

Controlling Climate-Related Risks: A Corporate Management Approach

A Qualitative Case Study

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Abstract:

The study investigates how an organization manages climate-related risks with Management Control Systems (MCS). With climate-related risks comprising seven of the top ten global risks in terms of likelihood and impact over the next decade (WEF, 2024) there is a need to understand how businesses should adapt management practices to address them. This qualitative case study focuses on a large Swedish manufacturing company, referred to as IndustryCo, utilizing the Simon's Levers of Control (LOC) framework. The study highlights the importance and complexity of integrating MCS into climate-related risk management, revealing the importance of competence, well-established definitions, and external and internal communication of commitments.

Keywords:

Climate-related risks, Management Control Systems (MCS), risk, Levers of Control

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1. Introduction

In recent years, new challenges have emerged and put societies and businesses to the test. Climate change, a before deprioritized risk, has transitioned into a central concern driven by its increased frequency, stakeholders' expectations, and stricter regulations. As the pressure to manage and confront these risks has increased and the requirements to communicate them becomes regulated, having comprehensive and robust processes established has never been more important for corporations.

1.1 Background

In 2024, The World Economic Forum highlighted that societal and environmental issues correspond to seven of the top ten global risks in terms of likelihood and impact over the next decade (WEF, 2024). Those risks are expected to intensify, taking a leading position on the corporate and societal risk agenda in the upcoming years.

In fact, climate-related risks have already revealed its tangible effects on businesses and societies. According to Deloitte (2023), two thousand executives have already witnessed impacts of climate change first-hand in the previous year with effects ranging from increased resource scarcity, shifting consumption patterns, and physical impacts from climate disasters and severe weather events. The Task Force on Climate-related Financial Disclosures (TCFD) noted that climate change is a significant risk for manageable assets, with potential losses of \$43 trillion by 2100 (TCFD, 2022). This has raised concerns among investors and other stakeholders, bringing into sharp focus the potential for climate-change to fundamentally disrupt the value of business assets.

In response to the increasing need for climate action, the European Union, following the ratification of the Paris Agreement, set a target to achieve climate neutrality by 2050 – a state where net zero greenhouse gas (GHG) emissions are achieved by balancing emitted amounts with those removed from the atmosphere through natural absorption or other means (European Council, 2024). This has driven a series of regulatory initiatives, resulting in over 1000 new or revised legislations (PWC, 2022). These regulatory changes increase the pressure on organizations to enhance their climate responses but also to expand their risk portfolios (TCFD, 2022; Ren et al., 2023).

With the growing acknowledgement of climate-related risks - defined as physical risks such as hurricanes and flooding, as well as transitional risks associated with the shift towards a net-zero society - there is an increasing demand for transparency in how these risks are managed. In January 2023, the European Commission introduced the Corporate Sustainability Reporting Directive (CSRD) to address this need. The directive demands that investors and other stakeholders should have access to the necessary information to evaluate the environmental and societal impact of companies, as well as to assess financial risks and opportunities arising from climate change and other sustainability issues. This regulation affects over 50,000 EU companies and 10,000 non-EU companies, significantly broadening the extent of mandatory sustainability reporting (Watershed, 2024).

To explore how organizations are enduring climate-change and the unprecedented challenges and pressures it brings, a qualitative case study was conducted at a large Swedish industrial manufacturing company, for the sake of anonymity, called IndustryCo in this study.

1.2 Prior Research & Research Gap

An extensive examination of the existing literature on climate risk management and Management Control Systems (MCS) reveals a well-established academic field with diverse scholarly perspectives. With climate-related risks challenging organizations to deal with a greater deal of uncertain and complex phenomena, four streams of relevant literature were identified that address this critically.

The first theme of literature solely focuses on risk management, leveraging external documents to quantitatively assess firms' reporting, perceptions, and responses to climate-related risks (Andersson & Arvidsson, 2023; Sakhel, 2017). The literature reveals a tendency among firms to focus on certain kinds of climate related risks depending on their industry and regulatory exposure, and a notable concentration on risks expected to materialize in the short term due to their perceived more immediate and substantial impact (Andersson & Arvidsson, 2023; Sakhel, 2017).

The second stream of literature explore the role and use of MCS in implementing corporate responsibility (CSR) strategies (Arjaliès & Mundy, 2013; Gond et al., 2012). The authors find that MCS play an instrumental role in integrating sustainability issues within the broader

organizational strategy and performance management system by establishing key performance indicators (KPIs) related to CSR activities, enacting formal systems for collaboration among different stakeholders to identify and discuss potential CSR risks, developing risk mitigation strategies and contingency plans to address identified CSR risks and integrating sustainability considerations with strategic objectives (Arjaliès & Mundy, 2013; Gond et al., 2012).

The third stream of literature explore risk management systems as a subset of the broader organizational control package, elucidating the critical roles played by risk-actors, cultures, rationalities, and technologies in shaping the strategic scope of risk management systems within organizations (Arena et al., 2010; Mikes, 2009).

The fourth and final stream, which is central to our study, investigates how companies deploy MCS to manage climate-related risks across various dimensions, such as social, environmental (Semenova; 2021), reputational, policy, and carbon-emission risks (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017; Subramaniam et al., 2015). Semenova (2021) analyzed public disclosures of the 1179 largest listed Nordic companies to assess how companies integrate social and environmental considerations with their MCS. Semenova found a negative relationship between the integration of social and environmental elements into management control systems and social and environmental risks faced by Nordic companies, indicating a need for improved integration. Bui & de Villiers (2017) and Kumarasiri & Gunasekarage (2017) examine how regulatory uncertainty and community pressure impact their use of management accounting control systems (MACS) for managing carbon-emissions, policy, and reputational risks. They highlight the dynamic nature of MACS as organizations adapt the role and use of carbon management accounting depending on their chosen risk management strategy (Bui & de Villiers 2017). The authors also found that companies predominantly employed short-term strategies driven by economic, regulatory, and reputational factors (Kumarasiri & Gunasekarage, 2017; Bui & de Villiers, 2017) though they underscore the importance for organizations to adopt long-term strategies and congruent use of MACS for sustainable performance.

In sum, previous literature on managing risk reveal that organizations predominantly focus on tangible and short-term manifestations of climate-related risks. The risk focus appears to be tailored to the industry (Andersson & Arvidsson, 2023) and its regulatory exposure. Yet the issue of short-termism remains, causing firms to neglect the broader strategic implications of

long-term climate changes. Though prevalent, the underlying causes of this focus and strategies for addressing climate-related risks remain poorly understood, necessitating future research to “focus on understanding the factors that drive or inhibit companies' perceptions and responses to climate risks to identify effective triggers for climate action” (Sakhel, 2017, p.11) In a similar vein, Andersson & Arvidsson (2023) underscore the importance for organizations to engage in continuous learning and apply techniques that foster future-forward thinking to improve their reporting and management of climate-related risks, prompting questions of what organizational dynamics and system that foster such ends.

Moreover, though extant literature outline how MCS can support sustainability and CSR risk management (Arjaliès & Mundy, 2013; Gond et al., 2012), specific investigations into how MCS are applied to manage risks that directly relates to climate change remain notably absent. This highlights a need for literature to address the current gap within the intersection of MCS and climate-change issues. The third stream of literature (Arena et al., 2010; Mikes, 2009) highlight contextual drivers that influence the design and strategic remit of risk management system, and thus the ability of the system to relay information relating to climate-related risks into strategic discussions and top-management agendas. However, the extent to which MCS shape the *risk-control texture*, such as risk cultures and rationalities, and the consequent implications for climate-related risks management remain unexplored to our knowledge.

Finally, considerate attention has been paid to the role and use of management accounting for coping with regulatory, reputational and carbon-emissions risk and uncertainty, highlighting a critical gap in elucidating how MCS can manage a wider array of risks arising from climate-change. Thus, we identify a need for future research to consider a broader examination of MCS configurations and their effectiveness in a comprehensive climate risk management strategy.

1.3 Aim and Research Question

The aim of this study is to discover and investigate how a large enterprise manage climate-related risks. This topic has grown in importance as regulatory pressure has increased, highlighted by the first mandatory reporting, CSRD, effective since January first 2024. Institutional and societal pressures and the tangible impacts of climate-change are likely to grow in quantity as its condition escalates, presenting enterprises with a challenge of unprecedented complexity, scale and urgency. Consequently, this study seeks to enrich current

knowledge and address existing research gaps with the purpose to support corporations with insights needed to accommodate and effectively manage climate-related risks. The research question is articulated as follows:

How does a company enact management control systems to manage climate-related risks?

To explore our research question, we will employ Simons' Four Levers of Control as a theoretical lens and analytical framework, guiding the organization and analysis of the gathered data.

1.4 Delimitations

The research is delimited to investigate how a company use internal controls to manage and address climate-related risks, without investigating other factors that may influence its management practices. Examining the environmental or economic impacts of climate-related risk is not of interest in this study, instead, it focuses on the intersection between the company's management control systems and climate-related risks. Following our research question, we focus on understanding how the company address these risks through control systems, rather than the myriad of different climate-related challenges the company faces. This approach allows us to provide a focused analysis and understanding of managerial responses within the context of climate risk management.

2. Literature Review

As the focus of this study is on climate-related risks, it is inherently concerned with organisational capabilities for managing risk versus uncertainty and ultimately the role and use of MCS in fostering such capabilities. Below, we will first unpack definitions of risk and uncertainty. Thereafter, we introduce the definition and characteristics of climate-related risks adopted within this study to provide a conceptual bedrock for how climate-related risks relate to the concepts of risk and uncertainty. We then explore the organisational capabilities needed to thrive under uncertainty and relate them to MCS, followed by an examination of the conceptual and performative alignment of MCS and risk management. Last, we dive into empirical examinations of the role and use of MCS within risk-management and climate-related risk management.

2.1. Risk and Uncertainty:

Knights (2012) provide a classical distinction between risks and uncertainty, whereby the former represents an event whose probability of occurrence and distribution of impacts is known a priori or from statistics. The latter, uncertainty, embodies incipient changes whose probability and impact remains largely unknown (Kominis et al., 2022; Schoemaker et al., 2018; Vasileios & Favotto, 2022). Knight's (2012) provides a foundation for exploring how organisation design and use Management Control Systems (MCS) to address these distinct yet interrelated concepts. Indeed, our review of the literature seems to imply that the organisational notions of risk are rather construed from uncertainty (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017), evoking questions about how the concept of risk has evolved and its implications for corporate practices.

