



CHALMERS
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Development of a Sustainability Maturity Framework for Industrial Operations

An empirical study of organizational challenges and enablers to operational sustainability integration

Master's thesis in Quality and Operations Management

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Division of Innovation and R&D Management

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Abstract

What does it take for sustainability to move beyond strategy and become part of day-to-day decisions in industrial operations? This thesis dives into the space between intent and execution, where companies set ambitious climate goals but struggle to embed them in their operations. To address this challenge, the study designs a sustainability maturity assessment framework tailored to the realities of industrial contexts. Through an in depth single-case study at a global manufacturing firm, the framework is informed by an investigation into the organizational enablers and challenges that influence sustainability integration in practice.

The study is structured around two research questions:

- (1) What organizational enablers and challenges influence the integration of sustainability into operational decision-making in a large industrial firm?
- (2) How can sustainability maturity assessment principles be leveraged to design a contextually tailored framework for assessing operational integration in industrial firms?

Empirical findings highlight several challenges such as data accessibility issues, misaligned KPIs, and limited decision authority at operational levels. At the same time, strategic leadership, employee engagement, local initiatives, and internal tools such as the R framework and Lean based systems provide leverage points for integration. Building on these insights, the study proposes a tailored maturity assessment framework that reflects operational conditions and offers a diagnostic tool for identifying integration gaps and guiding improvement efforts. By examining how sustainability can be embedded in real-world industrial operations, the study contributes both empirical understanding and a practical tool for bridging the gap between strategy and execution.

Keywords: Sustainability, Integration, Maturity framework, Organizational enablers and challenges, Industrial operations, Quality, Operations

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Terminology

Assessment Framework: A structured model used to evaluate how well sustainability is integrated into an organization's operations, often through defined dimensions and maturity levels.

Cross-Functional Collaboration: The cooperation between departments or roles with different expertise (e.g., logistics, engineering, sustainability) to achieve common sustainability goals.

Embedded Sustainability: A condition where sustainability is integrated into daily operations, decision-making, and systems, rather than treated as a separate initiative.

Green Lean: The combination of Lean principles with environmental goals, aiming to reduce waste, energy use, and emissions while improving operational efficiency.

House Model: An internal conceptual model used in the thesis to structure the maturity assessment framework. It visually represents foundational elements, pillars (focus areas), and an overarching goal in the form of a symbolic "house".

KPI (Key Performance Indicator): A measurable value that indicates progress toward specific objectives. In this study, this includes both traditional metrics (e.g., cost, quality) and sustainability metrics (e.g., CO2 emissions).

Lean Management: A systematic approach to improving processes by eliminating waste and increasing customer value, originally developed in the Toyota Production System.

Maturity Indicators: Observable or measurable signs used to assess an organization's position on a sustainability maturity scale within a given area.

Operational Decision-Making: Day-to-day decisions related to logistics, production, and supply chains that influence how sustainability goals are implemented.

R-Framework: A circular economy hierarchy (e.g., Refuse, Reduce, Reuse, Recycle) used to guide decision-making towards greater resource efficiency.

Sustainability Council: An internal cross-functional group at the company tasked with coordinating sustainability initiatives, knowledge sharing, and supporting integration across departments.

Sustainability Integration: The process of embedding environmental, social, and economic considerations into organizational processes, culture, and decision-making structures.

Sustainability Maturity: The degree to which sustainability is integrated into an organization's operations and culture, assessed along a defined scale from basic to advanced levels.

Staircase: A visual model used in the thesis to represent maturity progression across different levels. Each "step" corresponds to a higher level of sustainability integration.

Triple Bottom Line (TBL): A sustainability framework emphasizing a balance between economic (profit), social (people), and environmental (planet) goals.

XPS (Company-specific Production System): A company's internal adaptation of Lean, incorporating customized tools and cultural principles to guide production and continuous improvement.

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1

Introduction

This chapter introduces the context, purpose, and scope of the thesis. It outlines the background of the sustainability, operations interface, presents the research questions, and defines the boundaries of the study.

1.1 Background

As the world faces increasing climate challenges and resource scarcity, the importance of sustainable development has become central to both society and business. According to the UN Intergovernmental Panel on Climate Change (IPCC), the industrial sector is one of the largest contributors to global greenhouse gas emissions, accounting for approximately 21% of global carbon dioxide emissions (IPCC, 2021). At the same time, industry plays a pivotal role in driving the transition toward a more sustainable society by optimizing resource use, reducing waste, and developing innovative solutions. The UN's Sustainable Development Goals (SDGs), particularly Goal 12 (Responsible Consumption and Production) and Goal 13 (Climate Action), serve as critical guidelines for companies striving to align business benefits with sustainable solutions (United Nations, 2025).

In this evolving landscape, sustainability has increasingly become an important dimension of quality. As noted by Siva et al. (2016), quality is no longer restricted to only traditional metrics such as performance, reliability, and conformance to specifications. Instead, they argue that the definition of quality must also include sustainability aspects such as environmental impact, resource efficiency, and ethical production practices. Building on this, sustainability is not just an add-on to existing quality metrics, it is becoming a core criteria for defining what constitutes a "high-quality" product or service. As stakeholders, ranging from consumers and regulators to investors and employees, demand more responsible business practices, the integration of sustainability into quality management has become not just a strategic advantage, eventually becoming a necessity to remain competitive.

This shift is driven in part by a growing awareness that sustainable products and processes contribute directly to business resilience and competitiveness. Studies have shown that organizations adopting sustainable quality strategies enjoy enhanced brand reputation, increased customer loyalty, and reduced operational risks (Zimon et al., 2020). Incorporating sustainability into quality frameworks enables companies to use quality tools in innovative ways that support environmental goals and customer satisfaction. For example, adapting methods like Quality Function Deployment to address sustainability considerations allows firms to evaluate environmental impacts alongside traditional quality attributes, supporting product lifecycle value (Siva et al., 2016). In addition,

synergies between Lean and Green principles are also increasingly recognized as valuable approaches, where efforts to reduce waste and improve efficiency align naturally with environmental and sustainability goals (Piercy and Rich, 2015; Kurdve et al., 2014). The convergence of quality and sustainability is thus both a practical and moral imperative that can drive companies to reimagine their products and operations in more holistic and responsible ways, in accordance with the Triple Bottom Line described by John Elkington back in the '90s (Elkington, 1997).

Despite the strategic importance of sustainable quality, organizations face significant and multi-layered challenges in operationalizing this paradigm. While many companies have developed sustainability strategies and set ambitious goals, translating these commitments into tangible, day-to-day business practices often proves to be difficult. Key obstacles include the complexity of measuring sustainability impacts (Sroufe, 2017), balancing short-term financial goals with long-term sustainability objectives (Zimon et al., 2020), and overcoming organizational inertia (Sroufe, 2017).

Measuring sustainability performance is a particularly large challenge. Unlike financial or operational metrics, sustainability spans a wide array of qualitative and quantitative indicators across environmental, social, and governance domains. The absence of standardized assessment tools and the often context-specific nature of sustainability make it difficult to define success or compare performance across organizations and sectors (Marra, 2025). This ambiguity can hinder the integration of sustainability metrics into traditional quality management systems, leading to fragmented or even superficial implementation.

Another tension lies in balancing the economic pressures of the present with the investments required for sustainable transformation. While sustainability initiatives often yield long-term benefits, such as reduced resource use, enhanced stakeholder trust, and regulatory compliance, they frequently involve upfront costs, organizational restructuring, and process redesigns that may be difficult to justify under short-term financial frameworks (McKinsey & Company, 2021; KPMG International, 2024). Consequently, sustainability is at risk of being deprioritized in strategic decision-making, particularly in economically volatile periods.

Moreover, the integration of sustainability into quality is hindered by the need to coordinate across complex supply chains. Companies are increasingly expected to ensure that their suppliers also adhere to sustainable practices. However, limited visibility, inconsistent standards, and diverse regulatory environments make it difficult to monitor compliance and enforce sustainability across multiple tiers of suppliers (Grimm et al., 2014). This challenge is especially pronounced for multinational corporations operating in regions with varying levels of governance and sustainability awareness.

To navigate these challenges effectively, organizations require structured methods and tools that can assess their progress and maturity in sustainability. Implementing sustainability maturity models enables organizations to evaluate their current practices, identify areas for improvement, and systematically advance their sustainability performance. Such models provide a structured framework for benchmarking and continuous development, facilitating the integration of sustainable practices into core business opera-

tions (Meza-Ruiz et al., 2017). However, while these models offer valuable guidance, their effectiveness depends on how well they are interpreted and applied within the unique context of each organization. A standardized, one-size-fits-all application risks overlooking organizational structures, cultures, and market dynamics that critically influence sustainability outcomes. Therefore, there is a growing need for research that explores not only the general utility of sustainability maturity models, but also how they can be meaningfully applied and, where necessary, tailored to diverse industrial contexts.

In light of these challenges, there is a clear need to better understand how organizations can assess their sustainability maturity in a way that reflects their operational realities. Addressing this need requires investigating both the internal organizational factors that influence sustainability integration and the ways in which existing assessment frameworks can be meaningfully applied within these diverse contexts. This study is designed to contribute to that understanding.

1.2 Purpose

The purpose of this study is to develop a contextually tailored framework for assessing sustainability maturity within industrial operations. The framework is intended to support organizations in evaluating to what degree sustainability is integrated into operational decision-making and identifying paths for improvement.

1.3 Problem and research questions

Industrial firms face growing pressure to align operations with sustainability goals, yet translating strategic ambitions into operational practice remains a major challenge. One reason is the lack of context-specific assessment tools, that account for the specific organizational realities in which sustainability efforts take place. Maturity assessment frameworks have been proposed as a way to evaluate sustainability integration and guide improvement. However, most are designed for general use and may not reflect the specific conditions of industrial operations or organizational issues, limiting their practical relevance. For such a framework to be effective, it should be designed with a deep understanding of the conditions it is meant to assess.

To address this gap, the study is guided by two research questions. The first explores the underlying organizational conditions that affect sustainability integration:

RQ1:

What organizational enablers and challenges influence the integration of sustainability into operational decision-making in a large industrial firm?

Understanding these dynamics is essential as they provide the foundation for developing a relevant assessment framework. As such, insights from RQ1 directly inform the second research question which focuses on the construction of a tailored framework:

RQ2:

How can sustainability maturity assessment principles be leveraged to design a contextually tailored framework for assessing operational integration in industrial firms?

