmental	3, 7, 8, 10, 13, 16
5	Telia Finland	Annual and sustainability report 2019	Yes	No	Telecommunications	Social, Financial, Environmental	9, 11, 12, 13, 16, 17
6	Supercell	n/a	n/a	n/a	Mobile games	n/a	n/a
7	Uros	n/a	n/a	n/a	IoT Ecosystem	n/a	n/a
8	DNA	DNA annual 2019	Yes	Yes	Telecommunications	Digital, workplace, climate, governance	n/a
9	3Step IT Group	Sustainability report 2018	No	No	Information Technology & Services	Social, Financial, Environmental	n/a
10	Accenture	Accenture Corporate Citizenship Report2019	No	No	Professional services	Social, environmental, workplace, supply chain, core values	1-17

The performed quality analysis demonstrates that the average quality of the reports is 2.56 (Table 12). The full list of the results is available in Appendix B. 2. This shows that the quality of the publicly published reports of the companies is above the average. Meaning that the sample, on average, has covered the essential aspects of quality criteria. For example, Nokia, with a 3.27 score of relevance and 2.50 of credibility, has the highest quality rate among the data sample. Tieto, with a minor difference, is in second place with a quality of 2.88.

Table 12 Summary of companies' report assessment

Company	Relevance	Credibility	Quality
Nokia	3.27	2.50	**2.89**
Elisa	2.91	2.67	**2.79**
Tieto	3.09	2.67	**2.88**
Telia Finland	3.00	2.33	**2.67**
DNA	2.55	2.17	**2.36**
3Step IT Group	1.82	1.83	**1.83**
Accenture	2.91	2.17	**2.54**
Average	2.79	2.33	**2.56**

Figure 31 illustrates that most companies are above the average, whereas 3Step IT Group has the potential to improve. Tieto and Elisa are in a very similar position as they have gained approximately similar relevance and credibility. In addition, Nokia, with the highest quality, has published the relevant information, whereas the credibility is lower than Tieto and Elisa.
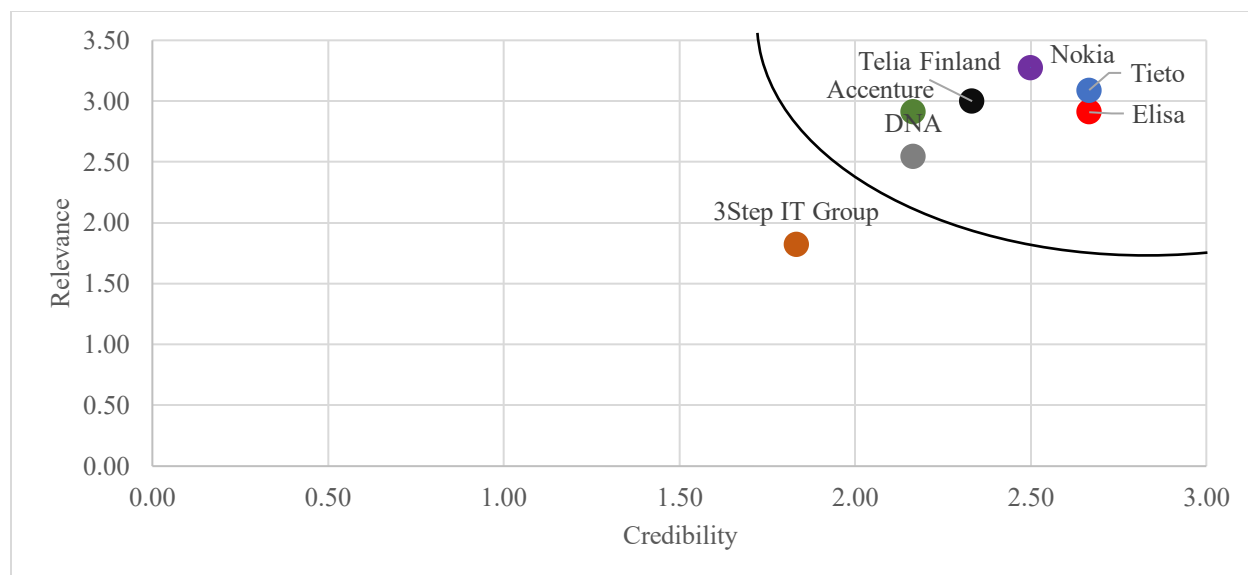
Figure 31 Plot of report assessment

The indicator sustainability strategy (R1) with 3.71 is the most scored (Table 13) criterion, showing that companies could clearly state their business strategy related to the various aspects of sustainability. The primary reporting (C2) as a variable in the credibility of information demonstrates that the reports have successfully covered the period, scope, and entity of sustainability development. Conversely, the companies have poorly presented any quantitative information regarding the community. Besides, the reports barely included any means to accept feedbacks (C5) or statements of an independent body (C6). Worth mentioning that companies devote the last page of the report to information of the company; however, it is thee official contact information of the company and not directly to person(s) responsible.