According to Power (2004), modern notions of risk have “exploded” as “more possible outcomes in the world are now regarded as amenable to human decision and intervention, rather than being in the hands of the gods” (Power, 2004, p.14). Beck (2009)'s theory of the *risk society* provides a theoretical bedrock for Powers' (2004) observations, positing a shift from a traditional industrial society to one defined “by the distribution of wealth (goods) but also of ‘bads’ (pollution, contamination, and other by-products of production). These are technological hazards that, because they are man-made, are considered preventable” (Baxter, 2019, p.3). Indeed, Becks' (2009) definition of manufactured risk as the very by-products of human

advancements in technology and science with transnational, systematic and unpredictable consequences map very well onto the concept of climate-change.

2.2. Climate-related risks

Though several definitions for climate-related risks exist, this study adopts the The Task Force on Climate-related Financial Disclosures (TCFD) classification of climate-related risks, distinguishing between physical and transition risks. Physical risks pertain to the tangible impacts of climate change, including both acute and chronic risks. Acute risks are event-driven, such as hurricanes, flooding, wildfires, or droughts, while chronic risks involve long-term shifts in climate patterns, like escalating temperatures, sea level rise, and more frequent heatwaves. Transition risks arise from the shift towards a low-carbon economy. They are linked to changes due to climate change in the economic, social, technical, and political environment (Andersson & Arvidsson, 2023). Congruent with the dispersed origins of climate-related risks, the potential idiosyncratic impacts of these systemic, environmental, and social changes are equally as complex as they are diverse (Andersson & Arvidsson, 2023). The multifaceted impacts of climate change include, but are not limited to, shifts in consumer demand, heightened regulatory measures, the devaluation of assets at risk from climate events, disruptions in supply chain logistics, and a fervent technological race to innovate (TCFD, 2022). Other traits of climate related risks further obstruct organization's abilities to comprehend, model and predict them. This includes the short, medium and long-term timeframe over which climate-related risks may unfold (Andersson & Arvidsson, 2023) and as noted by Herrington (2020), there is no historical precedent for climate change risks, making it difficult to predict their probability and impact based on past events. Thus, it becomes evident that many climate-related implications do not conform to the conceptual framing of risk as the product of probability and impact (Knights 2012). Rather, they are inherently uncertain.

2.3. Managing Uncertainty: The importance of Dynamic Capabilities

This begs the question, what organizational capabilities are needed to bear the uncertainty of climate-change? Innovation scholars have tried to answer this question by understanding why some firms, like Apple, survive and others, like Kodak, succumb in times of high competition and rapid change. Schoemaker et al (2018) stress the importance for organizations to build dynamic capabilities. This involves developing sensing, seizing and transforming skills, i.e to *sense incipient change* by building internal systems and processes that allows for strong

peripheral vision, to *seize* opportunities arising from external changes through agile systems that allow for swift reconfiguration of assets, capital, and organizational focus and to fundamentally *transform a firm's business model* to adapt to pivotal shifts in the market. This brings into sharp focus how MCS can foster and/or enable an organization's dynamic capabilities - which we will explore below:

Sensing: MCS help organizations to anticipate changes and potential risks by providing mechanisms to gather and systematically analyze information from different levels of the organization (Gond et al., 2012). Such proactive dialogues and theoretical projections of contextual changes and their possible implications between different levels of management is, we argue, akin to developing a strong peripheral vision by allowing signs of change sensed in different parts of the organization to flow to top management's attention and awareness, helping to guide decision makers under strategic uncertainty (Mikes, 2009).

Seizing: Once risks are identified, MCS support the organization's ability to respond effectively. This involves not only capturing opportunities but also mitigating threats as they arise. Once changes are identified and a strategic response is formulated, MCS act as a strategic fulcrum helping to redirect an organizations' resources through systems such as strategic planning and budgeting (Bui & de Villiers, 2017; Mikes, 2009).

Transforming: Last, MCS facilitate *transformative* processes within firms by ensuring that changes are implemented in a structured approach – similar to a transformational framework - allowing business processes to be redesigned and resources to be reallocated consistently throughout the firm's organizational structure, thereby ensuring adaptive transformation to environmental changes (Huikkola et al., 2017).

Integrating insights from the innovation literature and MCS theory not only enhances our understanding of how organizations manage risk and uncertainty but also underscores the strategic importance of MCS in fostering dynamic capabilities that help organizations adapt and thrive in uncertain environments. This highlights the profound relevance of MCS in enabling organizations to navigate the complexities of risk and uncertainty emanating from climate-change.

2.4. Management Control Systems and Risk Management

Looking at definitions of corporate risk management and MCS further solidifies their conceptual and performative alignment; MCS represent formalized information-based practices and processes mobilized by managers to alter or sustain organizational activities (Simons, 1995; Mikes, 2009) to achieve the objectives of the firm (Malmi and Brown, 2008). Similarly, risk management forms the set of principles, frameworks, and processes for managing the effect of uncertainty on achieving the objectives of the firm (Soin & Collier, 2013). Thus, MCS and risk management coalesce into systems and practices that aim to protect and realize firm objectives in the face of uncertainty.

Prior literature highlights that MCS both constitute and are constitutive of risk management systems. Several scholars investigate risk management systems as subsets of the broader organizational control package (Arena et al., 2010; Braumann et al., 2024; Mikes, 2009) while others focus on the application of MCS within corporate risk management (Bui & de Villiers, 2017; Kominis et al., 2022; Kumarasiri & Gunasekarage, 2017; Subramaniam et al., 2015). Collectively, the body of literature emphasize the significance of MCS design for managing an inclusive array of risk and uncertainty and their potential effects on firms' objectives (Vasileios & Favotto, 2022).

MCS inform an organization understanding of risks and uncertainties as they relate to a firm's operations and strategy. They enable the flow of critical information relating to a firm's strategy and operations by facilitating communication and collaboration across organizational departments (Vasileios & Favotto, 2022) forming risk intelligence system's that stimulate information gathering and dialogue around strategic uncertainties, that is, contingencies that may threat (or provide opportunities to) the firm as circumstances change (Kominis et al., 2022). Moreover, MCS informs management about emergent threats as they emanate within the organization by establishing acceptable domains of behavior for organizational actors and partners (Arjaliès & Mundy, 2013). In another capacity, MCS allow organizations to contain organizational performance to remain within pre-determined risk thresholds by formulating risk metrics and deploying tools for estimation and monitoring (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017; Vasileios & Favotto, 2022).

2.5. Review of Literature on MCS in Practice

In this section, we delve into empirical examinations regarding the operationalization of Management Control Systems (MCS) within organizations. The literature below will first address how contextual drivers impact the design and use of risk management systems within the broader organizational control package (Mikes, 2009). Second, we will explore how MCS are mobilized *within* the risk management systems to manage risks relating to climate-change issues (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017), specifically focusing on regulatory uncertainty, community pressure and carbon-emissions risk.

2.5.1 The Use and Role of Risk Management Systems Within the Broader Organisational Control Package

First, prior literature by Mikes (2009) expands our understanding of the contextual drivers that shape the strategic remit and design of risk management systems within firms. Given the nature of risk management tools to be “highly analytical, data-driven techniques” they are “likely to strike a different chord in different managerial cultures” (Mikes, 2009, p.4). Accordingly, Mikes (2009) found that in an organizational context dominated by *calculative enthusiasm* - that is, when managers aimed to “manage risk by the numbers, replacing judgmental risk assessments with risk quantification” (p.5) based on their profound belief in the capability of risk measures to reflect underlying economic reality and organizational governance principles that stressed “the role of control systems in the measurement of shareholder value” (p.5) – induced a highly calculative risk management system in which risk controls only addressed quantifiable risks that threatened the achievement of operational performance targets. Resultingly, the strategic influence of the risk management system was delineated to performance management and strategic planning as it was not intended to address non-financial aspects of performance nor to provide information about the contextual uncertainties that primarily spear-headed high-level managerial discussions about the strategic direction of the firm.

Conversely, within an organizational context dominated by *calculative pragmatism* in which managers viewed numbers as trend indicators rather than accurate representations of reality and a risk-based internal control imperative which underscored the importance for control systems to be “designed around the wider strategic objectives of the firm, including non-financial aspects of performance” (Mikes, 2009, p.5) the remits of risk management system

was extended to include both financial and non-financial aspects of performance. This allowed managers to adopt a wider conception of risks, encouraging them to view analytical risk models as trend indicators rather than accurate representations of economic reality and allowed for the inclusion of non-quantifiable risks within the risk management system. Consequently, as the risk management system addressed both current performance risk and served to provide information about external changes that could have implications for the fitness of the firms' strategic direction it rose as a significant input to discussions about emergent strategy formulation and adaptation.

2.5.2 The Role and Use of MCS Within Risk Management Systems

Kumarasiri & Gunasekarage (2017) and Bui and Villiers (2017) extend our understanding of the role and use MCS within the risk management system. Their research specifically explores how firms leverage MCS to address and respond to risks under social and regulatory uncertainty.

Regarding the role of MCS for managing climate change-risks – specifically emission and reputational risk arising from regulatory uncertainty and social expectations -

Kumarasiri & Gunasekarage (2017) invoke legitimacy theory. This theory posits how a potential breach of the social contract between an undertaking and society motivates an entity to comply with regulatory and social pressures. Accordingly, the authors found that the financial implications imposed by regulations, like a Carbon Tax, and the potential for non-compliance with regulations to damage organizational reputation were the main factors that prompted companies to take actions on climate change issues and use MACS for managing related risks. Similarly, in their longitudinal case-study of Australian Utilities, Bui and Villiers (2017) found firms to align their carbon management accounting (CMA) with the strategic orientation chosen in response to climate-change risks. Here, the role of MACS was to support the specific risk-management strategy chosen by individual firms.