2

Theory

This chapter presents the theoretical foundation for analyzing the integration of sustainability into operational management. It introduces key concepts, frameworks and models that inform both the analytical lens of the study and the development of the proposed maturity assessment tool. Central themes include the relationship between sustainability and quality, the Triple Bottom Line (TBL), Lean management principles, sustainability maturity models and system integration. Together, these perspectives provide a conceptual base for interpreting the empirical findings.

2.1 Introduction to sustainability in operations management

As the role of operations expands from a focus on efficiency and cost-effectiveness to encompassing broader societal responsibilities, sustainability has become a critical concern within operations management. This section introduces how sustainability principles intersect with traditional operations and quality management frameworks. By exploring the conceptual relationship between sustainability and quality, and presenting foundational models such as the Triple Bottom Line, it lays the groundwork for understanding how operational decision-making can support long-term environmental, social, and economic goals.

2.1.1 Relationship between quality and sustainability

Quality management and sustainability are increasingly viewed as interdependent concepts in modern business practice. While quality management has traditionally focused on fulfilling customer expectations through efficiency, consistency, and defect prevention (Juran and Godfrey, 1999), developments in environmental and social responsibility have expanded the scope. The integration of sustainability into quality management systems reflects the growing recognition that long-term organizational success depends not only on product excellence, but also on minimizing environmental impact, promoting social equity, and addressing broader stakeholder concerns (Sroufe, 2017).

In this expanded view, companies are increasingly incorporating environmental stewardship, ethical labor practices, and social responsibility directly into their quality frameworks. This alignment is not only a response to stakeholder demands and regulatory pressures, but also a proactive strategy for risk reduction, innovation, and value creation (Bansal and Roth, 2000; Porter and Kramer, 2019). In manufacturing and heavy industry, where environmental impacts are significant, the integration of sustainability into quality

and operational systems is not only a strategic imperative but also a source of competitive advantage (Sroufe, 2017). By embedding sustainability within existing management systems, these sectors can drive innovation, reduce risk, and create long-term value. The evolution of this relationship can be understood through the lens of Total Quality Management (TQM), which emphasizes customer satisfaction, continuous improvement, and employee involvement - principles that Sroufe (2017) indirectly affirms as foundational to integrating sustainability. While Dean and Bowen (1994) position these as broad managerial philosophies, Sroufe (2017) illustrates their practical translation into sustainability strategies through systems thinking, cross-functional collaboration, and stakeholder engagement, aligning quality management with broader societal and environmental goals.

The perspective is also further developed by recent research in Martin et al. (2020), who argue that our traditional, customer-centric definitions of quality must now be wider to include multiple stakeholder perspectives and sustainability considerations. They propose a framework based on “quality-in-use”, which embraces both objective and subjective dimensions of quality, as well as individual and collective stakeholder views. According to their framework, there are four key conceptualizations of quality:

- Quality-as-customer-value: subjectively defined by the end user’s experience.
- Quality-as-agreed-delivery: rooted in compliance with predefined criteria and industry standards.
- Quality-as-ecosystem-integration: collectively constructed within stakeholder groups or communities.
- Quality-as-society-values: objectively grounded in sustainability science, public good, and long-term societal outcomes.

This framework challenges that quality is only about satisfying individual customer needs, instead highlighting the tensions and trade offs between competing perspectives. For example, a high performing industrial product may satisfy quality criteria from a technical standpoint, while contributing to environmental degradation - a contradiction when viewed through the lens of societal quality (Taguchi and Wu, 1979; Martin et al., 2020). Therefore, quality has to be reframed to capture the multidimensional and sometimes conflicting demands that are placed on organizations today. In practice, this shift would require organizations to include sustainability in their design systems. An example in research can be found in Gremyr et al. (2014), suggesting that tools like Robust Design Methodology should be adapted to embed sustainability criteria into early-stage product development. Sroufe (2017) also found that integrated management systems that align environmental and operational performance objectives are increasingly adopted by leading organizations to cohesively manage sustainability and drive strategic change, reflecting a combination of quality standards like ISO 9001 and 14001.

The integration of sustainability into quality management ultimately reflects a change in how organizations can define and pursue excellence. Quality is no longer simply about compliance and conformance, it is also about responsible value creation. As quality systems evolve to embrace sustainability, they hold the potential to guide organizations not only toward better products, but toward a more resilient and competitive future, essentially following the concept of the Triple Bottom Line.

2.1.2 Triple Bottom Line

The Triple Bottom Line (TBL) is a framework that broadened the traditional measures of corporate success by incorporating three key dimensions: social, environmental, and financial performance (Elkington, 1997). It provides businesses with a holistic approach to guide decision making and measure impact beyond profit maximization. The concept was first introduced in the 90s by John Elkington, who emphasized that companies should be accountable not only to shareholders, but also to a wider range of stakeholders such as employees, customers, and the environment (Elkington, 1997). This approach encourages companies to balance economic growth with social responsibility and environmental impact, which reflects the close relationship between these three elements in sustainable development.

The financial dimension focuses on the economic value that a company generates. This is the traditional bottom line of profit and loss, measured with financial statements like income statements, balance sheets, and cash flow analyses (Milne and Gray, 2013). Companies have used these metrics to assess performance and profitability for a long time, but there are limitations of focusing solely on financial outcomes as external costs of business operations may be neglected (e.g. environmental degradation or social inequality) (Taghian et al., 2015).

The social dimension addresses the impact of business activities on employees, customers, and relevant communities. The most important factors include safe working conditions, fair labor practices, and the promotion of diversity and equality within the workplace (Bansal, 2005). The social bottom line also highlights the corporate contributions to the broader community, even including philanthropic activities and support for social causes. By focusing on social sustainability, companies seek to create positive social outcomes by supporting human rights, ensuring fair wages, and fostering inclusive economic growth (Elkington, 1997). Over time, both consumers and investors have been holding companies more and more accountable for their social impact, recognizing that commitment to people can lead to improved brand loyalty and trust among stakeholders (Margolis and Walsh, 2003).

The environmental component of the TBL addresses the need for businesses to minimize their ecological footprint, and adopt sustainable practices such as reducing carbon emissions, conserving natural resources, and minimizing waste (Dyllick and Muff, 2015). Companies are encouraged to engage in practices such as using renewable energy, reducing waste through recycling programs, and adopting green technologies. Adopting these practices will not only reduce their environmental impact, but may also create long-term value by positioning themselves as responsible corporate citizens (Porter and Kramer, 2019). Environmental sustainability has become a critical driver of competitive advantage in industries where customers and investors are increasingly prioritizing eco-conscious practices (Hart and Milstein, 2003).

The framework represents a shift in how business can measure success, and today companies are increasingly expected to operate in a manner that is not only profitable, but also considers their social and environmental outcomes.

2.2 Lean principles and sustainability

This section explores the relationship between Lean Principles and sustainability. It begins by outlining the foundational concepts of Lean management, followed by an examination of how Lean can act as an enabler for sustainability. Finally, it discusses the challenges associated with integrating environmental considerations into Lean-based operational systems.

2.2.1 Introduction to lean management

Lean Management is a systematic approach to optimizing processes, eliminating waste, and maximizing customer value. Rooted in the Toyota Production System, Lean has evolved into a widely adopted philosophy that applies not only to manufacturing but also to service industries, healthcare, and administration (Womack and Jones, 1997). Toyota Production System (TPS), which introduced two foundational principles: Just-in-Time, aimed at producing only what is needed, when it is needed, and in the exact amount required, and Jidoka (Automation with a Human Touch), aimed at empowering workers to stop production if defects are detected, ensuring quality control at every step (Womack and Jones, 1997). By integrating these principles, Toyota was able to reduce inventory costs, improve quality, and enhance responsiveness to customer demand. The core objective of Lean Management is to create a culture of continuous improvement, where employees at all levels work towards increasing efficiency, reducing non-value-adding activities, and enhancing overall performance Liker (2004). Lean Management is based on five guiding principles (Womack and Jones, 1997). The principles provide a structured framework for organizations aiming to enhance productivity and operational effectiveness:

1. Value Definition - Understanding what the customer perceives as valuable and aligning processes accordingly.
2. Value Stream Mapping - Analyzing all steps in a process to identify inefficiencies.
3. Flow Optimization - Ensuring smooth and uninterrupted workflows.
4. Pull Systems - Producing only what is needed, reducing overproduction.
5. Continuous Improvement (Kaizen) - Constantly seeking ways to enhance efficiency and eliminate waste.

Beyond the five core Lean principles, Liker (2004) introduced 14 management principles in *The Toyota Way*, which provide a structured approach to implementing Lean at a strategic and operational level. These principles emphasize long-term system thinking, creating a value flow, developing employees and partners and create a continuous improvement mindset, forming the foundation of Toyota's success in continuous improvement.

Building on these principles, Toyota developed the Toyota Production System (TPS), which is often visualized as a house seen in figure 2.1, where the foundation consists of stability and standardization, the pillars represent Just-In-Time and Jidoka (built-in quality), and the roof symbolizes the overarching goals of quality, cost efficiency and customer satisfaction. This symbolic structure illustrates how lean values are supported by both technical systems and organizational culture Kurdve et al. (2014).

Inspired by TPS, many companies have created their own company-specific production systems (XPS) to adapt Lean principles to their own operational contexts (Kurdve et al.,

2014). These XPS models serve as structured, conceptual abstractions of the production environment, incorporating people, processes, technologies and information flows. While the tools and structures of TPS have been widely replicated, research highlights that success depends on aligning structural elements with cultural and contextual factors. Simply copying TPS tools without internalizing its values and adapting to local conditions often leads to limited results Kurdve et al. (2014).