Table 13 Sub-indicators of reports

Sub-indicators	Average
R1 Sustainability strategy	3.71
R2 Key stakeholders	2.86
R3 Targets	3.29
R4 Trends over time	3.00
R5 Performance indicators: market place	2.71
R6 Performance indicators: workplace	2.29
R7 Performance indicators: environment	3.14
R8 Performance indicators: community	1.57
R9 Improvement actions	2.00
R10 Integration with business processes	3.00
R11 Executive summary	3.14
C1 Readability	3.29
C2 Basic reporting principles	3.71
C3 Quality of data	2.86
C4 Stakeholder dialogue outcomes	2.71
C5 Feedback	0.57
C6 Independent verification	0.86

6.2   Interview Results

The expert interview was carried out confidentially in order to protect the company and the research study from any associated scandals. One of the interview subjects has requested to protect the identity of the company; as a result, the identity of the rest interviewees are protected to include all participants perspective on the question. Additionally, as the study is done during the exceptional time, the discussion is held virtually, and the length of the interview was fixed to one hour time (Table 14).

Since the methodology is semi-structure, the author did not send the sample interview questions to interviewees along with the invitation, as the length and the depth of the questions may have influenced the willingness of the participants. However, the potential interview questions were available on-demand, and one of the participants requested to review them before accepting to have any discussion. Moreover, participants solicited to receive a copy of the study result. Therefore, at the end of the research, the results will be shared with interviewees.

Table 14 Interviewees subject summary

Company code	Industry	Interviewee position	Interview length	Interview via	Size of the companies
A	Telecommunications	Sustainability Manager	60 min	Microsoft Teams	Medium
B	Telecommunications	Corporate Responsibility Manager	60 min	Microsoft Teams	Medium
C	Telecommunications	Head of Service Management	60 min	Traditional phone call	Large

The motivation behind the implementation of sustainable development did not vary much at the beginning of the study. All participants showed a commonality in this regard, stating that sustainable awareness is increasing, and the stakeholders demand to be more sustainable. Clients and customers may appear to be sustainable aware. Nevertheless, it is not comparable to the level

of demand from the business partners. Meaning that the ICT companies are pressured to follow a certain level of sustainability to satisfy the legal requirements as well as stakeholders such as investors.

Sustainability issues are communicated across the organizations via regulated meetings, usually held twice a year with executives and top managers. Whereas, the responsible groups impart daily or weekly. Two interviewees claimed that sustainability issues had been incorporated with the business strategy of the companies; however, sustainability is embedded in only one of the companies' mission statements. In contrast, one participant believes that the incorporation of sustainable development is not adequate to state such a claim, and it is in the initial phases.

Furthermore, participants expressed that sustainable development strategy is the matter of the long-term process even though the performance is evaluated in the short-term. As it is evident from the previous section, companies follow specific approaches in reporting; however, during the discussion, they believe that such approaches are useful in reporting and are not strictly followed or employed during the planning or implementation. Specific criteria are communicated at the beginning of each sprint, and the key performance indicators are defined, and the results are interpreted using the approaches such as sustainable development pillars or SDGs.

Two companies utilize the sustainability approach of three pillars in their reporting; however, one has embedded technology as an extended pillar along with other pillars of social, economic, and environmental. Furthermore, as it was evident from the published reports, there is no balance in the defined pillars of the companies. The imbalance appears to be due to the defined strategy of the company and what the company tends to focus on. As a result, the environment and the technology pillars do outweigh the social dimension in most cases.

All companies agreed that in order to sustain the acquired awards, they are obligated to adjust their sustainable strategy at least once a year. The defined KPI at the beginning of the planning is the main control variables used to monitor the performance, and no pattern has emerged from the way participants monitor and control their sustainability performance. The defined KPIs are adjusted each year to develop a new milestone to maintain or enhance the performance of the previous year(s). Additionally, all interviewees believe that the sustainable development process is an

incremental process in essence as it can be recognized as a part of an efficiency plan. Company B argues that there is a direct link between being efficient and sustainable; thus, efficiency is equivalent to sustainability.