Regarding the use of MACS for managing risks relating to climate-change, Kumarasiri & Gunasekarage (2017) found MACS were primarily used for complying with reporting obligations and tracking progress towards regulatory emission caps. The transparency around corporate emissions brought by MACS were also used to manage reputational risk by signaling environmental stewardship to stakeholders. Additionally, the authors found MACS to be instrumental for integrating carbon-emission information into strategic decisions, such as

investments in emission's abatement technologies and evaluating the performance of current mitigation initiatives. Despite such benefits Kumarasiri & Gunasekarage (2017) contend that the long-term strategic advantages of CMA were severed by managers' risk-averse tendencies and focus on short-term economic outcomes. This tendency embedded MACS within emission-management strategies focused on returning immediate emissions- reductions rather than long-term and opportunity focused approaches. Thus, role and efficacy of MCS in risk management seem tightly linked a firm's strategic focus – a point of interest which Bui and Villiers (2017) furthers by examining how various risk management strategies influenced the use of MCS.

In their study, Bui and Villiers (2017) identified how firms adopting proactive and creative strategies – characterized by opportunity-seizing, innovation and deeply embedding sustainability within organizational processes - prompted future oriented and proactive CMA practices. CMA information was routinely collected across organizational departments and extensively used in managerial decision-making and investment appraisals, with CMA metrics focusing on saved emissions and energy costs rather than expensed. Conversely, in reactive and compliance-oriented strategies, CMA information was collected on an ad-hoc basis, involved few functions, focused on direct carbon costs, and mainly served to comply with reporting requirements. Bui de Villiers noted the emissions reductions achieved by each configuration of strategy and MCA use, concluding that proactive and creative strategies with future-oriented accounts yielded larger carbon emissions reductions.

2.6 Conclusion of Literature Review

We began our literature review by delineating the distinction between risk and uncertainty. Then, by the help of Beck (2012) and Power (2004) we understood how the modern concept of risk has grown to include an inclusive array of systemic events, that, because they are made by man, are assigned to corporate responsibility. Beck's (2012) description of these risks as having impacts of unprecedented complexity, scale and unpredictability, map very well onto our understanding of climate-related risks, and as it turns out, onto uncertainty.

This sparked questions about the capabilities needed of modern organisations to remain resilient within the “risk society”, where the innovation literature argued for the importance of dynamic capabilities. We then turned to empirical findings on the use of MCS for managing

risk and uncertainty, finding that internal control systems serve as a conduit for sensing strategic uncertainties and controlling known risks.

Furthermore, a granular analysis of MCS in managing climate-related risks revealed that their effectiveness, and the degree to which they address risk versus uncertainty, depends more on how the systems are used rather than their specific type. Empirical evidence supports our discussion about dynamic capabilities, as firms' who employed MACS in a *sensing* capacity where notably more effective in mitigating risks relating to climate-change. This not only warranted, but also sparked our curiosity, to further investigate how firms enact a broader array of MCS to manage climate-related risks. To comprehensively assess the potential of various MCS in managing risk and uncertainty resulting from climate-change, we will turn to Simons Levers of Control (LOC) framework (1995) since "each lever of control subsumes an understanding of risk, the levers—[Simons] argues—'are the mechanisms managers can adjust to control risks'" (Vasileios & Favotto, 2022, p.3) and ".../address key strategic uncertainties" (Mikes, 2009, p.4).

3. Analytical Framework

3.1 Framework Motivation and Usage

The Levers of Control (LOC) framework, introduced by Robert Simons over two decades ago, is the foundation of this study's approach to understanding how companies utilize management control systems to manage climate-related risks. Originating from empirical research in North America during the late 1980s and early 1990s, the LOC framework has been recognized as a "practice-informed" framework, rooted in real-world organizational strategies and controls, aligning with this study's managerial perspective (Simons, 1995).

Simons' significant contribution through both his academic publications and his 1995 book underscores the framework's relevance and widespread acceptance (Martyn et al., 2016). This historical depth, combined with its applicability in addressing contemporary organizational challenges, positions the LOC framework as a pivotal analytical tool in examining risk management within companies.

Its widespread acceptance in academia ensures that the study is grounded in a well-established theoretical base, facilitating further scholarly discussion and validation of our findings. The framework supports the researchers to gain a comprehensive and profound understanding of the management control systems employed, crucial to explore the complexity of this study's topic.

3.2 Levers of Control (LOC)

The Levers of Control (LOC) framework, by Robert Simons, is a comprehensive model for understanding and deploying MCSs within organizations. The framework outlines how managers can effectively balance organizational control with the need for innovation and strategic renewal. The LOC framework is structured around four distinct yet interrelated levers: *Belief Systems*, *Boundary Systems*, *Diagnostic Controls*, and *Interactive Controls*. These components collectively facilitate an organization's ability to navigate strategic uncertainties while aligning actions with core objectives and values (Simons, 1995).

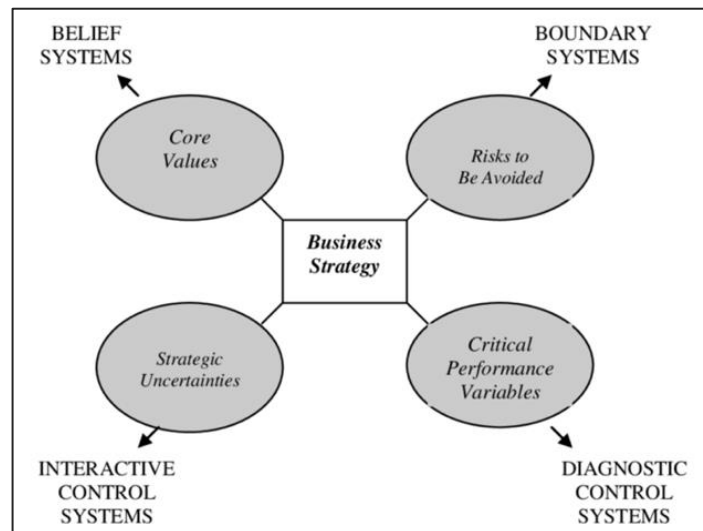


Figure 1: Illustration of the LOC-framework (Source: Simons, 1995, p. 7)

3.2.1 Belief Systems

Belief Systems form the ideological backbone of an organization, consisting of its core values, vision, and strategic direction. These systems are vital to give a sense of purpose and guiding organizational behavior. Through formal statements and organizational narratives, Belief Systems communicate the overarching priorities and ethical standards, fostering a unified culture geared towards strategic goals (Ahrens & Chapman, 2004; Simons, 1995). They play a pivotal role in enabling change by introducing new values or priorities that align with evolving external demands (Arjalies & Mundy, 2013).

3.2.2 Boundary Systems

Boundary Systems, on the other hand, defines the operational and strategic limits within which organizational activities must occur. These systems establish clear guidelines on acceptable practices and behaviors, preventing resource misallocation and ensuring that employee actions are consistent with the organization's objectives. In the context of managing climate-related risks, boundary systems can, for example, be the risk appetite that ensure CSR activities align with broader organizational goals and sustainable practices (Arjalies & Mundy, 2013).

3.2.3 Diagnostic Controls

Diagnostic Controls are utilized by managers to monitor and evaluate organizational performance against predefined targets and benchmarks. This component of the LOC framework emphasizes the importance of tracking progress on strategic initiatives through a mix of financial and non-financial measures, as well as comparative data on competitors.

Diagnostic Controls help to identify deviations from planned objectives, enabling corrective actions. These controls are essential in managing risks by providing a structured approach to measure and adjust strategies based on performance outcomes (Abernethy & Brownell, 1999; Simons, 1995).

3.2.4 Interactive Controls

Interactive Controls are designed to address strategic uncertainties and foster a dynamic conversation about potential threats or opportunities that could impact the organization's future. This component encourages active engagement and dialogue among managers and employees across hierarchical levels, integrating diverse perspectives and external stakeholder views. Interactive Controls are crucial for adapting to and managing risks by promoting organizational learning and innovation. They enable the organization to remain agile and responsive to changes, fostering strategic renewal and the development of effective risk management strategies (Bisbe & Otley, 2004; Simons, 1995).

3.2.5 The Interplay of the Levers

The balance between Belief Systems and Boundary Systems demonstrates the essential equilibrium between guiding organizational ambition and delineating operational boundaries. Arjalies & Mundy (2013) highlight how Belief Systems give organizations a sense of purpose, aligning intrinsic motivations and subsequent behavior with strategic goals. Concurrently, Boundary Systems provide a structured framework that outlines acceptable practices and behaviors, ensuring that initiatives align with the organization's overarching goals and regulatory standards. This symbiosis helps organizations in their pursuit of innovation within defined parameters while simultaneously safeguarding the organization's strategic integrity (Arjalies & Mundy, 2013; Simons, 1995). In terms of risk management, beliefs and boundary system compose the contextual systems within which interactive and diagnostic control sits. Thus, it presents an interesting lens for examining how the organizational "control-texture" (Vasileios & Favotto, 2022) influence the design and use of formal controls for managing climate-related risks. Furthermore, though these levers remain underrepresented within scholarly examinations of MCS in risk management (Martyn et al., 2016), those scholars who have included belief and boundary systems in their conceptual remit contend to the levers potential for supporting organizations' in managing sustainability and climate-related risks. According to Arjalies & Mundy (2013) a strong cultural bedrock of sustainability enhanced the vigilance and responsiveness of organizational actors to such risks. In a similar vein,

boundary-system “convey acceptable business conduct by setting appropriate limits to managerial action” (Vasileios & Favotto, 2022, p. 418). These systems have been conceptualized variably across scholars. For instance, Semenova (2021) found that environmental regulations and the social contract between the firm and the society imposed expectations on acceptable firm behavior. Thus, incompliance with regulations or social pressures signaled potential risks, such as reputational damage or litigation to firms. Adopting an intra-firm perspective, Arjalies & Mundy (2013) identified how boundary systems, such as supplier codes of conduct and environmental certifications, enabled firms to detect and address breaches of acceptable behaviors and firm performance along its value-chain.