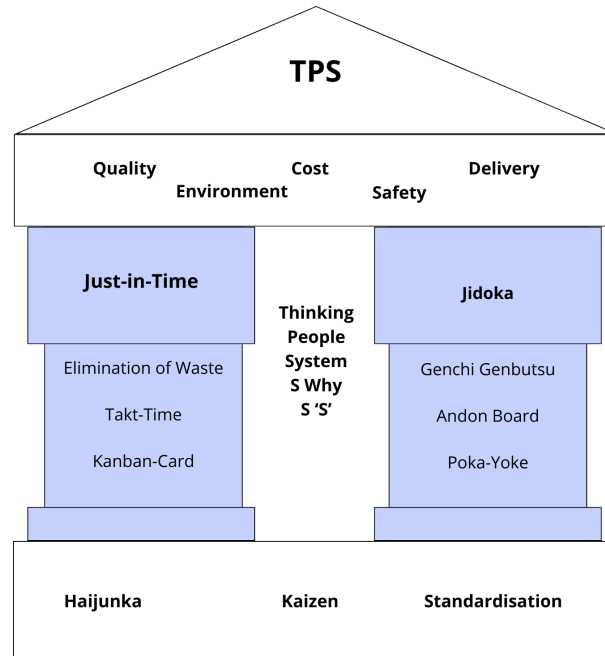


Figure 2.1: Toyota Production System (TPS) House (Kurdve et al., 2014).

Another fundamental aspect of Lean Management is eliminating waste (Muda), which is categorized into seven types (Shah and Ward, 2007). By targeting these inefficiencies, Lean Management ensures smooth, predictable, and efficient operations:

1. Overproduction - Producing more than required, leading to excess inventory.
2. Waiting - Delays in production or service delivery.
3. Unnecessary Transport – Moving materials or information inefficiently.
4. Overprocessing - Performing more work than necessary.
5. Excess Inventory - Storing too much material, leading to obsolescence.
6. Unnecessary Motion - Inefficient movements by workers.
7. Defects - Errors that require rework, causing delays and increased costs.

2.2.2 Green lean

As sustainability gains prominence in industrial operations, organizations increasingly explore how existing improvement systems such as Lean can be leveraged to meet environmental and social goals. This section delves into the evolving concepts of Green Lean and Sustainable Lean, which represent the intersection of Lean thinking and sustainability. It outlines how Lean principles can enable sustainable practices, while also highlighting the organizational challenges that may arise when attempting to integrate sustainability into Lean-based systems.

2.2.2.1 Lean as enabler for sustainability

Lean operations and sustainable practices are increasingly recognized as interconnected concepts in modern business management (Piercy and Rich, 2015; Kurdve et al., 2014). Lean, originally developed to eliminate waste and optimize production efficiency, is often linked to environmental benefits. By reducing overproduction, energy consumption, and material waste, lean practices contribute to lower environmental impacts while simultaneously achieving cost savings (Hajmohammad et al., 2013; Dües et al., 2013; Piercy and Rich, 2015). Dües et al. (2013) describes this in a summary visualization in Figure 2.2.

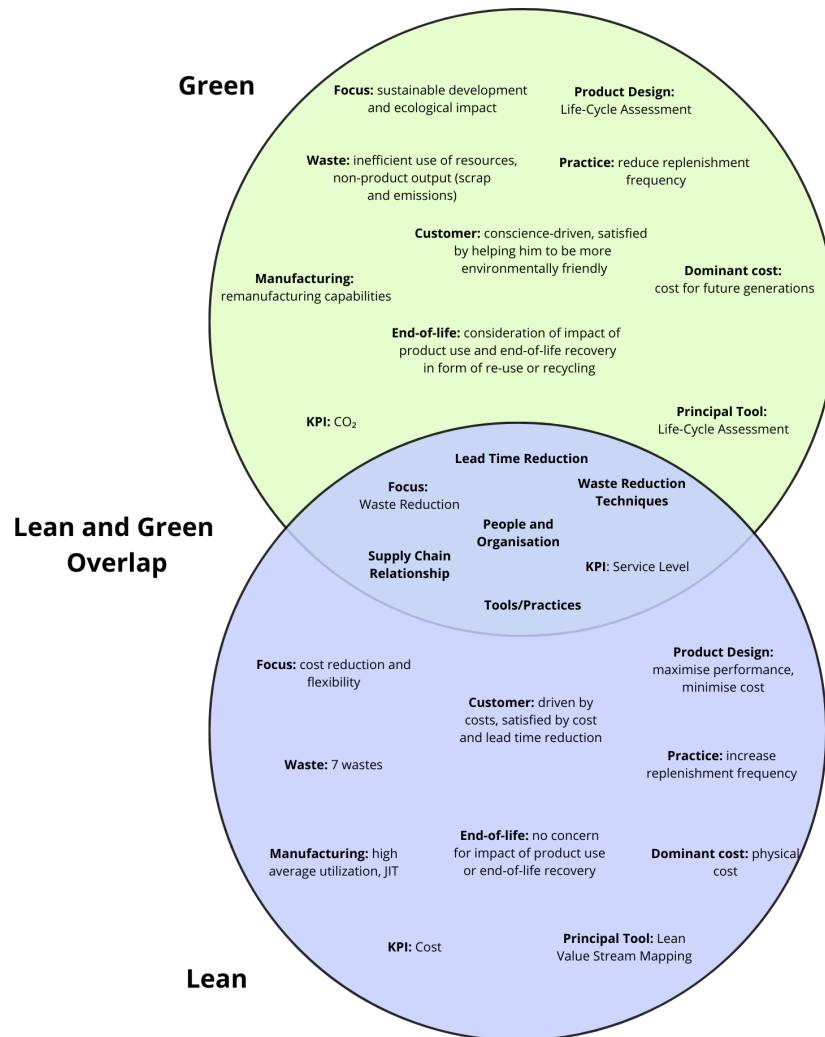


Figure 2.2: Overlap of Lean and Green Paradigms (Dües et al., 2013).

Moreover, lean production systems provide a structured foundation for sustainability integration. Kurdve et al. (2014) emphasize that company-specific lean-based improvement programs often referred to as XPS (company-specific production systems) offer infrastructure, principles, and tools that can be extended to include environmental and social sustainability. These systems typically include visual management, standardized work routines, KPIs, and auditing practices that make it possible to embed sustainability into both strategic planning and daily operations. The U.S. Environmental Protection Agency U.S. Environmental Protection Agency et al. (2007) similarly highlights that traditional lean tools, such as value stream mapping and 5S, can be adapted to target environmental waste, energy inefficiencies, and pollution sources.

In fact, in some organizations, environmental and safety concerns are incorporated as explicit pillars within their production system models. At Toyota Material Handling, for instance, sustainability is not only aligned with lean but described by an environmental manager as an integral part of the company's value system; "Lean thinking is environmental thinking" (Kurdve et al., 2014). Similarly, Rothenberg and Frits (2017) note that although lean and environmental objectives are often aligned in practice, the most significant sustainability benefits are realized when such goals are explicitly integrated into the lean strategy and management systems.

Piercy and Rich (2015) further state that the impact of lean goes beyond environmental sustainability. Research shows that lean operations also support broader sustainability goals, including improving workforce conditions, safety, and community engagement. Lean principles such as continuous improvement (kaizen), respect for people, and employee empowerment foster better working environments, leading to higher employee satisfaction and social benefits.

Companies that implement lean at a strategic level integrate sustainability into their long-term goals, ensuring that environmental and social considerations are embedded throughout the organization (Piercy and Rich, 2015; Kurdve et al., 2014; Dües et al., 2013). This also includes building transparent and resilient supplier relationships, prioritizing local sourcing, and using lean principles to reduce supply chain risk and environmental impact.

2.2.2.2 Integration challenges

While the synergy between lean and sustainability is evident, the practical integration of environmental management systems (EMS) into lean-based improvement systems presents several organizational challenges (Kurdve et al., 2014; Rothenberg and Frits, 2017).

Kurdve et al. (2014) mean that tools and methods used for environmental management are often isolated from those used in lean programs. Lean tools (e.g., value stream mapping, visual boards) are widely used by operational staff, whereas EMS tools (e.g., risk assessments, legal compliance audits) are often reserved for environmental experts. This disconnect hampers the operationalization of sustainability goals at the shop-floor level and reduces opportunities for cross-functional learning (?).

Furthermore, many companies lack a defined integration strategy, resulting in symbolic efforts rather than systemic change. Without strategic guidance, sustainability risks being treated as an add-on rather than an embedded dimension of operations (Dües et al., 2013; Kurdve et al., 2014).

A related challenge is the absence of clear roles and ownership. Sustainability is often perceived as the responsibility of specialists rather than operational managers, which limits cross-functional engagement. Kurdve et al. (2014) stress the importance of delegating sustainability responsibilities to operational teams to ensure long-term commitment and action.

Another significant challenge is the lack of integrated KPIs. Most performance management systems emphasize cost, delivery and quality, while sustainability metrics, such as energy use, CO₂ emissions or waste are often tracked separately or not at all (Kurdve et al., 2014; Rothenberg and Frits, 2017; Hajmohammad et al., 2013). As noted by Kurdve et al. (2014), “what is measured gets done” and the lack of environmental KPIs often leads to lower prioritization in practice.

Additionally, fragmented audit systems can further impede integration. Overlapping and disconnected audits, for example internal audits for lean systems and external audits for ISO 14001 consume resources and reinforce silos. This not only creates inefficiencies, but also disconnection between continuous improvement and sustainability goals. This has led several companies to express a desire for fully integrated audit frameworks that support continuous improvement across quality, environment, health, and safety (Kurdve et al., 2014).

Despite these challenges, Kurdve et al. (2014) argue that integration of XPS and EMS offers mutual benefits and is a necessary step toward establishing holistic, sustainable production systems. To achieve strategic integration, companies must align values, redesign tools for shared use, define joint KPIs, and integrate organizational structures and responsibilities (Hajmohammad et al., 2013; Dües et al., 2013; Kurdve et al., 2014).

2.3 Sustainability maturity

Sustainability maturity models (SMMs) provide a structured approach for organizations to assess and improve their sustainability performance. Typically structured around progressive levels of development, these models guide organizations from initial compliance-oriented approaches toward more transformative and innovative sustainability practices (Hynds et al., 2014). They assess not only performance outcomes but also organizational capabilities, stakeholder engagement, and integration into existing management systems. As sustainability becomes increasingly central to organizational success, maturity models offer structured pathways for assessment, benchmarking, and continuous improvement (Gunasekaran and Ngai, 2012; Srari et al., 2013).