In defining or adjusting sustainable strategy and mission, all participants declared that relevant stakeholders such as investors and executives are directly involved. Companies have a motivational program to engage and maintain the engagement of the stakeholder by holding workshops. Stakeholders are powerful influencers, and this study is not exceptional. The prioritization of sustainability targets and goals is done by key managers and executives, which resulted in some resilience. However, in most cases, top managers are in favor of the concept and idea of becoming more sustainable, and it appears that such public advocation and acknowledgment from top managers ease the process.

In the case of company A, the top manager and executives are directly influence the decision regarding sustainable strategies. Such a level of authority has been perceived as problematic and has the potential to shift the focus of the sustainable development process to become a business-oriented tool. In contrast, in companies B and C, the managers and executives are playing as a supporter, which facilitated the flow of the process. Such behavior and attitude are recognized as the most impactful success factor. Embracing and supporting sustainable development by managers and executives enabled one of the companies to alter the mission statement to include sustainability within the official business mission statement of the firm.

The implementation of the sustainable process in all companies can be generalized as they follow the same pattern. First, the plan, such as becoming carbon neutral by the end of 2020, is designed. Second, the detailed plan is presented to top managers for approval and budgeting. Then, the plan and its targets are tailored based on the available resources, and some prioritizations are taken into account. Fourth, the targets are tackled, and the plan is implemented. Ultimately, the results are reported. In addition to the steps above, company B receive consultation by experts to obtain final permission before publicly publish the report.

Similar to any change in organizations, participants mentioned some resistance from operational managers. For instance, some difficulties have been faced in the supply chain regarding following

the guidelines to purchase goods from trusted and sustainable sources. A second example might be, companies such as company A faces issues such as using rental facilities, which limits their ability to control their goals for carbon emission.

Sustainable managers/responsible person(s) struggle with the lack of human and financial resources. Such scarcity caused the companies to go through phase three to tailor and prioritize the targets and goals based on available resources. For example, in one of the cases, only one person is responsible for the communication between different groups and departments of the organization. The mentioned person plays more as a facilitator to communicate sustainable strategies across the organization.

Regarding measurement and indicators, similar to the results from the literature review and report content analysis, no particular pattern has emerged. Companies are apt to develop measurements and indicators based on their needs, and there is no commonality on how they define such measurements. During our discussion, company B mentioned the possibility of utilizing GSMA Sustainability Assessment in the future.

The employees are encouraged to use the balanced scorecard, and competitions to provide feedback and comments on how the development should be improved. However, in all cases, some groups persist in any "extra work". In contrast, some employees are eager to learn more and requested to provide new ways to involve personnel. In this regard, the companies have established courses to educate the personnel. Company C has compulsory sustainability courses for each department, and the attendance and scores are strictly monitored. Company B has created compulsory online learning courses that the personnel is supposed to participate in and questions to answer in order to pass the course. Company A has a mandatory physical class, code of conduct, to educate employees regarding the strategy of the company as well as employees' rights.

6.3   Reflection

The results of the content analysis and expert interviews demonstrate that the companies have initiated the process to integrate sustainable development into their core business strategy. However, there is no commonly used framework or process, which begs the questions of why. Sections 5.3 and 5.4 present, some frameworks proposed by scholars to aid the companies in the integration process. Nevertheless, the frameworks can be too detailed or too broad, which may require tailoring based on the needs of the corporation. Furthermore, it is possible to develop an appropriate framework that contains the steps and requirements for ICT companies to go through in order to become more sustainable.

Regarding the topic of sustainability in the ICT sector, as explained in chapter 2, ICT technologies are recognized as an enabler of sustainable development. Ergo, companies may need to take into consideration the three levels of effects in section 5.4 when proposing solutions. For instance, developing 5G technology may create some rebound effects such as dependent on IoT devices, which increases energy consumption and e-waste. Additionally, companies in the content analysis and interviewees did mention such classification. At the end of the interviews, an open-ended question was asked addressing the three-level effect, which resulted in an interesting debate with company C stating that the company is researching on the subject. In contrast, companies A and B were only aware of level one effects and referred to the circular economy concept.

Key performance indicators are one the ways to evaluate the success of any sustainable activity. Despite available researches presented in section 5.5 and table Table 9, during content analysis and interviews, companies did not mention the utilization of such KPIs. In contrast, they claimed that the defined KPIs are custom designed based on the need of the project. It wort mentioning that the success factors mentioned above in the literature are used as a motive to initiate the SD process. For instance, companies used market-based view and relational views such as brand value and reputation as well as customer relationships as drivers. This shows the lack of standardized key performance indicators and measurements in the sector.