The dynamics between Diagnostic and Interactive Controls illustrates the crucial balance between empirical monitoring and strategic dialogue. Diagnostic Controls provide tangible metrics for assessing performance and facilitating adjustments while Interactive Controls foster engagement and dialogue, ensuring learning and innovation (Abernethy & Brownell, 1999; Bisbe & Otley, 2004). If balanced correctly, these controls blend oversight with foresight, ensuring responsiveness and strategic agility, crucial when facing future challenges and opportunities. Thus, dynamic use of both interactive and diagnostic systems is highly relevant in managing climate-related risks, as the former is intended to manage the effect of known risks whereas the latter supports organizations to explore how uncertainties relating to climate-change may materialize in the long-term (Vasileios & Favotto, 2022). Empirical examinations of the levers involve diagnostic use of carbon-emissions accounting and performance measurement, (e.g., Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017), supporting firms to identify, monitor and evaluate current emission-risks and mitigation performance. Additionally, interactive processes allow the involvement of multiple stakeholders of different organizational levels in the identification and assessment of risks, enabling firms to gather diverse perspectives and inputs on potential [climatic] risk and opportunities (Arjalies & Mundy, 2013).

Collectively, the collective synergy of the four levers has the potential to foster strategic agility, crucial for navigating the volatile business environment. This agility stems from the integration of Belief Systems with Interactive Controls to cultivate a culture of innovation, and the coexisting application of Boundary Systems and Diagnostic Controls ensure practicality and alignment with organizational goals. Simons (1995) elaborates on this integrated approach, suggesting that the framework enables organizations to pursue strategies that are both

ambitious and realistic. The LOC framework equips organizations to adapt to external pressures and emerging opportunities, ensuring resilience and strategic renewal in the face of uncertainties.

3.2.6 Critical Evaluation

Despite its widespread application and utility, Simons' Levers of Control (LOC) framework has faced criticism as well as attempted revisions of the model. The criticism mainly focuses on the vague and occasionally ambiguous concept definitions, particularly concerning its four primary levers (Ferreira and Otley, 2009; Ahrens and Chapman, 2004). Efforts to refine the definitions of diagnostic and interactive controls have been made in attempt to clarify them (Bisbe et al., 2007; Ferreira and Otley, 2009). Moreover, while attempts have been made to revise the framework as a whole, such as the proposal by Ferreira and Otley in 2009, these efforts have notably omitted belief and boundary control systems. This exclusion has been a point of criticism, indicating a need for a holistic approach that addresses all levers of Simons' framework to fully capture the complexity of management control systems within organizations (Tessier and Otley, 2012).

4. Research Methodology

The selected methodology aims to collect comprehensive and accurate data, thereby optimally addressing the research question posed. As previously mentioned, the question under investigation is: *How does a company enact management control systems to manage climate-related risks?*

4.1 Research Design & Approach

This study employs an exploratory case study approach, primarily utilizing semi-structured interviews to investigate IndustryCo's use of control systems to manage climate-related risks. The methodological choice is driven by the purpose to deeply understand organizational practices and strategies.

4.1.1 Rationale for an Exploratory Case Study Approach

The exploratory case study is suited for this investigation due to its capacity to provide in-depth insights into the processes and strategies organizations employ to manage climate-related risks. This approach allows for a focused examination of the MCS use for climate risks within a real-life context, aligning with Yin's (2009) emphasis on studying contemporary phenomena where the boundaries between context and phenomenon are blurred. The exploratory nature of the case study, as supported by Bennett and Elman (2006), facilitates an understanding of the complex dynamics within the organization, making it a perfect fit for the research aims.

4.1.2 Semi-Structured Interviews as Primary Data Collection Method

Semi-structured interviews are chosen as the main data collection method due to the flexibility and depth. This approach is consistent with Eisenhardt's (2007) view on the value of qualitative data in building theory, particularly in emergent areas of research, in this case, climate risk management within MCS frameworks. Semi-structured interviews provide the necessary adaptability to delve into specific areas of interest while allowing new themes to emerge during interviews, which is critical for exploratory research (Ellet, 2007).

4.1.3 Justification for the Methodological Choice

The combination of an exploratory case study with information gathering through semi-structured interviews is well suited for addressing the research question. The methodology is specifically designed to capture the complexity and contextual nature of the study to ensure the

ability to apply the findings in other contexts, requiring an in-depth understanding. The flexibility provided by the semi-structured interviews ensure a rich, in-depth collection of data, highlighting the nuances of the case organization (Jones & Lyons, 2004; Stake, 1995). Bergen and While (2000) advocate the use of case studies when exploring complex practices within specific context, aligning with the nature of this study.

The decision to focus on semi-structured interviews within an exploratory case study framework is also supported by the literature on qualitative research methods (Perry, 1998; Simon & Francis, 2001). This methodology allows the researcher to engage with the subject in focus, facilitating a comprehensive understanding of how organizations manage the challenges of climate-related risks through MCS. The chosen approach aligns with the contributions of Jabareen (2009) and Stake (2010), highlighting the importance of qualitative research in unpacking the complexities of real-world phenomena.

4.2 Data collection

4.2.1 IndustryCo and Company Motivation

All interviews were conducted with employees at IndustryCo, a Swedish industrial manufacturing company with global operations and a history dating back roughly a century. IndustryCo is the group company for several business units operating within different spaces in the same industry. Historically, IndustryCo has proactively managed climate-related risks, for example, adopting standards and policies before regulations became standard.

Being a global company with operations around the globe, handling climate-related risks is crucial. The company transitioned to a heavily climate focused strategy just before the COVID-19 pandemic which has shaped a climate-conscious culture. This strategic shift combined with the relevance of climate risks, due to its global operations, highlights its fit with the purpose of this study.

IndustryCo hands out autonomy to its subsidiaries, requiring robust risk identification and management at the group level to effectively manage risks. This led to the implementation of an Enterprise Risk Management (ERM) system in the early 2000s, empowering business units to identify and manage risks.

Conclusively, with its rich experience of risk management, strategic focus on climate-related issues, and global operations, IndustryCo represents an ideal case company, allowing the researchers to investigate the management of climate-related risks from the group company down to individual business units, but also share the accumulated knowledge and practices from its experience.

4.2.2 Interview Sample

This study incorporates insights from 9 interviews conducted with employees at IndustryCo. The interviewed employees were sampled through a non-probability sampling method, more specifically a purposive sampling, where the sample were selected based on the subjective judgement of the researchers, contact person at the company, and our co-supervisor (Elfil & Negida, 2017; Berndt et al., 2020). Concentrating on the managerial aspects and the practical application of various control systems, the study's sample was primarily composed of employees actively engaged in risk management and/or strategy setting processes. To ensure a broad and representative understanding of the company's workforce, the research strategy deliberately invited participants from various organizational tiers, divisions, and functions, in addition to a diverse assortment of individuals.

4.2.3 Interview Design

The series of interviews conducted featured a total of 9 sessions involving 9 unique interviewees, all of whom were middle or top managers, with an average duration of 47 minutes. The interviews were organized and conducted in a sequential manner, following the interview guide, detailed in Appendix 1.

Table 1: Summary of Interview Sessions and Duration for Climate Risk Management Study

Session Number	Interviewee ID*	Duration (minutes)**
1	Employee 1	56
2	Employee 2	38
3	Employee 2	33
4	Employee 3	27
5	Employee 4	54
6	Employee 5 & 6	64
7	Employee 7	44
8	Employee 8	55
9	Employee 9	52

*Interview ID instead of employee role due to anonymity of interviewees

**Average interview length: 47 minutes

The Levers of Control (LOC) framework, crucial in both the construction of the interview guide and the analysis of the collected data, was essential for gaining a deep understanding of management control systems in climate risk management. By exploring the deployment of a wide arrange of systems (belief, boundary, diagnostic, and interactive), the framework allow for a comprehensive exploration of how the company use different MCS to manage climate-related risks but also the relationship between climate-related risks and MCS. Through leveraging the framework in this manner, this study aims to contribute to the existing body of knowledge of the interplay between management control systems and climate risk management.

The interview guide was segmented into six distinct parts for a comprehensive exploration of the subject. The initial section introduced a series of introductory questions, setting the stage for a deeper dive into their perspectives and experiences. Following this, an examination of the first major thematic area, "Belief Systems", was explored, which laid the groundwork for understanding the foundational values and principles guiding the organization's approach to climate risk management.

Subsequent sections delved into the three additional pillars of the Levers of Control (LOC) framework in the following order: "Boundary Systems," "Diagnostic Controls," and "Interactive Controls." Each of these sections was designed to investigate various mechanisms and strategies employed by the organization to navigate and manage climate-related risks effectively.

As we approached the conclusion of each interview, we introduced a set of closing questions. These were aimed at capturing any additional insights, reflections, or areas not previously covered during the structured dialogue. This segment provided an opportunity for participants to share further thoughts or elaborate on points that only were briefly discussed.

To ensure a thorough and nuanced understanding of each topic discussed, the researchers actively engaged in probing and follow-up questioning. This approach allowed to delve deeper into specific areas of interest, clarifying and expanding on responses given by participants. This methodology was essential in achieving a comprehensive and multi-dimensional perspective on the company's climate risk management practices.

4.2.4 Interview Setting

All interviews were conducted in a digital format through Microsoft Teams. Throughout seven of the nine interviews, both thesis authors were present, adopting distinct roles to enhance the process's effectiveness. One author assumed the responsibility of posing questions, guided by the structured interview guide (see Appendix 1), while the other focused on notetaking. This setup allowed for a dynamic interaction, where either author had the opportunity to interrupt with follow-up questions, facilitating a deeper exploration of the topics covered.

4.2.5 Secondary Data

To augment our comprehension and supplement the insights from the primary data gathered from employee interviews, we engaged in the collection of secondary data. This consisted of an array of sources, including news articles, content from the case company's website, as well as annual and Environmental, Social, and Governance (ESG) reports. These materials were essential for a deep understanding of the company's operational context, its MCSs, and overall performance, allowing the researchers to fully understand the information gathered from the interviews.

Furthermore, in pursuit of maintaining the integrity and enhancing the quality of our research paper, we organized five consultations with an experienced researcher in this field. These discussions were aimed to ensure the alignment of our findings with established academic standards and improving the robustness of our analysis.

Table 2: Illustration of Secondary Data

Type of Secondary Data	Description
News Articles	Articles from "Dagens Industri", "Dagens Nyheter", "SVT Nyheter", and "Svenska Dagbladet" providing context and external perspectives.
Company Website Content	Detailed information on IndustryCo's products, services, sustainability initiatives, corporate governance, and press releases from the official website.
Annual Reports	Detailed financial and operational data from IndustryCo's annual reports.
Environmental, Social, and Governance (ESG) Reports	IndustryCo's ESG reports to understand their sustainability practices and reporting.
Expert Consultations	Five sessions with an experienced researcher to ensure academic rigor and validity.

