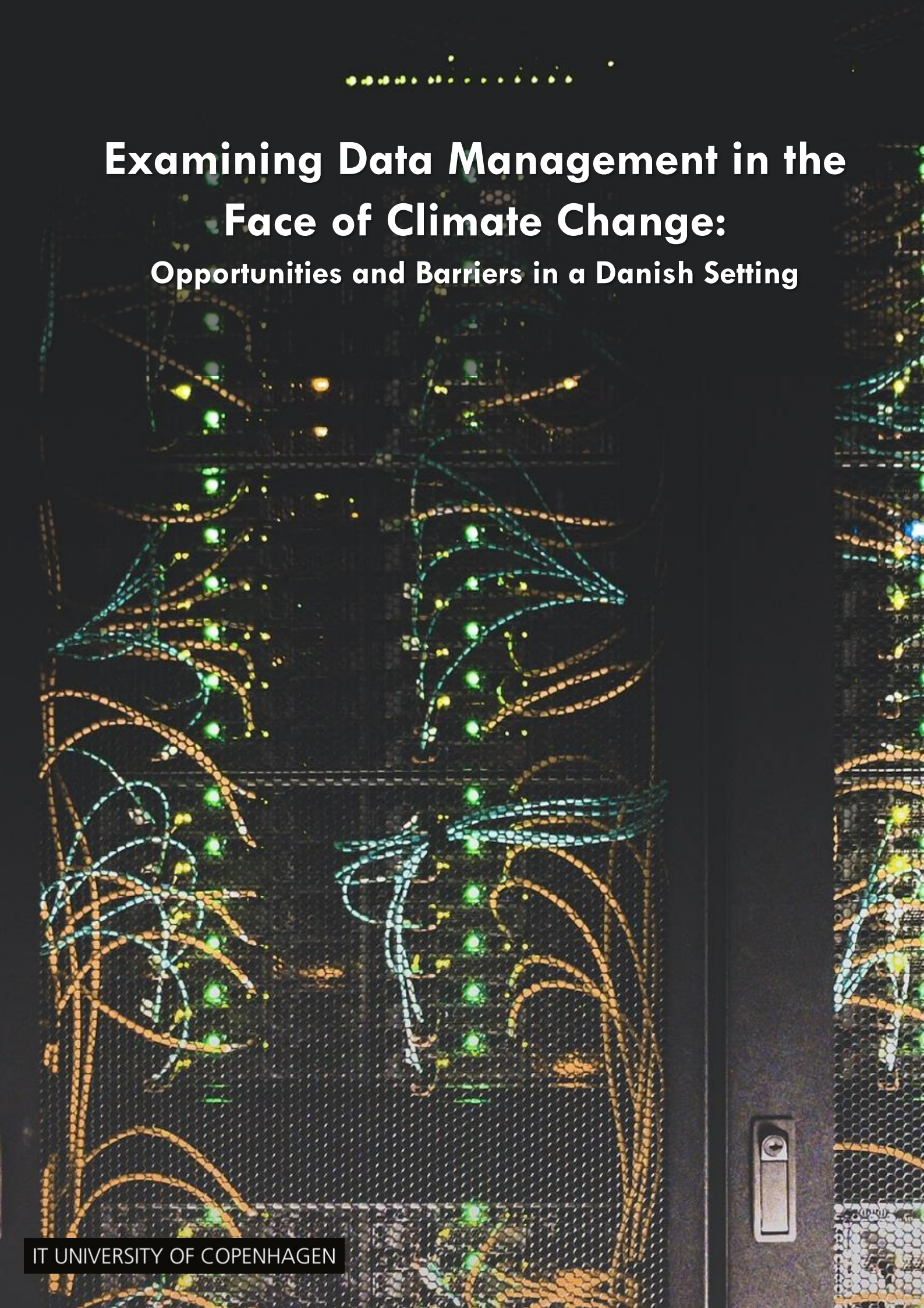
Examining Data Management in the Face of Climate Change:

Opportunities and Barriers in a Danish Setting



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Title:
Examining Data Management in the Face of Climate Change:
Opportunities and Barriers in a Danish Setting

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Abstract

The increasing amount of data from information technologies (IT) enhances the need for companies to include environmental sustainability as a factor in their data management strategies. The storing and processing of data require extensive computational power and energy, which emit large amounts of CO2. Relying on literature and empirical fieldwork, this thesis explores the current role of environmental sustainability in the formulation of data management strategies, including the barriers and opportunities for advancing green data management. Through online questionnaires and semi-structured interviews with IT representatives from six Danish private companies, we identified that environmental sustainability is currently not being considered within data management strategies. We find that the barriers for greener practices include strategic inertia, companies' expectations of the green transformation to happen by itself as well as sustainability not yet truly being embedded into the organizational culture. We argue that this, in turn, gives rise to different opportunities that can advance green data management. These encompass building greater awareness around the issue, ensuring internal alignment and dissemination of sustainability, as well as gaining support from all organizational levels. Furthermore, companies should realize the benefits of advancing green data management, by either being first movers or from collaborating with external partners. Last, we identify regulation as an external force. Ultimately, we advocate that the identified opportunities can help companies to overcome the barriers of greener data management.

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1. Introduction

The digital transformation has entailed an increased use of Information and Communication Technologies (ICT), which has also become a prominent part of all businesses. Not only is most information stored digitally rather than on paper, but more data is also being generated from the enhanced connectivity and online presence. Even devices like washing machines and cars are now connected to the network, and media such as computer games and TV have been moved to digital platforms. Whether it is Netflix activity, Facebook access, an email to a colleague, or a whole organizational platform, the data is saved, often for eternity. As internet consumption is increasing with 25% each year, the total amount of data is constantly growing (Foghsgaard in Politiken 2018). The storing and processing of data require data centers or server rooms, and this activity is referred to as data management. In turn, the data centers demand large amounts of computational power and energy to secure constant accessibility. As a result, large amounts of greenhouse gases (GHG), including CO2, are emitted. As a matter of fact, approximately 10% of the world's energy consumption stems from the internet, which is more than the yearly energy consumption of Iran. This means that 2% of the human-induced CO2 emissions stem from internet activities, which are as high as those of the aviation industry (ibid.; Jones 2018).

Information Technology (IT) is often perceived as a solution to environmental issues. More specifically, IT can be used to develop sustainable solutions in any sector, and insights driven by IT can induce more sustainable consumption or behavior (Mankoff et al. 2007). Importantly, the digital transformation also negatively impacts the environment, among others, through data storage and processing. In recent years, climate change has become an increasingly dominant topic on the public agenda, with an apparent focus on lowering CO2 emissions. While the European Union's (EU) goal is to reduce the overall emissions of greenhouse gasses by minimum 40% by 2030, the Danish government aims to reduce the emissions by 70% within the same time frame (Klima, Energi- og Forsyningsministeriet n.d.; Dansk Industri 2019). In order to reach the government's goal, it is of high importance that private companies participate because of their size and power. In order to foster clear co-responsibility from the companies, Dansk Industri (DI) has created a 2030 proposal of how to reduce emission, accelerate the green transitions, and increase welfare (Dansk Industri 2019). Thirteen climate partnerships have been established to collectively develop ideas for reaching the government's goal, but none highlight that IT also contributes to CO2 emissions (Statsministeriet 2019). Interestingly, none of the mentioned initiatives have any specific goals for data management.

From the private companies' point of view, they often declare their sustainability contributions in the form of Corporate Social Responsibility (CSR) reports, which are required for all Danish companies with more than 250 full-time employees (Thiele 2018). A CSR report consists of the social and environmental impacts of the company's operations. Even though sustainability as a term consists of economic, social, and environmental aspects, this thesis considers only environmental sustainability. Thus, whenever we use the term sustainability, we refer to environmental sustainability.

The need for sustainability to be considered within data management is validated by the European Commission. They stress the importance of considering sustainability within the data sphere, more specifically that data centers should become climate neutral by 2030 (European Commission 2020b; European Commission 2020c). With Danish companies being among the most digital in the EU (Danmarks Statistik 2020), and Denmark being acknowledged as a green state with numerous renewable energy sources, we find it important to investigate whether companies consider the coupling of data management and sustainability.

1.1 Motivation

Our motivation for this study is grounded in both its relevance for society, our educational backgrounds, as well as our personal interest in sustainability. First of all, an increasing amount of private companies start sustainability initiatives and tend to market themselves as sustainable. We find it interesting that companies focus on reducing their paper prints and increasingly turn digital but seem to neglect the environmental repercussions of the processing and storing of data. To give some context, a year of incoming emails emits, on average, 136 kg of CO2 per person, the same as driving 320 km in an average car (Tsukayama 2017). Second of all, throughout our master's degree in *Digital Innovation and Management*, we have been educated in comprehending the use of different technologies to improve business processes. The focus has mostly been on the opportunities of technological means as well as their influence on society, but not on the environmental issues that these technologies carry with them. Thereby, we saw an opportunity to combine our technological and organizational background with our personal interest in sustainability. We are motivated to understand the considerations of environmental sustainability within IT departments through the subject of data management. Thus, we perceive this small contribution of ours, as a way to use our education to advance knowledge that eventually can help push the combating of climate change.

1.2 Focus and scoping

The focus of this thesis is to investigate environmental sustainability's role in data management decisions. Research has displayed that many people do not realize that IT is contributing to environmental problems (Murugesan 2008). As such, it is unclear how far companies consider sustainability in the management of their data. To shed light on this, our thesis presents an examination of green data management through the case of six Danish private companies from various industries. Empirical fieldwork from the participating companies is collected through online questionnaires and semi-structured interviews guided by our research questions. Through the point of view of IT departments, we want to discover the degree to which CSR and sustainability initiatives have transferred and become integrated into data management decisions. Since we explore the role of sustainability within corporate strategies, our thesis takes an organizational perspective, rather than a technical perspective. As part of this investigation, we aim to reveal the factors influencing their

decision-making process in order to identify barriers as well as opportunities with regard to green data management.

1.3 Research question

Our research is guided by one main research question and three sub-questions. The main question (RQ) serves as an overarching theme for the thesis and guides our data collection and analysis. The research question is as follows:

RQ: *Which role does environmental sustainability currently play in the formulation of data management strategies, and what are the barriers and opportunities for advancing green data management?*

With *green data management* we refer to the action of data management that takes environmental sustainability into account. In the analysis, we disclose that none of the six examined companies consider environmental sustainability as a part of their data management strategies. Hence, based on the themes emerging from our empirical fieldwork, we develop three sub-questions. These themes shape the analysis, which is structured into sections dedicated to answering each of the sub-questions (SQ1 - SQ3). The three sub-questions enable us to answer the main research question and help us explore the barriers and opportunities for advancing green data management in the discussion. Accordingly, they also influence the literature we present in the literature review. The sub-questions are as follows:

- SQ1: *To what degree does alignment between business strategy and IT exist?*
- SQ2: *Which factors do the participating companies consider in their data management strategies?*
- SQ3: *Why is sustainability not on the agenda of data management decisions?*

1.4 Main findings

Through our data analysis, we find that despite the participating companies' having CSR reports or sustainable profiles, not a single interviewee mentioned environmental sustainability to be a factor they consider in their data management. By consolidating our findings with literature, we identify several barriers that explain why sustainability currently does not play a role in the formulation of data management strategies. These include strategic inertia, companies' expectations of the green transformation to happen by itself as well as sustainability not yet truly being embedded into the organizational culture. Based on the barriers, we propose opportunities that can advance green data management. Besides building greater awareness around the topic and ensuring internal alignment and dissemination of sustainability, we argue that support from all organizational levels is needed. Furthermore, we propose that companies can either advance green data management by themselves to reap the biggest benefits or join forces with external

partners to tackle this transformation. In case the so far mentioned opportunities are not enough, we suggest regulation as an external and powerful driver. We advocate that these opportunities can assist companies in overcoming the barriers toward greener data management.

1.4 Structure of the thesis

The remainder of this thesis is organized as follows. First, we explain how the COVID-19 pandemic has influenced our thesis process and which measures we took to accommodate for the special circumstances. The subsequent chapter explains the two partnerships arrangements we entered, including descriptions of the partners as well as the input we received from them. Next, we provide a thorough literature review that allows us to both gain an initial understanding of the field and to present the theoretical background needed for the discussion of our findings. The ensuing chapter elaborates on our methodological approach, including our research process and epistemological stance, as well as details on our empirical fieldwork, addressing both data collection and analysis. Following, we provide an overview of our interviewees and information on their respective companies before illustrating the findings that arrived through our analysis. After the analysis, we turn to the discussion of our findings. The first part of that chapter elaborates on the current role of sustainability within the formulation of data management strategies and the potential barriers that exist in advancing green data management. The second part of the discussion presents the opportunities that we identify to advance sustainable considerations within data management. Last, the conclusion provides an answer to our research question before illustrating reflections and further research perspectives.

2. Writing our thesis during a pandemic

Our thesis was written during the COVID-19 pandemic. As an attempt to limit the spread of the virus, strict restrictions for social interactions were set in place in countries all over the world. This was also true for Denmark, as restrictions were enforced by the Danish government throughout the spring and summer of 2020. This implied that citizens were encouraged to stay at home and rather use virtual tools for work and social interactions. In turn, this has further forced the world into a digital transformation. Both individuals and companies have increased their online presence, in order to stay in touch and in business, when physical contact is not an option (Innovationsfonden n.d.). The usage of digital services and streaming has increased exponentially, and subsequently led to a massive amount of data being generated and processed in data centers around the world (Cordes in Berlingske, 2020). Berlingske, a Danish newspaper, reports that the internet consumption in Denmark has not only reached an all-time high, but internet providers predict that the way people use the internet might permanently be changed (ibid.). As elaborated throughout this thesis, increased data processing entails a rise in energy consumption.

With that, the importance of understanding the link between data usage and environmental impacts becomes even more apparent. On the 20th of May 2020, it was brought on the agenda of the Danish government. Specifically, they announced six climate initiatives, mainly relating to energy efficiency and the usage of renewable energy. In one of the initiatives, they specifically refer to data centers and how they aim to incentivize companies to act more sustainable (Regeringen 2020). The awareness regarding data and emissions seems to be increasingly raised, and we argue that it underpins the relevance and need for our research.

The partial shutdown of the society, and not being able to physically meet, as such also affected our teamwork, fieldwork, and, most importantly, the companies we were studying. In the following, we account for how these special circumstances influenced our thesis process. Our collaboration as a team had to be adjusted to a new reality. Usually, we would meet face-to-face to brainstorm and discuss. As libraries and universities closed, and we strived to comply with governmental recommendations during these times, most interaction was moved into the digital sphere. Naturally, the pandemic also affected the way we conducted our fieldwork. First of all, the entire data collection was also conducted solely via digital tools, as will be elaborated in the methodology (chapter 5). Secondly, we initially aimed to involve a higher number of interviewees in order to draw more general conclusions from our research. A challenge encountered was that the interviewees in our target group were particularly busy during this period, as many of them were responsible for supporting their companies' increased digital presence. That being said, those who took the time out of their busy schedules to participate in our study provided us with highly useful insights. Furthermore, they were all comfortable with using technology and had no problems with the interviews being conducted virtually, except when they were interrupted by the presence of their children.

All in all, the special circumstances challenged the conduction of our research, but not our motivation regarding it. On the contrary, we are convinced that the current times render our thesis topic ever more relevant.

3. Partnership arrangements

Initially, we planned to write the thesis in close collaboration with an industrial partner, both to connect theoretical findings with empirical insights of the industry, but also to end up with results that could benefit the partner. Instead, this project has partly been conducted in collaboration with two different and independent organizations. DigiPlex served as an industrial partner and the Copenhagen Center of Energy Efficiency (C2E2) as a research partner. Both partners were involved through interviews and provided insights that helped us define and scope our project. There was no official agreement of a specific delivery for either of the partners, as we stayed in charge of the process. Rather, they were involved as sparring partners for the project. This section explains the role, relation, and background of these two partners.

3.1 DigiPlex as a partner

DigiPlex is a data center provider which as such, designs, builds as well as operates sustainable data centers in the Nordics. They have recently established a data center in Copenhagen with the ambition to become the market leader in the whole Nordic region (DigiPlex.com 2019). In the very beginning, before having scoped our thesis focus, we reached out to establish a partnership with DigiPlex as we wanted to investigate how to influence decision-makers in Danish companies to shift to a green data center. We found DigiPlex as a great match for the project due to their focus on sustainability and green IT, which was also expressed by our contact person, Anders E. Hansen when he accepted the partnership offer. Anders is the Sales Director of DigiPlex's Danish department, and recently became a member of the board of the Danish Data Center Industry (DDI) - an association working with the purpose of attracting data center investments to Denmark (Danish Data Center Industry n.d.). During informal interviews, we learned that DigiPlex prioritizes establishing new partnerships and gaining research knowledge. Amongst other, they are a contributing stakeholder in a research collaboration with Aalborg Universitet, DTU, and RUC with a focus on making more accurate measures of IT and data centers' CO2 footprint (Møller in Infinit n.d.).

DigiPlex served as a practical, industrial partner, which was particularly important for us at the beginning of the project. They provided us with inside knowledge of the industry, validated the relevance of our topic, and helped us adjust our focus based on the gaps and needs that exist in the industry. The partnership was facilitated through informal talks and interviews, as well as a guided tour of their data center's technical infrastructure. The last-mentioned stimulated our technological background knowledge of how a data center is constructed and operated, as well as the considerations that can be taken in relation to environmental sustainability. Furthermore, we gained insights that were not necessarily accessible through literature, such as the relevant actors in the industry and the challenges which the industry faces. These insights also guided our choice of interviewees, as we became knowledgeable of the titles of the people responsible for data management in companies. Lastly, Anders and his colleague intended to recruit interviewees through their

extensive network of CTO's and CIO's in a majority of Danish companies. However, this was not realized, as none of their contacts accepted the offer, which is further explained in the methodology (chapter 5).

3.2 C2E2 as a partner

C2E2 was involved as a partner later in our thesis process. C2E2 is a global thematic hub for energy efficiency, working to accelerate the uptake of energy efficiency policies and programs on a global scale. They work in the context of the United Nations Secretary General's Sustainable Energy for All (SEforALL) initiative, where C2E2's primary responsibility is to support actions that help meet SEforALL's 2030 objectives of doubling the improvement rate of energy efficiency. C2E2 is an institutional part of UNEP-DTU, a collaborating center between three different partners: United Nations Environmental Project (UNEP), the Technical University of Denmark (DTU) and the Danish Ministry of Foreign Affairs. The center has more than 20 years of experience in international research and advisory work within the area of climate, energy, and sustainable development. (C2E2 n.d.).

We initially reached out to C2E2 to get an expert interview with the purpose of understanding their research and the current initiatives undertaken to tackle the topic. After a few illuminating discussions, we identified a few areas where C2E2 could offer guidance support through its Sustainable Data Centre project (C2E2 n.d.). Xiao Wang, the Programme Officer, and Jorge Izquierdo Pérez, the Programme Associate, were our points of contact, who provided us with research material on the data center industry as well as access to webinars on ICT and data center carbon footprint. Both were important actors in helping to scope the problem and research area, choosing the target group for the case studies, and, similar to DigiPlex, confirmed the relevance of our topic. Furthermore, they assisted our academic development, by for instance introducing us to the Delphi method, as further explained in the methodology (chapter 5) and created dialogue for us with an Assistant Professor who contributed with knowledge and feedback of our use of the method, as she has frequently employed it.

Both partnerships enriched our research by providing deep industry knowledge and relevant research material, as well as sparring and discussions in the process of scoping our focus. In return for the partnership sparring, we provided both partners with our research results. More specifically, they get insights regarding companies' considerations in data management strategy formulations, and which factors they currently take into account. Furthermore, we present barriers and opportunities that can be used to incentivize their customers and partners to advance green data management decisions.

4. Literature Review

Following Webster and Watson (2002), the overall purpose of our literature review is to serve as a foundation for the project, to display areas of extensive existing research and close research gaps where possible. This literature review serves two purposes. First, it was a way for us to gain an initial understanding of the field and the gaps which our project can contribute to. Second, it serves as a theoretical background, supporting the discussion of our empirical findings. Following the purposes, the literature review is divided into two parts.

First, as green data management is a topic that none of us have previously occupied ourselves with, it was essential for us to get an understanding of the field by reviewing various literature. This allowed us to frame the problem as well as to illustrate the need and importance of our research contribution. We start by providing some background information and historical development of sustainability. While shortly touching upon sustainability in general, we quickly consider sustainability from an organizational perspective. We then go over to IT operations, explaining our understanding of data management and its role within organizations, before illustrating the link between IT operations and sustainability. As such, the first part, consisting of 4.1 and 4.2, allows us to explain the link between sustainability and data management.

The second part (section 4.3) presents a theoretical understanding of the problem, which serves as a basis for discussing our empirical findings. As such, this part is more tailored to our research question, rather than displaying the whole field. It focuses on organizational strategies both in regard to IT and sustainability separately, as well as the junction of the two. We provide some general literature on strategic decision-making before explaining the development and role of IT as a strategic asset. Afterward, we introduce the concepts of strategic renewal and inertia, which can explain the extent to which organizations are able to adopt newer factors, such as IT and sustainability, into their corporate strategies. Lastly, we illustrate what is required for sustainability to be implemented in actionable organizational strategies and present the potential barriers for environmental sustainability to be considered in IT operations and data management.

Our literature review is based on peer-reviewed academic articles as well as consultancy reports, news articles, and statistics. Where possible, we based our literature review on peer-reviewed academic articles. The consultancy reports were mainly chosen from some of the biggest consultancies, McKinsey & Company, Deloitte and Bain & Company, and complemented the academic articles, as they provided a more recent overview of the current state of the industry and corporate sustainability. We employ some news articles to illustrate the topic of data management and to explain the link between data and CO2 emissions. Lastly, we refer to articles from the European Commission as well as laws and publications from the Danish government to display the current regulatory framework.

4.1 Sustainability

As touched upon in the introduction, IT negatively impacts the environment. That being said, IT is also considered as having the potential to solve environmental problems in two different ways. First, digital solutions can be perceived as the enabler of the green transformation. This perspective is labeled as "sustainability through IT" , where IT is the key component in making other sectors such as transport, energy, and buildings more sustainable (Mankoff et al. 2007). Secondly, the environmental footprint of IT solutions can be reduced, thus, making the practice of IT more sustainable, as such “sustainability in IT” or "Green IT" (Murugesan 2008). The last-mentioned is the focus of our research. More specifically, our focus lies on how companies can incorporate sustainability efforts into their data management strategies. According to a McKinsey research, many digital organizations “rush to invest without a considered, holistic data strategy. They either focus on the technologies alone or address immediate, distinct use cases without considering the mid- to long-term creation of sustainable capabilities.” (Blumberg et al. in McKinsey 2017 n.p.). Thus, there is a need for data management strategies that consider sustainable aspects. In order to understand the green potential of data management, in the coming section, we consider sustainability from an organizational perspective. In other words, we explore sustainability within organizations, specifically as part of their corporate strategies. This enables us to understand the incentives and responsibilities organizations have to make sustainability a part of their agenda, and more specifically, their decisions and strategy for IT operations.

4.1.1 Definition of sustainability

Sustainability and *sustainable development* are concepts used interchangeably, as well as themes that become increasingly dominant and appear with notable regularity. Nevertheless, they have different roots. Sustainability originates from the science of ecology to describe the ability of biotic communities to remain existent in the future. Sustainable development, on the other hand, stems from a more societal perspective (Ihlen and Roper 2014). The last-mentioned became especially popular after being defined in the Brundtland Report, Our Common Future in 1987, as; “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland et al. 1987, p. 29). The report became one of the most widely read UN reports in history, and the encompassing term sustainable development went viral. Today, this definition of sustainable development is commonly endorsed and accepted, thus, used as the starting point for most sustainability discussions (Mebratu 1998). Nevertheless, the term is often criticized for its inaccuracy, opacity, and its inability to be translated into tangible actions or behaviors. The vagueness and ambiguity of the term have been considered as a political strategy to secure global consensus (ibid., p. 503), but has entailed a broad acceptance, thus, a foundation for everyone to define and interpret it to their own advantage (Bell and Morse 2012).

4.1.2 Sustainability initiatives in corporations

While sustainability is important to be considered on an individual basis, we focus on sustainability from an organizational perspective. To illustrate this angle, the following provides an overview of sustainability initiatives that can guide corporations' sustainability efforts. We also shortly touch upon critiques of these to present a comprehensive understanding and to enable a complete data analysis.