Table 13 demonstrates a lack of presence of community and feedback in the reports. It is also visible in literature as well as the interviews. In the conducted literature review, not many authors

addressed the value of community nor feedbacks. It is assumed that companies focus on reporting to communicate with relevant stakeholders, which resulted in the absence of such variables.

It appears that the sustainable reports are integrated into the annual report since the topic is vastly important for relevant stakeholders, and in order to keep them informed, it is best to create a more comprehensive report altogether. Moreover, the free format reporting mentioned in section 6.1 was not addressed in the literature review. However, during the meeting, companies claimed that it provides them a certain degree of freedom. The author of this research believes that such autonomy carried positive and negative risks that require further studying.

Merging with more sustainable companies puts more pressure on to adjust the sustainable strategies (relational view: strategic alliance). Participants believe that moving towards sustainability is an incremental process, and the companies are at the initial phase of maturity and are interested in growing. Participants argue that the nature of sustainable development is incremental, and from the beginning of the process, it was viewed as a series of small improvements.

Green-washing is illegal in most countries, causing companies to innovate on how to inform the clients and consumers on their sustainable development activities (Table 8) and performance. Ergo, company B, and A are using green campaigns to motivate and appraise the customers of their sustainable strategy. In addition to establishing green campaigns, company B mentioned that awards could be an extra incentive or criteria in order to improve their performance. Such behavior has been recognized by company A as well.

The content analysis and expert interviews showed that there is an imbalance in sustainability pillars. This imbalance is highly recommended to be addressed as early as possible by scholars in the literature review. However, in practice, company A is more focused on the social aspect and developing a better workplace for employees. Company B emphasized on the technology and emissions, whereas company C address environmental pillar more. Additionally, the results show that atmosphere of company C is supportive and devote more resources to sustainable development even though there is no direct sign on the company's business strategy. Researchers believe that an imbalance in either of pillars will avoid the possibility of achieving sustainable development.

As Figure 4 in section 2.2 demonstrates, focusing on social and economic pillars is only bearable, and considering environmental and economic pillars will result in viability. Thus, companies are genuinely sustainable only when they can find a balance between all pillars.

According to section 5.6 and Table 10, it is possible to say that all studied companies are passed the rejection and non-responsiveness phases. For instance, company A may belong between the phases of compliance and efficiency, whereas company B and especially C are in the phase of strategic proactivity.

The study shows that companies face various types of limitations and restrictions. The findings from section 5.6, Figure 30, listed various constraints. In this research, participant A and B referred to only one of the barriers, lack of financial resources. Moreover, both participants A and B mentioned the lack of human resources, which has not been recognized in previous studied. Conversely, participant C confidently declared that any limitation had not challenged them.

In section 5.2, we explained the importance of mission as the most dominant element of the sustainable decision making. Regarding mission and visions, as mentioned in section 6.2, only one of the companies have included sustainability into the companies' mission statement. According to the corporations, it shows devotion of the company to become more sustainable. Furthermore, section 5.2 also covers the importance of stakeholders and top managers in decision making and supporting the program, which was seen in companies B and C.

It is highly recommended for companies to invest more in internal sustainability. The supply chain and contracts can easily monitor the process of the marketing department. Such devotion automatically provides an opportunity for companies to be more sustainable. An investment in Research and Development department regarding sustainability can be very beneficial for each company.

7 CONCLUSION, LIMITATION AND FUTURE RESEARCH

This chapter address the conclusion and different contributions of the work to draw some patterns in order to answer the formulated research questions. Afterward, the limitation of the study and future studies will be discussed.

7.1 Conclusion

The purpose of this study was to examine the incorporation of sustainable development into the core business strategy of ICT companies in Finland. Moreover, the results attempt to find some patterns on the common practices and measurements as well as common barriers faced by ICT companies.

As mentioned in section 1.5 and illustrated in Figure 2, the results are generated by first studying the existing literature reviews on the question. The qualitative and quantitative analysis explained in chapter 3 are used to conduct the literature reviews, and then the results in chapter 4 are utilized to provide a holistic view of the subject and view of the importance of the topic and its development process. The outcomes in section 6.1 are then refined to analyze the content of publicly published sustainability reports and formulate questions to conduct the expert interview. The interprets of the interview in section 6.2 enabled the possibility to validate the findings and provide additional value to answer the research questions as well as the development of further studies. Figure 32 contains recommendations based on this study and compiled into a framework of sustainable strategy development.