4.3 Data Analysis

The data analysis involved recording, transcribing, codifying, and thematically evaluating the codes. The interviews were recorded with the researcher's mobile devices. In all cases, there was always another device recording simultaneously serving as a backup recording device. All the recordings were uploaded to the researcher's computers to transcribe the interviews with an internet-transcription service named "klang.ai".

The transcripts and notes were initially codified by the researchers using NVivo 14 to state the content of the interviews and facilitate the identification of distinctions and overlaps among the respondents (Mishra & Dey, 2022). Data of no significance were omitted during this stage. All initial codes were then added a label or phrasal descriptor to simplify the interpretation and comparative analysis of the codes. The codes were then reviewed and analyzed by the researchers to classify and bundle them into the four levers of the LOC-framework. During this process, emerging themes were simultaneously created by bundling up associated codes and classified under one of the four levers.

4.4 Ethical Consideration

To ensure that all participants of this study were treated with dignity and respect, the core ethical principles highlighted in the Belmont Report of 1979 were used as guidance throughout the creation of this report. The core principles highlighted include Respect for Persons, Beneficence, and Justice. These principles were at all times considered and shaped every aspect of the research approach.

To uphold the Respect for Persons, we ensured that participants were performed about the nature, purpose, and any potential risks and benefits of their participation in the study. This process was essential to receive an informal consent of participation and highlighting our efforts to protect and care for individuals involved. This process involved permission to record the interviews, which was essential for the quality of the report.

In line with the principle of Beneficence, our study was designed to minimize potential risks to participants while maximizing possible benefits. This involved a thorough evaluation of the study's procedures to mitigate any harm and enhance the overall well-being of the ones involved.

Justice was a cornerstone of our participant selection process, guaranteeing an equitable approach that avoided any form of discrimination. We strived to ensure that the burdens and benefits of the research were distributed fairly among diverse demographic groups, consciously avoiding the exploitation of vulnerable populations.

Additionally, all data were strictly managed and stored according to the GDPR guidelines. This included the deletion of all audio recordings after transcription and removal of personal identifiers throughout the research process. A stance of professionalism and neutrality were also maintained to the best extent possible to prevent biases.

By applying these ethical principles into the fabric of our research, we aimed to not only adhere to the highest ethical standards but also to honor the dignity, rights, and welfare of all participants involved.

4.5 Methodology Discussion

4.5.1 Quality of Research Design and Trustworthiness

Lincoln and Guba's trustworthiness framework is used to evaluate the robustness and reliability of the study's methodology (Stahl & King, 2020). The exploratory case study approach, primarily utilizing semi-structured interviews for data gathering, is evaluated through the four dimensions, namely: credibility, transferability, dependability, and confirmability (Ibid).

The approach of semi-structured interviews aligns with the credibility dimension of the framework, enabling a deep and genuine exploration of the participants' perception and experiences. Allowing for an in-depth and nuanced understanding of the contextual and complex practices within the company. Potential improvements within this dimension involve triangulation, member checking, and peer debriefing.

An aspect that can decrease the credibility is caused by the need of translating quotes from Swedish to English due to all interviews being conducted in Swedish to ensure interviewees' comfort. This credibility problem has been mitigated as much as possible by the researchers, carefully translating quotes, to create an as representable picture of the company and findings as possible.

To ensure transferability, a detailed description of the research context and the reasoning behind the selected case company, IndustryCo, is communicated. These detailed sections provide context to enable others to interpret and judge the applicability of the findings of this study in other settings. However, there are possible improvements to enhance transferability. It could involve offering comprehensive details about the case company and the interviewees roles. However, this was purposely avoided to ensure the anonymity and confidentiality for both the company and employees.

Dependability emphasizes the need for the research process to be repeatable and consistent. This was ensured by having an interview guide setting the structure of the interviews, however, due to the choice of conducting semi-structured interviews, questions varied, and interviews could focus on different areas depending on the emerging topics highlighted by the interviewee. The interviews therefore could potentially possess the risk of biases.

To enhance the credibility of the study, the researchers held an ongoing dialogue with the case company, supervisor, and experts within the field. This dialogue contributed significantly to the study's reliability and quality through guidance, advice, and mentorship.

Confirmability requires that findings are shaped by the participants and the data, rather than researcher bias. The methodological framework outlined suggests an awareness of this need, particularly through the choice of semi-structured interviews which prioritize participants' voices. To enhance confirmability, the researchers always had in mind to be as objective as possible to decrease biases and did their best to ensure that the questions asked during the interviews did not contain any biases or steered the participant into a certain outcome or answer.

5. Empirical Findings

The following section is divided into four parts with associated subheadings, presenting the empirical findings according to the four levers in the LOC-framework: belief-, boundary-, diagnostic-, and interactive lever. All following findings are based on data collected from the interviews and published resources from the company.

5.1. Belief Lever

This section presents the empirical findings of IndustryCo's use of belief systems across two subheadings. "Belief in Sustainability and Strategic Commitment" details the company's use of its climate strategy to intertwine environmental stewardship with core organizational values. "Misalignment of Organizational and Shareholder Values" explores the tensions between long-term environmental objectives and short-term financial imperatives, highlighting a prevalent purpose dichotomy within the company.

5.1.1. Belief in Sustainability and Strategic Commitment

In November 2020, IndustryCo announced its commitment to provide 100% fossil free products by 2040, with the ambition of making IndustryCo a net-zero company by 2050 in line with the goals of the Paris Agreement. As part of its up climate-strategy, IndustryCo committed to the Science Based Target Initiative (SBTI) - a multi-stakeholder initiative meant to support firms in setting GHG emission reduction targets in line with the Paris Agreement - to establish targets and a defined roadmap to net zero.

Since, the transformation roadmap and net-zero commitment have "guided all business units" of IndustryCo and serviced to reinforce organizational values of commitment, passion and change. Several interviewees affirmed that the climate strategy had reinforced values of a strong commitment and determination towards sustainable transformation and environmental stewardship:

"There is no possibility for us to fail, as we have committed to reducing emissions according to the conditions required for the planet to be sustainable, so, it's very clear, it's 100 percent. There are no exceptions, it's 100 percent. And with the commitment where we were very early with the science component, it was also very clear what the long-term goal is" – Employee 5

The transformation strategy and SBTI-goals commitment also serviced to communicate and reinforce values and beliefs about the strategic significance of risks relating to climate-change and IndustryCo's transition. Due to the high GHG-emissions related to the products, GHG reduction has become the locus of IndustryCo's strategy while the SBTI-targets function as the polestar(s) of its transformative journey:

"We have a very big focus on CO2. Very, very big focus on the CO2 issue. /.../. And that is where we, with the technological development that is happening, can also make the biggest impact within the company. So, if we manage to get a new technology or develop the technology that we have and can scale it up, then we will achieve the [SBTI] goals, and it will have the greatest effect on cooperation overall." – Employee 8

Thus, the climate strategy managed to intertwine IndustryCo's core value proposition, its long-term *raison d'être*, with GHG emissions reduction and technological innovation:

"Of course, we're not doing it just to do society a favor, of course, but we're doing it primarily because it's like our *raison d'être* [reason for being] as a company. If we continue to produce [what they mainly sell today, removed due to anonymity], we don't believe we'll exist as a company in 20 years." – Employee 2

5.1.2. Misalignment of Organizational and Shareholder Values

Even though all interviewees understood the importance of transitioning to sustainable products, a moral tension between balancing long-term value creation and short-term performance was found. IndustryCo's commitment to value creation through a sustainable transformation was found counterbalanced by its commitment to shareholder value creation in the shorter term. It was also found that their customers have yet not showed the expected demand for sustainable products, inhibiting a fast shift to sustainable products.

"An obvious opposing relationship is profitability in the short, medium, and long term. Simplified now, so the transformation strategy is about us being profitable in the long term. In the short term, we don't sell as many sustainable products as we would like, so in the short term, it's more profitable to continue developing non-sustainable products. So it's like, that can be an opposing relationship." – Employee 2

"But in the short term perspective, there are definitely difficulties in managing these risks for some. They exist. We can't just sell what we want to sell. We have to sell what customers want to buy. So yes, there are definitely contradictions related to sales, profitability, and other things. Yes." – Employee 2

According to the respondents, IndustryCo's commitment-dichotomy is fueled by the internal decision processes which is highly affected by the current incentive systems which are aligned with shareholders' investment horizon:

"It [profitability vs the transformation] can indeed be a contradictory relationship, and by having shareholders who expect dividends and we want to have a profitable company and we who work here would like to have a good bonus, and that is also linked to our profitability. So it is a challenge to manage that tension". – Employee 8

"The owners have an investment horizon. It can vary depending on the type of company one invests in. But when investing in [IndustryCo's industry], the typical investment horizon is about five years. So you expect to retain your ownership for about five years. And this is reflected in everything from bonuses for top management to all reward systems in the company with that time horizon". – Employee 3

The statements reveal that IndustryCo on the one hand has committed to create value in the long-run, as reinforced by its climate-centric and innovative culture. On the other, its commitment to creating short-term value for its shareholders as reinforced by internal rewards systems, causing internal misalignment and tensions around current business priorities.

5.2. Boundary Lever

This section on the Boundary Lever is divided into two subheadings, each presenting emerging findings from the data. The first subheading "Definitions and Risk Appetite" discusses the conceptualization and application of risk thresholds, focusing on the integration of regulatory frameworks and absence of formalized definitions. The second subheading "Calculative Risk Language" showcase how establishing boundaries, or definitions of risks, is made more difficult by the company's predilection to manage risk by the numbers.