The United Nations' Sustainable Development Goals (SDGs) are perceived as one of the modern times' most salient departure points for accounting and achieving organizational actions that contribute to sustainable development. The SDGs have been endorsed by many organizations and serve as guideposts for committing to a transition towards a more sustainable direction, where the organizational policy and actions can be rooted in one or more of the 17 SDGs (Bebbington and Unerman 2018). The rather broad definition of the SDGs allows companies to define their own subsidiary goals and link them to their own business strategy (CSR.dk n.d.). Thereby, the SDGs can serve as a visual and communicative tool for companies to publicize and specify their sustainability commitments, as well as allow for global recognition. This purpose has entailed that, traditionally, sustainability initiatives have been rooted in communication and marketing units of organizations. "Going green" has been seen as a marketing opportunity that improves reputation, and so forth can bring more business (Ihlen and Roper 2014). It is criticized that clustering sustainability under marketing can tarnish the motives of the greater good, and have companies do initiatives solely for the sake of reputational purposes. Thus, it is recommended that sustainability should either form its own department or be represented throughout the entire organization (Coombs and Holladay 2011).

Today, the evaluation of corporations' sustainability performance is often expressed as corporate social responsibility (CSR) strategies or public statements on how the company is meeting sustainability goals. In Denmark, all C20 companies have been required to have a CSR strategy since 2008 (CSR.dk n.d.), and from January 2020, all large companies were by law obligated to supplement their management's review with a non-financial CSR report. Smaller companies are not legally required to account for their CSR but encouraged to do so (Samfundsansvar.dk 2019). The CSR report must consist of information about environmental and social considerations of the company's work. The environmental considerations concern the company's work of reducing the environmental impact of their activities, whereas the social considerations concern the working conditions and conditions in relation to human rights along with the fight against corruption and bribery (Årsregnskabsloven §99a in Danske Love 2018). None of these concerns data directly. The fundamental idea behind a CSR report is that in order for the stakeholders of companies to make informed decisions, they are required to be knowledgeable of the circumstances in which the product or service is created (CSR.dk n.d.). Investors are one of these stakeholders who seem interested in companies' green efforts when making investment decisions (Globalreporting.org 2017). They know that while reaching sustainability goals can benefit businesses, failing to attain them can negatively impact a company's reputation and, as such, its financial situation.

Despite CSR reports being recognized as important, they are also subject to criticism. The Harvard lecturer on social impact, Mark R. Kramer, criticizes CSR reports for allowing companies to relegate their issues and results of their efforts to a "glossy" report, rather than making a fundamental shift in their business model to a more sustainable direction (Kramer 2020, n.p.). Furthermore, the author argues that investors do not read CSR reports, as they do not cover the economic performance measures, which investors are interested in. More specifically, he describes sustainability reporting as "unreliable, inconsistent, [which] largely covers factors that are immaterial both to the economic performance of the company and to the company's global impact" (Kramer 2020, n.p.). Therefore, Kramer (2020) suggests that a better link and language between sustainable impact and economic performance is needed in order for investors to "anticipate the economic significance of sustainability strategies" (n.p.), and thus, allocate resources to the most sustainable companies. Importantly, Kramer does not criticize companies' sustainability efforts, but rather the way CSR reports are perceived. He and other researchers hold that ultimately, sustainable accountability can be turned into a competitive advantage whereby organizations can differentiate themselves from others (Kramer 2020; Epstein and Buhovac 2014). Generally, the increased interest in sustainability among companies has entailed that companies do not have to choose between doing business or being sustainable, but can do both.

As this section shows, the SDGs and CSR reports enable companies to illustrate their sustainability endeavors. However, the impact of CSR strategies and reports is subject to debate. This sparked our interest to explore whether having a CSR strategy actually diffuses sustainability considerations throughout the organization, or if it is limited to being a "glossy report". Specifically, we are interested in investigating the presence of sustainability in the IT operations of Danish companies.

4.1.3 Sustainability and the bottom lines

Traditionally, a company's success is measured by the bottom line and monetary performance of the business, and the impact is to be found in accounting statements. Supporting this, numbers from Deloitte (2019) show that companies traditionally incorporate sustainability efforts into their strategies because of a desire to cut costs and increase profit. As companies are used to measure success in terms of profit, numerous researchers and experts argue that results of a company's sustainability efforts should be converted into monetary measures such as an increase of revenue or reduction of costs (Willard 2012; Epstein and Buhovac 2014).

As an attempt to encourage companies to do more than just add economic value, and to integrate values of environmental quality and social justice into their agenda, John Elkington coined the concept of Triple Bottom Line (TBL) in 1994 (Elkington 2013). As such, TBL goes beyond the traditional accounting framework. Overall, the TBL consists of three areas, often referred to as the three Ps; People, Planet, and Profit, as visualized in Figure 1. *People* concern the working conditions and how much the company "gives back" to the community. *Planet* refers to the efforts a company takes to reduce its ecological footprint. Lastly, *Profit* refers to the financial profitability and economic value of the company. Importantly, profit should not

be considered as an antipode to the other areas, as a company's efforts in People and Planet can also induce Profit. (Elkington 2013; University of Wisconsin n.d.). A sustainable value exists where the three areas overlap, resulting in a balance between them. To meet all three performance areas, companies should integrate relevant requirements not only into their market parameters but ultimately into the DNA of the organization. This makes them able to simultaneously improve performance in both sustainability and financial matters (Elkington 2018). Several industry reports focus on the relationship between environmental sustainability and financial performance and find that there are promises of growth and prosperity connected to a green transition (Burchardt et al. 2018; PWC 2019; Dansk Industri 2019; European Commission 2019).

Figure 1: Triple Bottom Line (University of Wisconsin n.d.)

Looking back at his work around 25 years later, Elkington (2018) states that People and Planet does not get nearly as much attention and action as when businesses aim to reach Profit targets. He further argues that businesses use the rather broad definition of sustainability and its accompanying range of options as an "alibi for inaction" (ibid., p. 4). It is challenging to benchmark the progress, impact, and performance of businesses' sustainability efforts, as the two new areas cannot just be measured in traditional terms of monetized gains and losses (ibid.). In any case, Deloitte (2019) reports that an increasing number of companies incorporate sustainability efforts into their strategies because it is "the right thing to do", and that external incentives like regulation and tax credits are important drivers for them to do so.

As this chapter has so far illustrated, while sustainability has increasingly been put on the agenda in corporations, their motives to consider sustainability vary. Similarly, the companies' success in implementing such endeavors as well as the reach of their implementation efforts within the companies differ. Furthermore, disagreements exist on the sincerity and effect of CSR reports. As the last paragraph revealed, companies have traditionally been found to incorporate sustainability efforts for the sole sake of cutting costs. Increasingly though, they seem to intrinsically care more about doing good for the world. As such, it is

interesting for us to explore the motivation behind Danish corporations and to identify ways to advance sustainability efforts in data management endeavors.

4.2 Sustainability within data management

Recently, the European Commission has highlighted the importance of considering sustainability within the data sphere, more specifically within data centers. This is especially driven by its executive vice president, Margrethe Vestager, who is responsible for setting the strategic direction of the priority "Europe Fit for the Digital Age" (European Commission 2020a). The European Commission has published a plan of increasing the use of big data and artificial intelligence to make Europe fit for the digital age, as data is becoming of increasing importance. In their publication, they state that digital tools will be a prominent solution for combating climate change and making a green transition (European Commission 2020b). To enable this, the European Commission stresses the importance of putting environmental sustainability on the data management agenda, stating that data centers and IT must be "more energy-efficient, reuse waste energy, and use more renewable energy sources. They can and should become climate neutral by 2030" (European Commission 2020c, n.p.). This illustrates the high importance for companies to consider sustainability in their IT operations and leads us to draw attention to data management.

First, we describe our understanding of data management and its importance to organizations, before explaining how data centers contribute to emissions as well as their potential to be more environmentally friendly. Last, we touch upon measures of sustainable performance.

4.2.1 Data management

Data management relates to the different practices, techniques, and tools for accessing and delivering data to meet the requirements of applications and business processes (Gartner n.d.). The term encompasses a variety of disciplines and aspects, and its importance has continuously increased throughout history and technological development (Watson 2008). As such, data management can be defined in various ways (ibid.). We acknowledge the broad nature of the term, but lay our focus on IT operations, specifically the infrastructural aspects of storing and processing data. IT infrastructure can be defined as "hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment", and it is necessary to deliver services to customers, employees, and partners (Techopedia 2018, n.p.).

Companies' IT solutions are expected to constantly be accessible, scalable, and have 100% up-time, which implies a high demand for stable and secure data management (Johnson n.d.). Therefore, IT infrastructure, and more specifically, data management, is of high importance to organizations. Any company that generates or uses data needs a data center of some level. In essence, to safeguard the mentioned expectations and

demands, just about every company, either needs its own dedicated data center or access someone else's to store and process their data (ibid.). A data center is, in simple terms, a centralized location with computing equipment for the purpose of collecting, storing, processing and distributing data. In these locations, companies can, amongst other things, store and serve websites, interaction services, applications, and transactions (Bilal et al. 2014).

Whilst some build their own data centers on-premises, many rent server space from colocation data center vendors or use cloud-based services like Amazon, Microsoft, or Google. To choose a cloud-based service does not imply that the data is not stored on physical hardware and servers. In fact, the cloud is just data housed on data servers at remote locations, facilitated by a cloud provider, where the clients can virtually access their data (Johnson n.d.). Several experts, including our partner from DigiPlex, believe that calling it "the cloud" is one of the most misleading terms in the IT industry, because it allows people to associate it with white clouds and pure skies, and thereby to distance themselves from the environmental repercussions of the data centers in which the data is actually hosted in (Riggins 2020; Mønsted 2019). Importantly, this lack of awareness of the physical nature of data contributes to an omitted understanding of the link between sustainability and data management, as explained in the following section.

4.2.2 Emissions related to data management

As mentioned above, ICT performance is dependent on data centers that host the computational power and storage space required for enterprises and is considered a central element of IT infrastructure (Wang and Khan 2013). Since constant up-time and accessibility, often demanded in real-time, are highly crucial, data centers are constantly running. They steadily need to be cooled down and thus consume large amounts of electricity and water. Studies have found that as much as around 90% of data centers' electricity usage is spent on being idle while waiting for the next batch of traffic, and only as little as around 10% is used for actual computing (Glanz 2012). Furthermore, constant processing causes the servers to generate heat, and as such, large amounts of water are consumed for cooling (Lamb 2009). This makes ICT and data centers giant energy consumers on a global scale, although they continuously become more energy efficient. Data centers alone represent 1% of the global energy consumption (Andrae and Elder 2015), which is foreseen to grow rapidly (Hilty and Aebischer 2015). As such, they heavily contribute to CO2 emissions.

As the population size is growing and a continuously increasing share of the world's population is online, the amount of data being processed is rising. During the timespan from 2009 to 2018, internet penetration has grown from 24% to 51% and is expected to grow to 66% by 2023 (Cisco 2020). Predictions on ICT development differ between scholars with the most extreme forecast suggesting that, because of the increased online presence, ICT will surpass 20% of the world's energy consumption within the next 15 years (Andrae and Elder 2015). This is a problem because "the demand for ICT performance has increased even faster than its energy efficiency" (Hilty and Aebischer 2015, p. 72). Furthermore, digital ICT is not only problematic due to the large energy consumption during the use phase, but also because other phases of the life cycle are

either consuming large amounts of energy or have negative environmental impacts such as in the production and disposal of the hardware (Hilty and Aebischer 2015; Murugesan 2008). That being said, according to DTU professor Leif Katsuo Oxenløve, technology and data will probably be a part of the fight against global warming. In an interview with the digital newspaper Zetland, he stresses that in order for that to be the case, data centers have to run on green energy and be built in a sustainable manner (Oxenløve in Molin 2019). In other words, the need for sustainability considerations in data management is unarguably present.

4.2.3 The green potential of data management

There are several ways to improve the environmental sustainability of data management, both for companies having their own data center and for those who outsource their data management infrastructure to data center vendors. The scholar and UN's data center advisor on SDGs, Susanna Kass, recommends having goals in place related to waste, emissions, or carbon, regardless of the company's setup (Kass 2019). Often, ambitious goals are set for one or more of the mentioned: to reach zero waste, zero emissions, or zero carbon. *Zero waste* implies re-use all output from data centers, both from the facilities' operations and their equipment, i.e., electronic waste. We place our focus on the operational aspects, so utilizing systems for better usage of heat generated from cooling is an example of how to lower wastage (ibid.). *Zero emissions* imply that no output from the facilities should go into the atmosphere or water sources. Finally, the goal of *zero carbon* relates to powering the facilities solely with renewable energy (ibid.). Kass further advocates that a truly green data center should reach zero in all three aspects, as well as generating solely renewable energy to be used on-site (Kass in Riggins 2020). In simple terms, greener data management can be reached by, for example, reducing data center temperature, increasing server utilization, or decreasing power consumption of the computing resources (Wang and Khan 2013). Supporting this, in their widely acknowledged report "Clicking Clean", Greenpeace stresses the importance of building digital infrastructure on renewable energy in order to support the growing digital economy whilst still taking care of the planet (Cook et al. in Greenpeace 2017).

One of the main reasons high emissions are connected to the data center industry is the great need for cooling. When cooling servers, enormous amounts of excessive heat are generated. As a way of enabling better energy efficiency on a societal level, several companies possessing data centers in Denmark have, for a long time had ambitions to transfer this heat into the Danish district heating system, so it can be utilized to warm up nearby buildings and homes. However, companies that wish to sell their excessive heat to the district heating system have been subject to taxation for this transaction (Skatteministeriet n.d.). As such, much of the excess heat has gone to waste. The taxation on utilizing heating that alternatively goes to waste raised debate about whether Danish regulation hindered companies in acting sustainably (Nielsen 2017). That being said, the Danish government very recently decided to abolish the taxation as a whole, for facilities running on green energy. In a statement given late May 2020, they announce that in order to promote the utilization of excess heat from green data centers and production facilities, they disregard the current taxation (Regeringen 2020).

This decision was communicated as one of six new environmental initiatives that the Danish government has committed to. One of them specifically addresses ways to incentivize data centers to use green energy and promotes the utilization of heat generated at the facilities (ibid.). We argue that this is a big step in the direction of getting the issue on the political agenda.

As such, despite data centers contributing a lot to CO2 emissions, they have the potential to be more environmentally friendly. It remains to be seen in how far Danish companies actually draw on these potentials for greener data management, as will be revealed in our analysis (chapter 7).

4.2.4 Measuring sustainable performance of data centers

One issue of advancing greener data management is related to the ambiguity of sustainability measures. Experts criticize data centers' current sustainability measures to slow down the process of rendering IT more sustainable. They argue that a measurement and monitoring process of the energy used by data centers must be developed since one cannot manage what one cannot measure (Lamb 2009).

Currently, the most common way of measuring a data center's performance is by assessing its Power Usage Effectiveness (PUE). PUE displays how energy efficient the data center is by dividing the electricity delivered to the facility by the energy used for computing (Rouse 2009). The PUE measure only takes into account the isolated energy efficiency of the facilities, disregarding where the energy comes from, i.e., whether it comes from renewable sources. Furthermore, it neither considers to what extent companies utilize the excess heat that is generated. As such, PUE has been criticized for not being a sufficient measure for energy efficiency when considering environmental sustainability (Yuventi and Mehdizadeh 2013; Dastbaz and Akhgar 2015.).

As such, new methods of measuring environmental sustainability performance have emerged. A leading measurement method is called Life Cycle Assessment (LCA). This method provides stages for assessing the direct and indirect environmental effects of products and services from the cradle to the grave (Widheden and Ringström 2007; Brusseau 2019). This entails considerations for environmental impact regarding both input, throughput, and output of these products or services, unlike PUE, that only considers the throughput. Examples of input, throughput, and output considerations are respectively whether the energy is green, how efficiently data is processed and to what extent heat generated in the process is utilized. The limited inclusion of cost and investment considerations is one of the most important limitations of using LCA to guide strategic decision-making from an environmental perspective (De Benetto and Klemeš 2009). As companies are mainly interested in cutting costs, this is an important part of their overall operational assessment (Wang and Khan 2013). Thus, the cost has been added as a sixth parameter that has been calculated for all the different parameters, to visualize their relation to each other (ibid.). Regardless, companies do not seem to have adopted this method yet.

To conclude this chapter, as the volume of data being stored and processed is expected to steadily increase, the European Commission pushes for environmental sustainability on the data management agenda. As was illustrated, the processing and storing of data requires data centers, which in turn represent as much as 1% of the global energy consumption. There are different ways to render data centers more sustainable. As said, we are interested to see the extent to which Danish companies currently consider sustainable performance within data management. A hurdle in that transition is represented by the current sustainable performance measures of data management. That being said, our project is not focused on the technical aspects of improving or measuring sustainable performance, but instead, the organizational aspects of how sustainability considerations can be incorporated in data management strategies.

4.3 Shaping organizational strategies

Now that we have presented the literature used for scoping our topic and explaining the link between sustainability and data management, we turn to the part of the literature review serving as a foundation to discuss our empirical findings. More specifically, this section is dedicated to viewing the topic from the perspective of organizational strategies. As such, part of the literature presented here helps us answer the question of how environmental sustainability can be adopted into corporate strategies and, ultimately, data management strategies. First, we provide an overview of strategic decision-making, allowing us to understand how companies formulate their strategies. Next, we present the changing role of IT in organizations to illustrate the importance of business-IT alignment that is required to successfully transform IT into a strategic asset. The alignment also allows C-level management to realize the potential of IT infrastructure investments. This, in turn, requires companies to alter their strategies, which leads us to explain strategic renewal and inertia in the subsequent section. Lastly, it is described how sustainability can be successfully incorporated into data management strategies, including the barriers of doing so.

4.3.1 Strategic decision-making

We regard it as important to account for more theoretical literature on strategic decision-making in order to set the scene for the upcoming sections and allow us to supplement the discussion of our empirical findings. As this thesis concerns the factors considered in companies' data management strategies, it is essential for us to understand the process of strategy formulation. Furthermore, we need to understand the cognitive and theoretical background to discuss how to make the move to more environmentally sustainable strategies.

Strategic decision-making is part of the broader literature on decision-making with origins in economics, psychology and management (Wooldridge and Cowden 2020). Decision-making is understood as the cognitive process of choosing between alternatives (Goldstein 2011). It postulates that to choose between alternatives, humans take their values, preferences, and beliefs into consideration. Generally, decisions are required to reach a specific goal or to avoid undesired results (Hastie and Dawes 2010). Strategic decisions

are decisions that are important for a company as they prepare organizations for opportunities and threats that arise in their surroundings (Hambrick and Snow 1977). These decisions are understood as constituting one of upper management's tasks, usually concerned with actions and allocation of resources (Eisenhardt and Zbaracki 1992).

A company's strategy consists of several closely linked decisions aimed at adjusting its resources to external conditions. For several decades now, scholars, specifically from the management research discipline, have dedicated their work to the study of strategic decision-making (Wooldridge and Cowden 2020). While the body of literature is very extensive, we merely provide a summary of the field that serves valuable to our later discussion. For this overview, we mainly draw upon two academic sources. The first one is a historical account of strategic decision-making by Eisenhardt and Zbaracki (1992), at the time, two researchers at Stanford University, focussing on strategy and organizations in technology-based companies. The second is a recent review that adds to the historical account by drawing on newer findings. This review was written by Wooldridge and Cowden (2020), two management professors interested in strategy processes.

Research on strategic decision-making has contributed to a nuanced comprehension of how organizations formulate their strategies. Originally, it was understood as a rational activity, inspired by economics. More specifically, economic models assume that if humans are rational, they consistently choose the alternative that maximizes the individual's outcome by considering all options, their values, and possibilities (Hastie and Dawes 2010). Behavioral science challenges this account with the concept of *bounded rationality*, a more nuanced notion that recognizes humans' cognitive limitations (Wooldridge and Cowden 2020). As such, an organization's activities are often limited to its standard operating guidelines (Eisenhardt and Zbaracki 1992). In line with this finding, Allison (1971) suggested that a company's past actions best predict its future behavior. Instead of considering strategic decisions without any preconceptions, executives are thought to use past experiences to evaluate decisions (Tversky and Kahneman 1973). The research by Amos Tversky and Daniel Kahneman (1973), awarded with the Nobel Prize, elaborates that humans use cognitive biases to simplify and make sense of the world around them.

Another stream of research on strategic decision-making stems from the political science literature. This political account suggests power as the decisive factor, meaning that the most powerful individual chooses the strategy (Eisenhardt and Zbaracki 1992). It considers organizations to consist of coalitions, made up of individuals with competing interests. Thus, rather than assuming that organizations are steered by a single prevailing goal, it recognizes that consensus among actors needs to be established rather than being a given (ibid.). As such, constructive disagreement and debates can foster the quality of strategy decisions (Wooldridge and Cowden 2020). Even though consensus is ultimately wished for, the decision-making process benefits from conflicts of diverse decision-makers. In addition, the importance of including people with different backgrounds and expertise in decision teams in order to match the complexity of the decision issue is highlighted (ibid.).

As Eisenhardt and Zbaracki (1992) summarize, organizations are understood as political systems consisting of individuals with partly conflicting goals and cognitive limitations. Wooldridge and Cowden (2020) add that strategy should be seen as a pattern of several decisions made over time in different parts of a company, instead of being a highly intentional process and a result of a big overarching decision. As such, reciprocity exists between strategic decisions and their implementation. Overall, this gives us an understanding of how strategy formulation takes place, which enables us to interpret and discuss our empirical findings. Next, we review how IT can shape corporate strategies.

4.3.2 IT as a strategic asset

As previously illustrated, data centers contribute to CO2 emissions. There are different ways to make data management more sustainable, which require companies to invest in IT infrastructure. Hence, this section describes the importance of business-IT alignment to ensure these investments and also presents the changing role of IT.

Over the last two decades, the role of IT in organizations has transformed. While IT has traditionally been considered a support function, it is now being acknowledged to entail a more strategic role. Already in the late 1990s, Henderson and Venkatraman (1999) recognized this shift and described it as: "IT is transcending its traditional 'back office' role and is evolving toward a 'strategic' role with the potential not only to support chosen business strategies but also to shape new business strategies" (p. 4). The importance of this change has reached widespread recognition and was even named amongst the most crucial management issues several years in a row (Rivard, Raymond and Verreault 2006). It was found that alignment is needed to turn IT investments into business value and thereby to realize its strategic potential (Henderson and Venkatraman 1999). Alignment is defined as "the process by which those responsible for managing information technology (IT) and stakeholders from the rest of a firm work together to achieve long-term business value" (Fonstad and Subramani 2009, p. 31). More specifically, business-IT alignment is "traditionally conceptualized as the extent of fit or congruence between business strategy and IT strategy" (Queiroz 2017, p. 22).

The business-IT misalignment is further illustrated by Fonstad and Subramani (2009). They explain that despite companies investing, on average, 46% of their entire IT expenses in IT infrastructure, the majority of business executives perceive infrastructure investments as unnecessary. They argue that it is holding the company back from valuable development of new applications (ibid.). This perception seems to be constructed through their idea that IT reflects a cost point of doing business, rather than IT being able to contribute to the business strategy. In other words, IT is often thought of as an internal domain, neglecting how firms can position themselves in the marketplace through IT (Henderson and Venkatraman 1999). More recent research confirms the enduring relevance of business-IT alignment to both practitioners and academics (Amarilli, Van Vliet and Van den Hooff 2017). The missing understanding of IT infrastructure expenditure leads to problems, specifically in organizations whose business operations are dependent on shared IT assets

and infrastructure (Fonstad and Subramani 2009). It is further reported that in these companies, non-IT executives refrain from participating in decisions around IT investments, which heavily contribute to business-IT misalignment. To reach alignment across an entire organization, it is essential that business and IT managers learn to collaborate, specifically in decisions regarding IT infrastructure investments, for instance, concerning data management. This, in turn, also requires managers to communicate effectively and, thus, refrain from using a technical language that is difficult to follow for the counterpart. The authors (Fonstad and Subramani 2009) refer to engagement opportunities as a measure to strengthen enterprise-wide alignment. More specifically, regular board meetings between both IT and business executives enable them to develop a common understanding and mutual trust, which is beneficial for strengthening synergies and ultimately alignment. Importantly, rather than being seen as an event, alignment is considered "a process of continuous adaptation and change" (Henderson and Venkatraman 1999, p. 5).

The importance of business-IT alignment has been demonstrated by several empirical studies. Organizations with alignment between their business and IT strategies outperformed those lacking such alignment (Henderson and Venkatraman 1999). This finding has been cited as "one of the most widely accepted assumptions in the information systems literature" (Queiroz 2017, p. 21). As such, it highlights that managers are required to acknowledge IT as a crucial component for business strategy decisions. Ultimately, companies need to understand that technology can enable them to differentiate their operations from competitors. To conclude, business-IT alignment is important IT to turn investments into business value. The question arises, whether companies are able to truly adjust their strategic priorities in order to reach the required alignment.