The findings can aid the ICT companies in determining the sustainability issues and align the sustainable strategies with business strategy. It is believed that the companies may benefit more when the development starts from within the organization involving and educating all departments by altering the business mission and visions to be more sustainable. This will enable companies to change the focus of corporations on reporting for the sake of satisfying stakeholders and gain or maintain awards to utilize the reporting as a tool to measure their performance and innovate. Currently, it appears that companies perceive sustainable reports as a mandatory process. Companies can adopt a systematic way of sustainable development to reduce costs and allocate

them resources on becoming true green and sustainable companies. Finally, it worth mentioning that the results of the thesis are subject to be published in two different articles.
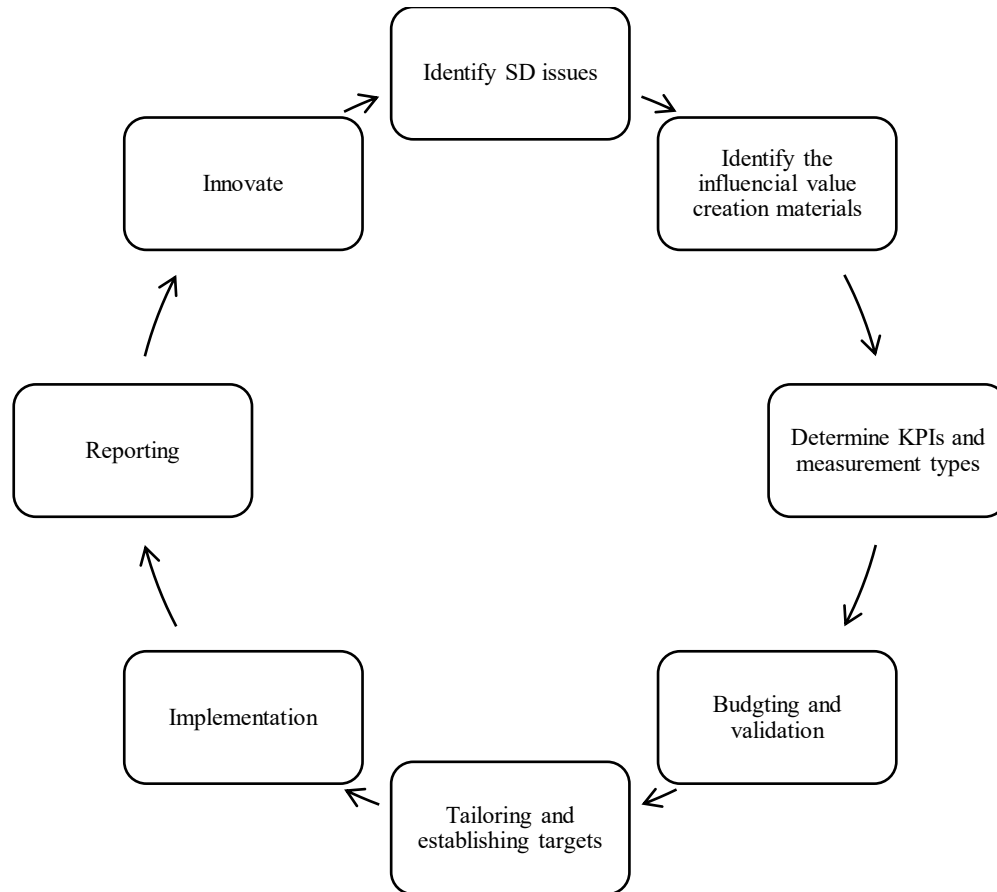

Figure 32 Proposed framework of sustainable strategy development

7.2   Limitations and future research

The thesis and the research have it is own constraints. In addition to time and resource limitations, the scope of the research is limited to Finland. The scope of the international and activities of companies exceed the capabilities to include in one single study. Thus, the results are at the general level, and the examined industry is limited to telecommunication, which may affect the premise of the study. Furthermore, the number of the analyzed report is limited to ten companies, and the interview was held confidential, which put a further restriction on the research. This study is

conducted during the COVID-19 pandemic and did not favor the author to conduct a quantitative analysis of a bigger sample using a survey.

For future research, developing a maturity model will enable researchers and organizations to understand better and scale, which phases the companies are at the moment. As the results demonstrated, there is a lack of systematic measurement and indicator which require more in-depth investigation. Moreover, a framework to include direct, enabling, and systematic effects will enable the possibility for companies to reduce their negative impacts, such as rebound effects.