5.2.1. Definitions and Risk Appetite

The Boundary Lever is conceptualized as "any practice that delineates acceptable domains of organizational behavior to control risks threatening the strategic objectives of the firm" (Simons, 1995). Accordingly, this study examined how the concept of risk appetite, i.e., a threshold or framework for evaluating acceptable and non-acceptable levels of firm specific risk, informed IndustryCo's identification and evaluation of climate-related risks. A consensus among the respondents quickly emerged that IndustryCo had not developed a formalized risk-appetite:

"I would probably answer no to that question. That I don't think we have a clear framework for what can be considered an acceptable risk." – Employee 7

"We dont have it [defined risk appetite]. We are very low on that scale." – Employee 4

Despite the lack of a formalized risk appetite, other regulatory frameworks, such as the EU taxonomy and ISO certification, functioned as codes of conducts and/or benchmarks that established lower-limits of acceptable and unacceptable activities, thereby alerting management of potential risks relating to sustainability performance:

"We do not have an explicit risk appetite, but then there are these 'limits' within our governance structure where they have it, but right now it is not explicit, and it is not something that is included in the risk work." – Employee 1

Moreover, it was found that IndustryCo's formal risk management process used a financial benchmark to evaluate the severity of operational risks:

"Now, in that [risk management] process, one has defined the risk associated with the impact it would have on our working capital. And that's essentially the definition of whether the risk is low, medium, or high based on the amount of money we're talking about " – Employee 1

With a definition related to the pure financial impact, only quantifiable climate-related risks could be identified and evaluated against it. For example, the definition worked well for climate-policy risks due to their easily computable impact on financials:

"I have indeed seen this, for example legal risks /.../. Then we have definitions for what is even a significant risk. There, the risk appetite is defined as follows. Is it something that is below this amount or is it something of this nature? Then you don't need to report it. And that's a way to define risk appetite. What is above that threshold is something that is de facto a risk that we want to know about. So there, I can say that yes, there is a defined risk appetite in that way." – Employee 2

Our responses were also indicative of several implications resulting from the lack of a formalized risk appetite applied to climate-related risks. First, the risk appetite was instrumental for establishing definitions of risk within the organization. Due to the tradition to evaluate risks against a financial threshold, the conception of risk within IndustryCo was strongly numeric and tied to financial performance. Due to the difficulty of quantifying transitional and physical climate-related risks, such as the risk of low customer uptake of transformational products, IndustryCO faced challenges in establishing a universal and aligned understanding of what constitutes climate-related risks and how they should be evaluated. The need for “a common battery of definitions” throughout the organization was mentioned by several respondents:

"I believe it's necessary to have a common set of definitions in order to identify risks, compare them, and assess them against each other. You need to have a defined risk appetite, as you mentioned. It feels necessary to be able to identify and address risks in a structured and professional manner. The first step is to identify that the risk exists and be able to compare it to other risks, understand its significance. And in order to do that, as I mentioned, you need tools and definitions for what risk entails in these contexts". – Employee 2

“We might have slightly different views on this and what constitutes big and what constitutes small...” – Employee 7

5.2.2. Calculative Risk Language

Several respondents believed that IndustryCo’s risk management process would be enhanced by quantifying the financial impact of climate-related risks as it resonated with their normal way of talking about and perceiving risk. Thus, the challenge of measuring these risks made it more difficult for managers grasp and communicate them within the organization compared to traditional risks:

"Well, both yes and no. I believe it's instinctively more difficult to define risk if one doesn't speak in monetary terms. And that's a challenge because many sustainability-related risks and climate risks, to some extent, can be expressed in monetary terms. But to some extent, they don't." – Employee 7

"I think it [quantification in financial terms] would have helped. We are more accustomed to discussing risk in that manner." – Employee 8

In summary, the absence of a boundary system that effectively establish and instill a common definition of climate-related risks within IndustryCo undermine managers ability to consistently identify, evaluate and reach a consensus on which climate-related events that pose the greatest threat to the firms objectives. Compounding the definition issue is the incompatibility between the prevailing risk culture and language and the nature of climate-related risks, which do not easily lend themselves to quantification. However, those events that can be understood in terms of numbers and probabilities receive more attention and apprehension in exchange for their cultural and conceptual conformity.

5.3. Diagnostic Lever

This section focuses solely on the theme of "Short-term Controls Versus Long-term Environmental Objectives", highlighting a central issue within IndustryCo's risk management approach.

5.3.1 Short-term Controls Versus Long-term Environmental Objectives

IndsutryCo's used several MCS to monitor and measure risks. However, it was found that these systems tended to be based on short time horizons, one employee explains.

"We have worked with two time horizons where the three years mark have been a breaking point between the two. [...] The reason that this has been important overall in the process is that we have quantified the risks that we believe can materialize within three years because that's where we have financial plans, investment plans so we can relate that quantification to something. Then, we have not quantified what we have said has been in the longer term." – Employee 1

As previously mentioned, employees at the company are used to quantify and discuss risks in terms of their impact on working capital. However, IndustryCo also quantify risks by relating them to their volume and sales targets, a method applied for some transformative risks. Another employee continues:

”I think that we don't set them [climate-related risks] so much in relation to economic metrics, but we measure more against SBTI [Science Based Targets initiative] targets, although we haven't determined a monetary impact.” – Employee 6

The statement highlights the contrast between traditional risks, expressed in monetary terms, and climate-related risks, related to more intangible measures. On top of the Science Based-, volume-, and sales targets, the company employ weekly follow-ups on suppliers to ensure their resilience in resisting the shift in technological development. Additionally, IndustryCo stands out from their competition by requiring 100% content from all suppliers to enable a full understanding of the impact of the materials. However, a majority of the interviewees mention that familiar and popular KPI's are preferred, e.g., CO2-targets, having a high focus within the organization.

It is apparent that traditional and climate-related risks are handled differently in terms of accountability. It is revealed that climate-related risks lack ownership and therefore falls through the cracks, an employee explains:

”I do not see that process in front of me. I see it as I said from the beginning. We discuss these types of issues and so on, but there is like no real home for it, there is no owner of it in that way” – Employee 7

A problem is noticeable when considering IndustryCo's “muscle memory”, having to quantify risks to address them, and how traditional and climate-related risks are handled. Employing diagnostic controls of financial nature for traditional risks while relating and converting climate-related risks to diagnostic controls of non-financial nature, causing a low priority.

It is obvious from the empirical data that IndustryCo's dependence on diagnostic controls mainly serve to monitor and manage short-term risks. This approach of solely quantifying risks

with a three year time-horizon creates a disconnect between the company's strategic aspirations towards a climate-centric future and the operational reality guided by these diagnostic controls. The short-term focus of these controls does not completely grasp or back the long-term, transformative goals embedded in IndustryCo's climate strategy.

5.4. Interactive Lever

The following four sub-sections focuses on the interactive mechanisms IndustryCo employs to foster robust governance, learning, and dynamic communication across its decentralized structure but also the various challenges it is facing within this area.

5.4.1. Governance and Communication at IndustryCo

This decentralized organization is managed through a mix of centralized and decentralized means. It lets the different subsidiaries function as their own company but handles specific functions and takes the groups perspective in consideration when e.g., formulating the strategy. To encourage collaboration between the different functions, the group has created different forums where people, mostly managers, can discuss different topics and ask questions, all to collaborate and learn from the other functions.

IndustryCo has recognized the importance of discussing and reflecting together. It is found that in addition to the forums, there are steering committees, collaborations between functions, and discussions with stakeholders in place, all fostering the dynamic capability of staying up to date within various areas. However, it is discovered that the stakeholder discussion differs by being highly centralized to a few employees being responsible for this dialogue. There are also events such as conferences and leadership summits where exchange of views tend to happens in an informal setting. Two employee says:

“From my headquarter’s perspective, I think that here we have once again quite good governance. We have various steering committees and so on. And project teams and such where representatives from different departments sit. There we manage to achieve good, I think, cross-functional communication, so that it's not very siloed. So from my perspective, I feel that there is good communication and oversight and so on.” – Employee 9

”As I mentioned, the Sustainability Council is a forum that I mentioned. In addition to that, we have an Environmental Committee, we have a Taxonomy, project management, we have various networks. So, there are more focus areas, focused small steering committees that take on relevant issues. But beyond that, we also have the other larger forums, for example, ERM.”

– Employee 7

Moreover, when it specifically comes to risk management, there are a few dedicated meetings to specifically address this area. It includes meetings with all units that recently have reported a risk, CFOs from all business areas, top management, the audit committee, the IRM-committee, and the board of directors. None of the meetings are focused on addressing climate-related risks specifically even though they are discussed in other circumstances:

”These risks that we discuss [climate-related risks] are talked about in many different meetings in the ways and levels where they are relevant. We have SBTI meetings where we discuss the major risks, and we also have focused working groups that deal with [specific tasks with positive impact removed due to anonymity]. We don’t have a meeting that involves the entire group, but these issues are part of an ongoing effort that permeates daily work. There is no specific forum for climate-related risks.” – Employee 4

When asked about how they choose people involved in the risk management forums, it is uncovered that the group company asks the business units whether there is a responsible employee and lets them choose representative for their unit. However, a complexity, with this bottom-up approach, is found in several interviews, one example is:

”Much of the ERM process as I perceive it today is a bottom-up process where each business area is asked if there is a responsible person. And it's not certain that they are perfectly knowledgeable about these issues. [...] However, there is a need to train those who will report the risks so that they also think in this way.” – Employee 8

The employees mention that training and education potentially is needed to increase the knowledge about climate-related risks to ensure that those are monitored and acted upon in time. Another employee mention that this education is needed to use the tools and gain the understanding to correctly report these risks to the group company. One employee explains that the responsibility to tackle this challenge lays on the group company:

”and then, of course, it's up to us at the headquarters, as a support function, to help them.” – Employee 5

Secondly, a tension was found between the system for reporting a risk and the maturity of the company, closely related to the competence question. Several employees explain that the immaturity of the company, in the context of handling climate-related risks, can lead to a hindered communication and awareness of those type of risks, partly due to absence of established common definitions, causing miscommunication and difficulty to be discussed properly. Resulting with these risks going under the radar.