4.3.3 Strategic renewal and inertia

The ability of companies to alter their strategies in response to a changing environment is described by the concepts of organizational inertia and strategic inertia. Organizational inertia is defined as "the inability to enact change in the face of a changing external environment" (Meehan and Bryde 2011, p. 95). Strategic inertia refers to "the tendency for organizations to remain with the status quo and their resistance to strategic renewal outside the frame of their current strategy" (Hopkins, Mallette and Hopkins 2013, p. 77). As such, both types of inertia focus on how companies tend to remain on their current trajectory. As this paper focuses on the formulation of strategies, we will only refer to strategic inertia, but use concepts from both interchangeably.

Meehan and Bryde (2011), management scholars from the Liverpool John Moores University, explain that with time, companies promote stability and continuity, also referred to as the process of "institutionalization". Institutionalization encompasses routinizing a company's activities, making the organization reliable and accountable for its actions. While internal accountability often fosters long-term success, it can also create inertia and resistance to change. As such, with increasing time and size, companies become more prone to experiencing structural inertia and, thus, are less likely to adopt new practices. More specifically, as routines

become more rigid, an organization's employees refrain from adopting new rules, ultimately limiting behavioral changes. An ambiguity of new rules aggravates this inertia, either since these are difficult to interpret with their existing knowledge, or because they are inconsistent or even conflicting with known rules (ibid.).

The management professors, Hopkins, Mallette and Hopkins (2013) add that strategic inertia can occur in response to a company's changing competitive environment, within our focus an example of this is the need of organizations to strategically use data. Strategic inertia emerges, and companies fail to adapt when the speed of these external changes outperforms that of organizational changes. However, if companies manage to adapt, strategic renewal takes place (ibid.). In addition, the authors reveal that the interaction between top management and middle managers influences the occurrence of strategic inertia. Middle managers are qualified to give critical input to the renewal of organizational strategies given their affinity to trends and market developments. Nevertheless, if they do not feel empowered by higher-level executives to impact strategy renewal, their commitment to achieving renewal is decreased (ibid.). This highlights that both top management and middle management are important actors in strategy decisions.

As this section illustrates, companies' ability to adjust their strategies depends on how internalized their ways of thinking are and how open they are to exchange ideas and to collaborate. This steered our curiosity to explore how far companies are able to consider sustainability within their strategies if IT has not been truly acknowledged as a strategic asset yet.

4.3.4 Turning sustainability initiatives into success

As shortly touched upon before, support from senior leadership is crucial for the integration of sustainability into corporate decision-making. More specifically, in most successful implementations, CEOs are involved or even the drivers of corporate concern to implement sustainability (Epstein and Buhovac 2014). This implies that C-level management needs to support and be involved in the formulation of sustainable strategies. Nonetheless, despite many organizations having added sustainability to their agenda, most of them experience difficulties implementing these principles into strategies and actions, which can lead to strategic inertia (Meehan and Bryde 2011).

Meehan and Bryde (2011) have investigated the extent to which sustainability was incorporated into procurement strategies. The authors revealed that sustainability was not taken into account throughout procurement practices and refer to strategic inertia to explain this finding. We regard this example as important as it allows us to draw parallels to data management practices since neither procurement or IT traditionally take sustainability factors into account. Through institutionalization, procurement practices have gotten used to focusing on factors like price, time, and quality when acquiring products (ibid.). Sustainability can be thought to add a new dimension to procurement decisions that employees did not have experience

with and thus refrained from using. In addition, as sustainability is touched upon in multiple guidelines, employees might be overwhelmed by the volume of sustainability indicators amplifying a feeling of confusion or even anxiety (ibid.). Therefore, strategic inertia needs to be overcome to effectively transform sustainability endeavors into action.

Besides strategic inertia, other organizational barriers can hinder companies from successfully implementing sustainability initiatives. A report by Bain & Company reveals that despite many CEOs declaring sustainability a top priority and committing the necessary resources to it, few reach their aims (Davis-Peccoud, Stone and Tovey in Bain & Company 2017). While just twelve percent of organizational transformation initiatives succeed, only two percent of sustainability programs meet their targets. Rather than indicating a lack of buy-in from management as a reason, the authors refer to the resistance of employees. When given a choice between sustainability and business objectives, most employees choose the last-mentioned. In this way, executive passion is hindered from flowing through the organization (ibid.).

Through a survey that was answered by more than 300 companies undergoing sustainability transformations, four guidelines aimed at increasing success rates were developed (Davis-Peccoud, Stone and Tovey in Bain & Company 2017). First, companies should openly commit to sustainability goals, including quantitative objectives, since these can enact a sense of mission and, thereby, assist overcoming resistance to change. As support from senior leadership was found to be highly important, C-level management should communicate concrete actions. This links to the second guideline, which states that the CEO must express personal involvement in the transformation. Third, management should create business cases displaying the importance of sustainable transformation. Many employees and frontline managers consider sustainability initiatives as "nice to have" rather than business essential. They perceive sustainable attributes to increase costs but decrease corporate performance (ibid.). Another author supports this and describes that many employees do not take executive leadership's sustainability agenda seriously (Mingay 2007).

Important to mention at this point, individuals and as such, also employees, often comprehend and make sense of sustainability in various ways. The broad nature of the term causes disagreement on the consequences of climate change. Mike Hulme, a professor of Human Geography and well-known academic for his research on the climate, has studied how individuals comprehend the term. The different understandings of climate change can according to Hulme (2009) reveal a deeper level of individual differences; differences in attitudes towards risk, technology and comfort, differences in ethical, ideological and political convictions and finally, differences in interpretations of the past and visions about the future (ibid.). Consequently, it is crucial for leaders to help employees understand the importance of sustainability and create a shared direction. The report by Bain & Company advises companies to present business cases that clearly illustrate the link between sustainability and success, so their employees can start to comprehend the importance of sustainability (Davis-Peccoud, Stone and Tovey in Bain & Company 2017). The last and fourth guideline argues that sustainability should be wired into organizational decision-making processes by

rendering managers responsible and accountable for delivering results. Novo Nordisk serves as an example of how this guideline can be implemented. There, the business units that successfully reduced carbon emissions received part of their budget back as a reward (ibid.). As such, each employee and department are openly held accountable for their sustainability efforts. This initiative successfully followed a framework by Future-Fit Business that includes clear targets and measurements on what it requires and entails to be sustainable (Future-Fit Business n.d..). Future-Fit Business is an organization that works for benchmarking sustainability efforts to establish accountability. We will touch upon this example again in the discussion (chapter 8).

As this stream of research suggests, senior leadership support, buy-in from employees, and overcoming organizational inertia play important roles in turning organization sustainability efforts into success. These findings serve useful for our empirical analysis as well as for the discussion of our findings, as they allow us to explore the barriers and opportunities that exist in advancing green management strategies. As a next step, we look at what is required to advance environmental sustainability considerations within the field of IT and data management.

4.3.5 Barriers of green data management

Achieving IT strategies that consider environmental sustainability, requires organizations to incorporate sustainability as part of their corporate strategy (Thambusamy and Salam 2010). Businesses that strategically use IT to enable their environmental sustainability strategies and are able to demonstrate environmental ambidexterity are set to achieve a competitive advantage, legitimacy, and positive reputation (ibid.). Besides strategic inertia, there are other organizational barriers on the way to a green transition and more environmentally sustainable IT and data management, as presented in the following.

Similar to what was described in the previous section on turning sustainability initiatives into success, we see these also apply to data management. First, management often does not acknowledge the importance of investing in sustainable IT as they tend to focus on the growth of business applications (Lamb 2009). Gartner Research validates this by stating that “CIOs must develop a green IT strategy that tackles ITs own impact, as well as helping the enterprise meet its growing environment-related challenges and exploiting the environment-related opportunities.” (Mingay in Gartner 2007). Lamb (2009) argues that participation in the strategy from the CFO and CIO are unusual but highly needed, as they are the most important stakeholders. In order to represent the view of the whole organization, stakeholders, including C-level, facility managers of the data center, and other technical employees, should actively participate, support, and collaborate (ibid.). Likewise, Hird (2010) argues that both people within and outside the IT department should participate and that their respective stakeholder views should clearly be addressed. Overall, this illustrates the importance of internal alignment and collaboration for the success of sustainable data management.

Moreover, management teams are often challenged in connecting sustainability to increased business performance. As previously mentioned, measuring sustainable performance is different from measuring financial performance. The intangibility and ambiguity about what the measurements are actually showing creates uncertainty among companies and investors (Kramer 2020). This, combined with a potential knowledge gap about how to measure sustainability performance and compare it to financial performance, is seemingly an important barrier. As such, a common obstacle for companies to move towards environmental sustainability in their data management operations is the lack of trust in alternative performance measures (Banerjee and Akuli 2014). Similarly, few companies acknowledge the potential benefits of energy efficiency improvements for themselves (UNECE 2017). As a study conducted by the United Nations Economic Commissions for Europe illustrates, decisions regarding improved energy efficiency have a low priority, as this infrastructural part of the organization is usually disconnected from the core business (ibid.). This illustrates that few IT heavy enterprises have realized that the unsustainable "business as usual" model cannot continue (Mingay in Gartner 2007).

As described in the first part of the literature review, companies traditionally incorporate sustainability efforts into their strategies because of a desire to cut costs (Deloitte 2019). Likewise, other authors highlight that in order to gain support from top management and to realize green IT within organizations, sound cost models are required (Sarkar and Young 2009). Thus, cost savings through sustainable transformations seem to be of utmost interest to business executives. As such, organizations consider implementation costs in relation to potential savings or increased revenue. Since companies are struggling with high implementation costs, these represent another barrier toward sustainable data management (Banerjee and Akuli 2014).

While many of the barriers are internal to organizations, some refer to the lack of external incentives as a barrier. More specifically, the study by UNECE highlights a lack of state incentives and the importance of strong regulatory frameworks (UNECE 2017). As is discussed in a podcast by DR with Gorm Bruun Andresen, an energy researcher from Aarhus University, many Danish companies are also pointing towards legislation and the lack of a regulatory framework to push for a green transition (Andresen in Nielsen 2017). As such, the introduction of regulations represents an opportunity to push a green agenda for data management. This is also confirmed by Deng and Ji (2015), who state that regulatory force through coercion or governmental regulations impacts organizations' decision to turn to green IT.

While companies seem to desire environmental sustainability considerations, it has not been turned into actions. This is illustrated by Lamb (2009), who presents the result of two different surveys. First, a survey by Forrester research from 2007 states that 85 percent of the respondents find it important to consider sustainability in their planning of IT operations. Nevertheless, only 25 percent actually include it as a criterion. Similarly, a survey conducted by Gartner in 2009 predicts that more than one-third of IT companies will consider environmental sustainability as one of the top buying criteria within the following year (ibid.). In the meantime, no studies were published that illustrated how big of a role environmental sustainability

plays in IT operation strategies. To close this gap, our research is dedicated to revealing the extent to which environmental sustainability is considered within Danish companies' data management strategies. This also allows us to contribute to the research on green IT transitions. The following section accounts for our empirical approach to exploring this gap.

5. Methodology

In this chapter, we first elaborate on our research process and epistemological stance. Next, we describe how our empirical field is defined, including how we recruited the companies. Lastly, we explain how the data was collected through questionnaires and interviews, as well as our process of analyzing our findings to generate insights for our research question.

5.1 Research process

This section gives a brief overview of our research process, as displayed in Figure 2. Our interest in the link between IT and sustainability fostered our motivation to explore the topic in our thesis. The thesis process started out with our partnership arrangement with DigiPlex. This, along with literature, provided us with industry learnings to understand the field and its necessity for further research. We further scoped our focus through the additional partnership with C2E2. While this prolonged our scoping and learning process, it helped us to acquire substantial knowledge about the industry. In parallel, we continuously updated and adjusted our literature review, which allowed us to interpret our findings. As such, the constant revisiting of literature resulted in an iterative and lengthy process. Once we finalized the scoping, we initiated the process of conducting fieldwork by recruiting interviewees. As Figure 3 illustrates, for each individual interviewee, the process consisted of a questionnaire, which was analyzed and combined with desk research to form the basis of the subsequent interview. We followed this process for each interviewee individually. Finally, after having concluded the data analysis, our research process was completed by receiving approval from participating companies and partnerships. The specific parts of the process are explained more thoroughly in the following sections.

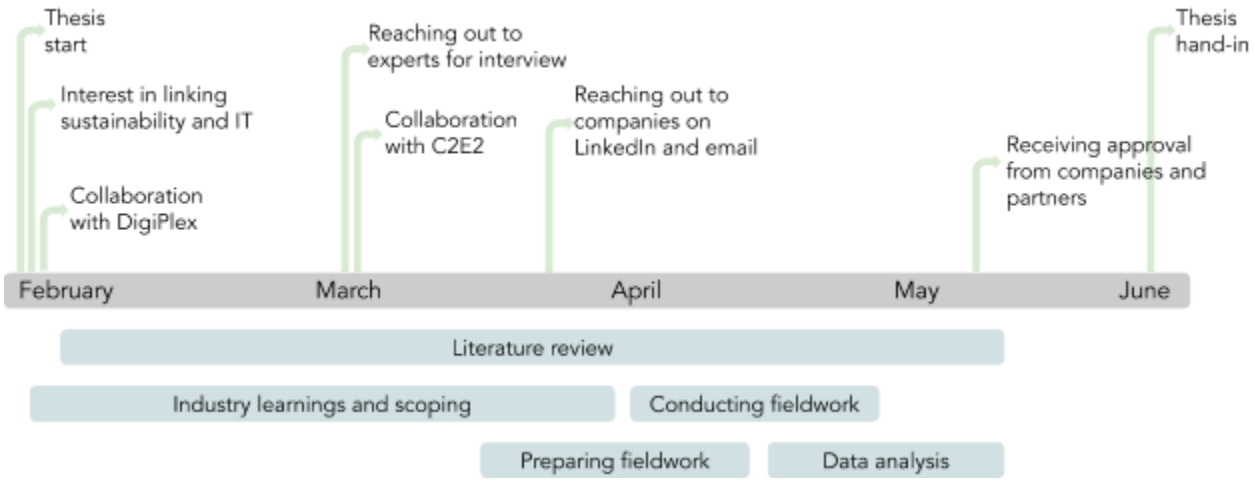

Figure 2: Timeline of our research process

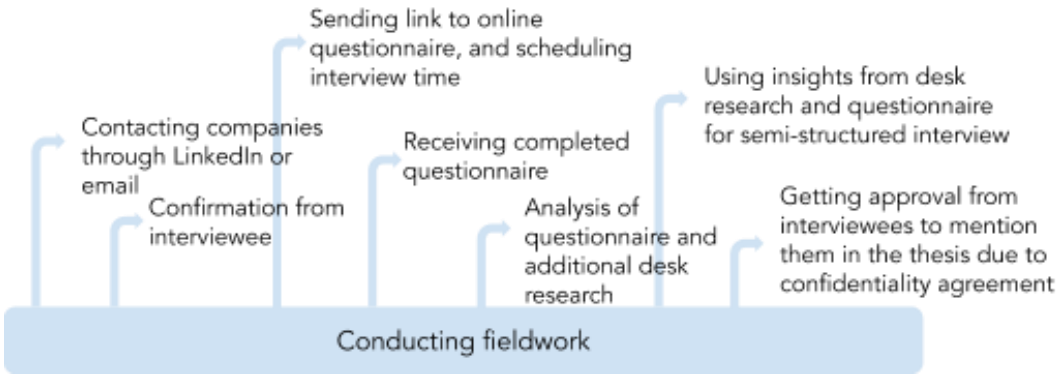

Figure 3: Detailed timeline of our fieldwork

5.2 Epistemological standpoint

At this point, we would like to point out the epistemological and interpretative stance that we take during our research. As such, it should be kept in mind that both the methods used and the corresponding findings are affected by this standpoint. Following Walsham's (2006) advice on doing interpretative research on information systems, we understand reality as a social and inter-subjective construct. Our research field's limitations and opportunities, as well as our own context, educational background, influence and, as such, bias, our selection of theories and methodologies. Therefore, the later presented empirical data and results emerge from our interpretations of theories and our interviewees' construction of reality, i.e., of how they make sense of the world. With respect to data collection, our interpretive stance assumes that "what we call our data are really our own constructions of other people‘s constructions of what they and their compatriots are up to" (Geertz 1973, p. 9). This also impacts the way we analyze our data to report findings. More specifically, instead of reporting facts, we consider ourselves to interpret our interviewees' interpretations. Our position in the research might have affected our data collection and analysis. Thus, the findings of our thesis should be considered as situated in our approach and not as objective truth (Haraway 1988). Importantly, we highlight that the reader should consider our study as an exemplification of six companies' green data management considerations, through the point of view of one or two employees from each company. As such, the insights cannot be understood as the view of the whole company, neither as a general tendency in Danish companies.

5.3 Empirical fieldwork

Our empirical fieldwork follows the seven stages for doing qualitative research by Kvale and Brinkmann (2014). The authors propose making several considerations before, during and after conducting qualitative interviews. The stages consist of thematization, design, interview, transcription, analysis, validation and reporting.

5.3.1 Thematization

The first stage, thematization, involves scoping the topic and defining *what* to research and *why*, before deciding on *how* (ibid.). Thematization was done through a thorough literature review as well as informal and unstructured expert interviews with C2E2 and DigiPlex. These were conducted without specific questions and themes at an early stage in order to get a grasp of the field and the industry as a whole (Blomberg and Burrell 2002). C2E2 provided us with in-depth research-oriented knowledge of the field, whilst DigiPlex introduced practical, hands-on insights from the industry and their challenges. The interviews were central in scoping our research and formulating our research questions, as well as providing us with input and recommendations on relevant methodology.

While Kvale and Brinkmann do not explicitly mention recruitment in any phase, we consider it a crucial part of scoping and defining the field. As such, and in order to present our empirical fieldwork in chronological order, we place the process of defining our empirical field and recruiting participants under thematization.

5.3.1.1 Defining our empirical field

Companies with headquarters in Denmark were of interest to us, given that we aim to investigate the extent to which Danish companies consider environmental sustainability in their data management strategies. To further scope our search for potential companies, we looked into data-intensive industries and aimed to find organizations ranging from small and medium-sized enterprises (SMEs) to big corporations. Initially, we wished to focus on companies categorized into three different groups according to their focus on environmental sustainability. Our reasoning behind this classification was to take a structured approach to compare the categories and to be able to generate high-level results. Thus, for classification purposes, we investigated annual and sustainability reports to discover whether they had specific goals in relation to environmental sustainability, energy efficiency, or data management. However, we realized that the world doesn't always fit into predefined categories. More specifically, Rosling, Rosling and Rönnlund (2018) argue that labels are used to simplify the world, while they at the same time hinder researchers from detecting important details. Accordingly, Marquardt (2016) illustrates that labels foster ignorance and can bias the data collection. Furthermore, as explained in the following, we quickly learned that it was challenging to recruit participants. Thus, we would not be able to have representatives from all categories nor the same amount in each category. With this in mind, we refrained from categorizing companies at all.

5.3.1.2 Recruiting participants

Our company insights were collected through a combination of questionnaires and semi-structured interviews. Each questionnaire response served as a foundation for the subsequent interview; as such, all our participants were recruited to participate in both. The following section presents the recruitment process.

First, we shared a post on LinkedIn (Figure 4), which in total had 3078 views and 70 reactions; however, it only resulted in one person contacting us. Following, we forwarded the LinkedIn post to persons in our network who worked at relevant companies. We decided on a rather broad definition of our target group for the LinkedIn post in order to increase our chances of recruiting relevant persons. Nevertheless, we acknowledge that our formulation might have been too broad, and as such, the people we aimed to reach were not certain of fitting within our target group.

Are you involved in your company's data management decisions? And do you work in a Danish company?

As part of our master thesis in Digital Innovation and Management, my thesis partners **Frederikke Grunnet**, **Kristine Waldal Olsen** and I are looking for interview participants. And we need your help to find the right persons.

In our thesis, we are investigating data management strategies, more specifically how companies decide to store and operate data, including the factors and people influencing the decision process. As such, we are looking to interview stakeholders who are responsible for making or executing the mentioned strategy in Danish companies.

It will involve a 30 min. survey and 1 hour interview - taking place online whenever it fits your schedule. In return, you will receive insights from our comparative analysis of multiple Danish companies regarding their data management strategy, which can serve useful for future strategy decisions.

Could this be of interest to you or someone you know? Please reach out here and we will provide more information.

Feel free to share, or tag someone in your network or company who you believe fits the description.

#datamanagement #ITstrategy #masterthesis

Figure 4: Our LinkedIn post

Given the low response rate, we further recruited respondents by personally reaching out to managers of IT departments from different companies, inspired by employee titles that DigiPlex recommended to us. We either reached out through email or LinkedIn, depending on our connections. For some companies, we reached out to multiple employees, which resulted in interviews with two representatives from the company. In total, we contacted 35 persons, resulting in eight interviews from six different companies. In return for their participation, we promised to provide the participants with the results of our final thesis. Furthermore, our contact at DigiPlex reached out to 182 persons in his LinkedIn network, however, resulting in no interviews. As such, we used convenience sampling to recruit participants. Convenience sampling is a non-random technique of study participants selection (Emerson 2015). In contrast to random sampling, which randomly picks participants from the study population resulting in more generalizable results, convenience sampling can skew the findings. The reason for us using a non-random sampling method is the simplicity it brings with it. It enables us to identify and contact interviewees in an inexpensive and quick way.

Independent of the medium, when contacting the different companies, we provided them with some information about our research. The main topic communicated to them was data management strategies. In general, our interest in sustainability was deliberately not mentioned since we did not want the data to get skewed. We assumed that if we put environmental sustainability on the agenda from the beginning, it could potentially influence their focus. Furthermore, we feared that potential participants might refrain from taking part in our research as they might fear disclosing something on behalf of their company which they are not entitled to. As the general public is increasingly observant of sustainability, corporations' sustainability endeavors can attain a positive reputation, whereas lack of initiatives can damage the reputation (Epstein and Buhovac 2014). This can make companies highly aware and considerate of discussing related subjects in public.

We acknowledge that our point in time of reaching out to companies might have affected the success rate of our recruitment efforts. First, it was shortly before the Easter break, thus, employees might be busier than usual, finalizing their tasks before taking time off. Second, it was during the early phase of the Covid-19 pandemic. Our potential interviewees might have been more busy than usual, as many of them were responsible for enabling their companies to handle remote work setups and increased digital presence. Ultimately, the particular time period of recruitment, along with the time constraints of the thesis, represented barriers for the data collection. As such, we recognize that a greater number of respondents would have been beneficial in answering our research question. We will further elaborate on this in section 9.2 (*Reflections and further research perspectives).*

5.3.2 Design

The second stage considers the design of the interview process (Kvale and Brinkmann 2014). Inspired by the Delphi methodology, which we got to know through our partnership with C2E2, we decided to collect our company insights through a combination of questionnaires and semi-structured interviews.

The Delphi method is commonly used in information systems research to determine and prioritize managerial decision-making matters (Okoli and Pawlowski 2004). More specifically, the method can be employed to structure group conversations in which experts discuss a complex problem over the course of rounds. Typically, the method draws on expert knowledge, where respondents function as experts clustered into different groups. Their responses are anonymous and build upon each other's answers to reach consensus (ibid.).

We merely employ the Delphi method as an inspiration that helps us to identify the factors considered in the company's data management strategies. As such, we do not use the methodology in its full entity for two reasons. First, one of its drawbacks is that a lot of waiting time can be expected, due to the variance in the time it takes respondents to complete the questions, and all questionnaires having to be analyzed together. Second, we did not know which companies were willing to participate in the study from the start, thus, making us unable to assign them to groups. Instead, the Delphi method inspired us to employ a questionnaire as the foundation for subsequent semi-structured interviews with the company representatives.

The questionnaire was administered in the form of an online questionnaire created using SurveyXact, a survey service offered by Ramboll. As part of our email correspondence with the respondents, we sent a link to the questionnaire, together with a specified deadline. We scheduled the one-hour interview in the same email. The questionnaire was estimated to be completed within a maximum of 20 minutes, depending on the level of detail their answers entailed. At the beginning of the questionnaire, we highlighted the objectives of the study, without mentioning sustainability, and promised confidentiality. The rationale behind refraining from mentioning sustainability was the same as to why we did not name it in the recruiting process: to detect whether respondents would consider environmental sustainability themselves, without knowing that it was our focus. We presented the two objectives of the study as the following (Table 1):

1. Identify the factors that are considered in strategic decisions regarding data management and the relative importance of these (Note that the term data management relates to that within IT operations, including both the storing and processing of data)
2. Investigating the different roles that employees have in the process of deciding on where to store data, at which times they are present and which impact/power they have

Table 1: Study objectives as presented in the questionnaire

The questionnaire allowed us to get a substantial understanding of the respondents as well as their companies. Responding to each question was mandatory, and all questions were open-ended. This format enabled the respondents to use their own words when answering the question, rather than being led in a specific direction by fixed response options (Cohen, Manion and Morrison 2000). We acknowledge that this question format required more time and attention from our respondents, which resulted in a difference in the level of detail each respondent's answers entailed. Figure 6 presents the questions included in the online questionnaire.