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APPENDICES

Appendix A Evolution of the research topic

Journal	Record	Percentage
Journal of cleaner production	143	11.4
Sustainability	138	11
Business strategy and the environment	42	3.4
International journal of life cycle assessment	20	1.6
Corporate social responsibility and environmental management	15	1.2
Information technology for development	15	1.2
Journal of business ethics	14	1.1
Sustainable production and consumption	14	1.1
European journal of sustainable development	13	1
Resources conservation and recycling	12	1

Appendix A. 1 Table of most relevant sources
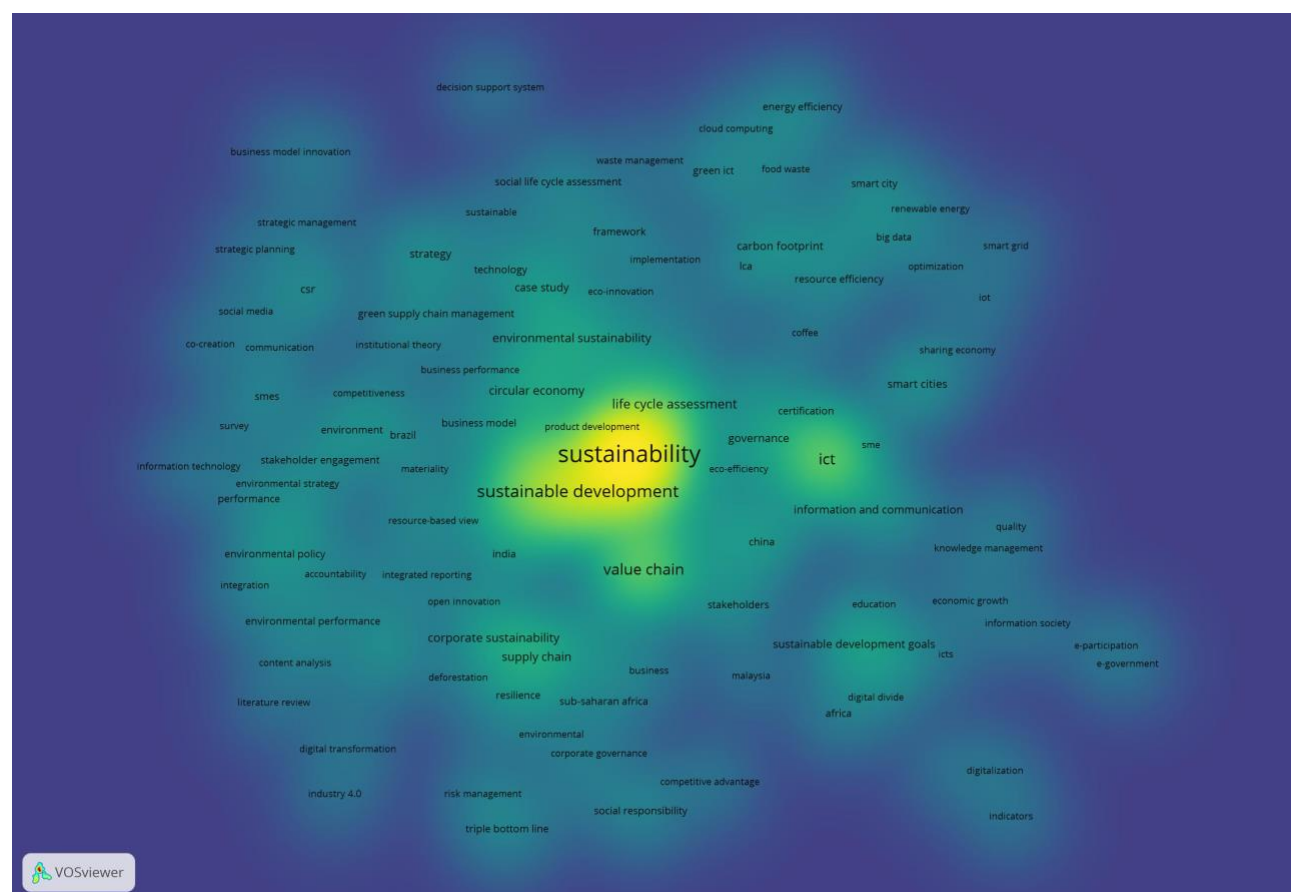
Appendix A. 2 Author's keyword Density
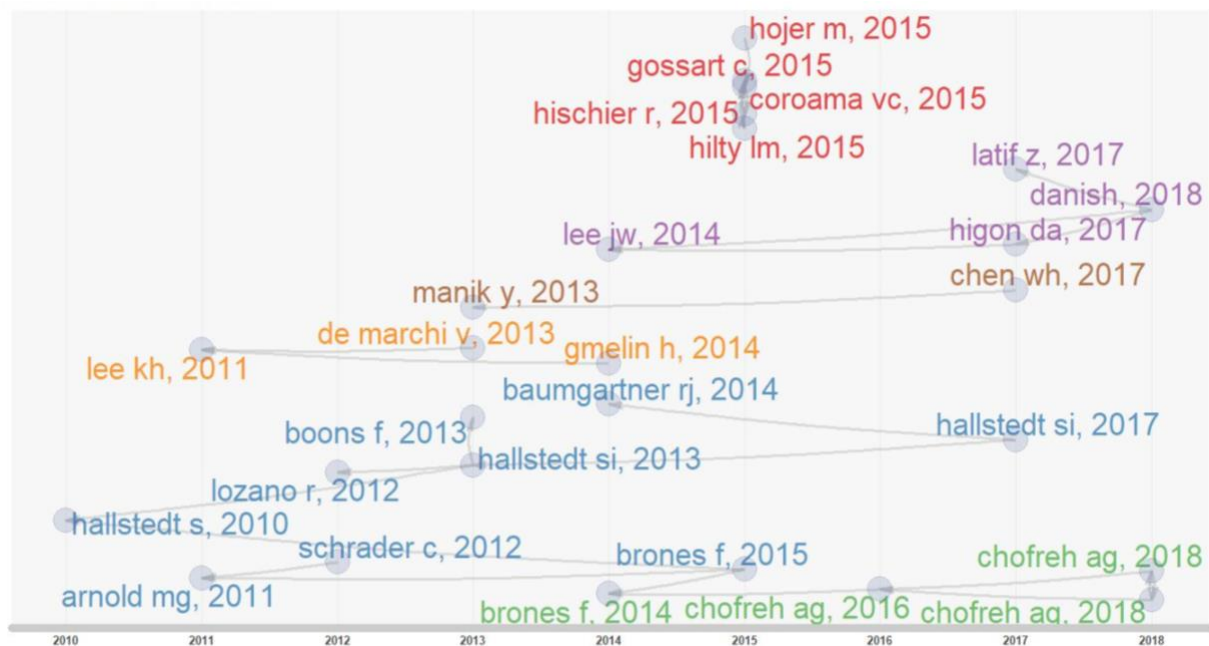
Appendix A. 3 Historical Direct Citation Network