”we see that maturity is very low in truly understanding what different types of sustainable risks and various sustainability issues are and how they can impact the company.” – Employee 3

5.4.2. Potential for Improved Collaboration

Evidently, IndustryCo has recognized the increased complexity of risks and the importance of collaboration within the group to manage these. This development of collaboration has been recognized by the employees:

”But I also feel that lately there has been more discussion about these issues, for example in the corporate management, and that it's being done more cross-functionally across different types of functions because perhaps it's not just one function that can solve these issues.” – Employee 7

Many employees mention that the current established collaboration processes are working well. However, even though their many forums and other spaces for collaboration, the data collected reveal that further collaboration is demanded by some employees. Business units explain that “IndustryCo is not very involved” and that they see improvement potential for IndustryCo by working more united. Another employee highlights the need for more collaboration between business units:

"There are economies of scale around different technical solutions where perhaps we and [another business unit] could have the same. We are locally reinventing the wheel over and over again, so I see that there might be opportunities." – Employee 6

An employee mention that the formal processes that promotes collaboration between business units has room for improvement since they are currently people dependent:

"Now, it's somewhat dependent on the individual that one makes contact and gets to know someone, and it works well to work with them, that's when you start to collaborate. And that works very well for me here right now, but it is then dependent on me as a person." – Employee 8

5.4.3. Need for Increased Competence

It was found that there is a system [ERM] employed to identify risks using a bottom-up approach. However, it is also found that the competence of climate-related risks is currently highly centralized to a few employees. An employee mention:

"If one takes a look at the ERM process, then I believe that if that's what it's supposed to be, then perhaps there is also a need to actually educate the people who are going to assess these risks so that they also consider sustainability risks, which might require examination." – Employee 1

The employee highlights the importance of the employees in the business units being educated within this area to be able to both recognize and assess these risks, highlighting the need for competence throughout the organization. Both at the bottom where the risks are identified, but also at top-management level where the strategy and decisions are set. This illustrates a misalignment with their bottom-up approach and risk identification of climate-related risks, potentially causing these risks to go unrecognized.

"And then they [top-management] are supposed to sit there and talk about risks and fill that in. [...] And obviously, it's more difficult for them to 'brainstorm' and discuss and reason about risks that they are not used to talking about. And as mentioned, they are much more accustomed to discussing the more traditional risks because they have been doing that for like 20 years." – Employee 2

Conclusively, it is evident that simply having a climate-centric strategy is not enough to successfully manage climate-related risks and foster learning. Having educated personnel throughout the organization is needed to capture, assess, and take optimal decision when considering both traditional and climate-related risks.

5.4.4. Importance of Publicly Communicating Goals

Lastly, it has been uncovered that investors are a highly prioritized stakeholder. An employee highlight this by emphasizing the importance and prioritizations of goals and visions communicated to this stakeholder:

”And in practice, that means the only thing that is really important is what we have told the financial market. What we write in the annual report, etc. What we say in other forums, the internal decisions, they can be changed all the time. Back and forth if you want.”

– Employee 3

The statement illustrates the relative importance of different interactive controls but also underscores how plans and statements are transformed into actions when publicly communicated. This because of their obligation to inform stakeholders if anything changes e.g., foresee that they will not be able to meet communicated plans/goals. In other words, committing to communicating plans and goals is a confirmation that the organization will proactively take action to fulfill them.

6. Discussion

6.1. Answering the Research Question

The research questions this study address is the following:

How does a company enact management control systems to manage climate-related risks?

By conducting a case study of IndustryCo, collecting data through semi structured interviews and publicly available material, it was revealed that IndustryCo use several different control systems to manage climate-related risks. The answer to the research question is the following:

1. The company use public mediums to foster a climate-centric culture and reinforce organizational values (belief systems)

By communicating its transition strategy to internal and external stakeholders, through mediums such as public announcements, the annual report and internal meetings, the company reinforced the connection between climate-change mitigation, sustainability, and its core organisational values, transferring awareness and recognition of climate-related risks throughout the organization.

2. Defining risk appetite in financial terms for legal risks (boundary systems)

To help the legal department prioritize between risks and know what is seen as a risk for the company, the company has developed a risk appetite consisting of financial amounts. These amounts aid legal councils to know which climate-related (and traditional) risks should be considered.

3. The company attempt to convert and quantify climate-related risks in terms they are used to (diagnostic controls)

Habits of discussing and expressing risks in quantitative terms makes the company strive to quantify climate-related risks. An attempt to do this is by relating climate related risks to internal volume and sales target, e.g., setting sale goals for sustainable products, but also wide goals such as SBTI-targets.

4. Climate-related risks are discussed across a wide array of knowledge and information exchange mediums (interactive controls)

A comprehensive number of interactive controls such as forums, steering committees and established collaborations exists to foster information sharing and knowledge exchange. However, it is found that climate-related risks do not have its own forum or medium where it stands at core, instead they are discussed across several controls of this nature.

5. A bottom-up approach is employed to recognize risks; a strategy also used for climate-related risks (interactive control)

The company employed a risk identification system with a bottom-up approach, letting the different business units identify and report risks to the group company where discussion and decisions on further action takes place.

The five answers highlight the diverse set of management control systems used to attempt manage climate-related risks. Even though employing belief-, boundary-, diagnostic-, and interactive controls, IndustryCo still has room for improvement, highlighting the complexity and difficulty of integrating non-traditional risks into one's risk management. It is still uncertain how companies should manage those risks, but it is evident that climate-related risks have impacted the traditional view of risk as a whole and risk management practices.

6.2. Discussion with Previous Research

6.2.1 Managing Risk

Our findings show that IndustryCo place a significant emphasize on managing risks that are likely to materialize in the short-term, echoing findings of previous scholars (Andersson & Arvidsson, 2023; Kumarasiri & Gunasekarage, 2017; Sakhel, 2017; Semenova, 2021). IndustryCo's relatively more mature risk management process for legal risks associated with climate-policy mirrors the organizational impetus of addressing risks perceived as immediate with clear financial implications – traits that support managers perceptions of their strategic significance (Sakhel, 2017). Additionally, our findings expand the understanding of how governance imperatives distinctly shape the management of climate-related risks. First noted by Mikes (2009), the strategic significance of risk management systems is contingent upon the role they are assigned by within the organization. At IndustryCo, the use of the risk management system appears to primarily measure and monitor performance and to serve the role to maximize shareholder value creation. This *diagnostic use* of the risk management system within IndustryCo's broader control framework was reinforced through remuneration

and incentives schemes based on short-term financial performance, though research contend to the importance of aligning these systems with long-term value creation (Kumarasiri & Gunasekarage, 2017).

A critical contribution of this study is its exploration of how definitions and conceptual boundaries support the management of climate-related risks, an area not extensively covered in existing literature. Previous research (see Kumarasiri & Gunasekarage, 2017), has examined how human cognition and biases affect responses to climate-related risks, noting that threat-bias leads managers to address climate issues more promptly. However, their analysis does not extend to whether organizations share a common understanding of what constitutes a climate-related risk, nor the implications of such understandings for risk management. Our research fills this gap by demonstrating that climate-related risks compel companies to redefine their concepts of risk. We find that the concept of risk appetite is pivotal in this context, as it both shapes and is shaped by managers' perceptions and understandings of risk within IndustryCo. In addition, a lack of a common risk-universe impairs managers ability to align on climate-related issues, potentially hindering efficient and swift action on critical challenges. This points to the importance of establishing a unified framework for understanding and categorizing risks to align perceptions and facilitate coordinated responses. Indeed, climate-related risks have become the new normal in Beck's (2009) 'risk society,' where their pervasive and complex nature calls into question the traditional definition of risk (Knights, 2012), underscoring a paradigm shift in how risks are perceived and managed.

6.2.2 Managing Uncertainty

Despite the observed tension between managing short-term and long-term risks, IndustryCo maintains a robust focus on long-term risks and opportunities related to climate change and the transition to net zero. Our findings highlight the effective use of multiple MCS levers in fostering a culture deeply rooted in sustainability, climate awareness, and long-term value creation, reflecting the theories presented by Mundy et al. (2012). For example, IndustryCo leverages Science-Based Targets (SBTI) and transition roadmaps not only to monitor performance (diagnostic use) but also to reinforce its core commitments and values (belief system), thus solidifying its *raison d'être* to contribute to climate change mitigation across the organization.

These practices resonate with the findings by Bui & de Villiers (2017), supporting the idea that successful long-term risk management hinges on a profound commitment to sustainability and its seamless integration with the overarching business strategy (Mundy et al, 2012). Thus, although the risk management system primarily dealt with short-term climate-related risks and policy risks, the close integration of sustainability and strategy ensured that long-term risks and uncertainties remained a salient element on the managerial agenda. Managerial awareness, or sensing, was also supported by IndustryCo's formalized systems for gathering and analyzing information across various organizational functions, enabling emergent risks sensed within the business areas to cascade to the cognitions of top-level management. These practices confirm the significance of interactive systems, as discussed in previous studies (Kominis et al., 2022; Mikes, 2009; Vasileios & Favotto, 2022) which emphasize the critical role of interactive MCS in fostering an environment supportive of dialogue and knowledge sharing for extending and enhancing an organization's peripheral vision.

6.3. Contribution

The study contributes to the current understanding of the intersection between management control systems and climate-related risks in several ways. The first subsection elaborates the practical implications of the findings, offering valuable insights for enterprises seeking to improve their practices. The subsequent section covers how the study addresses theoretical gaps, enhancing the current comprehension of this overlap.

6.3.1. Practical Implications

The empirical findings of this study have numerous implications for enterprises. Firstly, the study reveals the importance of recognizing one's own risk culture and "muscle memory" when it comes to handling and discussing climate-related risks. Accordingly, managers should be vigilant to the established risk culture within their organization to understand what term risks need to be expressed in to be acted upon, e.g., quantified to financial terms, or to consider the necessity of altering these habits to better accommodate the nature of climate-related risks.

Secondly, our study brings in the importance of top-managers establishing common definitions of risk, risk appetite, and climate-related risks throughout the organization to avoid miscommunication and allow for a shared view of the most critical climate-related risks that the organization is exposed to. We believe that ensuring internal alignment is the fundamental piece for allowing a firm to effectively address risks and seize opportunities resulting from

climate-change as it ensures that internal politics and disagreements do not come in the way of swift action on these issues or occupy managerial focus from significant strategic threats.

Third, the findings of this study underscore the usefulness of interactive controls to battle climate-related risks and avoid “reinventing the wheel over and over again”, highlighting the value for organizations to establish formalized processes that foster collaboration and exchange of perspectives rather than it being dependent on people taking own initiatives.