2.3.1 Overview and general trends

A notable trend across recent models is the shift toward a stakeholder-centric perspective. Rather than viewing sustainability as an internal performance issue alone, maturity frameworks increasingly emphasize the importance of stakeholder engagement and transparent reporting. Cöster et al. (2020) illustrate this through a maturity grid focused on the quality and completeness of sustainability reporting. Their approach places emphasis on how organizations disclose performance along the entire value chain, how they respond to externally set targets, and how they present progress over time. This reflects a growing recognition that sustainability maturity is also about accountability: how organizations communicate with, and are perceived by their stakeholders.

Another defining characteristic of mature sustainability practice is its integration with existing management systems. Instead of treating sustainability assessment as a stand-alone

process, several frameworks promote embedding it within structures already familiar to the organization. Poltronieri et al. (2018), for instance, emphasize the integration of sustainability within ISO-aligned management systems, creating synergy between quality, environmental, and occupational safety standards. This approach not only reduces redundancy but also reinforces sustainability as a dimension of overall performance excellence. Integrated frameworks like this are particularly valuable in large or complex organizations where siloed initiatives may otherwise struggle to gain traction. Nawaz and Koç (2019), through a systematic review of organizational sustainability initiatives, identify nine recurring themes (such as resource optimization, corporate citizenship, and business excellence) that underpin mature sustainability strategies. These themes go across organizational silos and point to the broader cultural and strategic orientations that enable sustainability to take root and encourages organizations to cultivate sustainability as an embedded, organization-wide ethic.

There's a growing popularity of self-assessment mechanisms which speaks to a broader shift toward adaptive learning within organizations. Frameworks developed by Eisner et al. (2022) and Sari et al. (2020) both rely on structured self-assessment tools, using questionnaires or maturity grids to help organizations evaluate their readiness and performance. These tools allow for internal benchmarking and continuous improvement without the immediate need for external audit. While self-assessment may sacrifice some rigor compared to third-party evaluations, it empowers organizations to own their sustainability journeys and engage staff across departments in the process of reflection and improvement.

2.3.2 Maturity stages

Central to many sustainability maturity models is the concept of progressive stages. These stages typically reflect an organization's depth of sustainability integration, ranging from ad hoc or compliance-based actions to practices characterized by continuous learning, innovation, and systemic change. In the supply network maturity model developed by Srari et al. (2013) for instance, maturity unfolds across five levels, each associated with increasingly sophisticated capabilities, from basic process alignment to strategic network design. This staged approach allows organizations to reflect on their current practices and identify what operational or strategic shifts are necessary to move forward. Similarly, Gunasekaran and Ngai (2012) conceptualize sustainability as an evolutionary path, wherein maturity is marked by the degree to which sustainability is embedded into key business processes.

Another detailed example is outlined by Hynds et al. (2014), who defined four levels of sustainability maturity:

- **Beginning:** Organizations at this level focus primarily on regulatory compliance. Sustainability is treated as a legal obligation rather than a strategic priority, with minimal integration into core business processes.
- **Improving:** At this stage, sustainability considerations are incorporated into new product development (NPD), supplier engagement, and key performance metrics. Organizations begin to recognize the benefits of sustainability but do not yet fully integrate it into all operations.

- Succeeding: Companies at this level embed sustainability across their enterprise, including marketing, financial reporting, and competitive strategy. Sustainability is leveraged as a means of differentiation and brand positioning, rather than merely a compliance requirement.
- Leading: The highest maturity level is characterized by the full integration of sustainability into business strategy and operations. Organizations take a leadership role in setting sustainability standards, driving industry-wide change, and proactively addressing emerging sustainability trends.

In a similar vein, the R framework for circular economy developed by Potting et al. (2017) offers a lens through which to assess the evolution of sustainability practices, especially in relation to circularity. It emphasizes a shift from the traditional linear model (where raw materials are extracted, used to make products, and then discarded as waste) toward a more sustainable circular model. In a circular economy, the goal is to keep resources in use for as long as possible, extracting maximum value from them while in use, and recovering and regenerating materials at the end of their service life (Potting et al., 2017). Rather than focusing strictly on organizational maturity levels, the R framework introduces resource strategies in a hierarchical structure based on their potential to retain value and minimize environmental impact. At the top of the hierarchy are the circular strategies that aim to reduce resource use altogether, such as refusing unnecessary consumption or rethinking product design. Furthest down the hierarchy are strategies common in linear economies, such as recycling for materials for new production, or extracting energy from waste streams. Potting et al. (2017) highlight that the most effective sustainability strategies are those that preserve the function and integrity of products, rather than merely recovering raw materials or extracting energy from waste after use. The framework helps clarify that not all circular actions are equal, as some have a greater potential to reduce environmental impact than others. In the context of SMMs, the R framework also helps clarify the kinds of operational and strategic shifts that characterize organizations at more advanced stages.

3

Method

To explore the organizational enablers and challenges of sustainability integration, and to design a contextually tailored maturity assessment framework for industrial operations, this study adopts a qualitative research approach. Quantitative data methods are typically employed to test hypotheses or measure variables in a generalizable way, and are useful for identifying patterns in large populations or testing the strength of relationships between predefined variables (Bell et al., 2019). However, given the complexity of organizational systems and the need to capture perceptions, behaviors, and contextual nuances, a qualitative design is well-suited to exploring these dynamics in depth (Patton, 2015). This study is not concerned with testing predefined hypotheses or producing statistically generalizable results. Rather, the goal is to develop a rich and in-context understanding of how sustainability is interpreted and enacted in practice, and how theoretical models can be adapted to this reality. Thus the research focuses on the alignment (or misalignment) between theoretical frameworks and practical implementation. Such analysis requires access to the real experiences and knowledge of individuals within the organization, which are best understood through detailed and context-sensitive data. Additionally, the project seeks to generate insights that may inform both theory and practical application - a goal that is aligned with qualitative methodologies which are valuable when existing theory must be adapted or extended (Eisenhardt and Graebner, 2007).

3.1 Research design

To enable the depth of exploration that is required by the purpose and research questions, the study is designed as a case study conducted at a single organization. Case study research is a commonly used qualitative strategy that enables the in-depth exploration of complex phenomena within their real-life context (Bell et al., 2019; Yin, 2009). It is especially appropriate when the research aims to answer “how” and “why” questions, and when understanding of both the phenomenon and the contextual conditions in which it is embedded is of interest. Case studies are often employed in organizational research to explore processes, behaviors, and perceptions that are difficult to isolate or quantify. Eisenhardt and Graebner (2007) also emphasize that case studies, especially when rich in empirical detail, can be used to refine and build upon existing theory.

As this research seeks to understand what internal organizational factors that influence sustainability integration (RQ1), and how maturity assessment can be utilized accordingly (RQ2), a single-case design provides the opportunity to examine these dynamics in detail. While the study does not aim for statistical generalization, it seeks analytical generalization by generating insights that can be conceptually transferred to similar or-

ganizational settings (Yin, 2009). The empirical investigation of a real-world case allows for the identification of context-specific barriers and enabling factors, which can inform broader theoretical understanding.

According to Yin (2009), single-case studies are particularly well suited when the case is unique, revelatory, or representative of a broader phenomenon. In this research, the selected company offers an opportunity to to examine how existing sustainability maturity models interact with the conditions of real world organizations and how they may be adapted to the company’s specific context. As such, the single-case design is supportive of the explorative objectives of the study.

3.2 Company background and case sampling

In this study, a large Swedish manufacturing company has been selected as a single-case study. The rationale behind this choice is based on the case’s strategic relevance, contextual richness and practical alignment with the research purpose.

The company is a global industrial manufacturer headquartered in Northern Europe, employing approximately 1,500 people. Operating as a business unit within a larger corporate group, it provides components, systems and services for a range of industrial applications. The products and services are used by private customers, larger companies and organizations in various sectors (based on internal company documentation and public corporate material, anonymized for confidentiality).

This thesis focuses on the company’s logistics, operations engineering and production functions, which are part of the broader operations division. These functions are responsible for managing global supply chains and production logistics, ensuring the efficient delivery of complex technical products to customers worldwide.

The scope of the study is limited to the company’s internal efforts to integrate sustainability into operational decision-making within the operations department. Product development, sales and externally sourced sustainability data are outside the scope. Instead, the analysis centers on how strategic sustainability goals are understood and acted upon at the operational level and how this integration is shaped by organizational processes, structures and practices.

3.2.1 Case sampling

The company is part of a large multinational corporation with clearly stated sustainability ambitions, both at group and business unit levels. This makes it an ideal setting for exploring organizational enablers and challenges in an operational reality, which directly aligns with the first research question.

Furthermore, the case organization represents a complex industrial setting, including supply chain planning, production logistics and order fulfillment across global markets. These characteristics offer high relevance for theory building, especially in the adaptation of sustainability maturity principles, addressed in the second research question.

The company also operates as a semi-autonomous unit within a broader group-holding structure, which introduces additional layers of governance, shared responsibility and strategic alignment. This creates a relevant example for exploring how sustainability work can be driven in organizations that are not fully self-governing, but instead must navigate both local initiatives and overarching group-wide directives. Insights from this context may therefore be transferable to other companies within similar corporate structures, where decentralized business units operate under a common sustainability umbrella.

Lastly, the company's accessibility and willingness to collaborate has enabled rich, in-depth empirical data through interviews and internal documentation, which is a prerequisite for a qualitative case study with exploratory ambitions.

3.2.1.1 Company functions and locations

In addition, the company's operations department is currently undergoing a transformation journey to strengthen its sustainability work across their different operations. This includes initiatives such as internal sustainability councils, employee engagement efforts and updated performance indicators, providing a real-time and dynamic context where sustainability integration is actively evolving. This allows to observe not only the current state, but also the organizational tensions, challenges and enablers that influence change.

To capture a broad yet operationally grounded perspective, two sites within the operations department were selected for deeper investigation: one office-based environment and one production-oriented setting. These contexts represent distinct but complementary parts of the operational value chain, ranging from global supply chain planning and order coordination to physical manufacturing and logistics execution. Their selection was based on both strategic importance, diversity of operational roles and relevance to the research purpose.

The office environment serves as the company's main coordination hub for planning-related functions and decision-making processes that influence logistics, transport and supplier interaction. As such, it plays a critical role in connecting high-level sustainability targets with operational choices across departments. The production site, by contrast, is one of the company's key manufacturing facilities, responsible for a broad spectrum of products and serving both standard and specialized customer demands. This site has also been recognized internally for its engagement in sustainability initiatives, making it particularly relevant for studying how environmental considerations are integrated into daily shop-floor operations.