While the figure only displays Factor 1, each respondent was required to list a minimum of five factors in prioritized order. Furthermore, we asked the respondents to complete the questionnaire while thinking back on a situation when they last discussed the data management strategy of their current company. This encouraged them to ground their answers in previous experiences.

We examined each questionnaire and complemented it with desk research on the company before conducting the subsequent interview. In total, we conducted eight individual in-depth interviews with stakeholders from six different companies. The interviews allowed us to further explore the factors, ask in-depth questions, as well as have informants validate our understanding and their prioritization of factors. Overall, the purpose of the empirical process was to gain an understanding of the factors that Danish companies consider within data management strategies, to disclose whether sustainability is prioritized and valued as a factor, and to reveal the company's internal alignment. This, in turn, allowed us to get a thorough comprehension of the companies and to identify barriers and opportunities regarding green data management.

Participant Information

Your name:	
Your position:	
Company name:	
Years of experience in IT:	
Description of areas of responsibilities in job:	

In your own words, how do you define data management?	Please describe the importance of data management within your company.

Who is involved in formulating the data management strategy in your company?	Who is involved in executing the data management strategy in your company?

Factor 1

Factor	
Why important	
Driver of factor	
Comments	

Figure 5: Questions of the online questionnaire

5.3.3 Interview

The third stage is the interview itself and the questions asked during it (Kvale and Brinkmann 2014). As our interviewees are inhabiting elite positions, such as managers or experts, they are likely used to being asked about their attitudes and thoughts. Therefore, to gain respect and achieve sympathy in the interview relation, we as researchers had to be well-informed about the topic, master the terminology and be familiar with the interviewee's position (Kvale and Brinkmann 2014, p. 201). The better we are prepared for the interviews, the higher the quality of the knowledge produced in the interview, and the easier a dynamic and relaxed interview atmosphere is established. As such, the importance of our thorough literature review and industry and market knowledge became even clearer. Since the questionnaires served as the foundation for the subsequent interviews, a thorough analysis of them further contributed to our prior preparation for the interviews. We tailored the questions in the drafted interview guideline accordingly to further explore and validate our interpretations of their questionnaire responses.

Because of the special circumstances due to the spread of the COVID-19 virus, it was not an option to physically meet our interviewees. Instead, all interviews were conducted online through Microsoft Teams, an application for virtual meetings. Because many of the interviewees did not use their cameras, physical elements such as gesticulation and facial expressions were lost (Kvale 2007). Furthermore, the digital nature of the interviews slightly challenged the natural conversational flow. In order to safeguard a good flow, we split up the tasks for each interview. While one person led the interview, one took notes and one transcribed. To be mentioned, conducting interviews virtually also has its benefits. It allowed us to communicate internally about progression and potential follow-up questions, without the interviewees noticing. In addition, it provided flexibility for the interviewees.

In the design of semi-structured interviews, a *soft laddering technique* was followed (Schultze and Avital 2011, p. 9). Soft laddering allows the interviewees to influence the flow of the interview, by articulating and prioritizing their own understandings and values, as such, generating context-rich and experience-grounded data. Furthermore, we included follow-up questions built on the answers provided by the interviewees. This method served as a way of continuously clarifying the answers' true meaning in regard to labels that can be used for subsequent coding and analysis (Kvale and Brinkmann 2014). As we gained experience from each interview, we continuously learned how to best phrase questions in order to faster reach essential points and, as such, have more time to explore these points. The flow of the interviews also improved with experience, and the act of bringing environmental sustainability onto the agenda of the interview became increasingly natural.

According to Kvale and Brinkmann (2014), an interview guide should be both thematic, to extract knowledge for analysis, and dynamic, to establish trust and comfort between researchers and interviewees. A good academic and thematic question is not necessarily a good dynamic question (ibid.). With this in mind, questions were phrased to be easy to understand, short, and without academic or complex phrasing. To ensure

receiving answers to our research questions, we designed an interview guide with six overarching topics, as displayed in the following (Table 2):

1. Personal experience with and understanding of the term data management
2. The importance of data management in their company
3. The current internal alignment in decision and strategy making in the company, more specifically between business and IT
4. An elaboration on the factors considered in the formulation of their data management strategy
5. The representation of CSR initiatives in their day-to-day operations and department
6. The influence of the company's environmental sustainability efforts on their data management strategy, and expectations of future development

Table 2: Overarching topics of the interview guide

At the beginning of the interviews, we stated that we were interested in the physical, infrastructural, and architectural aspects of data management in order to guide the conversation and follow our scope. Furthermore, in order to establish a safe environment from the start, the interviewees were informed about purpose, consent, and confidentiality at the very beginning of the conversation (Walsham 2006). Here, we informed them that we would solely use their position, company size and industry.

5.3.4 Transcription

For the fourth stage, transcription, we used the artificial intelligence (AI) transcription application, Otter, which enables both recording and transcribing of the interviews. The transcriptions were cross-validated to ensure correctness, but we acknowledge that flaws in the technology could risk extracting incorrect statements. To mitigate this, we dedicated at least one person to take notes during the interview, which also helped to safeguard capturing the essence of what was said. Furthermore, all interviews were recorded and revisited to adjust the transcriptions according to our understanding of the recordings.

5.3.5 Analysis

The fifth stage concerns the analysis of the data. As this research follows an interpretive approach, it is of importance to elaborate on how we derived our findings through the data analysis. Since we are not aiming to report facts, but our interpretations of our informants' interpretations, it is crucial to explain how we arrived at our results (Walsham 1995). In the following, we describe how we conducted the data analysis after having finalized the data collection through all interviews.

First, we created a collective overview of the most intriguing findings based on the interview notes and questionnaire responses. This allowed us to easily revisit the key findings throughout our process. Afterward, we further analyzed the transcripts of all interviews. Here, we coded the transcripts in a structured manner to ensure that all of the data was examined and clarified in a thorough way (Eisenhardt 1989). Coding refers to a method of categorizing insights and assigning them with defined and descriptive labels based on their meaning (Kvale and Brinkmann 2014; DeCuir-Gunby, Marshall and McCulloch 2011). We utilized a combination of a theory-driven and data-driven approach, as labels were defined based on a mix of literature on the topic as well as allowing them to be influenced by our interview findings (ibid.).

Following Corbin and Strauss' (1990) guidelines on a coding process, we turned to open, axial and selective coding. First, we applied the method of *open coding*, which is the process of interpreting data and clustering it into main themes (ibid.). When investigating and coding each of the interviews to define labels, we considered the data with three overarching themes in mind. The themes were based on the interview guides, as well as guided by our research questions. The overarching themes were *data management and strategic factors, organizational decision-making processes, and alignment*, as well as *environmental sustainability*. Next, we turned to *axial coding*, which is a way to analyze and verify the main category labels defined in the open coding phase (ibid.). As such, we investigated the themes to identify sub-themes as well as the relations between the themes. Thereby, it became evident that the themes could be reduced into two: we eliminated the theme *organizational decision-making processes and alignment* as it was present within the other two themes, and no labels could be placed solely under it. Under the two remaining themes, the labels were as follows (Table 3):

Data management and strategic factors:	Environmental sustainability:
● Data management definitions are based on position or industry ● Data management is of increasing importance ● Data management setups stem from historical decisions ● Price and cost are always central ● Regulations and GDPR as an example of how regulations can push change ● Data governance and security is an important factor ● Market demand is an important factor ● Business-IT alignment ● Management's role in decision-making	● Sustainability as a sensitive topic ● Role of sustainability in data management strategy ● General increased focus on sustainability ● Energy efficiency is the relateable sustainability focus ● Justifications of inaction

Table 3: Overview of labels

Finally, we shifted to a more abstract level and created a ‘core category’. As such, we went through the process of selective coding (Corbin and Strauss 1990). The core category was based on the patterns of the labels as well as the focus of our research and was defined as “the role of environmental sustainability within data management strategies". As such, it was used to build a storyline of the analysis, with the insights being prioritized accordingly. In addition to connecting all labels to the core category, we revisited the transcript to further elaborate or integrate insights (ibid.). Overall, this process allowed us to explore the overarching topic and answer our research question.

In the process of coding the interviews, each interview was analyzed individually with the themes and literature in mind. Overall, the coding was an iterative process, where we revisited the interviews several times to ensure the inclusion of all relevant points (DeCuir-Gunby, Marshall and McCulloch 2011). Furthermore, we continuously revisited the transcripts in order to safeguard that the context of the insights was not neglected, and the recordings were revisited to validate the transcription from the artificial intelligence application.

5.3.6 Verification

In the sixth stage, researchers should aim for verification of the study. The aim of the verification stage is to determine the validity, reliability, and generalizability of the research findings (Kvale and Brinkmann, 2014). Validity refers to evaluating if the data collection supports the desired focus of the study. Reliability means assessing the consistency of the findings. Finally, generalizability refers to assessing what generalized conclusions can be drawn from the study (ibid.).

We ensured validity through the coding process of our data analysis. More specifically, open and axial coding allowed us to select the data that enabled us to answer our research questions. As we were able to answer our research question based on our collected data, we argue that we have ensured the validity of the study. However, neither reliability nor generalizability could be accounted for. In order to assess the reliability of our findings, we would have needed to either interview more persons from the same company or entirely repeat the study, including more participants. In addition, considering our sampling method, as well as the sample of companies included in our research, we cannot generalize our findings to other companies, nor to entire Denmark. This is elaborated in section 9.2 (*Reflections and further research perspectives).*

5.3.7 Reporting

The seventh and final step after Kvale and Brinkmann (2014), is reporting. The results of the study should be communicated in a scientific matter, accounting for ethics and readability. In terms of ethics, we have safeguarded our interviewees' confidentiality by anonymizing their statements. Anonymity was deemed very important for many of our interviewees, as they did not want to represent and speak on behalf of the whole

company (further described in 7.3.3). The results of our research are communicated in the form of this master thesis, following scientific methods and guidelines for readability.

6. Overview of interviewees

This study investigates the extent to which environmental sustainability is considered in relation to companies' data management strategies, through the sample of six Danish companies. All companies have been anonymized to safeguard the confidentiality of our interviewees and their respective organizations. In order to contextualize the insights, this section presents the interviewees and the industry of their company in compliance with our confidentiality agreements.

Overall, we studied six private companies through eight individual interviews that were based on their previous questionnaire responses. The sizes of the organizations range from <10 to >25.000 employees, and their industries include *IT services*, *financial services*, *transportation, shipping and logistics*, *food retail*, and *industrial engineering.* Whilst their level of global presence differs, all companies have their headquarters placed in Denmark. The companies are highly different from each other but share the attribute of being heavily reliant on data. Furthermore, the degree of IT experience and title of the interviewees vary, but all are involved in the formulation of their company's data management strategy and have insights on internal alignment and considerations taken into account in respective strategy formulations. Generally, all companies' data management strategies have a relatively low maturity, with some not having such a strategy, others are working on one, and some have recently made one, as became apparent from the interviews.

In terms of sustainability, the majority of the companies, except the IT services company, are due to their size required to have a dedicated CSR strategy (Samfundsansvar.dk 2019). Hereof, we are specifically interested in their environmental considerations. Generally, the companies with a CSR report strive to reduce emissions and energy consumption, as well as to increase energy efficiency. None of them mention IT infrastructure or sustainability initiatives in relation to IT in their CSR report. Lastly, it is worth noting that there can be variety in how inherently sustainable the industry of the chosen companies are, but this will not be further explored nor defined in our thesis.

The following table (Table 4) presents how each interviewee is referred to throughout the thesis and provides an overview of their respective title, the industry, and size of the company:

Interviewee reference	Interviewee title	Industry	Company size
A	CEO and Chief Software Architect	IT Services	<10
B1	Data Governance Specialist	Financial Services	>2500
B2	Data Enablement Director	Financial Services	>2500
C	IT Director	Transportation	>5000
D1	Data Center Manager	Shipping and Logistics	>5000
D2	Business Intelligence Director	Shipping and Logistics	>5000
E	Enterprise Architecture Manager	Food Retail	>25.000
F	Architecture, Data and Analytics Director	Industrial Engineering	>10.000

Table 4: Overview of interviewees

We now shift our attention to a more thorough description of the participants. This chapter elaborates on the industry characteristics of the different companies, including descriptions of the interviewee(s) from each company.

6.1 IT services company

The first company to elaborate on, is a small start-up company with less than ten employees, operating in the IT services industry. It is by far the smallest and youngest company among our participants. They deliver an open-source software platform, which utilizes data from Internet of Things devices to provide insights to their business customers. The company's goal is to enable their customers to make qualified decisions based on data-driven insights to drive environmental sustainability and a green transition. Thus, by its very nature, data is in the backbone of the organization. Due to the size of the company, they are not legally required to have a CSR strategy, but the goal of their existence is to advance data-driven, green choices.

Interviewee A is the founder and CEO of the company. He is a software architect with 25 years of IT experience, and his responsibilities include management, sales, software design, and IT architecture. Thus, he has a comprehensive overview of the data management strategy and the corporate strategy of the company.

Additionally, he has the final say in all decisions and has been involved throughout the company's full existence.

6.2 Financial services company

The next company is a large, European enterprise in financial services with more than 2500 employees located in 20 European countries. This company has a long history and legacy in the Nordic countries and is, like all companies in the financial industry, characterized by being highly regulated in order to be "licensed to operate". The company is mainly focused around business-to-business services and is currently undergoing several mergers and acquisitions, which has resulted in a reevaluation of how they manage the massive amount of data flowing across the organization. Due to the large size of the company, they are legally required to have a CSR report in which they present goals of reducing their carbon footprint. The main part of their emissions is related to energy consumption from running and operating systems and physical locations.

Two employees from the company were interviewed to gain insights on the internal alignment from different profiles, areas, and historical experience in the company. Interviewee B1 is a data governance specialist with eight years of experience in IT, but is new to the organization, as she comes from one of the recently acquired companies. She is responsible for data migration and the maintenance of data servers, on a high-level, not operational level. On the other hand, interviewee B2 is concerned with data enablement with more than 25 years of experience within IT and has been with the company for seven years. He is leading a team of data scientists who deliver actionable insights based on advanced analytics to both internal stakeholders and business customers. As such, interviewee B1 is new to the company and has a high-level data governance perspective, while interviewee B2 has extensive experience in the company and hands-on knowledge from a data enablement perspective.

6.3 Transportation company

We interviewed one employee from a transportation company with more than 5000 employees in Denmark. They serve private customers, and have in recent years, started utilizing data more. Massive amounts of data are generated, compiled, and analyzed to gain insights about current operations and process performance to ultimately turn it into a strategic asset for building new business models, partnerships, and societal improvements. Even though the Danish transportation infrastructure is placed among the best in the world, new IT and big data are considered as a driver to increase safety and the utilization of the current infrastructure (Infrastrukturkommissionen 2008). The company is legally required to have a CSR report in which they commit to lowering their energy consumption, both connected to transportation, buildings, and operations.

Interviewee C is the company's IT Director and has 22 years of experience in IT. He is responsible for four departments and the overall architecture and systems portfolio. Three years ago, they made a new strategy for IT and data management in the company, and as such, the insights he displayed reflect his learnings from that process.

6.4 Shipping and logistics company

From the shipping and logistics industry, we have interviewed two employees from a large company with more than 5000 employees in 20 countries, serving both private and business customers. The Danish shipping and logistics industry is characterized by strict legislation and a wide variety of actors (DLA Piper n.d.). Our examined company is heavily reliant on and deals with large amounts of data, which are processed and analyzed in real-time to the benefit of the employees using the systems. In the company's CSR report, they put emphasis on reducing pollution, waste, and noise in the communities in which they operate. Amongst other initiatives, they have set specific targets on reducing electricity and heating consumption from their offices, warehouses, and terminals.

Two employees from the company were interviewed to shed light on internal alignment and the role of data management from two different departments. Interviewee D1 has 20 years of IT experience and is responsible for IT operations, including all backend systems, servers, storage, and data center facilities. Interviewee D2 also has 20 years of IT experience and is responsible for delivering products from the business intelligence department. He is aiming to push the company towards becoming more data- and insights-driven, by working on a strategy formulation on how to handle data in the organization. As such, we examined the company from two perspectives on data management; one operational- and system-oriented, and one oriented by business development and analytics.

6.5 Food retail company

Another company we interviewed is a large food retailer of more than 25.000 employees in Denmark, responsible for delivering value to its private customers. Generally, the Danish food retail industry is characterized by a few big actors dominating the market. The sector is highly competitive, and this company aims to use data to serve customers beyond what they expect, as well as to enable better collaboration with external partners and vendors. In their CSR report, they place emphasis on saving energy and being more energy efficient in all stores and buildings, and they highlight that sustainability is part of their DNA.

Interviewee E is an Enterprise Architecture Manager with 22 years of experience within IT. He is responsible for the overall IT architecture and systems portfolio in the company, by leading a team of enterprise architects

that assesses the systems against the desired processes. As such, he represents a broad view of the companies' data management strategies, including both business and technical perspectives.

6.6 Industrial engineering company

Lastly, we interviewed a large company in the industrial engineering industry. In this industry, companies are driven by optimizing operations, reducing costs and waste whilst at the same time, maintaining safe working environments. Our examined company has more than 10.000 employees worldwide and delivers end-to-end products to solve logistics and operations challenges for their business customers. As such, utilizing data to generate insights is crucial for the company. Nevertheless, their current data management strategy is considered rudimentary. In their CSR report, they commit to enabling their customers to achieve a zero-emission production by 2030. They also aim to lower their internal emissions but primarily focus on their customers as they believe that this is how they can generate the biggest impact.

Interviewee F has 12 years of experience in IT and inhabits responsibilities within IT architecture, data and analytics. He is managing three teams in the company's digital department regarding IT architecture, data engineering, data science and data management. As such, his perspective derives from a managerial, high-level point of view that mainly draws on data enablement, but also partly on architectural and infrastructural aspects.

After having provided background information on the participating interviewees and their respective companies, we will now move on to the analysis to explore the insights gathered from the interviews.

7. Analysis

The following chapter presents the insights generated through the analysis of our empirical fieldwork, including both answers to the questionnaires as well as quotes from the interviews. In order to answer the overarching research question (RQ), the analysis was guided by our three sub-questions (SQ1 - SQ3). These are as follows:

RQ: *Which role does environmental sustainability currently play in the formulation of data management strategies, and what are the barriers and opportunities for advancing green data management?*

- SQ1: *To what degree does alignment between business strategy and IT exist?*
- SQ2: *Which factors do the participating companies consider in their data management strategies?*
- SQ3: *Why is sustainability not on the agenda of data management decisions?*

As such, the findings from this study aim to provide insights that can help to answer these questions. The analysis is divided into sections dedicated to answering each of the sub-questions (SQ1 - SQ3). First, the role of data management is presented to uncover the variety of the term's definitions. The same section will touch upon the business-IT alignment and the decision-making process of the respective companies. Next, the explanation and prioritization of factors included in the companies' data management strategies is presented. Finally, the last part of the analysis presents reasons for the lack of environmental considerations, as well as the motivations for and opinions on sustainability.

7.1 Data management and organizational alignment

This section is dedicated to exploring the sub-question regarding strategic alignment between business and IT (SQ1). We start with an illustration of the complexity and importance of data management, both in terms of the interviewees' understanding of the term and its representation in the business. Finally, we present the companies' current business-IT alignment, as well as their decision-making process.

7.1.1 Divergent understandings of data management

In order to understand the underlying organizational mechanisms that influence alignment and decision-making of data management strategies, we aimed to uncover the individual understandings of the term and what these imply for their respective companies. Overall, we found that our interviewees have different understandings of data management, as expressed both in their questionnaire responses as well as during the interviews:

> *"From my position, the view of data management is purely from an operational point of view, and not the content. It's how you store your data in a safe, secure and accessible manner."* (Questionnaire response from interviewee E)

> *"[Data management is] the ability and discipline of treating data as an asset (...). This also means that assets and outcomes from data management need to be carefully and closely linked to value creation. Otherwise, the continued investment into this will be reduced."* (Questionnaire response from interviewee B2)

The first response stems from a data center manager and the second from a data enabler. As these two quotes illustrate, some focus on the operational aspects of data management in terms of data storing and processing, whilst others perceive it more as part of business development and strategies, such as data analytics and insights. Thereby, the definitions clearly reflect their corresponding roles and expertise. This was also highlighted in the literature review (chapter 4) by Watson (2008), arguing that the term encompasses a variety of disciplines and aspects. The following data management definitions further highlight the influence of individuals' roles:

> *"Where does data live and flow, and as [IT] architects, we are also very interested in how the data is used."* (Questionnaire response from interviewee E)

> *"If you look at data management, it is how we manage our data, how we store it, how we secure it, how we work with it. But the most interesting part is always, what are we doing with those data, which kind of value."* (Interview with A)

Whereas the first stems from an enterprise architect, the latter stems from the CEO of the IT services startup and reveals that he is most interested in the value data brings for the company. It seems natural that a CEO values the bigger picture, ultimately caring most about its company's profitability and the value it brings.

7.1.2 Importance and difficulty of data management

As illustrated by interviewee A in the previous quote, data is increasingly viewed as an asset that can generate value for companies, as also highlighted by the European Commission (2020c). The data center manager from the shipping and logistics company adds that data management is essential for businesses to function well:

> *"It's a hygiene factor. This means that if you do your job properly, nobody will notice. If you don't, people will start to complain very quickly."* (Interview with D1)

However, as pointed out in the following quote, the way IT and data are viewed across the organization is gradually changing from representing just a hygiene factor to also becoming a strategic asset:

> *"Everybody is starting to recognize data as a strategic asset (...). Especially on a senior executive level, all agreed and all push for data becoming more and more important. But the old data strategy was more or less a cost saving exercise and that was probably why the different business units also hated it. It started to be a distant focus meaning benefits or data is much more valuable and they're also willing to invest much more into getting data in that way."* (Interview with C)

This quote demonstrates that data and IT were previously seen as supporting functions that could be subject to cost-saving initiatives, instead of representing a main priority. As such, it fully supports the shift acknowledged by Henderson and Venkatraman (1999). This is further advocated by interviewee D2. He

points out that data should be treated more like an asset, and that the value of their data, or the downside of not having it, should be measurable:

> *"IT has been traditionally seen as a cost center, something that you just have to have. (...) It's an umbrella and not seen as sort of a separate thing. I don't think that data is being treated as an asset. (...) It would be a good idea to actually treat data as an asset. You know, what's it worth to us to have it, and especially what's the risk if we lose it?"* (Interview with D2)

As this quote illustrates, companies are slowly realizing the potential of data. With this changing view, data is gradually getting acknowledged as a non-negotiable asset that serves as the backbone of companies. As interviewee B2 points out, this generates the need for a more centralized strategy to manage the data:

> *"So, though, there wasn't this centralized management of data or treating data as an asset. It was more, you know, here and there and small, small initiatives, and then off they went. So there was a wish from upper management to establish this as a more centralized steer capability."* (Interview with B2)

Despite the importance of a data management strategy, its formulation seems to be a difficult task. As illustrated in the section above, data management is a broad term, comprising different perspectives, disciplines and focuses. The challenge of successfully managing data is acknowledged by the following interviewee:

> *"I personally believe - because now I've been working in IT for, for quite many years and I've also been responsible for architecture (...). Data is insanely hard, and it's insanely difficult to make a successful data management strategy because you have to have so many different competences in place and you have to have so much collaboration across it."* (Interview with C)

Interviewee C further argues:

> *"So if you take the organization of data, sometimes it's only in the business, sometimes it's collaboration between business and IT, and sometimes it's IT that has the biggest role to play in it. And it says something about the complexities going into this (...). This area has tons of potential, but it's also one of the most challenging ones."* (Interview with C)

As this quote illustrates, good data management requires different parts of the organization to collaborate. The understanding across departments is not a given, and communication between business and IT can often be challenging because of the differences in terminology, as described by Fonstad and Subramani (2009). Given IT's technical and complex nature, communication with IT specialists can be perceived as difficult for non-technical employees. Furthermore, the interviewed companies seem to only recently have started to integrate IT and data more. In order to turn IT into a strategic asset, business-IT alignment is needed (Henderson and Venkatraman 1999).

7.1.3 Business-IT alignment

As explained in the literature review, aligning business with IT is a challenge many companies are facing (Fonstad and Subramani 2009). As the role of IT is becoming increasingly important, the data management

strategy needs to support the business objectives and vice versa. Interviewee C, representing the transportation company, highlights why this has not always been so easy to achieve in their organization:

> *"Historically, [the organization] was very silo oriented, meaning that each department had their own wishes and needs for data, and they didn't really collaborate across. So it was a very fragmented stakeholder setup."* (Interview with C)

As such, despite the importance of data management being recognized across the interviewed companies, there is a difference in how they handle it. There are also differences in the alignment between their business and IT units. Elaborating on the previous quote, interviewee C continues by describing how their current internal alignment has improved:

> *"It's a synergy between the two - business and IT. One is that the business has some perspective about the current projects and about the current platforms. (...) The second one is that the [company] from [its] own perspective has used a strategic direction, and then we, from the IT side, try to understand this - change the strategy and try to understand how we could actually help it."* (Interview with C)

Our interviewee from the financial services company also reports a relatively good alignment by explaining who is involved in their data management strategy formulation:

> *"[My company] have previously had strategic initiatives anchored at ExCo level to establish new foundational data capabilities, but these days the initiatives lie further down in the respective legs of the organization, and assume an operational and tactical nature."* (Questionnaire response from B2).