Lastly, our study highlights the importance of aligning incentives and knowledge across the organization to allow for effective risk management of climate-related risk. It is apparent that a bottom-up approach to recognize risks require a widely educated workforce to efficiently identify risks. Upskilling of climate-related risks is found important both at top-management level where decisions are made but also in lower levels of the organization where risks are identified. This brings into sharp focus the necessity for organizations to review their general knowledge of these issues and make available resources for educating employees on the topic. In addition to upskilling within the organization, organization need to overview their incentive program to manage climate-related risks effectively, ensuring that employees are evaluated on both short-term financial performance but also on metrics geared towards long-term climate mitigation and sustainability goals.

Table 3: Practical Implications for Enterprises Addressing Climate-Related Risks

Practical Implication	Description
Recognition of Risk Culture and "Muscle Memory"	Managers should recognize and understand their organization's risk culture and habits regarding handling and discussing climate-related risks. They should assess whether existing risk expressions align with effectively addressing climate risks or if adjustments are needed.
Establishing Common Definitions	Top managers should establish clear and common definitions of risk, risk appetite, and climate-related risks throughout the organization. This alignment prevents miscommunication and ensures a shared understanding of critical climate risks, facilitating swift and effective action.
Implementation of Interactive Controls	Formalized processes and interactive controls are crucial to combat climate-related risks. Organizations should establish systems that encourage collaboration and the exchange of perspectives to avoid redundancy and promote efficient risk management strategies.
Alignment of Incentives and Knowledge Across the Organization	Organizations need to align incentives and knowledge across all levels to effectively manage climate-related risks. This includes upskilling employees at all levels to identify risks efficiently and adjusting incentive programs to prioritize long-term climate mitigation and sustainability goals.

6.3.2. Theoretical Contributions

Our study extends previous research by drawing on several streams of literature – innovation, MCS and risk management - to conceptually understand the capabilities needed to effectively manage climate-related risks. Notably, our study unveil new factors – such as risk appetite and risk definitions - that shape companies’ perceptions of climate risk, responding to the calls of Sakhel (2017). Furthermore, by leveraging all four levers in Simons Framework we contribute to the accrued need for a comprehensive examination of MCS in managing climate-related risks (Martyn et al., 2016; Vasileios & Favotto, 2022). Accordingly, we address a current gap in research by emplacing Simon’s framework in the – to our knowledge – new domain of climate-related risk management. By examining the interplay of the four levers, our study expands research on the intersection between MCS and risk management by considering how cultural and boundary systems imprint the interactive and diagnostic control systems that are situated within them as opposed to examining the systems in isolation (ibid). In doing so, we demonstrate the conceptual potential of Simons framework for understanding risk management as a part of the broader organizational control package. We elucidate the inherent tensions among different control systems and examine their implications for managing risk, thereby extending the framework’s theoretical applicability and enriching our understanding of the suit of organizational dynamics at play to bear the risk and uncertainty of climate-change.

6.4. Limitations

This study has several limitations. Due to the nature of case studies, the findings and results might not be as generalizable compared to if a cross-sectional study was conducted. Moreover, two limitations are connected to the theoretical framework, namely the LOC-framework. Due to the choice of structuring the interview guide and study according to the framework, there is a risk that aspects brought up by other frameworks are disregarded and missed during interviews. The other limitation connected to the framework is the, previously mentioned, abstract nature of the framework and the interrelation between the four levers. This caused a difficulty in classifying certain systems and controls into one of the four levers. Furthermore, as this study heavily relies on the researcher’s interpretation of the collected data, the empirical findings rely on the researcher’s ability to neutrally interpret the data. Another potential limitation is caused by the structure of IndustryCo, being a huge group of subsidiaries and business units, potentially giving a misrepresentative image for an “average” enterprise.

6.5. Further Research

Building on the insight discovered from this study on IndustryCo's usage of MCS in managing climate-related risks, several areas for further research are discovered. A longitudinal approach could explore the changing effectiveness of MCS as environmental and regulatory contexts change. Additionally, the integration of emerging technologies, such as artificial intelligence, into MCS could reveal new strategies and practices to enhance risk management. Another emerging gap is research on the importance of competence. Investigating how the level of competence about climate-related risks affect companies management of those risks could be a fruitful avenue for future research. Furthermore, considering IndustryCo's large size, a comparative analysis of how small- compared to large enterprises manage climate-related risks could fill the gap of how applicable findings from large enterprises are for other sized companies. Lastly, investigating how different industries manage these risks can deepen our understanding and illustrate differences and similarities, possibly finding best practices. The above suggestions of further research would contribute to the knowledge and aid enterprises with developing risk management practices that efficiently handles traditional and climate-related risks.

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8. Appendix

Appendix 1 - Interview Guide

Introductory Questions

- Please tell us a bit about yourself and your role at IndustryCo.
- Generally speaking, on a scale from 1–10, how successful do you think IndustryCo is in terms of risk management? What about in sustainability activities?
- Is there a clear process/guideline for identifying, assessing, and evaluating climate-related risks? What does it look like? Is this process different for traditional risks? Can you mention three strengths and weaknesses?

Strategy

Do you feel that IndustryCo works with a unified governance approach to handle climate-related risks? What are the three biggest challenges you face with organizational leadership and long-term planning regarding climate risks and risk management overall?

Follow-up Questions:

- Is your work at IndustryCo guided by a defined risk appetite, i.e., a level and direction of risks the company can accept to achieve its strategic goals? Is this a strength or a weakness? Why?
- Is the risk appetite formalized, and how is it communicated?
- How does IndustryCo communicate its strategy within the organization?

Belief Controls

Do you think IndustryCo's strategy, values, and goals serve as a compass for your risk management and sustainability work? Can you give an example? Are the company's values anchored and communicated throughout the company? Are there any conflicting priorities, values, or goals that might hinder or complicate efforts to manage climate-related risks?

Follow-up Questions:

- How can external pressures or stakeholder expectations affect the organization's assessment and management of climate-related risks? Can you give an example?
- Do you think certain types of risks receive more attention? What do you think this depends on?

Boundary Controls

Do you feel that there are clear boundaries for the risks you can take on and stay within?

Follow-up Questions:

- Do you have a clear picture of IndustryCo's risk universe and the most critical climate risks within the organization? Is this picture shared throughout the organization?
- How does the company assess and adapt to regulatory changes related to climate risks?

Diagnostic Controls

Do you use measures/tools to analyze climate-related risks? Which ones do you know are used? Do you feel that there are preferences for how a risk is expressed and presented to be considered and discussed?

Follow-up Questions:

- What are the three biggest challenges/strengths when it comes to measuring climate-related risks?
- How do you tackle risks that are difficult to measure?
- Have you used KRIs/KPIs that measure risk to determine if the risk is acceptable or not? How do you monitor and follow up on these?
- Do you see any clear opportunities for improvement in how the organization measures and evaluates climate risks?

Interactive Controls

Do you report climate risks internally, and if so, how? How do you discuss and exchange views on climate-related risks and their potential impact on IndustryCo's strategy internally? Who within and outside the company is involved in these discussions? How do the discussions affect how you assess and prioritize climate-related risks? How often do these (formal/informal) discussions take place?

Follow-up Questions:

- Do you think that unwritten rules about how risks are presented affect your willingness/ability to communicate climate-related risks to managers/colleagues?
- How do you perceive the collaboration between different departments in managing climate-related risks? Are there any strengths/opportunities for improvement? How do you think this would strengthen the work on climate-related risks?

- Do you think IndustryCo's handling of climate-related risks has helped the company find and seize opportunities? Can you give an example?
- How does the organization stay updated on emerging climate risks and opportunities?
- Do you feel there is an increased need for transparency and communication about climate-related risks to stakeholders? How has this affected your risk process and communication of risks?

Other:

- Reflecting on our conversation, what do you see as the strengths in the company's approach to climate risk management? And what can be improved in the current system for managing climate-related risks?
- In your opinion, how well are the company's climate risk management methods integrated into its overall business strategy?
- Could you mention a recently completed project or initiative that exemplifies effective climate risk management?
- What training or resources are available to employees to increase their understanding of climate risk management?
- Is the strategy clearly broken down into goals?

Appendix 2 – Comment on Artificial Intelligence

Throughout the composition of this thesis, we leveraged Artificial Intelligence (AI) tools to enhance the quality of the report. More specifically, the AI tools Paperpal, ChatGPT, and ChatPDF were used.

Firstly, these AI tools were used to improve the efficiency of our writing process. By handling repetitive tasks such as grammar and spell checks, we were able to focus on truly gaining a deep understanding of the subject and content of the report. This allowed us to save time and also ensure a high standard of language and consistency throughout the report.

Secondly, AI tools were used to ensure the content and meaning of our thesis were clear and easily readable. Paperpal's paraphrasing and contextual synonym features enabled us to find alternative and more suitable words. It also helped us structure sentences, which was especially

useful for refining complex sections of the study, ensuring preciseness and ease of understanding.

Thirdly, during the research period, all articles covered in the study were read manually. However, the tool ChatPDF was used to ensure that covered concepts were properly understood. This tool aided in both identifying areas we did not fully understand and enhancing our comprehension, thereby speeding up the research and knowledge gathering period.

Fourthly, ChatGPT was also used to compensate for our limited experience in conducting research. This helped us to gain a first draft of the roadmap for tasks we were encountering for the first time, such as creating an interview guide or structuring the thesis.

Lastly, an AI transcription service named Klang.ai was used to efficiently transcript the content from the interviews. However, all transcripts were read and corrected while simultaneously re-listening the interviews to remove any errors or mistakes.

To clarify how different AI tools were used during the completion of this study, a table is provided below:

AI Tool	Purpose	Application	Benefits
Paperpal	Enhancing Writing Quality	- Conducted grammar and spell checks - Provided paraphrasing and contextual synonyms - Assisted in structuring sentences, refining complex sections	- Maintained high standard of language and consistency - Ensured clarity and readability
ChatGPT	Generating Ideas and Structuring Content	- Drafted interview guides - Helped in structuring the thesis - Provided initial drafts for various sections	- Compensated for limited research experience - Streamlined initial content creation
ChatPDF	Deepening Understanding of Research	- Summarized articles - Clarified complex concepts - Identified areas needing further understanding	- Enhanced comprehension of covered concepts - Accelerated research and knowledge gathering
Klang.ai	Streamline transcription process	- Turn audio recordings into text format	- Less time spent on manually transcribing interviews - Allows the researchers to spend more time on the analytical part of the analysis