Appendix B Content analysis

Assessment criteria		Comments
Relevance of information		
R1	Sustainability strategy	The report presents the business strategy which relates to the aspects of sustainable development
R2	Key stakeholders	The report contains identification of organization's stakeholders, their expectations and a way of engagement with individual groups
R3	Targets	The report presents targets for the future, targets set in the previous reporting period and the level of their achievements
R4	Trends over time	The report contains indicators shown over several reporting periods indicating this way direction of change and ensuring their comparability
R5, R6, R7, R8	Performance indicators: R5 market place, R6 workplace, R7 environment, R8 community	The report contains quantitative information concerning organization's performance achieved in particular areas (market place, workplace, environment, community).
R9	Improvement actions	The report describes improvement activities undertaken by the organization to meet the objectives of sustainable development; e.g. programs to increase resource efficiency, reduction of emission etc.
R10	Integration with business processes	The report contains information confirming that the aspects of sustainable development are included in the decision making process and implemented in the basic processes (purchasing, sales, marketing, production, etc.)
R11	Executive summary	The report provides a concise and balanced overview of key information and indicators from the reporting period
Credibility of information		
C1	Readability	The report has a logical structure, uses a graphical presentation of the data, drawings, and explanations where required or uses other tools to help navigate through the document
C2	Basic reporting principles	The reporting period, scope and entity is defined in the report as well as limitations and target audience
C3	Quality of data	The report describes the processes, procedures of collection, aggregation and transformation of data and determines the source of the data
C4	Stakeholder dialogue outcomes	The report contains a description of the stakeholders' dialogue and the results of this dialogue in relation to aspects of sustainable development (surveys, consultations, focus groups, round tables, programs, engagement, etc.)
C5	Feedback	The report contains a mechanism that allows feedback process (contact point for suggestions or questions, hotline, e-mail, reply card, questionnaire etc.)
C6	Independent verification	The report contains a statement of independent body attesting the authenticity of data presented in the report as well as proposals for future improvements

Appendix B. 1 Quality criteria (Hąbek *et al.*, 2016)