This highlights that IT becomes inherent in all units and that its strategy should be distributed out in the organization. In other words, each department has started to recognize the importance of data. The interviewee elaborates that "execution is quite distributed, (...) lifted through various business units and group functions", further illustrating that alignment between different departments exists and thereby contributes to the greater strategy.

In comparison, other companies we interviewed still seem to be characterized by misalignment—the reasons for this vary. Interviewee D2, representing the shipping and logistics company, explains that despite executive management understanding the importance of data, they have not yet called for a data management strategy. This is supported by the previously mentioned McKinsey (Blumberg et al. in McKinsey 2017) study, stating that companies often lack a holistic data strategy. Nonetheless, the interviewee recognizes the importance of a formal data management strategy, and as such has started working on his own initiative, by involving various technical specialists across the company:

> *"I try to set up a strategy for how we handle data (...), it's ongoing work in the early stages, but I think we need some sort of a documented data strategy. I think that would be beneficial. (...) We have to talk to the right stakeholders in our company to make sure that we get their saying in this."* (Interview with D2)

The shipping and logistics company has not yet reached internal alignment between business and IT. While their business intelligence department values a strategy on data management, upper management does not

seem to push for this yet. Misalignment is further illustrated by the following quote from interviewee D1, claiming that they currently do not have a formal strategy:

> *"You know it's not like we have a fancy strategy document to say this is on-premise, you know, (...) it's just something you know we've grown to, to where we are today. " (*Interview with D1)

While informant D2 seems to be working on a strategy document, colleague D1 does not mention this, even though informant D2 explicitly explains D1's department to be involved in the execution of such a strategy. The strategy document is however, argued to be in early stages, as such, interviewee D1 might simply not have been involved yet. Nonetheless, informant D1 recognizes that alignment and centralization are improving in the company.

The industrial engineering company also shows signs of misalignment between business and IT. Interviewee F explained that the organization recently established a Digital department in addition to the existing IT department, as IT was not able to deliver many projects because of internal cost-cutting initiatives. While IT deals with hardware, Digital works as a transformation point for the whole organization. Alignment between these two departments still lacks in regard to the formulation of a data management strategy:

> *"It is unclear. Currently, it is Global IT who claims the responsibility for that. But until Digital started to push and ask for data quality, no one looked into it."* (Questionnaire response from F)

He further elaborates that there is no data management strategy in their company, contributing to a lack of clear responsibilities leading to frustration and extra work, especially in his department. Moreover, size also seems to matter in regard to alignment. As the following quote illustrates, the small startup we interviewed has a flat hierarchy, which is beneficial for overall internal alignment:

> *"It comes down to, I am the CEO of our company and (...) I have the final saying. And I'm also responsible for what we deliver to our customers. So, (...) we don't have a lot of middle leadership, it's a very flat organization, being only seven people, but those decisions are on my table and, obviously, when I propose something, we discuss it together."* (Interview with A)

Overall, it seems like alignment between business and IT is partly dependent on the organization's size, as well as its digital maturity and integration in the various units. In other words, the degree to which a company is inherently digital and acknowledges the value data brings with it, is important for the alignment between business and IT. Furthermore, the smaller and less siloed a company is, the easier it is to ensure alignment. This is an interesting finding for our study, as it displays which parameters influence the business-IT alignment and how that influences the formulation and implementation of their data management strategy.

7.1.4 Decision-making process

Whether there exists organizational alignment or not, decisions are made every day. In the coming section, we explore drivers that influence the current data management setup, and who makes the final call when formulating data management strategies in the respective companies.

Especially in big, old companies with a lot of legacy, historical decisions influence future ones. As previous research suggests, mature companies tend to stick to old practices, rendering them less adaptable to new practices and ultimately experiencing strategic inertia (Meehan and Bryde 2011). Overall, we found agreement across interviewees, supporting this tendency. Their data management decisions from the past, influence their current and future decisions:

> *"There's an inertia in the big companies - you're used to doing things in one way."* (Interview with D2)

> *"I don't think that, you know, one makes a decision to make all of this, this is just grown out of history."* (Interview with D1)

As such, their current data management setup is based on historical decisions and has not changed since. The companies seem to stick to what they are familiar with, and they know works. This implies that the informants are often not sure who decided on the data management setup, or the reasons thereof. The following quotes further illustrate this tendency:

> *"[Our current setup was] decided before I was born. It's not me who decided, and I cannot change it."* (Interview with D2)

> *"So it's a bigger thing to work in big organizations, and although I know that's also frustrating because when you're a company like this, there's a lot of legacy. There's a lot of old systems and we still have mainframes running, they're very stable because they have been looked after for 20 years, so don't touch these systems."* (Interview with B2)

However, given that the role of IT and data is changing from purely being seen as a supporting function, other departments are getting more involved in such decisions:

> *"Where data is located, traditionally has been an IT decision. I think now we are seeing that that is changing. Well, you know, it used to be, say, a DBA decision but now it's sort of changing to be more of an application developer point of view and we are sort of moving away from having big monolithic systems into many services where data is stored. So, there is a paradigm shift ongoing at the moment."* (Interview with D2)

Besides an organizational mindset change, other aspects can also trigger changes in the companies' current data setup. These primarily concern market demands and security issues as the following two quotes illustrate respectively:

> *"Oh, let's say it can be something from outside, external, like vendor decisions, if some factors change in terms of either finance or some other risks or security that provider is giving, or it can be internal like if there's a big transformation going on"* (Interview with B1)

> *"We could look to others, but there's no reason for us to change (...) unless we have some customers who say that is not even enough that the data is inside the EU - 'we need data to be on Danish soil'."* (Interview with A)

Interviewee D2 further expects that security factors will be driving upper management to decide on the formulation of a data management strategy:

> "*For our sake, they [upper management] haven't called for a data management strategy. As such, yet. I think they're still looking at IT security and just saying 'okay you handle it guys', but I think it'll be something we talk more and more about over the next couple of years"* (Interview with D2)

Overall, upper management seems to be the one making the final strategic decision by either directly making the call or signing off the decision-making to experts from the given field:

> *"We talked to our strategic vendors and saw what they could offer. And then we brought in some external advisors, [and] we did some reviews with external and technology experts to make sure we have a platform and a strategy (...). And then, after making that proposal for the strategy, then we went again to all stakeholders and presented them with our ideas."* (Interview with C)

Usually, experts work on a proposal including different alternatives, which is then discussed with upper managers who select the final option. This confirms what was found by Eisenhardt and Zbaracki (1992), arguing that the most powerful individual chooses the strategy. Therefore, it is ultimately executive management having a decisive say, as further illustrated by interviewee B1:

> *"It's always a top management call on what's the priority regarding the strategy."* (Interview with B1)

As became apparent from this section, the companies' data management setup and strategic decisions thereof are highly influenced by historical and legacy factors. Drawing on the literature review, the companies can be said to be subject to institutionalization and strategic inertia (Hopkins, Mallette and Hopkins 2013). External factors like customer demands or changing regulations seem to be the most important forces for companies to assess and reevaluate current strategies. In the end, the final strategic call is usually made by top management.

7.1.5 Key insights on SQ1

The first part of our analysis revealed that data management is a broad and complex field that offers both challenges and opportunities for companies. We found that the definition of data management is dependent on the individual's role and experience, as well as the company and industry they work in. The wide variety of definitions enables us to gain insights from a range of perspectives, enlightening different parts of the topic. The term's complex and overarching nature allows it to be understood in an array of ways and, thus, causes difficulties in achieving organizational alignment of data management (Watson 2008).

In addition, this section showed that IT has historically been viewed as a hygiene factor in organizations. Gradually, the companies are realizing the critical value of IT and data, and as such, the perception of IT is

changing. In other words, data is gradually getting acknowledged as a non-negotiable asset that serves as the backbone for companies. With this realization comes the importance of having a data management strategy. However, this is viewed as a highly difficult task and the companies we interviewed seem to, at best, be in the midst of changing their view of IT's role in the organization (Henderson and Venkatraman 1999). This also becomes apparent through the missing alignment between business and IT in many companies.

Another intriguing finding is that strategic IT decision-making rarely happens without initiative or buy-in from upper management and is usually based on historical decisions. The interesting part is that there seems to be an inherent passiveness to change, and rather an ambition to keep things "as they have always been". This suggests that the companies experience strategic inertia given their inability to adjust to the changing value of IT (Hopkins, Mallette and Hopkins 2013). Additionally, from the interviews, it became apparent that change in the data management setup and strategy rarely happens without a pull from external forces, such as customer or market demands. Only then, upper management sees the incentive to make changes. We found this interesting and will further elaborate on it in the discussion (chapter 8).

7.2 Factors considered in data management strategies

This section is dedicated to answering the second sub-question (SQ2). As such, it presents our data analysis with regards to the factors our interviewees consider in their data management strategies. First, we shortly explain how the interviewees interpreted the question regarding the factors. Following, we present the discovered factors. Last, we summarize this section and describe the importance of the findings and how they will be revisited in the discussion (chapter 8).

7.2.1 The factors and drivers of the strategy

In the questionnaires, the participants were asked to describe a minimum of five factors. Several of the mentioned factors were similar, only their wording differed. The level of detail varied, for instance, in describing the exact title of the driver, or simply referring to "management". Furthermore, when we asked about their thought process and rationale for listing the factors, we discovered that they interpreted the question differently. Here, it became apparent that some interviewees looked back on previous experience of formulating a data management strategy (Interviewee B2, C, D2 and F), while others thought of what they consider in their current strategy (interviewee B1 and A). One interviewee (interviewee E) acknowledged that they simply did not have a strategy, so the factors were more or less listed based on a gut feeling. Likewise, it was acknowledged by another interviewee that the factors were filled out from the top of his mind and his point of view in the particular moment of answering the questionnaire:

> *"It's probably not 100%, but I just filled in what I sort of had top of mind on the things that I had been checking. Yeah. So, I guess it's not an exhaustive list." (*Interview with D2)

Overall, this rendered it crucial for us to ask the participants to elaborate on their answers from the questionnaire during the interviews. This allowed us to validate our analysis of the questionnaires, as well as to understand in which context the factors were considered. In addition, providing the interviewees with a questionnaire prior to the interview allowed them to prepare and reflect on their answers. We consolidated the most appearing factors into the following insights.

As previously described, the interviewees' roles influence their definition and perception of data management. Generally, we discovered that despite the individual differences in the interpretation of the questions and wording of the answers, the interviewees considered the same factors. When making data management strategies, factors regarding *compliance with regulation, data security and governance, market demand*, as well as *cost* were the most frequently mentioned and prioritized factors across all interviewees. These are described individually in the following.

7.2.2 Regulations

Our findings display an increased awareness about data protection and storage in all industries after the updated GDPR regulation took effect in 2018 (GDPR.dk n.d.). GDPR is a regulation that companies need to comply with if they handle personal data, which has been a driver for the heightened focus on governance, ownership and accountability of data. GDPR has been around since 1995, then called the Data Protection Directive, at the early stages of the internet (EDPS n.d.). Because of the drastic development of the internet and its extensive use, the GDPR rules were reviewed and updated in 2018. As a result, the focus was turned more towards data governance. All interviewees included GDPR as an example themselves, as it was not a topic that we deliberately introduced.

Most of our participating companies are required to comply with the GDPR regulation, as they store and process personal data in their databases. Interviewee E, A and D2, all explained that the GDPR regulation led to further considerations and actions in their respective companies in order to thoroughly comply with the regulation. Despite stemming from three different industries, namely IT services, shipping and food retail, the interviewees experience the same effect of the regulation:

> *"We've always had a lot of data, but with GDPR, we sort of needed to shape up. (...) Each department head or manager is managing the data that they use, and make sure that they don't violate any regulations, both the GDPR and otherwise."* (Interview with E)

> *"When the, you can call it 'GDPR age', started out, you had to be even more thorough, both in the way you develop and document everything and the way you want to sell your software service application to a customer."* (Interview with A)

> *"You know [with] GDPR (...) we did a lot of work on that, but of course it's continued work to have accountability or ownership. So we are looking at who actually owns what data (...). Those are things we have discussions about now."* (Interview with D2)

GDPR is also highly important to the financial services industry. Interviewee B1 highlighted that their data management framework is continuously being adapted to new regulations, as such, the regulations steer the strategy:

> *"We have to align with [regulations]. For example, if a new GDPR regulation comes out and they give us some new rules on how to document data, or how to treat data, we have to go with our data management framework in that way."* (Interview with B1)

Their industry is highly regulated, and thus, multiple regulations and legislations need to be complied with in order to be "licenced to operate". Regulations are not only influencing the strategy, but also the direction of the business as explained by two colleagues:

> *"Our business is a business that needs to have a license. It's a highly regulated industry. So, if external standards change, we have to change our internal business in that direction."* (Interview with B1)

> *"So, a big driver for [the data management strategy] decision was the strict compliance and information security rules that [the company] is underlying."* (Interview with B2)

On the other hand, the industrial engineering company stores no personal data. Thus, they do not need to consider GDPR and they are only affected by a few regulatory frameworks. Nevertheless, it remains top of their mind to always ensure compliance with relevant legislation and regulations:

> *"Our first kind of step is always to look into the regulation. (...) [But] there is no regulation in the [industry]. The next step is to figure out - is that GDPR compliant? We look at it [the data] and say - well, there is no personal data - then it means it's not regulated and there is no GDPR obligation. That actually tells you that you can store it for however long you need it for."* (Interview with F)

In another interview, it was revealed that upper management cares about compliance in order to avoid both penalties and negative influence on their reputation:

> *"If something is not being done in a better way, that can cause either penalties, deterioration or lower reputation"* (Interview with B1)

In addition, implicitly driven by GDPR regulations, companies consider security as a factor. For instance, interviewee D1 from the shipping and logistics company highlighted the importance of keeping the data safe to meet laws and regulations. Similarly, interviewee A listed security as a highly important factor:

> *"So how do you structure your API is to make it both as accessible for the development going to use it, and as fast and secure as possible. (...) with these kinds of data, security is the first issue that we consult and talk about - how can we make this secure enough?"* (Interview with A)

To conclude, despite our interviewees and companies stemming from a range of different industries, they all prioritize regulations. Companies handling personal data are most affected by the recent GDPR regulation, but even companies that are not, still consider regulation in order to serve their employees, customers and partners in a compliant manner. This section highlighted that regulation is a crucial factor to consider in data management. More specifically, we find the update of the GDPR regulation interesting as it seems to lead to a change in data awareness and governance.

7.2.3 Market demands

Our analysis revealed that speed and accessibility of data are increasingly becoming important for companies to stay on top of market demands and thereby remain competitive. The expectation of real-time data is increasing, both to serve the needs of the organization and customers (Glanz 2012). Interviewee D2, representing the shipping and logistics company, experiences this demand in his own unit as well as in the whole company to be able to efficiently handle data effectively:

> *"We do see that real-time data is something that, (...) is now being more of a demand, throughout the business."* (Interview with D2)

A colleague with a more operational point of view from the same company highlights that even though speed is important, it is only true to a certain price. They do not necessarily require the fastest speed on the market; it simply needs to be fast enough to serve their business objectives:

> *"Speed is one of the main tasks. That doesn't mean that we have the fastest piece on the block, but it's fairly fast and so on, but it could easily go out and spend more money and get something which is significantly faster."* (Interview with D1)

The drivers for high speed within the shipping and logistics company were mainly internal. Besides the internal pull, the financial services company also experiences an increasing customer demand. As they are delivering data insights reports to their business customers, these increasingly expect high speed, partly because they are becoming more dependent on the data insights that they are receiving:

> *"Once you start building predictions or reporting, your customers start taking these insights (...) into their daily processes, so they're getting dependent on it. (...) Then you also get expectations back that we can do it faster and faster. Now we need to deliver insights faster and faster and with better and better quality."* (Interview with B2)

Similarly, the IT services company stated that accessibility is essential, as customers need to access and update their data often (Interviewee A). As high speed is needed for business customers, our findings show that it is also crucial for companies delivering services to private customers as. The food retail company must avoid any delays or congestion to serve their customers and achieve well-functioning day-to-day operations:

> *"We needed to make sure that we provided a network connection that was fast enough for that latency to be as low as possible. We don't want any congestion on the line."* (Interview with E)

In this section, we highlighted that market demands represent another crucial factor. It became apparent that across the industries, speed and accessibility, present the most important customer demands, regardless of whether the company was serving businesses or private customers. As such, all companies valued speed and accessibility of their data as an important factor to stay competitive in their respective industries.

7.2.4 Cost

The last factor, cost, is the one that was mentioned most frequently. Some interviewees explicitly listed costs as one of the factors (interviewee A, B2, C, D1 and D2), whereas others indicated revenue as the driver of several factors (interviewee D1 and F).

Firstly, interviewee D1 prioritized price as a factor with the argument of getting as much value for money as possible by making an assessment of the needs across the organization and the potential solutions that can serve that. Similarly, interviewee C listed cost as the ultimate determining factor for the data management strategy by arguing that cost efficiency is always important. In line with this, interviewee F and C add that everything comes down to costs:

> *"In the end of the day it will all come down to price and money."* (Interview with F)

> "*Basically, you can boil down the factors to cost and benefit. How much does it cost and the benefits we'll get out of it. Those are the two most important ones, no matter what."* (Interview with C)

Interviewee C further argued that the strategy should be changed if there is a possibility to lower costs. However, he elaborates that while IT was historically considered a cost point, the company is becoming more willing to invest in high class IT solutions. Nevertheless, cost awareness is always in the back of their minds:

> "*We continuously do an exercise where we look at what the biggest cost drivers are. So we see where we are using the most money. (...) From an IT perspective in a lot of companies, there should always be a cost savings initiative going on because new technology is developing, there's other ways you can do it or maybe the business changed its need.*" (Interview with C)

This illustrates that cost motivates companies to constantly reevaluate and assess whether their current setup is most cost-efficient in terms of what the business needs, and what they are willing to pay for it. This influences decision-makers to compromise other factors to get a lower price, as illustrated by interviewee B2:

> *"Sometimes, you are also okay with not having that amount of data. So, I think that it was also an aspect of cost-consciousness to not just push it into [a new data management setup]."* (Interview with B2)

Overall, this section highlighted that cost is of high importance to the interviewees, and that the cost-benefit relationship matters most.

7.2.5 Key insights on SQ2

By following the second sub-question, we identified three factors that all companies considered in their data management strategies: regulation and data security, market demands, and cost. While complying with regulation and security standards is of primary importance in order to avoid penalties and poor reputation, market demands are always assessed in relation to cost. Companies are willing to accept some data latency if it allows them to cut costs, as long as it does not damage their market competitiveness. Interestingly,

sustainability does not seem to be considered in their data management strategy. The following section further investigates this.

Besides neglecting sustainability as a factor, there are two other aspects we find worth discussing. The first concerns the importance of speed. As shortly explained in the literature review (chapter 4), increasing demand for real-time data implies higher data processing, which ultimately leads to more CO2 emissions (Glanz 2012). This is interesting because it directly contradicts sustainability considerations, as will be examined in the discussion (chapter 8). The second relates to the power of regulations. We find it very interesting that once the GDPR regulation was updated, allowing to sanction non-compliant companies, they quickly changed their data awareness and governance. We suggest this finding can be used to incentivize companies to consider environmental sustainability within their data management. Not only will the last-mentioned point be elaborated in the discussion (chapter 8), but also touched upon in the subsequent section.

7.3 Sustainability

The sub-question we aim to answer in this section is centered around environmental sustainability (SQ3). More specifically, this section illustrates the findings with regard to the prioritization of environmental sustainability in data management strategies. In other words, we explore the reasons behind the lack of environmental sustainability's prioritization within their data management strategy.

7.3.1 Environmental sustainability is not considered

First and foremost, as the previous section implies, sustainability was not mentioned by a single interviewee as a consideration in their data management strategies. This finding is very interesting, and also a bit surprising, given that all of the companies we interviewed have a CSR strategy or a sustainability-focused business proposition. Especially striking was that sustainability was not considered within data management, despite the food retail company's aspiration to be the frontrunner in regard to sustainability, as interviewee E describes:

> *"We want the best for our customers. And we want to be the company – that CSR company – that you look up to. So it's really important for us to do the right thing and do it early enough for it to matter. Meaning that, if we were just number six or seven in the row, that did something on the environmental side of things, then we would just be following everybody else. And that's not what we want. At least not in that area."* (Interview with E)

Surprisingly, the companies' sustainability initiatives do not seem to impact their data management strategy, despite sustainability affecting other parts of the business. In order to understand the reasons for this, the following section displays the motivation behind focusing on sustainability.

7.3.2 Motivations behind sustainability initiatives

As previously mentioned, the Danish state requires companies of a certain size to report on CSR. This made us wonder to what extent environmental sustainability is truly imbued in the entire organization. With that in mind, we explore the companies' motivations for their sustainability endeavors in the following. At this point, it is important to repeat that sustainability was not mentioned in the questionnaires nor in the recruitment process, wherefore interviewees did not have the chance to prepare their thoughts on this topic prior to the actual interview. We highlight that we do not wish to expose nor to judge the companies' sustainability efforts, hence we have prioritized to display the rationale and context of the interviewees' answers in this section.

Deloitte (2019) identifies a growing trend and changing mindset in organizations, as companies are increasingly driven towards sustainability because it is "the right thing to do". The food retailer company has been founded around these initiatives and used it as an opportunity to be a first-mover towards green initiatives in its industry. In line with the Deloitte report, they express that their sustainable endeavors are motivated by the desire to "do the right thing". Instead of just following everyone else, they intend to lead the way and do something that is not necessarily expected in their industry, which others can look up to. As such, the food retailer is intrinsically motivated to advance its sustainability endeavors. In contrast, other companies choose to be followers in regard to sustainability initiatives. They advance their green agenda to be able to compete with others. One respondent made this especially evident by stating that he believes that companies simply follow each other:

> *"It's kind of like in the school - like everyone comes with a Mac, so I need to come with a Mac as well, you know, something like that. Everyone is talking about CO2 emissions, let's do that as well."* (Interview with F)

Profitability is also perceived as a motivation for sustainability efforts. More specifically, economic factors seem to be important incentives for companies to develop a sustainable strategy, which is in line with cost representing a strategic factor. One interviewee expressed that investors positively react to these efforts, possibly because they know that it is also valued by partners, clients or customers. Thus, according to interviewee E's personal opinion, many companies primarily follow green initiatives because it attracts more investors:

> *"I think many organizations, go after this notion of, you know, being CSR and being green and stuff to generate more investments to kind of, you know, attract more investors and to get high rating so they can get cheaper loans and stuff like that so there is an economic agenda behind this decision anyway."* (Interview with F)

As such, sustainability endeavors represent a selling point for investors. As Kramer (2020) points out, investors seem to increasingly value sustainability efforts. However, he stresses that investors do not read CSR reports when evaluating green efforts and that a new way of communicating with them needs to be established.

According to some of our interviewees, one reason for adopting sustainability initiatives is the increasing interest of the general public. With regard to B2C companies, a green portfolio can be considered a competitive advantage. B2B companies can also profit from sustainability initiatives as these serve as a selling point that can attract new partners, as interviewee B2 expresses:

> "*As the climate agenda gets more and more on top, you know, if you want to be the selected partner by other companies, you simply also need to have a chapter on how you help drive the green agenda and the CSR.*" (Interview with B2)

However, the same informant acknowledges that often B2C businesses prioritize green initiatives more so than B2B businesses do because it is primarily private consumers demanding it:

> *"A green agenda has worked very well with the business-to-consumer, you know, buy this shampoo, because you know it's degradable in nature. All these things work very well, but when it comes to business-to-business, there's less of this public visibility around the things so there's more money game, but you know, if our partners suddenly decide to run with a green agenda and think that is very important - be sure that those requirements will be equivalent to us as a business-to-business partner."* (Interview with B2)

This also serves as a justification for B2B companies to not have considered environmental sustainability as a factor. The interviewee highlighted that it was of primary importance for them to remain competitive when deciding on a data host solution. To our questions on whether environmental sustainability was considered in that decision, he answered:

> *"No, it wasn't. And that's a really honest answer. I think we were very driven in the beginning by (...) our ability to be competitive in the market, and we saw that we needed analytics, as a new business area, simply to work to start monetizing data.*" (Interview with B2)

Interviewee A adds to this by explaining that businesses value security and compliance more than sustainability:

> *"It [a green profile of data host] wouldn't be a primary parameter for the customer, it would be; can we do the job, can we do it in a secure way, and are the data managed securely and reasonably and are the data transferred out of the EU or not."* (Interview with A)

Another interviewee explained that instead of environmental sustainability representing a crucial factor, it is merely considered a "nice-to-have" attribute when evaluating vendors. More specifically, in their overview of vendors, environmental sustainability does not appear as a factor:

> "*We have, it is basically an Excel spreadsheet where we list all the factors we need to look at, (...) such as price and cost and we put a weight on these and then we put a score on each thing. And we don't have a dedicated (...) environmental aspect in that situation at all. That's just a nice side benefit of course."* (Interview with D1)

Lastly, sustainability initiatives can also help companies to attract young talent. In other words, younger generations value sustainable companies, which companies can use for their own advantage by positioning and branding themselves as sustainable. As one interviewee explains, sustainability is becoming more important to existing employees:

> "*So, I guess it's getting more and more important for us, we also see that the people we employ (...), it's important to them*." (Interview with D2)

Overall, it appears that it is primarily economic factors that motivate companies to adopt sustainability initiatives. As expressed by various interviewees, companies hope to attract more investors, customers and employees through their green efforts. Consequently, they can turn such initiatives into a competitive advantage. However, environmental sustainability is seldomly considered within data management because of its invisibility and low importance to customers. Interestingly, the interviewees mention the drive of customer demands but do not consider themselves as customers of data host vendors. This makes us wonder who should drive this agenda and be the first mover to inspire others and thereby potentially advance an entire industry. We will further elaborate on this in the discussion.