Within the company's operational structure, the two sites were considered especially suitable for the study due to their combination of strategic centrality, breadth of functions and documented sustainability ambitions. Together, they offer an information-rich setting to explore how sustainability is interpreted, prioritized and operationalized across structurally and functionally different environments operating under the same corporate strategy.

Based on these arguments, the operations department of the company therefore serves as a purposeful and information-rich case that provides valuable insights for investigating

how sustainability can be assessed and integrated in complex operational environments, both within and across organizational boundaries.

3.3 Data collection

To gain a comprehensive understanding of how the company engages with its strategy and goals, this study employed a qualitative data collection strategy using multiple sources. The primary method was semi-structured interviews, which were complemented by informal observations, and secondary data analysis. This multi-method approach enabled a richer, and more triangulated understanding of how sustainability is interpreted, practiced, and communicated within the organization. This also ensures that the study captures both the formal structures and documented strategies, as well as the informal routines and lived experiences of employees.

3.3.1 Interviews

Semi-structured interviews formed the core of the data collection process. This method was chosen because it offers a structured yet flexible approach that is well-suited to exploratory qualitative research (Kvale and Brinkmann, 2015). Semi-structured interviews allow for comparability across participants while also enabling the researcher to follow up on relevant insights and nuances that emerge during the conversation (Bryman, 2016; Patton, 2015). This flexibility is particularly important when studying complex and context-dependent phenomena (e.g. sustainability integration).

The purpose of conducting interviews was to gain a rich and qualitative understanding of how sustainability is interpreted, communicated, and implemented throughout the organization. Interviews provided insight into both the formal and informal dimensions of sustainability work, revealing how strategic ambitions are reflected (or not reflected) in daily operations, decision-making, and internal communication. These perspectives were essential for answering both research questions.

3.3.1.1 Selection of participants

Participants were selected through purposive sampling (Patton, 2015), aiming to capture a broad and relevant range of perspectives. Interviewees included senior management, mid-level leaders, and staff from departments such as logistics, sustainability, production, and business process development. This cross-sectional approach, illustrated in figure 3.1, was chosen to ensure variation in experience, responsibility, and organizational function, which is widely recommended in qualitative research to capture the complexity and contextual nuances of organizational phenomena (Bryman, 2016; Patton, 2015).

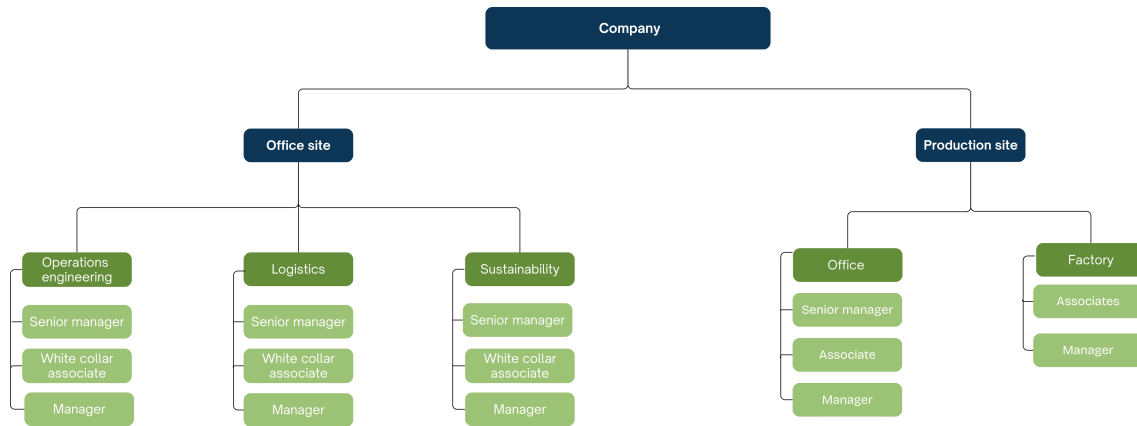


Figure 3.1: The study’s hierarchical structure of the company’s operations.

In total, 21 interviews were conducted. Some participants were identified through formal organizational roles, while others were recommended via snowball sampling, where existing contacts suggested other knowledgeable individuals (Kvale and Brinkmann, 2015). This combination helped ensure both relevance and breadth in the data.

3.3.1.2 Interview process

To ensure comprehensive insights, the interviews were designed to explore a range of themes. The interviews were focused on the following thematic areas:

- Awareness and understanding of the company’s sustainability goals and strategy.
- Communication and documentation of sustainability information (e.g., policies, reports, KPIs, dashboards).
- Daily work practices that reflect sustainability integration.
- Perceived gaps between strategic goals and actual practices.
- The influence of sustainability considerations on decision-making.
- Organizational challenges in implementing sustainability initiatives.
- Feedback mechanisms for evaluating sustainability performance.
- Cross-functional collaboration around sustainability.
- Alignment or disconnects between different organizational levels.

To guide the conversations while allowing flexibility, a semi-structured interview guide was developed based on the thematic areas outlined above. The questions were open-ended to encourage reflection and elaboration, and they were sometimes adapted slightly depending on the participant’s role and area of expertise. Follow-up questions were used to explore particularly relevant or unexpected topics that emerged during the interviews. The full interview guide is found in appendix A.1. Below is a selection of sample questions from the interview guide:

- What does sustainability mean to you in your work position?
- What established measurements / KPIs do you work towards and assess how well you and your department is doing?
- What strengthens the sustainability integration today?
- Can you describe any specific challenges you have encountered during the integration of the sustainability strategy, and how were these addressed (or not addressed)?

- How do you collaborate with other departments or teams when working on sustainability initiatives? What works well, and what could be improved?
- What is your perception of sustainable initiatives in terms of “top-down” communication?

The questions were designed not only to gather factual information but also to explore perceptions, experiences, and challenges related to the integration of sustainability into daily work. The open-ended nature of the questions allowed for rich, qualitative insights while ensuring a degree of consistency across interviews.

All interviews were conducted by two researchers. This collaborative approach helped improve the quality of the interviews by enabling active listening, complementary follow-up questions, and shared note-taking. However, having two interviewers can potentially influence the interview dynamic, possibly making some participants more cautious. To address this, efforts were made to create a relaxed and constructive atmosphere.

Interviews were audio-recorded with informed consent from participants. While recording can sometimes lead to self-censorship (Kvale and Brinkmann, 2015), it was deemed essential for ensuring accurate transcription and data integrity. Participants were informed of the purpose of the recordings, the confidentiality of the data, and their right to withdraw at any point.

Interviews ranged from 25-50 minutes, with most lasting approximately 30 minutes - a duration that allowed for discussions of depth while respecting the availability of the participants. Due to the exploratory nature of the study and the number of interviews, the interviews were not fully transcribed verbatim. Instead, detailed notes were taken during each session, and the recordings were used to fill in any gaps, clarify meanings, and extract accurate quotations for the results chapter. This approach ensured both efficiency and accuracy and is consistent with qualitative research practices where full transcription is not essential for thematic analysis (Miles et al., 2014; Patton, 2015).

3.3.1.3 Overview of participants

A total of 21 participants were interviewed across two sites and multiple functions within the operations division. To enable comparative analysis, participants were grouped into three role categories based on their formal responsibilities and position in the organizational hierarchy: Senior Management, Management and Associate-level employees.

- **Senior Managers** refer to individuals with overarching responsibility for a department or function. They typically sit in strategic leadership positions and are involved in cross-functional coordination and long-term planning.
- **Managers** are responsible for leading teams or sub-functions within a department. This group commonly holds personnel responsibility and oversees the day-to-day execution of operational plans.
- **Associates** represent white-collar employees without formal leadership responsibilities. They are often specialists or coordinators working with specific operational

tasks within planning, logistics, or engineering.

This classification enabled the study to capture variations in perspectives depending on organizational role and level of influence. A full overview of the participants is presented in table 3.1.

Table 3.1: List of respondents with roles, site and department affiliation

Respondent	Role	Site	Department
S1	Senior Manager	Office site	Logistics
M1	Manager	Office site	Logistics
A1	Associate	Office site	Logistics
M2	Manager	Office site	Logistics
A2	Associate	Office site	Logistics
A3	Associate	Office site	Logistics
M3	Manager	Office site	Logistics
M4	Manager	Office site	Logistics
S3	Senior Manager	Office site	Operations Engineering
A4	Associate	Office site	Operations Engineering
A5	Associate	Office site	Operations Engineering
A6	Associate	Office site	Operations Engineering
A8	Associate	Office site	Business Process Development
S2	Senior Manager	Office site	Sustainability
A7	Associate	Office site	Sustainability
S4	Senior Manager	Production site	
M5	Manager	Production site	
M6	Manager	Production site	
A11	Associate	Production site	
A12	Associate	Production site	
A13	Associate	Production site	

3.3.2 Informal observations

In addition to the primary data collected through semi-structured interviews, the study also drew information from informal observations and contextual insights gathered throughout the research process. These observations were not part of a structured protocol, but emerged naturally through the site visits, informal conversations, and general presence of the researchers in the organizational setting. This aligns with qualitative research practices that recognize the value of contextual understanding drawn from the researcher's presence in the field (Patton, 2015).

Such informal engagement provided valuable background for the company structure, interpreting interview data, and aiding in the understanding of how sustainability efforts were approached in daily practice. While no systematic field notes were maintained, reflections on the site level dynamics, organizational routines, and workplace culture were documented and used as supplementary input during analysis. According to Yin (2009), observational insights can play a critical role in enhancing the depth and validity of case study research, whether structured or incidental. These contextual observations strengthened the study by triangulating data sources and provided a richer interpretation of the organizational environment in which sustainability maturity was being assessed.

3.3.3 Literature review

The literature review was based on secondary data and was conducted continuously throughout the study to build a deeper understanding of the research area. According to Blomkvist and Hallin (2015), the purpose of a literature review is to identify, categorize, and critically analyze previously published research relevant to the topic. In this study, the literature review was used both to guide the development of the theoretical framework and to support the analysis and interpretation of empirical findings. The review focused on three main thematic areas:

- Sustainability in operations management
- Lean principles and sustainability
- Sustainability maturity assessment

The literature was primarily gathered through the academic databases Web of Science, Scopus, Google Scholar, and the Chalmers Library search engine. Complementary sources, such as industry white papers and reports, were also used when relevant to gain practical insights. Examples of search terms included: lean and sustainability, XPS environmental integration, sustainability maturity, operational decision-making and sustainability, green lean, and organizational change barriers.