Company	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	C1	C2	C3	C4	C5	C6	Quality	Credibility	Relevance
Nokia	4	3	4	4	2	1	4	3	4	3	4	3	4	3	2	1	2	2.89	2.50	3.27
Elisa	4	4	2	3	3	1	3	2	2	4	4	4	4	3	4	0	1	2.79	2.67	2.91
Tieto	4	4	4	3	4	3	2	1	2	3	4	3	4	3	4	1	1	2.88	2.67	3.09
Telia Finland	4	4	4	2	4	1	4	1	2	4	3	3	4	3	3	0	1	2.67	2.33	3.00
DNA	4	2	3	4	2	4	3	1	1	2	2	4	4	3	1	0	1	2.36	2.17	2.55
3Step IT Group	3	1	2	2	1	2	3	0	1	2	3	3	3	2	3	0	0	1.83	1.83	1.82
Accenture	3	2	4	3	3	4	3	3	2	3	2	3	3	3	2	2	0	2.54	2.17	2.91
Average	3.71	2.86	3.29	3.00	2.71	2.29	3.14	1.57	2.00	3.00	3.14	3.29	3.71	2.86	2.71	0.57	0.86	2.56	2.33	2.79

Appendix B. 2 Result of report analysis

Appendix C Interview

Appendix C. 1 Email template for approaching interviewees

Dear [interviewee],

I am contacting you concerning my current research for my master's thesis. I am a student from LUT University, and I am doing this research as my master's thesis under the supervision of Professor Helinä Melkas and Professor Jari Porras. I am kindly requesting your participation in my research topic, "Incorporation of Sustainable Development into the Business Strategy".

The interview takes around 60 minutes via Zoom or Teams, and I am only trying to capture your thoughts and perspectives on how you view or maybe integrate sustainable development into/with your business strategy. The interview will be held informal, and more importantly, there is no right or wrong answer. Additionally, the result of the interview will be shared with you in a written description to ensure a mutual understanding and correctness.

Your participation in the research will be of great importance to assist me in my journey. Please feel free to suggest a day and time that suits your schedule for the virtual meeting next week or next two weeks. If you have any questions or concerns, please do not hesitate to ask.

Best regards,

Saeid Heshmatisafa

Appendix C. 2 Interview Questions for the companies

1. Sustainability culture and history
   a. Who/what has motivated the company to be more sustainable? Why?
   b. How are sustainability issues communicated inside the company? What about outside of the company?
   c. How deeply have sustainability issues been incorporated into the company's business strategy?

2. Sustainability strategy: coverage, approach and adjustment
   a. What are the main reasons behind implementing sustainability efforts and practices?
   b. Is it more a question of a long-term or a short-term process, in your view?
   c. Do you follow some specific sustainability approach or approaches? If so, which one(s)?
   d. Does the company tend to integrate the three pillars of sustainability (economic, environmental, social) into the business strategy? If so, what is the balance in practice?
   e. How often does the sustainability strategy get adjusted in a year? How is it done?
   f. Are relevant stakeholders involved in the definition or adjustment process of the company's sustainability strategy and mission?
   g. To implement the sustainability strategy, have the changes been radical or incremental by nature?
   h. How is the development towards better sustainability monitored and controlled?
   i. How has the history of the company been taken into account when developing the sustainability strategy?

3. Personnel and the sustainability strategy
   a. In the company, what positions are the people in who are responsible for implementation of the sustainability strategy? How involved are the middle and upper managers?
   b. How about employees and junior managers' involvement?
   c. Is the sustainability strategy followed in the same way in each department? Is there opposition? If so, why?

  d. Where does the company draw the line when it comes to the stakeholders' expectations regarding sustainability?

4. Implementation process

  a. Could you please state the main steps during the implementation?

  b. What have been the most common success factors in the implementation?

  c. What are the main barriers? How have you overcome the problems?

  d. Have you used any specific tools such as employee interviews, balanced score card, competitions, etc., to support the implementation?

5. Sustainability measurement and indicators

  a. How do you measure your the company's sustainability? Do you follow a specific standard or regulations?

  b. Does your company follow a certain theme?

  c. Do you use a specific tool (software) to measure sustainability in the company?

  d. How do you monitor if the sustainability indicators are appropriate?

  e. Do you have any green-oriented advertisement campaigns?

  f. How do you report your progress?

[i] https://homepage.univie.ac.at/juan.gorraiz/bibexcel/

[ii] https://support.clarivate.com/ScientificandAcademicResearch/s/article/HistCite-No-longer-in-active-development-or-officially-supported?language=en_US&r=5&ui-force-components-controllers-recordGlobalValueProvider.RecordGvp.getRecord=1

[iii] http://cluster.cis.drexel.edu/~cchen/citespace/

[iv] https://www.bibliometrix.org

[v] https://gephi.org

[vi] http://vlado.fmf.uni-lj.si/pub/networks/pajek/

[vii] https://www.vosviewer.com