7.3.3 Interviewees' personal opinions matter

Another finding we would like to highlight is the importance of interviewees' personal beliefs and opinions. In other words, the interviewees' interest in and knowledge of environmental sustainability highly influenced their answers. This became especially apparent when interviewing two people from the same company. In the shipping and logistics company, we got the impression that one interviewee had a better overview of the connection between data and sustainability than the other interviewee, which seemed to result from a personal interest in the topic. The personal interest was also evident in the industrial engineering company, where, despite environmental sustainability not influencing their company's data management strategy, interviewee F mentions a small initiative within his department. The interviewee's department has experimented with sustainable initiatives to contribute where they can:

> "*One of the things that we have been experimenting with once was to (...) write such a code that would minimize the use of the CPU, and thereby minimize the amount of electricity consumed, and thereby minimize the CO2. This is a very (...) small contribution, but still, we are kind of office people right. I mean, we can't go out and create a machine that will be, you know, running on air. Of course, we're not engineers, like mechanical engineers, but we are doing a lot of what we can from, from where we are*." (Interview with F)

This line of thought is supported by interviewee D2 who, despite numerous sustainability initiatives, expresses that his company is not yet doing enough. More specifically, he suggests that sustainability should be part of every project in the company:

> *"Are we doing enough? No, I don't think so. I think that we could in every project do an impact factor (...). Does this have an impact factor? Is it a negative or is a positive impact factor?*" (Interview with D2)

In contrast, interviewee D1 from the same company does not see the necessity of the data department to engage in sustainability endeavors because he considers these efforts as less impactful than other activities in the organization:

> "*Spending the time and money on the environmental sustainability side in the data department does not take much to the gate."* (Interview with D1)

Sustainability within data management seems to be highly debated across interviewees and, as such, depends on personal opinions. This finding was also acknowledged by the interviewees themselves, as most of them immediately expressed that their answers to sustainability-related questions were based on their personal opinions, and not their company's. Interestingly, this was not something they felt the need to highlight in previous parts of the interview, most likely because the other questions concerned their experience and expertise. For instance, when replying to sustainability topics, interviewee B2 explicitly stated:

> *"I just, I want to say that, you know, the opinions stated here are solely my opinions, not necessarily reflecting the company's opinion. Just as a disclaimer."* (Interview with B2)

We also asked the interviewees why they felt the need to make such disclaimers. It became evident that there are certain experts in the company who are cleared to talk about sustainability-related matters. As such, other employees are mindful of their statements within these matters. However, as we were set to analyze the role of sustainability from an IT perspective, we did not consult these sustainability experts.

Supporting this finding, Epstein and Buhovac (2014) stress that mismanaging or miscommunicating sustainability can lead to reputational damage of companies. Sustainability experts both know how to frame it in the media to benefit the company's reputation and may also be more knowledgeable of the current and future initiatives in the company. To illustrate this, when asking interviewee F why he was so careful when answering the corresponding sustainability questions, he replied:

> *"Maybe because I'm telling things that are not necessarily in line with corporate politics. Hmm, I don't know, maybe that's why. Because maybe I'm also telling things (...) that I think is the true reason behind things and it's not what is being portrayed in the media."* (Interview with F)

Interviewee B2 adds to this by referring to his role and expertise which lies on technological matters and not sustainability:

> *"I'm not cleared as a spokesperson for (...) public media. And you know, the way we want to frame our brand and position in the media, I would leave that up to the experts. (...) So it's my personal opinion, to be honest, it's not necessarily what my company might stand for and have, you know, maybe in half a year."* (Interview with B2)

It was interesting for us to experience that most interviewees did not feel confident to answer sustainability-related matters, while no such disclaimers were made in regard to data management, despite them sometimes not being involved in the strategy either. Thus, sustainability seems to be perceived as a very sensitive topic, which none of our interviewees felt secure discussing with us. The lack of expertise seems to contribute to this feeling. A potential explanation of expressing these disclaimers is related to *climate shame*. According to a scholar from Copenhagen Business School, climate shame refers to a tendency of considering one's personal consumption and actions in relation to climate consequences (Sløk 2019). More specifically, individuals feel embarrassed for actions that harm the environment or that are simply not considerate of their

impact. Thus, we assume that our interviewees could feel ashamed of their passiveness in regard to sustainability wherefore they felt uncomfortable touching upon the topic.

7.3.4 Passive rather than active measures

Generally, we found that many interviewees justified not considering environmental sustainability as a factor by explaining that soon every cloud provider and data host vendor will solely use renewable energy anyways, automatically making data management more sustainable. In other words, the interviewees take on a passive role instead of taking proactive measures. Specifically, two different interviewees illustrate this point, as they explain that active decisions are not needed because the industry has already started the green transition:

> "*So for me, to be honest, it wasn't, let's say, a factor in deciding, but we just know that our industry, the IT industry, is moving in that direction*." (Interview with C)

> "*I don't think in a sales perspective that whether we used Amazon or Google, that would be a very strong parameter for our customers selecting us or someone else, because it's common sense. Amazon will eventually reach hundred percent, Google will reach hundred percent Microsoft and Apple, and Facebook will reach hundred percent. It's not only because it's a wiser choice but it's going to be the only electricity you can get. Eventually everything will be running on green electricity*" (Interview with A)

Another interviewee adds to this by highlighting that currently, economic factors are more important than sustainable ones, however, he expects it to change in the future when younger generations take over the power:

> *"You have to accept that there is a world's rule that says -- money first and then environment second. But I think it's a thing that will come more and more over generations."* (Interview with B2)

As such, companies seem to wait for the world around them to change, i.e., their vendors to automatically become more environmentally sustainable instead of choosing vendors based on their green performance. They acknowledge that the sustainable transformation is driven by a demand from customers and partners, which they are currently not experiencing. Yet, the interviewees do not seem to acknowledge that they themselves are customers of other services, and thus have the mandate to express such demands to other companies. Nevertheless, some interviewees expect that environmental sustainability will be considered as valuable in the future as the following quote illustrates:

> *"Let's say that not so much, not as a strong factor, but it is a factor that is being tracked and given more and more value.*" (Interview with B1)

Other interviewees blame previous decision-makers and claim that if the decision was taken again and they themselves were involved, they would consider sustainability, as apparent from two different interviewees:

> "*If we had to choose today, we would obviously make that one of our priority parameters for selecting a host.*" (Interview with A)

> "*If we have data stored in their data center, are we sure that it's done with green energy, are we taking the excess heat from the data center and putting that out into the local area? You know, for me that's*

important to have enough of a say in that. Is it something that I will push? I'm sure it is. I'm not sure it's the most important decision - and I'm sure it wasn't the most important decision last time we took the decision on where to store the data. (...) I think next time when we do this again, (...) then it's something we'll look at (...) Would it be as important as price - I don't know - but it would be a factor." (Interview with D2)

Interestingly, many interviewees turn to future developments and decisions to justify their inactiveness and explain that everything will automatically improve over time. Ultimately, cost is considered of utmost importance, as the last quote exemplifies.

7.3.5 Incentivizing companies to consider sustainability

Given that the companies currently do not consider environmental sustainability in their data management strategies, we wondered how companies could be incentivized to advance their green considerations. Our empirical data suggests two different options, an economic and a regulatory one. As previously shown, companies adopted CSR strategies to comply with national requirements and for economic reasons, thereby fostering competitiveness. As one interviewee argues, a real impact can be reached by coupling economics with environmentally sustainable incentives, confirmed by the Triple Bottom Line (Elkington 2013). However, at this moment, the interviewee does not see his company benefit from prioritizing sustainable efforts:

"I think that real innovation will happen when they couple financial benefits (...) with green benefits (...). I don't think, necessarily where we operate in the market, that putting green as the first value proposition on top is the most effective for us to survive as a company. And I think it has to be part of the storytelling and increasingly so going forward." (Interview with B2)

Several interviewees add to this by suggesting that highlighting cost-saving potentials of choosing renewable energy can incentivize companies to become greener:

"*A lot of times, buying a solution comes down to return on investment. (...) And if we can lower energy consumption which makes us more green. (...) then it's a win-win situation."* (Interview with A)

"*We have reduced our power consumption on data centers with a fair amount - is that sustainability or is that like 'can we save money'?*" (Interview with D2)

With the introduction of GDPR, every company started to actively investigate how personal data is stored and processed in a secure manner. Following these learnings, the interviewees acknowledge regulations as a potential driver for companies to consider environmental sustainability as a factor:

"*Let's be honest, sometimes it's just, if it's regulated, it will be done in a more thorough way. And not just from the perspective of companies and individual entities*." (Interview with B1)

Accordingly, we assume that regulations could push companies to consider sustainability in other aspects, including data management.

In the interviews, we also asked who in the company should be driving this change. It became evident that buy-in and drive from top management are required for changes to be adopted in a widespread manner. This is supported by research from Epstein and Buhovac (2014). However, even though sustainability needs to be prioritized and enforced by higher management, it is not necessarily them kickstarting these ideas. Informant F from the shipping and logistics company shared his experiences with employee-driven initiatives for sustainable efforts. He stresses, however, that in order for initiatives to have an impact in the business, it needs to come from the top:

> *"So it is being a focus from top, and there's ideas coming up from the bottom. (...) So I would say it's both small initiatives that come bottom up and, but the big ones that really have to have an impact, they come from the top."* (Interview with D2)

7.3.6 Key insights on SQ3

The last part of the analysis revealed that despite the companies' having CSR reports and sustainable profiles, not a single interviewee mentioned environmental sustainability to be a factor in their data management strategy. As such, environmental sustainability is not reflected in the companies' IT operations. We will further explore potential reasons and barriers in the discussion (chapter 8).

Another interesting finding concerns the interviewees' discomfort when being asked about sustainability. First, we thought that this arises from their lack of sustainability expertise or knowledge. However, our informants did not state the same disclaimers when discussing their data management strategy, even when they have not been involved in its formulation. As such, environmental sustainability was regarded as a very sensitive topic, which they shied away from. The discussion will further elaborate on this tendency.

A third intriguing discovery was that many of our interviewees personally believed that most corporate sustainability initiatives were driven by economic incentives. The reasons for adopting sustainability efforts were to attract investors, new employees or customers. Ultimately, this leads to economic benefits. This finding is supported by existing theory, stating that a company's sustainable accountability can be transformed into competitive advantage as it allows them to stand out from others (Epstein and Buhovac 2014).

Similarly, cost is one of the most important factors considered in data management strategies and, as such, reveals that economic drivers are of primary importance and interest to businesses. This in turn, implies that in order to advance sustainability endeavors in companies, financial incentives are necessary. Previous studies support this as they found that in order to be successfully implemented, sustainability actions should aim to increase revenue or reduce costs (Epstein and Buhovac 2014). To be mentioned, it is possible to both be green and generate revenue, innovation and new market opportunities while at it (Burchardt et al. 2018; PWC 2019; Dansk Industri 2019; Compress n.d.). We will further discuss this in the subsequent section since it allows us to suggest ways to incentivize companies to focus on environmental sustainability. For instance,

we believe that regulation can act as a motivation for companies to change. The potential role of regulations will further be discussed in the following chapter.

Last, we would like to highlight the companies' passiveness with regards to environmental sustainability within data management. Many of the interviewees justified not considering sustainability as a factor by explaining that this change will arrive automatically. On the other hand, they stated that once their own customers or partners wish for a greener profile, they will change the extent to which they consider sustainability. This is an interesting paradox; the companies wait for an automatic change or push by their customers, but do not consider themselves as customers of data host providers. In relation to this, we will discuss how being the first mover towards green data management can push an industry to change.

8. Discussion

It is now time to shift our attention to discussing the gathered insights. Based on the main findings, we have chosen some general themes to discuss while drawing on theory from the literature review. This enables us to draw conclusions to the research question. To follow its structure, the discussion is divided into two parts. The first part discusses the role of environmental sustainability in the formulation of data management strategies, as well as barriers for its increased presence. The second part discusses potential opportunities for advancing green data management in the future.

8.1 Which role does environmental sustainability currently play in the formulation of data management strategies and what are the barriers to advancing its influence?

In addition to discussing the role of environmental sustainability in data management strategies, and the reasons thereof, this section debates potential barriers for advancing its presence in current strategies. We elaborate on strategic inertia, the companies' passiveness and the diffusion of CSR goals.

8.1.1 Strategic inertia hinders sustainability considerations in data management

The analysis (chapter 7) revealed that environmental sustainability was not a factor in data management strategies for any of the companies. This was despite all companies possessing CSR strategies, thereby suggesting sustainability to be an important corporate consideration. Interviewee D1 expressed that while other factors are being prioritized, they do not "*have a dedicated (...) environmental aspect in that situation at all. That's just a nice side benefit.*" Furthermore, we found that the interviewed companies overall considered the same factors when formulating data management strategies. As such, these factors appear to be standard considerations independent of the industry and the extent to which regulations apply. In the following, we explore why sustainability is not considered by turning our attention to the current strategy formulation.

Since the current strategies seem to have evolved and been reinforced over time, we assume they are institutionalized. In other words, the data management decision process can be assumed to be a routinized activity where the same factors are always considered. This is also supported by the fact that many of the data management solutions stem from historical decisions that the currently responsible managers have accepted. In a research journal on business strategy and the environment, Meehan and Bryde (2011, p. 102) explain that following such rigid routines can lead to strategic inertia and resistance to change. With the literature on strategic inertia in mind, the fact that sustainability is not a factor does not surprise us but is yet a highly important finding. As businesses are traditionally judged according to monetary measures, one of

the factors that has become subject to routinization is economic performance (Davis-Peccoud, Stone and Tovey 2017). As a result, most of our interviewees seemed to consider sustainability as nice-to-have rather than business-critical, and many reported that it conflicted with economic aspects. This is interesting, as research shows that sustainability efforts and cost reduction often go hand in hand (Burchardt et al. 2018; PWC 2019; Dansk Industri 2019; Compress n.d.). Sustainable efforts have been proven to not only reduce costs but also to generate new business opportunities and increased competitive advantage. This does not seem to be the case in the companies we interviewed. Rather, the factors considered within data management strategies have reinforced themselves over time, decreasing the likelihood of new factors, like environmental sustainability, being adopted into data management practices.

The lack of environmentally sustainable considerations might further be the result of employees' uncertainty of how to interpret and apply sustainability into data management decisions. In contrast to economic aspects, they do not have any experience of how to integrate sustainability. While monetary elements are entirely inherent to all corporate activities, thereby having been internalized by employees from the very beginning, sustainability aspects are new to many. In addition, as found in existing literature, the complexity of sustainability adds to its ambiguity resulting in employees feeling overwhelmed, leaving them puzzled and confused about how to consider the aspect in data management practices (Hopkins, Mallette and Hopkins 2013). This ambiguity aggravates organizational inertia, as employees shy away from implementing sustainability into their strategies. But, in how far can the concept's complexity explain that it is currently not being considered in corporate data management strategies? While being a possibility, we do not think that ambiguity is to blame for this. Rather, we received the impression that many saw the connection between data management and environmental sustainability but might not understand the severity of the issue. It appeared that most of our interviewees did not prioritize environmental sustainability as part of data management as they were attuned to the factors they have used over time.

Another potential explanation for the proposed strategic inertia refers to the interaction between middle managers and executives. As Hopkins, Mallette and Hopkins (2013, p. 78) revealed, if middle managers do not feel encouraged by C-level to adjust strategies, their commitment to strategic renewal decreases despite their expertise to give valuable inputs. Middle managers are considered as possessing positions two or three levels below executive management, but one above the operating level (ibid.). Some of our interviewees can be recognized as middle managers. Since many informants stressed the decision power of upper management and referred to them as having the final say, it seems plausible that they do not feel the necessary encouragement by C-level to renew the data management strategies themselves. In other words, the executives' mindset, also understood as the beliefs and values they bring into decision-making, might discourage our interviewees from expressing their ideas (ibid.). If senior management is perceived as sticking to their previous decisions, middle managers do not feel supported to express new ideas and trends. For instance, they might not push for adopting environmental sustainability as a factor. This, in turn, can lead to

a lack of commitment to goal fulfillment by lower managers and ultimately results in strategies following old trajectories, adding to the routinization of factors currently being considered.

Last, responding to market demands represents another routinized factor. This factor can be argued to directly counteract sustainability considerations in data management. More specifically, our interviewees reported continuous growth of data utilization and market demand for faster accessibility times. As explained, constant data processing contributes to higher energy usage, which in turn increases CO2 emissions (Glanz 2012). Thereby, it contradicts taking environmental sustainability into account. Surprisingly, the majority of the companies highlight in their CSR reports to have goals specifically related to lowering their carbon emission by being more energy efficient. However, these considerations are not reflected in the choice of data management setup whatsoever. It seems that the direct correlation between data usage and electricity usage has not been drawn or internalized by the companies. As such, we argue that it should be of utmost importance for companies to understand this link in order to find ways to reduce CO2 emissions stemming from data, whilst their data utilization continues to grow. In addition, we suggest that the inherent rules of IT need to be challenged. The environmental cost of speed and accessibility of data needs to be clear in order to provide employees with incentives to make more conscious decisions regarding data management. This opportunity will further be discussed in the second part of this chapter.

8.1.2 Companies expect sustainability to happen by itself

As the analysis further revealed, interviewees were justifying their inactiveness towards sustainability by their expectation that the transition will happen by itself. They all supposed that sustainability would be considered more within data management in the future, but seemingly do not expect this transition to be dependent on them taking a proactive role.

The interviewees referred to mainly two explanations, both regarding external factors. First, it was claimed that the data center industry is moving towards using 100% renewable energy, so they do not have to demand their partners to be sustainable because they eventually will be anyways. Supporting this argument, hyperscale data centers have set ambitious goals of becoming climate neutral in the future. Giant IT companies like Google, Facebook and Amazon are increasingly prioritizing renewables and pushing the transition on a race to become 100% green (Nielsen 2017; DR P1 2017). Interestingly, most of our informants portray this change to happen automatically, without them as customers requiring a shift of their respective providers. Seemingly, they hand over their responsibility and accountability to their vendors and as such refrain from their own active role.

Second, it was argued that our participating companies would not start putting sustainability higher on the data management agenda until there is a pull from their own customers. It is unsure whether this pull will arrive in the near future, as there seems to be no public visibility around data management. In other words,

companies' back-office processes, like data management, remain invisible and intangible to the public. In any case, this justification seems counterintuitive. On one side, companies await sustainable action until their customers demand it. On the other, they expect their vendors to become more environmentally sustainable without seeing their own opportunity as customers to actively push for this change. As such, data centers need to be intrinsically motivated to install sustainable measures themselves instead of having their customers demand it. Although all interviewees seem to welcome a green transition, it becomes apparent that active change towards it is expected to happen outside the companies. The problem is that a green transition in organizations rarely happens without internal push (Davis-Peccoud, Stone and Tovey 2017). Research shows that without buy-in for sustainability efforts flowing through the organization, the chances are small for substantial and long-lasting success (ibid.). With tendencies of justifying environmental passiveness, one can question whether intrinsic motivation for considering environmental sustainability exists in the respective companies. Another explanation for their passiveness could be the lack of knowledge about their own role and potential in making a change for the environment. Based on our own education as IT students, we know that sustainability is often underrepresented in IT education. As such, data management specialists could feel uneducated and unequipped to address sustainability in their operational tasks.

8.1.3 Sustainability is not truly embedded in corporations

It became apparent during our interviews that the informants found it more difficult to address sustainability-related matters than other topics from the interview guide. Sustainability seemed to be a sensitive topic to talk about, and they apparently felt a lack of expertise in this area. In other words, even though the companies all have CSR strategies with measurable goals that they are reporting on, these goals have not been embedded in the culture to the extent that it is under the skin of the employees. This raised three questions about why that might be, which we elaborate on in the following:

1. Are CSR goals not specific enough, allowing managers and employees in IT departments to disregard them in their operations?
2. Are CSR goals simply under-communicated to the IT department?
3. Is the reason rather rooted in individual perceptions and prioritization of sustainability efforts?

To address the first question, Danish companies above a certain size are required to have a CSR strategy, demanding certain parameters for companies to report on. However, it is unclear how, if at all, the progress is being enforced and diffused throughout the specific departments. If the companies' motivation for having a CSR report is simply because of the requirement, it can cause failure in translating CSR goals into actions that can be diffused throughout the organization, amongst others, the IT department. None of the measurable CSR goals concern data specifically. Thereby, the IT department is not directly affected by the CSR goals as data is not touched upon. The broad and generic definition of sustainability and its accompanying range of options poses as an "alibi for inaction" (Elkington 2018, p. 4). As such, IT employees are unsure how the CSR goals directly relate to them and their daily operations, which they can use as a justification for their

passiveness. This could explain why the digital and IT departments have not embraced environmental sustainability in relation to their operations. Or, at least not yet.

In regard to the second question, it is unclear how the CSR efforts have been communicated from the dedicated department to the remainder of the organization. The fact that the IT departments have not adopted the goals into their own strategies and operations could imply that the communication between them has not been sufficient. A possible explanation for this could be rooted in a misalignment between the CSR strategy and IT, or the lack of a clear communication and action plan from the CSR department. Another reason could be that management has not included the different departments in CSR formulation and how sustainability could be applied to their respective operations. As such, it would be interesting to consult representatives from C-level management and the CSR department in future research in order to understand the issue from their point of view.

Lastly, for the third question, personal interpretations of climate change and the need for sustainability can influence how environmental efforts are adopted by the individual and how it is communicated to others. As mentioned previously, differences in attitude, personal convictions and perception of the past and future influence the extent to which people see their own role in combating climate change (Hulme 2009). Thereby, the lack of individual conviction regarding the importance of environmental sustainability efforts might affect how these initiatives are implemented in their respective units. Furthermore, it could also influence their ability to understand the link between their daily operations and emissions. Considering that the CEO's personal involvement was found to be crucial for the success of sustainable transformation, C-level support is especially important (Davis-Peccoud, Stone and Tovey 2017). As such, if data managers are not interested in sustainability, nor motivated by C-level, environmental sustainability is not considered within data management.

8.2 What are the opportunities for advancing green data management?

Now that we discussed the current status of the six companies, this part of the discussion builds on and further debates the previously presented points and considers them with a more future-oriented perspective. It seeks to discuss the driving forces and opportunities that might contribute to pushing companies in a direction where sustainability is higher prioritized on the IT departments' agenda. It is worth keeping in mind that as the companies are different, their incentives might be as well. The severity of the push from each driving force might be different for the companies, thus, this section will debate them on a more general level.

8.2.1 Demonstrating the link between data management and sustainability

The first aspect to consider is the way the topic is presented and discussed. Including environmental sustainability into a data management strategy implies connecting two fields that are usually placed very far apart from each other in organizations. Isolated, that is a challenging task alone, but adding to this complexity is the fact that both fields are defined by ambiguous and broad terms. This can cause several challenges.

The analysis (chapter 7) displayed that the term data management is perceived as broad and interpretation of it is highly context dependent. We believe that this is partly due to its intangible nature, as illustrated at the example of the cloud. Its fuzzy and intangible nature allows people to distance themselves from its environmental repercussions (Riggins 2020; Mønsted 2019). We suggest that increased coverage can render the connection between data and CO2 emissions more visible and thereby lead environmental sustainability to be increasingly considered within data management. The work already done by the European Commission and its representative Margrethe Vestager is a step in the right direction, but we think that the topic needs to be communicated on a more frequent basis to reach the awareness of customers, partners and the society as a whole. In addition to it being covered by politicians, we believe that companies successfully demonstrating the link can also serve to highlight its importance and motivate other companies to follow. More specifically, we recommend that the ambiguity and technical nature of the topic must be reduced to be of relevance to and understood by the public.