The search strategy was iterative, and additional literature was added based on insights that emerged from the interviews and preliminary analysis. As noted by Blomkvist and Hallin (2015), the use of well-defined search terms and a structured review process is essential to ensure relevance and comprehensiveness. In addition, a snowballing approach was used to identify further relevant sources by reviewing the reference lists of key articles and following citation trails, in line with the approach described by Wohlin (2014). This method allowed the literature review to evolve dynamically and ensured that emerging theoretical perspectives could be incorporated as the study progressed. The collected

literature contributed to shaping the research questions, identifying knowledge gaps and building a foundation for the discussion of the empirical findings.

3.3.4 Documentation

To complement the primary interview data, a variety of internal documents were reviewed to deepen the understanding of the company's structure, strategic focus and operational context. The materials were accessed through the company's internal management system (SharePoint) and included sustainability strategies and reports, policy documents, procedural guidelines, internal presentations, organizational charts, KPI dashboards and communication materials.

The document selection was informed by early conversations with company representatives, who guided the researcher to relevant sources and provided background context. This collaborative approach ensured that the documentation aligned with the study's focus on sustainability integration within operations.

As Bell et al. (2019) note, organizational documents in case studies offer valuable insights into structural developments, strategic direction, and historical progression. In this case, the documents contributed to building a timeline of sustainability-related initiatives and clarified how sustainability is currently embedded or omitted in operational decision-making routines. Special attention was given to existing internal assessments, which primarily focus on quality, delivery and safety, but currently lack formal evaluation criteria for sustainability performance.

In addition to contextualizing interview findings, the reviewed documentation also helped inform the development of interview questions and served as a basis for understanding governance structures, performance management systems and role distribution related to sustainability in logistics and production.

3.3.5 Source triangulation and validity considerations

Interview data formed the empirical core of the study, while internal documentation provided additional structural and strategic context. Cross-checking interview findings with documentary evidence supported the identification of consistent patterns and helped reduce the risk of bias or misinterpretation. This triangulation allowed for the validation of themes across different data types, thereby improving the trustworthiness and dependability of the results. The approach aligns with recommendations in case study methodology, where combining empirical material from varied sources strengthens both the depth and credibility of qualitative insights (Yin, 2009).

3.4 Data analysis

This section outlines how the empirical material was analyzed to answer the study's research questions. The analysis was based primarily on semi-structured interviews, which were examined through a thematic coding process. To interpret the empirical data, link it with the theoretical basis and the study's questions, a tailored analytical framework

was used to explore how sustainability is understood, prioritized and integrated into operational decision-making.

3.4.1 Interviews

To analyze the qualitative data collected through semi-structured interviews, a thematic analysis approach was applied. Thematic analysis is a widely used method for identifying, analyzing, and interpreting patterns or themes within qualitative data (Clarke and Braun, 2017; Bell et al., 2019). According to Bell et al. (2019), recurring elements in the data often serve as a useful indicator for identifying patterns, though it is essential to critically assess whether these repetitions are truly relevant to the research question. This approach is particularly suitable for case studies with an explorative character, as it offers flexibility while providing a clear structure for organizing complex data.

To apply this method in a structured way, the interview material was first organized according to two dimensions: Organizational location and hierarchical role. This dual categorization was motivated by the aim to explore how sustainability is interpreted and acted upon across different operational contexts and levels of influence. Interviews were first divided between an office-based site, primarily concerned with planning and coordination, and a production site, focused on physical manufacturing and execution. Within each site, participants were further grouped into three categories based on their formal roles: Senior Management, Management and Associate-level employees. This structure enabled a comparative understanding of how sustainability-related perceptions, challenges and opportunities differ depending on role and responsibility. The thematic analysis was then conducted separately for each role category, allowing themes to emerge within and across hierarchical levels.

The process followed Clarke and Braun (2017) six-phase model for thematic analysis. In the first phase, all interview recordings were reviewed. Familiarization with the material was established by reading through interview notes and recordings multiple times, supported by reflections taken during and after each interview session. In the second phase, initial codes were generated by systematically highlighting interesting features of the data relevant to the research questions. Coding was carried out manually, where segments of the interview notes and recordings were marked and labeled. During the third phase, codes were grouped into potential themes based on conceptual similarity and relevance. All themes were sorted to reflect recurring patterns across interviews. The fourth phase involved reviewing and refining the themes to ensure internal consistency and clear distinction between themes. This was done iteratively, comparing themes back to the original data to ensure they accurately captured the participants' perspectives. In the fifth phase, the themes were defined and named, providing a coherent narrative of the findings. Examples of the resulting themes include current sustainability practices, challenges with integration, individual vs. structural enablers and perceived needs for improvement. Finally, in the sixth phase, the themes were compiled and presented in the results section of this thesis.

By structuring the analysis across organizational locations and hierarchical levels, the thematic approach enabled a nuanced understanding of how sustainability is interpreted and operationalized in different parts of the company. The method provided a systematic

yet interpretive framework for making sense of the empirical material, and supported the development of insights that are both grounded in participant experiences and aligned with the study's research purpose.

3.4.2 Analytical framework

To ensure a coherent and structured connection between the theoretical foundation, empirical data and the study's research questions, this thesis employs an analytical framework that integrates insights from sustainability and operations management literature with themes identified in interviews and internal documents at the company. The framework serves as a bridge between abstract theory and organizational practice and supports a systematic analysis of sustainability integration in operational decision-making. The framework consists of five analytical areas: (1) organizational enablers for sustainability, (2) challenges with integration, (3) maturity stages in sustainability, (4) assessment dimensions and tool adaptation, and (5) organizational learning and system integration. Each area reflects a cluster of concepts drawn from the theoretical review and is linked to empirical patterns emerging from the study.

Organizational enablers is based on sustainability as a value-driven ambition, connected to identity, reputation, and strategic positioning. These enablers are often supported by internal communication efforts and engagement tools that foster a sense of purpose among employees.

Challenges with integration reflect organizational tensions such as conflicting priorities, lack of mandate, and insufficient measurement. These challenges illustrate the complexity of embedding sustainability into day-to-day decisions and performance frameworks.

Sustainability maturity refers to the degree to which sustainability principles are embedded in organizational structures, routines, and roles. This area draws on staged models that help identify where different departments or functions currently stand on their integration journey.

Assessment dimensions and tool adaptation include the ways in which sustainability can be evaluated, tracked, and made actionable through appropriate tools and indicators. This involves the development or adjustment of decision-support systems, metrics, and routines that are context-specific and user-oriented.

System integration and organizational learning refer to how formal structures, such as management systems and improvement routines, can support coordinated and reflexive sustainability work across departments.

Figure 3.2 summarizes the framework and illustrates how each analytical area connects theory, empirical themes and the study's two research questions. This structure supports an interpretive yet systematic approach to understanding the dynamics of sustainability integration in operational contexts. The framework was used iteratively throughout the analysis process, allowing for flexibility as new patterns emerged in the empirical material. This adaptive approach ensured that the analytical categories remained responsive to

organizational realities, without compromising theoretical coherence.

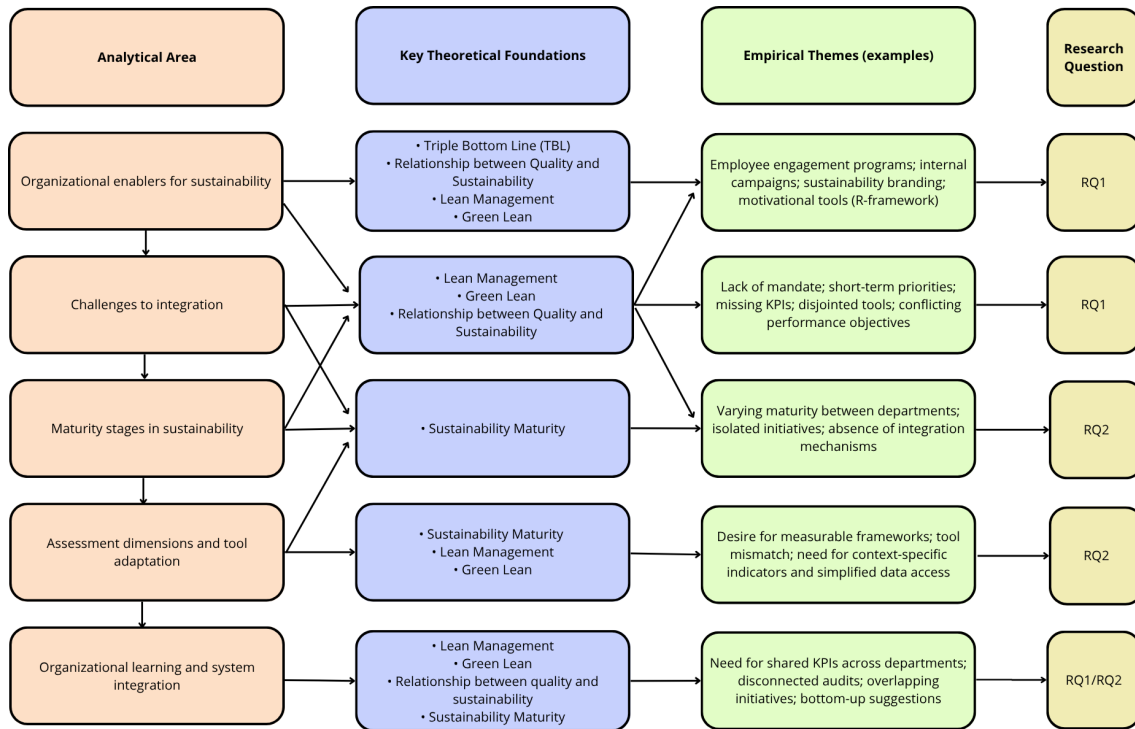


Figure 3.2: Overview of the analytical framework.

3.4.2.1 Designing the maturity assessment framework

To support a structured evaluation of sustainability maturity, a custom-built assessment framework was designed as part of this study. The rationale for creating a tailored model stemmed from limitations in existing frameworks, which were either too generic or not aligned with the operational and cultural context of the case company.