Moreover, we hold that sustainability also needs to be made more tangible. As explained before, there are many ways to report on sustainable performance, among others the SDGs, CSR and the Triple Bottom Line. The numerous different initiatives illustrate the ambiguity and complexity of sustainability accounting. From our own experience, we know that this renders the topic difficult to understand and grasp. This makes it challenging to translate sustainability into tangible and measurable actions or behaviors (Kramer 2020). As previously mentioned, data management is rarely accounted for specifically, and the efforts do not seem to be deeply rooted in the organizations' core. This means that companies can solely state that they are aiming to cut emissions and to consider sustainability, without being held accountable for their commitments. As such, we argue that more research is required to establish a consolidated and actionable way of measuring that can guide organizations and render them accountable for reaching the goals. An example to be inspired by is how Future-Fit Business helps companies to establish internal accountability for their sustainability efforts (Future-Fit Business n.d.). We believe that this could be applied to IT departments, where managers would be held responsible for decreasing CO2 emissions connected to their data management. The numbers would help decision-makers to measure the performance of the company's sustainability efforts, which seems to be crucial in order to incentivize companies to take environmental action (Kramer 2020; Elkington 2018). Another way to illustrate sustainability endeavors is given through certificates. We suggest that issuing green certificates could potentially motivate companies to advance their sustainability endeavors within data management, as these increase acknowledgment and visibility among their customers and partners.

8.2.2 Achieving organizational alignment

In the analysis, we displayed the current misalignment that exists between business and IT. Now we will return to some of the arguments in order to discuss how alignment can potentially be created in the future. It is important to note that alignment is a continuous process rather than an event which, as such, needs to be worked towards through different measures (Henderson and Venkatraman 1999).

While the importance of IT and data is increasingly being acknowledged across the interviewed companies, business-IT alignment is not a given. This can imply that upper management neglects the importance of IT infrastructure investments which are needed to advance its sustainability trajectory. The literature points to C-level's unwillingness to participate in IT investment decisions, which in turn highlights the importance of increasing the collaboration between upper management and IT departments (Fonstad and Subramani 2009). Since alignment is crucial to turn IT into a competitive advantage, we suggest that companies install regular meetings between higher management and managers from the corresponding IT departments (Henderson and Venkatraman 1999).

Similar to business-IT alignment being required for companies to inherently implement IT into business strategies, we believe that alignment is needed to advance corporate sustainability. More specifically, we hold that alignment between business and the CSR department is necessary to incorporate sustainability into business strategies. As a second step, communication between the sustainability department and the rest of the organization is required to spread sustainability endeavors into all business units. As our findings suggest, seemingly, no active communication between the companies' IT and sustainability departments took place. This can possibly explain why environmental sustainability is not considered as part of their data management strategies, and why data is not included in CSR goals. To foster such communication and collaboration across the two departments, we propose three different measures.

First, drawing on the research by Fonstad and Subramani (2009), who refer to engagement opportunities as measures to increase alignment, we suggest the facilitation of meetings and discussions, similar to achieving business-IT alignment. This can both be beneficial when phrasing the data management strategy, but also to continuously discuss new initiatives and evaluate the strategy. Our research supports that instead of being an intentional and planned process, strategy making seems to result from several incremental changes made over time (Wooldridge and Cowden 2020). Thus, installing regular meetings seems to help strategic renewal and, as such, to consider sustainability within data management. This might further enable companies to plan ahead and consider long-term rather than short-term benefits and break with their current trajectory of following legacy decisions.

Second, it would be essential to create decision teams of people with different expertise that take part in these meetings. Since involving various people with competing interests leads to constructive disagreement and debates, the quality of strategic decisions can be enhanced (Wooldridge and Cowden 2020). We suggest that

the decision teams should, in our case, consist of representatives from senior management, the CSR department as well as the IT departments, including those responsible for data management. By including the IT department in the formulation of sustainability goals, they could build commitment as well as ownership. Without this, only the employees who are most passionate about sustainability contribute out of their intrinsic motivation, while others sit around waiting for instructions. This participatory way of involving those people affected by the initiatives could motivate them to take measures and contribute with ideas. The CSR department could facilitate meetings with the various departments to raise the importance of sustainability and create a sense of urgency to consider it in all decisions. Here, it would be important to present a business case for change and support employees in understanding how sustainability can lead to business success in their respective departments (Davis-Peccoud, Stone and Tovey 2017). With regards to the IT department, the case should specifically illustrate how sustainability can be considered within IT and data management, so they each understand its link to their work instead of sustainability being ambiguous.

Last, we consider where the CSR department should ideally be placed in businesses to spread sustainability initiatives across the organization's departments. Drawing on Coombs and Holladay (2011), we suggest that had there been one CSR responsible in each department, sustainability might be considered on all levels and decisions. The authors (ibid.) discuss different options of where CSR activities should belong in the organization. As mentioned previously, CSR is often clustered under communication, which can undermine an organization's motives behind sustainability. Dedicating CSR its own department is beneficial for the consistency of sustainability strategies but separates sustainability endeavors from the rest of the organization. This hinders sustainability from becoming ingrained in the company's DNA as the following quote illustrates: "CSR becomes the responsibility of 'that department', not the entire corporation" (ibid., n.p.). A third alternative is to have different departments execute CSR. While this risk sending out divergent sustainability messages, it ensures the diffusion of sustainability across the organizational culture and thereby fosters accountability (ibid.). In other words, we believe that having a dedicated sustainability person in each department allows sustainability to be considered on all levels. This will ultimately foster sustainability to become a parameter of data management strategies and contribute to internal alignment.

Overall, we believe that when starting to incorporate sustainability as a criterion for decision-making, more people in the organization should be involved to generate higher alignment. This should not only be a debate between business and IT people but also require the involvement of sustainability or CSR focused employees. Collaboration across employees with different expertise and points of view could help all actors understand and prioritize the potentials of environmental sustainability as a criterion in data management. Furthermore, it could foster ideas for additional or future initiatives as well as business models in the sphere of technology and sustainability.

8.2.3 Generating support from all organizational levels

In order to diffuse sustainability considerations and objectives throughout the organization, it is crucial to get buy-in from C-level, middle managers and employees, so they can act as drivers for the change. Throughout this thesis, it has been demonstrated that various different stakeholders are needed in order to incorporate a sustainable focus when formulating a data management strategy.

As previous research shows, employees' resistance to adopt sustainability initiatives, and their tendency to choose business objectives above sustainability goals, can be traced back to a lack of clear commitments with quantitative targets from management (Davis-Peccoud, Stone and Tovey 2017). With the absence of push by management for environmental sustainability considerations, employees have to initiate these changes themselves, meaning they need intrinsic motivation and encouragement to do so. To foster this behavior, middle managers should actively work to build such encouragement in their departments. Furthermore, it is illustrated that in order to make employees able to comprehend and prioritize sustainability, to proactively initiate sustainable efforts, the link between sustainability and business success needs to be clearly illustrated by middle management (ibid.).

Not only is management's mindset and encouragement important to make employees consider sustainability in their daily work, the employees' encouragement and initiatives can also influence that of the management. Our analysis (chapter 7) illustrate that grassroots initiatives can influence management's agenda, but these initiatives need to be enforced by top management: "it's both small initiatives that come bottom-up and, but the big ones that really have to have an impact, they come from the top" (Interview with D2). In other words, by encouraging environmentally sustainable initiatives throughout the company, employees might contribute with new innovations to the company that are both profitable and ethical.

Employees can function as beneficial drivers in their suggestions to the board, but importantly, also in the execution of the implemented initiatives. Evidently, C-level management plays an important role as a driver and executor for change, but the importance of employees down the line should not be underestimated. They are not just insignificant puzzle pieces, but can, by joining their forces or through middle managers, suggest and ask for the change. In addition, all employees are highly important in carrying out the changes.

8.2.4 Realizing the benefits of advancing green data management

As was previously argued, companies do not have to choose between doing business or being sustainable. Incorporating sustainability as part of companies' corporate strategy does not only allow them to achieve sustainable IT strategies but also benefits them in other aspects. New economic models might arise from the organizations' environmental ambidexterity, which can lead to competitive advantage, legitimacy, and better reputation (Thambusamy and Salam 2010). Thereby, rethinking the role of sustainability in data management can entail several benefits, as the following reveals.

Nielsen (2018) predicts that customers will increasingly demand sustainability from their providers, which in turn will lead to a growing opportunity space for sustainable business in the years to come. Furthermore, it is argued that the companies moving into this opportunity space first, will be reaping the biggest benefits. According to Greenpeace's "Clicking Clean", managers from Facebook and Google are paving the way by committing to sustainability considerations in their data management setups (Cook et al. in Greenpeace 2017). We believe that these big players serve as an inspiration and can, as such, further move an entire industry to a more sustainable path. A BCG report further supports this by arguing that companies can experience great financial advantages from being first-movers (Burchardt et al. in BCG 2018). Giant IT companies, like the above mentioned, are now highly prioritizing renewable energy and thereby pushing the green transition in what seems to be a tight race into this opportunity space (Nielsen 2017; DR P1 2017). The aim to be a first-mover with regards to sustainability rather than a follower is also reflected by one interviewee, arguing that:

> *"We want the best for our customers. And we want to be the company – that CSR company – that you look up to. So it's really important for us to do the right thing and do it early enough for it to matter. Meaning that, if we were just number six or seven in the row, that did something on the environmental side of things, then we would just be following everybody else. And that's not what we want. At least not in that area."* (Interview with E)

Surprisingly, the company still does not consider data management as a part of their sustainable efforts, at least not yet. Other companies are more hesitant to be the ones moving first towards new sustainable efforts. That being said, as found in our analysis, if their competitors start initiating a green transition, the industry will follow to stay competitive:

> *"It's kind of like in the school - like everyone comes with a Mac, so I need to come with a Mac as well, you know, something like that. Everyone is talking about CO2 emissions, let's do that as well."* (Interview with F)

The reasoning for companies to choose not to be first-movers is explained by findings from BCG (Burchardt et al. in BCG 2018). In a study, they reveal that some assume that being the first to move towards implementing sustainability goals implies serious business disadvantages. As such, many companies choose to team up with customers, competitors and other partners in order to collectively explore this emerging opportunity space in a collective and coordinated manner.

This shows that collaboration does not solely need to be internally but can take place across companies. Companies can partner up strategically and benefit from learning from each other, as argued by Lamb (2009, p. 40): "Companies are collaborating by discussing what works and what doesn't work, instead of everybody having to reinvent the wheel individually". This can increase innovation and improve initiatives for the participating companies. Data management is evidently a complex task, which numerous companies struggle with, so they likely have a lot to learn from each other. This is illustrated by interviewee C, who says the following about data management: "This area has tons of potential, but it's also one of the most challenging ones." Thus, we believe that collaborating with other companies on ways to incorporate sustainability

initiatives into data management strategies can be beneficial as fruitful discussions and knowledge sharing across companies is enabled. As an example, the Danish Data Center Industry serves as a collaboration facilitator between private and public companies with the aim to impact the political agenda (Dansk Data Center Industry n.d.). They have, for instance, been working towards removing the tax on excess heat, which has very recently been achieved. Another case in point was discovered in an unstructured interview with our research partner DigiPlex. They have partnered up with research institutes, industry organizations and consultancies in order to investigate new ways of utilizing their potential to become more environmentally sustainable (Møller in Infinit n.d.). As supported by existing research, strategic partnerships are highly recommended to generate successful and substantial environmental and business impacts (Keys, Malnight and van der Graaf 2009).

While being the first mover has inherent advantages and can move an entire industry, fighting for change as a single company might be a difficult battle. We suggest that a solution is to ally with organizations that have the same interests, as partnerships can lead to new sources of growth or learnings that might be both cost-saving and sustainable.

8.2.5 Installing new regulations

As demonstrated throughout this thesis, changing organizational behavior is challenging. However, if linked with the right incentives, we suggest regulations can push companies to adopt a more environmentally sustainable focus. In the analysis (chapter 7), we discovered that the implementation of the updated GDPR regulation required companies to become more thorough in their data governance to avoid penalties and tarnish of reputation (GDPR.dk n.d.). The updated regulation enabled governments to sanction non-compliant companies, which in turn incentivized organizations to comply. This reveals the power of economic incentives in making companies change, even at a drastic pace. Supported by the literature review (chapter 4), external government pressures like regulation and tax credits are one of the key drivers and leading impetus for a greener IT strategy (Deloitte 2019; Epstein and Buhovac 2014; Lamb 2009). Furthermore, we suppose that regulations can ensure that decision-makers are relying less on their own values, preferences and beliefs for decisions on these matters and more on actual requirements (Hastie and Dawes 2010; Hulme 2009). This is especially relevant in companies where the decision-makers are more hesitant towards climate initiatives because their personal convictions will have to be set aside in order to comply with jurisdiction. The drive of regulations is further illustrated by interviewee B1: “Let's be honest, sometimes it's just, if it's regulated, it will be done in a more thorough way.” This made us wonder if regulations could be installed to enforce considerations of environmental sustainability within data management. Consequently, we asked ourselves what is currently being done on this trajectory.

The Danish government has already committed to cutting 70% of emissions from 1990 to 2030 (Statsministeriet 2019). They have invited companies to participate in 13 climate partnerships, in order to

collectively develop ideas on how to reach this goal. One of the partnerships concerns service, IT and advisory. However, it solely focuses on how IT and data insights can be utilized to achieve a green transition. To our surprise, the 13 partnerships disregard that IT also contributes to CO2 emissions, nor do they challenge companies to include sustainability considerations in regard to data management (ibid). It left us puzzled that this aspect of IT is not reflected within the partnerships, but perhaps this could be changed if the link between data management and emissions gains higher awareness.

The European Commission also started different initiatives to combat climate change. One of them is constituted by the Energy Efficiency Directive, which installed binding measures in order to reach the EU's energy efficiency targets (European Commission 2014). It primarily concerns the energy efficiency of buildings and, as such, the construction industry. Interestingly, some of its projects are dedicated to excess heat utilization in industrial facilities (European Commission 2017). However, while the directive touches upon excess heat, it does not include data management directly. Rather, it perceives ICT as a way to visualize energy efficiency and thereby to increase awareness of energy-saving potentials among the population and stakeholders (ibid.). Similarly, another initiative of the European Commission is the EU Emissions Trading System (ETS). It introduces a "cap and trade" scheme for companies in highly emitting industries in the EU (European Commission 2020d). More specifically, it is enacted through a total limit or "cap" on the amount of emissions allowed for companies within power and heat generation, commercial aviation and other energy-intensive production industries. Companies are however allowed to buy and sell carbon allowances between each other. The system has been successful in lowering the overall emissions in the sectors involved in it but does currently not focus on emissions connected to IT usage and data management (ibid.). Nevertheless, it is proof that putting a price on carbon can incentivize companies towards more environmentally sustainable operations. While there are some initiatives pushing for environmental considerations, none of them address the matter from a data management perspective.

This leads us to underline that installing new regulations requires sufficient buy-in from politicians. We believe that the fact that Margrethe Vestager is highlighting the importance of rendering data centers more sustainable is a necessary step in the right direction, but more is required to advance this interest and bring it to the Danish government's agenda. This is exemplified by the current taxation of excess heat. The Danish Data Center Industry and its members have pushed for removing the taxation for a long time. It seemed like support for a renewed regulation was lacking from the Danish government. The current Minister for Climate, Energy and Utilities even stated, very recently, that he does not think that it pays to streamline, i.e., by using excess heat from data servers, when they are driven by renewable energy (Henriksen 2020.). However, shortly after the Minister's remark, the government shifted. In May 2020, they announced that as an initiative to promote and incentivize greener data centers, they abolished the taxation on excess heat for facilities running on renewable energy. This illustrates that the link between data management and sustainability is increasingly covered on Danish policy-makers' agenda. We argue that this increases the possibility of obtaining political buy-in for future sustainability initiatives in regard to data management.

To conclude, according to our findings, the interviewees believe that sustainability will increasingly be put on corporate data management strategies in the future, with the coming generations having an inherent interest in sustainability as both employees and customers. However, it remains unclear when and how they expect this change to happen, as well as who will be driving it. This makes us wonder who will take the first step into this growing opportunity space, potentially leading the rest to follow. It remains to be seen whether the required transformation will be driven internally or if external forces are required to advance green data management.

9. Conclusion

To conclude, this thesis has investigated the role of environmental sustainability in data management. In recent years, climate change has become an increasingly dominant topic on the public agenda. To combat climate change, lowering CO2 emissions is crucial. As the digital transformation and the increased use of ICT has enhanced connectivity and online presence, it has resulted in a rapidly increasing amount of data. The data is stored and processed in data centers, which through their high demand for computational power and energy, emit large amounts of CO2 and, as such, negatively impact the environment. Given our education in business and IT and our shared interest in sustainability, we perceived this thesis as an opportunity to combine these aspects. Ultimately, our thesis answers the following research question:

Which role does environmental sustainability currently play in the formulation of data management strategies, and what are the barriers and opportunities for advancing green data management?

We have examined the potential of green data management advancements in six Danish private companies from various industries. Each company was represented by either one or two employees involved in strategic decisions around data management. We collected empirical insights through the use of online questionnaires and semi-structured interviews. Importantly, our findings show that not a single interviewee listed environmental sustainability as a factor. Therefore, environmental sustainability is currently not being considered in the formulation of their data management strategies. This is despite the fact that all interviewed companies have a CSR strategy with a focus on lowering carbon emissions, or a sustainability-focused business proposition.

Additionally, our findings reveal that all participating companies consider the same three factors: *regulation and data security*, *market demands* and *costs*. Through the interviews, we learned that the mentioned factors stem mainly from historical decisions. As such, these are subject to institutionalization giving rise to strategic inertia, which explains why the companies fail to renew their strategies by including new factors like environmental sustainability. The ambiguity of both sustainability and data management seems to contribute to this barrier, as employees are attuned to consider routinized factors like economic performance and market demand. Furthermore, we suggest that employees lack knowledge and experience in how to apply sustainability efforts in data management decisions. Besides strategic inertia, we have proposed two other barriers to explain why environmental sustainability is currently not considered as a factor in data management.

The second barrier is constituted by the fact that sustainability is not truly embedded in the whole organization, at least not to the extent that it affects data management decisions. This can be explained by the seeming misalignment between CSR initiatives and IT objectives, a result of the lack of strategic collaboration between CSR and IT departments. In turn, this leads to CSR goals not addressing IT specifically, which could render data managers to disregard the goals as relevant for their operations.

Adding to this, employees seemingly lack encouragement from upper and middle management to proactively renew their data management strategies or to suggest ways of accounting for green aspects. Last, employees' lack of personal conviction regarding climate change might make them feel unaccountable to combat it. This can further explain that sustainability is not yet ingrained into the organizational culture.

This leads us to the final barrier we identified, namely that the companies and its representatives seem to expect sustainability advancements to happen automatically, without them taking an active role in driving the transition. Instead of proactively introducing sustainability as a factor, the interviewees await a demand from their customers and expect that sustainability endeavors will naturally be advanced with new technologies and generations to come.

To answer the second part of the research question, we explored the opportunities for advancing green data management. In total, we identified five opportunities, either of internal or external nature. First, an increased demonstration and coverage of the link between data and sustainability is needed to build greater awareness amongst customers, partners and society. Notably, the link needs to be rendered more tangible to reduce the ambiguity and technical nature of the topic as well as diminish the current distancing from data's environmental repercussions. Second, we propose that internal alignment and an ingrained sustainability culture is required to advance green IT investments. More specifically, the CSR department should be involved in all decision teams and facilitate regular meetings with tailored business cases to increase the understanding of sustainability's importance and relevance to the IT departments. This leads us to advocate that support from all organizational levels is required to successfully diffuse sustainability initiatives, representing the third opportunity. Here, it is crucial that upper management clearly communicates targets and commitments to encourage employees to consider sustainability and to contribute with green ideas in order to stimulate grassroots movements. As the fourth internal opportunity, we suggest that companies must realize that environmental ambidexterity and advancing green data management can lead to competitive advantage, legitimacy and better reputation. It is predicted that customers will increasingly demand sustainability from their providers and being the first companies to move into this opportunity space will enable them to reap the biggest benefits. Besides being the first mover, companies can benefit from collaborating with external partners and learn from each other, as most find data management a complex and challenging task. If none of the proposed opportunities are successful, the last opportunity is an external push in the form of regulation. Inspired by the prioritization of data governance due to GDPR sanctioning, we suggest that regulations can incentivize companies to advance green data management. Notably, these requirements should be more explicitly directed towards data than the current governmental and EU initiatives. Receiving sufficient buy-in from politicians is difficult, but given the latest developments, we are hopeful that the environmental impact of data management will increasingly be addressed on a political agenda.

Overall, the findings of this thesis illustrate that environmental sustainability does currently not play a role in the formulation of data management strategies. Although we have identified a variety of barriers for green data management advancements, we believe that the numerous opportunities we identified have the potential to help companies overcome the barriers. For now, it remains to be seen to what extent Danish companies draw on the potentials of greener data management, and whether the required transformation will be driven internally or if external forces are required.

9.1 Our contribution to research and industry

After having answered this thesis' research question, we now turn to explain how our thesis contributes to research as well as partners and participating companies. First, our partners DigiPlex and C2E2, helped us to scope our research focus and validate its relevance. As such, we tailored our research to fill the knowledge gap of both partners. More specifically, both are interested in learning how private Danish companies formulate their data management strategies and to which extent they value environmental sustainability in the process. We imagine that our research enables both partners to get a preliminary understanding of sustainability considerations, which will further allow them to use these insights and learnings to adapt their ongoing work. For instance, DigiPlex can draw on our findings to adjust their communication strategies on how to address potential customers and convince these of the green aspect as a selling point. C2E2, on the other hand, can use our findings to better understand the decision-making process and help accelerate the uptake of sustainability endeavors in companies' data management. It will be interesting to receive feedback from both partners to see how they will ultimately make use of our findings.

As explained in the literature review, studies on the importance of sustainability considerations in IT operation planning date back to 2007. While these reveal that the majority of respondents find such considerations important, they also show that few actually include sustainability as a criterion (Lamb 2009). It seems that no newer research has been dedicated to exploring how far companies consider sustainability in operational planning, specifically not in a Danish setting. As such, our thesis contributes to closing this gap by illustrating that none of the companies we interviewed actually consider sustainability within their data management strategies.

Furthermore, we learned that our research endeavor is also beneficial to the participating companies themselves, as expressed by our interviewees. Many showed interest in reading our thesis, as they consider data management a difficult endeavor, and findings from our thesis can enable them to learn from other companies' approaches. Moreover, we assume that the opportunities can further be implemented in the companies by distributing our findings to upper management and the CSR department. Lastly, we hope that our insights will motivate the interviewees to advance the role of environmental sustainability in data management after having read our thesis.

9.2 Reflections and further research perspectives

Throughout the thesis, we reflected on the implications and limitations of our decisions and methodological approach. As such, our thesis and its findings should be regarded as resulting from a chain of decisions that we have taken throughout our thesis process. We acknowledge that other choices might have led to different findings. Reflecting on our decisions was important to identify limitations as well as aspects of the topic that are worth being examined in future research.

The first limitation we would like to address concerns the number of interviewees, as well as the number of represented companies included in our research. We recognize that examining the research question through eight interviews with representatives from six Danish private companies is not enough to draw generalized conclusions and represent a general tendency in Denmark. Ideally, we would have involved more companies in our study and we also expected to recruit more interviewees. As explained in the methodology (chapter 5), DigiPlex unsuccessfully attempted to bring us into contact with more companies. We assumed that their efforts would provide us with more questionnaire respondents. While we would still only conduct interviews with a limited number of companies, a higher questionnaire sample would have allowed us to get insights that are more representative of the Danish private industries and as such to draw generalizations. We believe DigiPlex's efforts have been unsuccessful, either because of their means of contact or the timing coinciding with COVID-19 and the upcoming Easter vacation. Nevertheless, we appreciate their help. If this research was to be repeated, we would strive to recruit more interviewees and think it would benefit from other means of establishing contact. For instance, we ourselves should have contacted more than the 32 companies we reached out to, instead of relying on DigiPlex's efforts. Furthermore, we would use more precise wording on our topic, given the intangibility of data management. Our LinkedIn networks might not have understood which people we are actually looking for. In addition, it would be interesting to expand and cover more industries to find industry tendencies. Nonetheless, the fact that we found similarities across company size and industries gives us reason to believe that our findings, to a certain extent, illustrate a tendency in the Danish market.