The framework was constructed through an abductive process, integrating both empirical insights and theoretical foundations. Empirical input included semi-structured interviews across departments and roles, field observations, and internal documents. These data sources were thematically analyzed (see Section 5.1), revealing key organizational enablers and challenges with sustainability integration. In parallel, academic literature on sustainability maturity models, Lean-based integration tools, and operational performance management informed the analytical dimensions and structural design of the framework. Notably, the work by Jefferson Hynds et al. (2014), Sroufe (2017), Poltronieri et al. (2018) provided reference points for the maturity scale and diagnostic approach.

The design process was iterative. Initial themes from the empirical analysis in section 5.1 were mapped to conceptual focus areas, which were then grouped into three thematic pillars aligned with the company's sustainability structure: People, Climate, and Resources. Each focus area was evaluated across three analytical dimensions, Strategy & Leadership, Processes & Tools and Culture & Engagement - selected based on recurring patterns in both theory and practice. A four-level maturity model was defined, with example of applicable indicators for each focus area and their analytical dimensions. The resulting framework is thus both context-sensitive and theory-informed, providing a structured

basis for diagnosis and improvement.

3.5 Data quality and ethical considerations

To ensure methodological rigor, the study was guided by the quality criteria for qualitative research proposed by (Lincoln and Guba, 1985): credibility, transferability, dependability and confirmability. Credibility was enhanced through source triangulation, combining interviews, internal documents, and informal site observations, as well as through sustained engagement with the case organization throughout the research period. Transferability was supported by providing rich descriptions of the organizational context, research design, and participant roles, allowing readers to assess the applicability of the findings to other industrial settings. Dependability was strengthened through systematic documentation of the research process, including coding structures, interview protocols and analytical procedures, ensuring that the study could be replicated under similar conditions. Confirmability was addressed through regular supervision with academic supervisors, peer debriefing and critical reflection on potential researcher bias, contributing to a transparent and trustworthy research process.

Ethical considerations were carefully observed throughout the study. All participants received clear information about the study's purpose, scope and voluntary nature. Informed consent was obtained prior to all interviews, and participants were reminded of their right to withdraw at any time without explanation. To ensure confidentiality, all data has been anonymized and presented in a way that prevents the identification of individual respondents, in accordance with established ethical research principles.

4

Results

This chapter presents the empirical findings from interviews, observations, and document analysis conducted at the case company. Section 4.1 outlines the company’s organizational structure and sustainability governance, drawing on information from interviews, internal documentation, and on-site observations. Section 4.2 and 4.3 presents thematically structured insights from the interviews, organized by site (office and production), then further divided by department and role.

4.1 Organizational structures and sustainability governance

Understanding how sustainability is integrated into operational practices at the company requires an examination of the company’s organizational structures and governance mechanisms. Organizational design plays a critical role in enabling, directing and embedding sustainability initiatives across functions and operational levels.

This section presents an overview of the structural framework within the scope of this study, including the hierarchical organization of sites, departments and roles, the functioning of the sustainability council, the use of the R-Framework to guide resource optimization and the company’s overarching sustainability focus areas.

4.1.1 Organizational hierarchy: The operation structure

The organizational structure at the company’s operations in this study plays a central role in shaping how sustainability initiatives are implemented across different levels of the company. The degree of empowerment, knowledge dissemination and cross-functional communication directly influence the integration of sustainability into operational decision-making. An overview of the main sites, departments and role hierarchy within the company’s operations is as presented earlier, in figure 3.1.

The company’s operations department is structured to support the efficient planning, production, and delivery of their products on a global scale. The operations department organization in this study is divided into two primary sites: production and office, both located in Sweden. The office site serves as the company’s global coordination hub for planning, logistics, and sustainability initiatives, whereas the production site focuses on manufacturing, assembly activities and local sustainability initiatives.

Within these sites, the organizational structure is further segmented into functional departments such as Logistics, Operations engineering and Sustainability. Each department

is composed of hierarchical layers that delineate responsibilities and decision-making authority. The role hierarchy in this study follows a progression from Senior Management, Middle Management and subsequently Associates.

At the senior management level, leaders are responsible for strategic oversight, long-term planning and alignment with group-wide objectives set by the group. Middle managers translate these strategies into operational plans and are accountable for department-level performance, resource allocation and continuous improvement initiatives. Associates execute daily operational tasks, contribute to local improvement activities and provide critical feedback from frontline operations.

The hierarchical structure supports both vertical accountability and cross-functional collaboration, particularly as sustainability objectives increasingly require integration across traditional departmental boundaries. Clear reporting lines, role definitions and escalation structures are designed to ensure operational efficiency. This structure enables strategic priorities, such as environmental performance and logistics resilience to be cascaded throughout the organization.

The information presented in this section is based on internal company documentation, organizational charts provided during the case study and clarifying questions discussed with contact persons within the logistics and production departments.

4.1.2 The company's sustainability focus: Climate, Resources and People

The company, as part of a larger group, aligns its sustainability efforts with the overarching strategy, which emphasizes three core areas: Climate, Resources and People. Figure 4.1 illustrates how the three focus areas. This triad forms the foundation for the company's commitment to responsible business practices and sustainable development. By integrating the three dimensions into its operations, the company aims to lead by example in the transition to sustainable transport and infrastructure solutions.

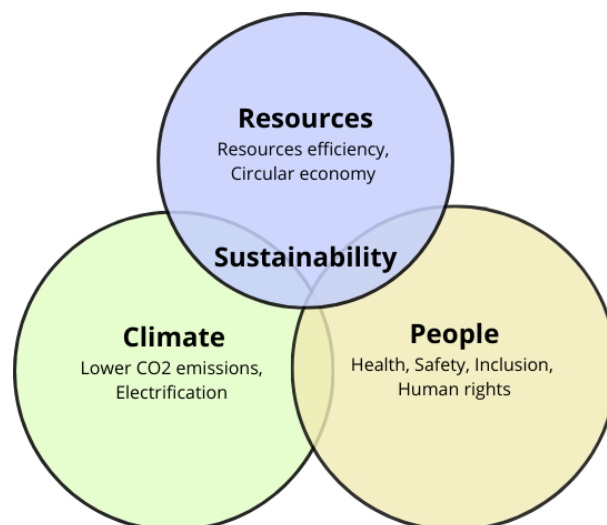


Figure 4.1: The company's sustainability focus areas.

Climate

The company is dedicated to reducing greenhouse gas emissions across its operations and product lifecycle. The company supports the ambitions of the Paris Agreement and has set science-based targets to achieve net-zero emissions by 2040. This includes developing products and solutions that lower CO2 footprints, such as electrification and alternative fuel technologies.

Resources

Recognizing the finite nature of planetary resources, the company strives to minimize environmental impacts through efficient resource utilization. Efforts include reducing lifecycle environmental impacts, minimizing waste and emissions and promoting circular economy principles by prolonging product lifecycles and enhancing recycling initiatives.

People

The company places a strong emphasis on social sustainability, focusing on health, empowerment, business ethics and respect for human rights. The company is committed to ensuring safe working conditions, fostering diversity and inclusion and upholding ethical standards throughout its operations and supply chain.

This description is based on internal company documentation, which is also publicly available material from the company's corporate sustainability strategy.

4.1.3 Sustainability council: Structure, function and role

At the company, the Sustainability Council functions as a central governance body designed to drive, coordinate and embed sustainability efforts across the organization. The council includes representatives from all major functions, ensuring that the three sustainability dimensions (Climate, Resources and People) are considered and operationalized throughout the company's activities. In addition to functional representatives, the council also includes sustainability experts who contribute with subject-specific knowledge and guidance.

The Sustainability Council was established approximately one and a half years ago and meets on a quarterly basis. Since its inception, it has evolved significantly, both in structure and influence. Initially, the council consisted primarily of sustainability specialists and a few engaged individuals from select departments, some at executive level who were highly committed but lacked direct operational responsibilities. As S2 explained, "They were positioned too high in the organization and didn't have the possibility to bring the work down into the functions". Over time, the council's composition was revised to ensure that each representative now carries responsibility within their specific function and is expected to prepare, present, and follow up on sustainability efforts relevant to their area.

The council reports directly to the company's executive group and serves as a formal channel for submitting proposals and feedback from operational levels to top management. Strategic sustainability priorities are discussed and defined in the council, based on inputs gathered from internal forums such as the Leadership Summit and then cascaded down through each representative. As S2 noted, "We have this year set five new company-wide priorities, built on feedback from across the organization". Representatives

are tasked with translating these priorities into actionable plans within their respective departments.

In preparation for each quarterly meeting, representatives are encouraged to gather improvement suggestions from their functions, such as ideas to improve communication or reduce material waste which are then brought to the council for discussion. This iterative process ensures follow-up, alignment, and continued progress, as the council evaluates what has been achieved and outlines the next steps for the upcoming quarter. This structured follow-up is critical for ensuring that the organization deploys “the right things”, as S2 put it.

The council’s scope has also expanded to promote cross-functional collaboration, especially between the company’s operations department and the central sustainability team. For example, the sustainability lead for the operations department is now responsible for coordinating cross-functional sustainability efforts across operational departments, and additionally the operations functions have been integrated into the council. Furthermore, there are also specific sustainability initiatives, such as a new process for reselling unused machinery in the factories or the development of sustainability-focused e-learning tools to support practical, hands-on improvements aligned with circular economy principles.

The communication flow and role structure of the Sustainability Council is illustrated in figure 4.2, showing how strategic discussions are connected to functional execution through clearly defined reporting lines and thematic areas.

The content of this section is based on interview and observation data, primarily drawn from a semi-structured interview with S2, sustainability representative and member of the council, complemented by internal company documentation.