Another limitation we want to highlight concerns the comparability across companies. Motivated by our interest in internal alignment, we decided to interview several representatives of the same company whenever the possibility was given. This resulted in two companies being represented by two interviewees, while we only interviewed one data management responsible from the other four corporations. As such, an imbalance in company representation arose. This, in turn, only allowed us to draw more explicit conclusions on internal alignment for two of the interviewed companies. For further research on the topic, it would be insightful to interview another representative for each of the remaining companies. The research would benefit from having an equal number of interviewees from all companies in order to achieve equal representation in the study.

As mentioned, our findings are influenced by our choice to investigate the topic from an IT perspective, which led us to solely recruit interviewees from IT departments. Importantly, our interviewees are only able to speak on behalf of their own point of view and not their entire company. As illustrated by interviewee D2, our thesis would have benefitted from interviewing company representatives with different profiles: "*now you're getting it from me and I have one view - but you should really be interviewing the entire company".* This would be particularly interesting in the large companies, where many stakeholders are involved in the decision-making process. For instance, it would be interesting to further investigate the topic by interviewing representatives from upper management as well as the CSR departments from the participating companies. This would allow us to shed light on the current CSR work as well as upper management's involvement in this. More specifically, it would enable us to understand the current organizational structure of CSR initiatives as well as their communication efforts and reach, which we did not gain insights into from our research. In addition, involving these profiles would reveal their current alignment efforts, both in terms of business-IT alignment as well as those affecting the diffusion of sustainability throughout the companies. For instance, as we suggested to implement regular meetings, it would be beneficial to explore the extent to which these might already take place or whether the interviewees would suggest different measures. As such, feedback from our participating companies on our suggested opportunities would be insightful to further advance our thesis.

Lastly, this thesis focused on exploring the role of environmental sustainability in data management decisions. As we find ourselves at the end of our research process, we are reflecting on our own considerations of this matter. We asked ourselves: Have we considered where our generated data is processed and stored? Have we chosen the most sustainable option for this? These reflections led us to acknowledge that similar to our interviewees, we ourselves relied on what we have always done, which is to use Google Drive. While it was not a conscious consideration at the time of the decision, we have eventually learned that Google is one of the better options, as they are on the road to becoming 100% green (Cook et al. in Greenpeace 2017). As such, we have personally experienced how easy it is to follow routinized considerations, which allows us to further understand the challenges our interviewees encounter. The learnings from this thesis highlight why we need to challenge the status quo. Communicating the physical aspects of data is crucial in order to raise awareness of its environmental repercussions and abolish it commonly being associated with something up in the clouds. Learning from our thesis' findings, we now consider data as a physical asset that needs to be prioritized and acknowledged. Going forward, we will not only consider it in our private lives but also as part of the companies we work for. In addition, we advocate IT education to cover IT's environmental aspects and green potential. But most of all, we hope that private as well as public companies will consider environmental sustainability within their data management strategies to lead by example and foster awareness in the general public.

10. References

Allison, G., 1950. T. 1971. Essence of Decision: Explaining the Cuban Missile Crisis. *Vol. XV*.

Amarilli, F., Van Vliet, M. and Van den Hooff, B., 2017. An explanatory study on the co-evolutionary mechanisms of business IT alignment.

Andrae, A. and Edler, T., 2015. On Global Electricity Usage of Communication Technology: Trends to 2030. *Challenges*, 6(1), pp.117-157.

Azoulay, M., 2020. *Temperature Monitoring In A Data Center Environment*. [online] Medium. Available at: <https://medium.com/@MosheAzoulay/temperature-monitoring-in-a-data-center-environment-84b653c4579c> [Accessed 31 May 2020].

Banerjee, S. and Akuli, R., 2014. Advantages of green technology. *Recent Research in Science and Technology*, 6(1), pp.97-100.

Bebbington, J. and Unerman, J., 2018. Achieving the United Nations sustainable development goals. *Accounting, Auditing & Accountability Journal*.

Bell, S. and Morse, S., 2012. *Sustainability indicators: measuring the immeasurable?*.Routledge.

Bilal, K., Malik, S., Khalid, O., Hameed, A., Alvarez, E., Wijaysekara, V., Irfan, R., Shrestha, S., Dwivedy, D., Ali, M., Shahid Khan, U., Abbas, A., Jalil, N. and Khan, S., 2014. A taxonomy and survey on Green Data Center Networks. *Future Generation Computer Systems*, 36, pp.189-208.

Blomberg, J., Burrel, M. 2009. An ethnographic approach to design. In Human-Computer Interaction. pp. 71-94 A. Sears and J. A. Jacko (Eds.). Florida: CRC Press.

Blumberg, S., Bossert, O., Grabenhorst, H. and Soller, H., 2017. W*hy You Need A Digital Data Architecture To Build A Sustainable Digital Business.* [online] McKinsey Digital. Available at: <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/why-you-need-a-digital-data-architecture> [Accessed 10 April 2020].

Brundtland, G. H., Khalid, M., Agnelli, S., Al-Athel, S. and Chidzero, B., 1987. Our common future. *New York*, 8.

Brusseau, M., 2019. Sustainable Development and Other Solutions to Pollution and Global Change. *Environmental and Pollution Science*, pp.585-603.

Burchardt, J., Gerbert, P., Schönberger, S., Herhold, P. and Brognaux, C., 2018. *The Economic Case For Combating Climate Change.* BCG.

C2E2., n.d. *Copenhagen Centre On Energy Efficiency*. [online] Available at: <https://c2e2.unepdtu.org/sustainable-datacentres-and-ict/> [Accessed 17 May 2020]

Cisco, 2020. *Cisco Annual Internet Report (2018–2023) White Paper*. [online] Available at: <https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html> [Accessed 12 March 2020].

Cohen, L., Manion, L., Morrison, K., 2000. *Research Methods in Education*, 5th edition, Routledge, London,

Coombs, W. T. and Holladay, S. J., 2011. *Managing corporate social responsibility: A communication approach.* John Wiley & Sons.

Compress Projekt, n.d. *Om Projektet*. [online] Available at: <https://www.compress-projekt.dk/om-projektet> [Accessed 17 May 2020].

Cook, G., Lee, J., Tsai, T., Kong, A., Deans, J., Johnson, B. and Jardim, E., 2017. Clicking Clean: Who is winning the race to build a Green Internet?. *Greenpeace Inc., Washington, DC*, *5*.

Corbin, J. M. and Strauss, A., 1990. Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative sociology*, 13(1), pp.3-21.

Cordes, T., 2020. *Danskernes Dataforbrug Eksploderer: »Familier Og Virksomheder Har Lært At Operere På En Bedre Måde – Mere Effektivt Og Mere Fleksibelt«*. [online] Berlingske. Available at: <https://www.berlingske.dk/virksomheder/danskernes-dataforbrug-eksploderer-familier-og-virksomheder-har-laert> [Accessed 17 May 2020].

Csr.dk. n.d. *CSR Rapportering: Den Forsømte Forretningsmulighed*. [online] Available at: <https://csr.dk/csr-rapportering-den-fors%C3%B8mte-forretningsmulighed> [Accessed 20 April 2020].

Danish Data Center Industry, n.d. *About The Association – Danish Data Center Industry (DDI)*. [online] Available at: <https://datacenterindustrien.dk/about-association/> [Accessed 1 May 2020].

Danmarks Statistik, 2020. *Danske Virksomheder Godt Rustet Til Virtuelt Arbejde*. [online] Available at: <https://www.dst.dk/da/Statistik/nyt/NytHtml?cid=36790> [Accessed 10 May 2020].

Dansk Industri, 2019. *DI's 2030-Plan - Sammen Skaber Vi Grøn Vækst*. DI.

Danske Love, 2018. *Årsregnskabsloven § 99 A*. [online] Available at: <https://danskelove.dk/årsregnskabsloven/99a> [Accessed 30 March 2020].

Dastbaz, M., Pattinson, C. and Akhgar, B., 2015. Green information technology: A sustainable approach. Morgan Kaufmann.

Davis-Peccoud, J., Stone, P. and Tovey, C, 2017. *Achieving Breakthrough Results In Sustainability*. [online] Bain. Available at: <https://www.bain.com/insights/achieving-breakthrough-results-in-sustainability/> [Accessed 8 May 2020].

De Benedetto, L. and Klemeš, J., 2009. The Environmental Performance Strategy Map: an integrated LCA approach to support the strategic decision-making process. *Journal of Cleaner Production*, 17(10), pp.900-906.

DeCuir-Gunby, J.T., Marshall, P.L. and McCulloch, A.W., 2011. Developing and using a codebook for the analysis of interview data: An example from a professional development research project. *Field methods*, 23(2), pp.136-155.

Deloitte, 2019. *Deloitte Resources 2019 Study - Energy Management: Balancing Climate, Cost, And Choice*. Deloitte.

Deng, Q. and Ji, S., 2015. Organizational green IT adoption: concept and evidence. *Sustainability*, *7*(12), 16737-16755.

Digiplex. 2019. *Nordic Sales Team Expands*. [online] Available at: <https://www.digiplex.com/insights/articles/nordic-sales-team-expands> [Accessed 17 May 2020].

DLA Piper, n.d. *Shipping, Transport Og Logistik*. [online] Available at: <https://denmark.dlapiper.com/da/sector/shipping-transport-og-logistik> [Accessed 21 April 2020].

DR P1, 2017. *Sviner Netflix skyen til?*. [podcast] Sidste Mand Slukker Lyset. Available at: https://www.dr.dk/radio/p1/sidste-mand-slukker-lyset/sidste-mand-slukker-lyset-11 [Accessed 13 Feb. 2020].

EDPS, n.d. *The History Of The General Data Protection Regulation.* [online] Available at: <https://edps.europa.eu/data-protection/data-protection/legislation/history-general-data-protection-regulation_en> [Accessed 7 May 2020].

Eisenhardt, K.M., 1989. Building theories from case study research. *Academy of management review*, *14*(4), pp.532-550.

Eisenhardt, K.M. and Zbaracki, M.J., 1992. Strategic decision making. *Strategic management journal*, *13*(S2), pp.17-37.

Elkington, J., 2013. Enter the triple bottom line. In *The triple bottom line* (pp. 23-38). Routledge.

Elkington, J., 2018. 25 Years Ago I Coined the Phrase Triple Bottom Line. *Here's Why It's Time to Rethink it*. Harvard Business Review Digital Articles, 2.

Emerson, R. W., 2015. Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research? *Journal of Visual Impairment & Blindness*, *109*(2), 164-168.

European Commission, 2014. EU 2020 Target For Energy Efficiency - Energy European Commission. [online] Available at: <https://ec.europa.eu/energy/topics/energy-efficiency/targets-directive-and-rules/eu-targets-energy-efficiency_en?redir=1> [Accessed 28 May 2020].

European Commission, 2017. *Good practice in energy efficiency*. European Commission.

European Commission, 2019. *Reflection Paper - Towards A Sustainable Europe By 2030*. European Commission.

European Commission, 2020a. Shaping A Digital Future For Europe - European Commission. [online] Available at: <https://ec.europa.eu/commission/commissioners/2019-2024/vestager/announcements/shaping-digital-future-europe_en> [Accessed 15 May 2020].

European Commission, 2020b. White Paper On Artificial Intelligence - A European Approach To Excellence And Trust. Brussels: European Commission.

European Commission, 2020c. *Shaping Europe's Digital Future*. European Commission.

European Commission, 2020d. *Report from the Commission to the European Parliament and the Council - Report On The Functioning Of The European Carbon Market*. Brussels: European Commission.

Epstein, M. J., and Buhovac, A. R., 2014. *Making sustainability work: Best practices in managing and measuring corporate social, environmental, and economic impacts.* Berrett-Koehler Publishers.

Foghsgaard, L., 2018. *Internettet Forurener Lige Så Meget Som Flytrafikken: Streaming Af Film Er En Overset Klimasynder.* [online] Politiken. Available at: <https://politiken.dk/viden/Viden/art6875385/Streaming-af-film-er-en-overset-klimasynder> [Accessed 31 May 2020].

Fonstad, N. O., and Subramani, M., 2009. Building enterprise alignment: A case study. *MIS Quarterly Executive*, *8*(1).

Future-Fit Business, n.d. *Future-Fit Helping Novo Nordisk Lead The Way*. [online] Available at: <https://futurefitbusiness.org/case-studies/future-fit-helping-novo-nordisk-lead-the-way/> [Accessed 16 May 2020].

Gartner, n.d. *Data Management (Dm)*. [online] Available at: <https://www.gartner.com/en/information-technology/glossary/dmi-data-management-and-integration> [Accessed 18 April 2020].

GDPR.dk, n.d. *De Nye GDPR Regler [online]*. Available at: <https://gdpr.dk>

Geertz, C., 1973. *The Interpretation of Cultures.* Basic Books, New York.

Glanz, J., 2012. The Cloud Factories - Power, Pollution and the Internet. *The New York Times*, [online] Available at: <https://www.nytimes.com/2012/09/23/technology/data-centers-waste-vast-amounts-of-energy-belying-industry-image.html?pagewanted=all&_r=1&> [Accessed 12 April 2020].

Globalreporting.org, 2017. *In Focus: Addressing Investor Needs In Business Reporting On The Sdgs.* [online] Available at: <https://www.globalreporting.org/resourcelibrary/addressing-investor-needs-SDGs-reporting.pdf> [Accessed 25 May 2020].

Goldstein, E. B., 2011. *Cognitive Psychology*. Wadsworth: Cengage Learning.

Hambrick, D.C. and Snow, C.C., 1977. A Contextual Model of Strategic Decision Making in Organizations. In *Academy of management proceedings* (Vol. 1977, No. 1, pp. 109-112). Briarcliff Manor, NY 10510: Academy of Management.

Haraway, D. 1988. Situated Knowledges: The science question in feminism and the privilege of partial perspective. Feminist studies.

Hastie, R. and Dawes, R.M., 2010. *Rational choice in an uncertain world: The psychology of judgment and decision making*, 2nd ed. Sage Publications.

Henderson, J. C., and Venkatraman, H., 1999. Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal*, *38*(2.3), 472-484.

Henriksen, K., 2020. *Klimaministeren kvæler grøn fornuft med sort logik for overskudsvarme*. [online] Available at: <https://datacenterindustrien.dk/klimaministeren-kvaeler-groen-fornuft-med-sort-logik-for-overskudsvarme/> [Accessed 20 April 2020].

Hilty, L. M. and Aebischer, B. (Eds.), 2015. ICT innovations for sustainability (Vol. 310). Springer International Publishing.

Hird, G., 2010. *Green IT in practice: How one company is approaching the greening of its IT*. IT Governance Publishing.

Hopkins, W.E., Mallette, P. and Hopkins, S.A., 2013. Proposed factors influencing strategic inertia/strategic renewal in organizations. *Academy of Strategic Management Journal*, *12*(2).

Hulme, M., 2009. *Why we disagree about climate change: Understanding controversy, inaction and opportunity*. Cambridge University Press. https://doi.org/10.1017/CBO9780511841200

Ihlen, Ø. and Roper, J., 2014. Corporate reports on sustainability and sustainable development:'We have arrived'. Sustainable development, 22(1), pp.42-51.

Infrastrukturkommissionen, 2008. *Infrastrukturkommissionens Betænkning*. Danmarks transportinfrastruktur 2030. Transport- og Boligministeriet.

Innovationsfonden, n.d. *Trods Øget Pres På Internettet Under Corona-Krisen Falder Klimabelastningen.* [online] Available at: <https://innovationsfonden.dk/da/investeringer/investeringshistorier/trods-oget-pres-pa-internettet-under-corona-krisen-falder> [Accessed 4 May 2020].

Johnson, B., n.d. *How Data Centers Work*. [online] HowStuffWorks. Available at: <https://computer.howstuffworks.com/data-centers1.htm> [Accessed 18 April 2020].

Jones, N., 2018. *How To Stop Data Centres From Gobbling Up The World'S Electricity*. [online] Nature.com. Available at: <https://www.nature.com/articles/d41586-018-06610-y> [Accessed 12 March 2020].

Kass, S., 2019. *Sustainable Urban Systems: Designing And Building Next Gen Sustainable Data Centers*.

Keys, T., Malnight, T. and van der Graaf, K., 2009. *Making The Most Of Corporate Social Responsibility*. [online] McKinsey. Available at: <https://www.mckinsey.com/featured-insights/leadership/making-the-most-of-corporate-social-responsibility> [Accessed 5 May 2020].

Klima, Energi- og Forsyningsministeriet, n.d. *Klimapolitik I EU*. [online] Available at: <https://kefm.dk/klima-og-vejr/klimapolitik-i-eu/> [Accessed 8 May 2020].

Kramer, M., 2020. *Larry Fink Isn'T Going To Read Your Sustainability Report*. [online] Harvard Business Review. Available at: <https://hbr.org/2020/01/larry-fink-isnt-going-to-read-your-sustainability-report> [Accessed 31 February 2020].

Kvale, S., 2007, *Conducting an interview*, in S, Kvale (eds), Doing Interviews, SAGE Publications, Ltd, London, pp. 52-67.

Kvale, S. and Brinkmann, S., 2014. *Interview*. 3rd ed. Copenhagen: Hans Reitzels Forlag.

Lamb, J. P., 2009. The greening of IT: how companies can make a difference for the environment. IBM Press/Pearson.

Mankoff, J., Blevis, E., Borning, A., Friedman, B., Fussell, S., Hasbrouck, J., Woodruff, A. and Sengers, P., 2007. Environmental sustainability and interaction. *CHI '07 extended abstracts on Human factors in computing systems - CHI '07*,.

Marquardt, N., 2016. Counting the Countless: Statistics on Homelessness and the Spatial Ontology of Political Numbers. Environment and Planning D: *Society and Space 34* (2): 301–318.

Mebratu, D., 1998. Sustainability and sustainable development: historical and conceptual review. *Environmental impact assessment review*, *18*(6), pp.493-520.

Meehan, J. and Bryde, D., 2011. Sustainable procurement practice. *Business strategy and the environment*, *20*(2), pp.94-106.

Mingay, S., 2007. Green IT: the new industry shock wave. *Gartner RAS Research Note G*, *153703*(7).

Molin, T., 2019. Internettet udleder lige så meget CO2 som hele verdens flytrafik. Løsningen er så simpel, at alle bør kende den. [online] Available at: <https://www.zetland.dk/historie/sO0E9bnv-aekdaa3R-f69bc> [Accessed 17 May 2020].

Møller, L., n.d. *Forskere På Aalborg Universitet Vil Energimærke Software*. [online] InfinIT. Available at: <https://infinit.dk/news/forskere-paa-aalborg-universitet-vil-energimaerke-software/> [Accessed 21 May 2020].

Murugesan, S., 2008. Harnessing green IT: Principles and practices. *IT professional*, *10*(1), 24-33.

Mønsted, S., 2019. *Dine Data Er Gemt I (Røg) Skyen*. [online] Forbundet Kultur og Information. Available at: <https://kulturoginformation.dk/perspektiv/fagmagasinet/2019/perspektiv-nr-5/dine-data-er-gemt-i-roeg-skyen> [Accessed 6 May 2020].

Nielsen, C., 2017. *Udfordring: Gør strømslugende internet grønt.* [online] DR. Available at: https://www.dr.dk/nyheder/viden/miljoe/udfordring-goer-stroemslugende-internet-groent [Accessed 13 Feb. 2020].

Nielsen, 2018. *THE EVOLUTION OF THE SUSTAINABILITY MINDSET*. [online] Available at: <https://www.nielsen.com/us/en/insights/report/2018/the-education-of-the-sustainable-mindset/> [Accessed 3 April 2020].

Okoli, C., and Pawlowski, S. D., 2004. The Delphi Method as a Research Tool: An Example, Design Considerations and Applications. *Information & Management*, *42*(1), 15–29.

PWC, 2019. *Creating A Strategy For A Better World - How The Sustainable Development Goals Can Provide The Framework For Business To Deliver Progress On Our Global Challenges*.

Queiroz, M., 2017. Mixed results in strategic IT alignment research: a synthesis and empirical study. *European Journal of Information Systems*, *26*(1), pp.21-36.

Regeringen, 2020. *Markante Drivhusgasreduktioner Og Investeringer I Den Grønne Omstilling.* [online] Available at: <https://fm.dk/media/18017/faktaark-til-foerste-del-af-klimahandlingsplanen.pdf?fbclid=IwAR1Cj8pEKpp4DLUDo_SQ8E9R2VgohjoinK08YGUzp7Wb5ZYZF3Msc2Q_7pE> [Accessed 25 May 2020].

Riggins, J., 2020. *Next-Generation Sustainable Data Center Design – The New Stack*. [online] The New Stack. Available at: <https://thenewstack.io/next-generation-sustainable-data-center-design/> [Accessed 6 May 2020].

Rivard, S., Raymond, L., and Verreault, D., 2006. Resource-based view and competitive strategy: An integrated model of the contribution of information technology to firm performance. *The Journal of Strategic Information Systems*, *15*(1), 29-50.

Rosling, H., Rosling, O. and Rönnlund, A., 2018. *Factfulness: Ten Reasons We're Wrong About the World – and Why Things Are Better Than You Think.* New York: Flatiron Books; 342 pp.

Rouse, M., 2009. *What Is Power Usage Effectiveness (PUE)? - Definition From Whatis.Com*. [online] SearchDataCenter. Available at: <https://searchdatacenter.techtarget.com/definition/power-usage-effectiveness-PUE> [Accessed 18 April 2020].

Samfundsansvar.dk, n.d. *Regler Og Retningslinjer.* [online] Available at: <https://samfundsansvar.dk/regler-og-retningslinjer> [Accessed 17 May 2020].

Sarkar, P. and Young, L., 2009. Managerial attitudes towards Green IT: An explorative study of policy drivers. *PACIS 2009 Proceedings*, 95.

Schultze, U. and Avital, M., 2011. Designing interviews to generate rich data for information systems research. *Information and Organization*, 21(1), pp.1-16.

Skatteministeriet. n.d. *Aftale Om Øget Udnyttelse Af Overskudsvarme*. [online] Available at: <https://www.skm.dk/media/1869379/Aftaletekst-fremme-af-overskudsvarme.pdf> [Accessed 14 April 2020].

Sløk, C. 2019. *Skam dig, din klimaskurk! Skam og skyld i den grønne omstilling*. København: Kommunikationsforum.

Statsministeriet, 2019. *Regeringens klimapartnerskaber* [Press release]. 13 November. Available at: http://www.stm.dk/_p_14887.html [Accessed 15 May 2020].

Techopedia, 2020. *What Is IT Infrastructure? - Definition From Techopedia*. [online] Available at: <https://www.techopedia.com/definition/29199/it-infrastructure> [Accessed 17 May 2020].

Thambusamy, R. and Salam, A. F., 2010. Corporate ecological Responsiveness, Environmental Ambidexterity and IT-Enabled Environmental sustainability Strategy. In *ICIS* (p. 191).

Thiele, M., 2018. Skal Din Virksomhed Redegøre For Samfundsansvar?. [online] Dansk Erhverv. Available at: <https://www.danskerhverv.dk/presse-og-nyheder/nyheder/skal-din-virksomhed-redegore-for-samfundsansvar/> [Accessed 26 April 2020].

Tsukayama, H., 2017. *How Bad Is Email For The Environment?*. [online] The Independent. Available at: <https://www.independent.co.uk/life-style/gadgets-and-tech/how-bad-is-email-for-the-environment-a7555161.html> [Accessed 10 May 2020].

Tversky, A. and Kahneman, D., 1973. Availability: A heuristic for judging frequency and probability. *Cognitive psychology*, *5*(2), pp.207-232.

UNECE, 2017. *Overcoming Barriers To Investing In Energy Efficiency*. New York and Geneva: UNECE.

University of Wisconsin, n.d. *A Simple Explanation Of The Triple Bottom Line.* [online] Available at: <https://sustain.wisconsin.edu/sustainability/triple-bottom-line/> [Accessed 13 March 2020].

Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of information systems*, *4*(2), pp.74-81.

Walsham, G., 2006. Doing interpretive research. *European journal of information systems 15,* pp. 320–330.

Wang, L. and Khan, S. U., 2013. Review of performance metrics for green data centers: a taxonomy study. *The journal of supercomputing*, *63*(3), 639-656.

Watson, R.T., 2008. *Data management, databases and organizations*. John Wiley & Sons.

Webster, J. and Watson, R., 2002. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly, 26*(2), Xiii-Xxiii. Retrieved May 31, 2020, from www.jstor.org/stable/4132319

Widheden, J. and Ringström, E., 2007. Life Cycle Assessment. *Handbook for Cleaning/Decontamination of Surfaces*, pp.695-720.

Willard, B., 2012. *The new sustainability advantage: seven business case benefits of a triple bottom line*. New Society Publishers.

Wooldridge, B. and Cowden, B., 2020. Strategic Decision-Making in Business. In *Oxford Research Encyclopedia of Business and Management.*

Yuventi, J. and Mehdizadeh, R., 2013. A critical analysis of Power Usage Effectiveness and its use in communicating data center energy consumption. *Energy and Buildings*, 64, pp.90-94.