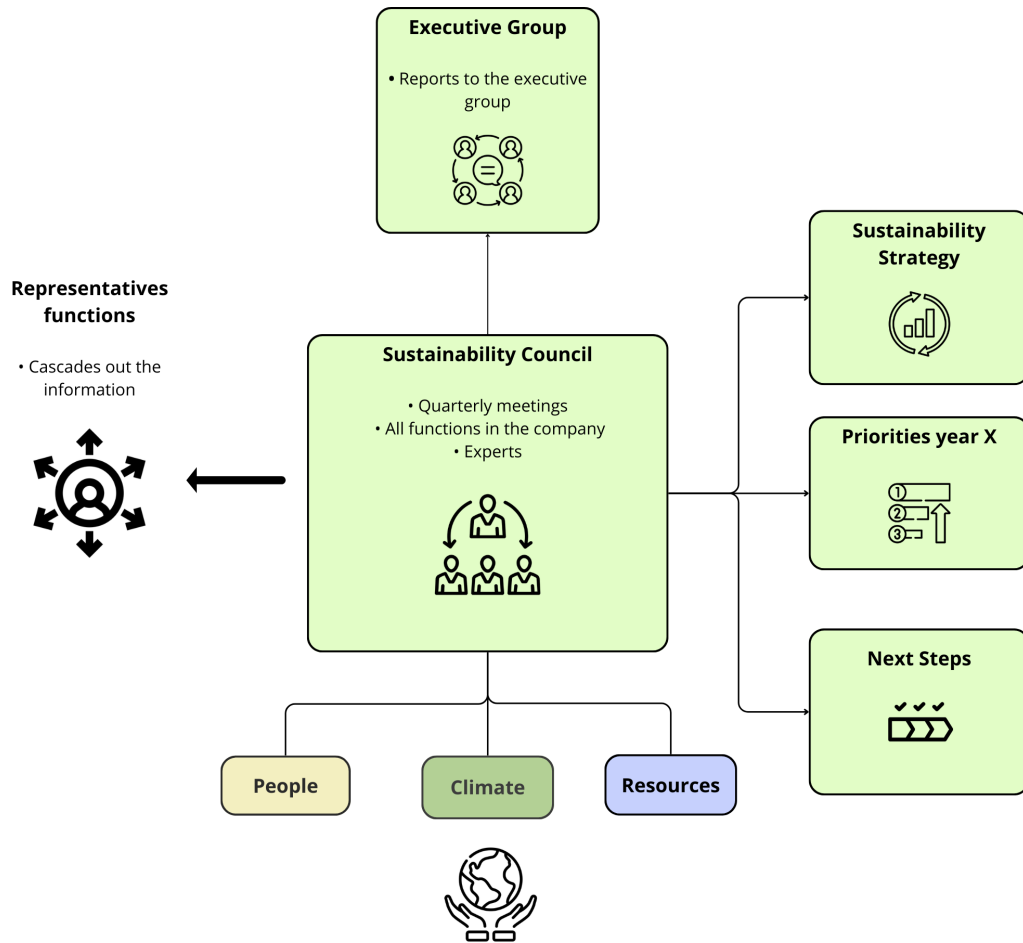


Figure 4.2: Structure and communication flow of the Sustainability Council at the company.

4.1.4 The R-framework: Guiding principles for sustainable optimization

At the company, sustainability integration into operational decision-making is guided by the application of the R-Framework, a strategic model for promoting resource efficiency and embedding circular economy principles. The framework is displayed in figure 4.3. Based on findings from internal interviews, the R-Framework is used to categorize sustainability actions into a hierarchical structure of strategies aimed at minimizing environmental impact, ranging from refusing unnecessary consumption to recycling and recovering materials. In practice, the framework serves as a guiding tool for evaluating decisions related to material selection, packaging design, logistics optimization, and product development. Employees are encouraged to log improvement suggestions and actions related to the 9 R-strategies through the company's internal SharePoint system, supporting the organizational goal that at least one improvement initiative per year should be linked to sustainability. By anchoring operational initiatives in the R-Framework, the company aims to move beyond traditional end-of-pipe solutions and toward more preventive, system-oriented approaches to sustainability. To further encourage the practical application of the R-Framework, the company has introduced a quarterly recognition program that awards the "Best Improvement Idea", highlighting initiatives that align with one or more of the nine R-strategies. This initiative promotes engagement and innova-

tion at the employee level, but also reinforces the company’s ambition to embed circular thinking into everyday operations (S2).

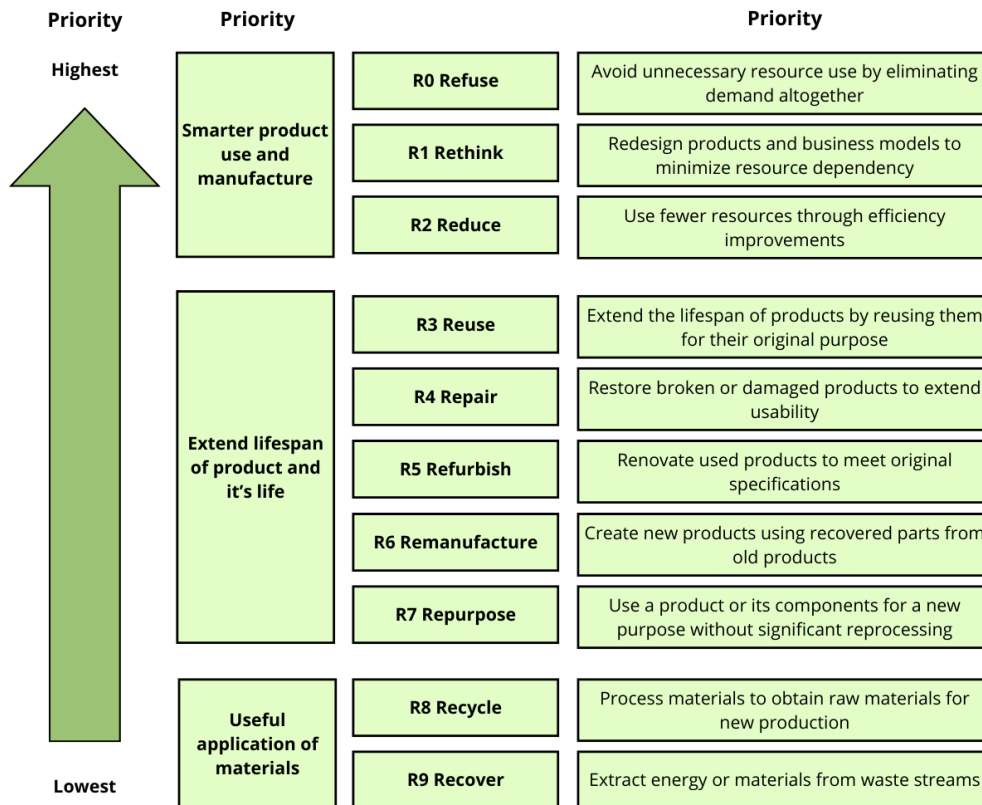


Figure 4.3: Hierarchical Structure of the R-Framework for Circular Economy Strategies (Company documentation)

4.2 Office site

This section presents empirical findings from the company’s office site, which serves as the central hub for planning, coordination and strategic decision-making within logistics and production. The analysis is based on interviews with employees across three hierarchical levels, senior management, managers and white-collar associates. By comparing these perspectives, the section explores how sustainability is interpreted, practiced and constrained in office-based roles. The findings are organized thematically to reflect recurring patterns, challenges, and opportunities in integrating sustainability into planning- and coordination-focused operations.

4.2.1 Senior management

This section is based on interviews with members of the senior management team at the office site. The respondents hold cross-functional leadership roles with influence over planning structures, performance targets and resource allocation. Their strategic positions provide insight into how sustainability is framed, prioritized and integrated into operational governance.

4.2.1.1 Broadening sustainability: From climate focus to a holistic approach

A recurring notion among senior managers at the department was the complexity and breadth of sustainability as a concept (S1, S2, S3). While climate-related issues dominated the discussions, there was a shared understanding that a comprehensive sustainability strategy must also encompass social and economic aspects.

S2 and S3 offered a clear framing of what sustainability means to them: “For me, sustainability is the UN’s 17 goals, wide and high-reaching. At the company, we have summarized it as Climate, Resources and People”. This triad captures not only carbon emissions and material usage but also the human dimension of organizational sustainability.

However, even with a shared conceptual understanding, the respondents highlighted that translating such a broad ambition into individual and operational behavior is not straightforward (S1, S2, S3). S2 reflected on the difficulty of personal accountability in large organizations:

“One of the biggest challenges is how I, as an individual can contribute, people tend to look at someone else. It’s not that they don’t want to, but it’s hard to break through on an individual level”

This lack of environmental awareness is, according to S3, a systemic issue. S3 believes that while sustainability is beginning to take root, it needs to reach the same level of internalized importance as quality once did. S3 means that the market is in transformation where sustainability will become a minimum standard rather than a competitive edge:

“Earlier, companies didn’t compete on quality, now it’s a hygiene factor. I believe it will be the same with CO2. Eventually, no one will buy products that aren’t sustainable. It won’t be about cost anymore - it’ll be a prerequisite”

S2 also highlighted the advantage of being part of a larger group, describing company group's structure as an important enabler for their sustainability ambitions. S2 underscores that organizational scale, can provide essential support and resources for transformation that might otherwise be out of reach:

“It’s a strength that we’re part of the larger group company. We can act from our platforms, but it’s a strength that the big group has set sustainability goals. We probably wouldn’t have had the muscles to handle it as a smaller company”

4.2.1.2 Bridging the gap: From strategic intentions to operational realities

Despite a strong strategic ambition and clear sustainability goals at the corporate level, a recurring concern among senior managers was the difficulty of translating these intentions into everyday practices (S1, S2, S3). The tension between high-level goals and practical execution was especially evident in how sustainability was perceived across functions and decision levels.

S2 highlighted this by explaining an example about the challenge of aligning long-term environmental goals with short-term market demands and business viability: “We have our goal for 2034, but we now see that it’s going to be really hard to reach it. We still want to, but we also have to be a profitable company that sells products customers want. So how do we become credible in this effort together?”

The contradiction between growth and CO2 reduction goals is widely acknowledged across the organization, including at the board level. S2 appreciated this transparency: “We’re open about this challenge from the boardroom down. We’re trying to balance it”. But S2 also pointed out that without broader societal shifts, in infrastructure, regulation and customer demand, it remains difficult to drive deep change from within.

S3 expressed a similar concern from an operations perspective, describing how environmental considerations still lack the systematic presence that financial metrics enjoy. The absence of robust environmental accounting undermines efforts to prioritize sustainability in investment decisions, supply chain planning, and product development: “We know exactly what things cost, how the company is doing financially, what productivity we have, but we don’t know how much CO2 we emit. The challenge is making it as natural a metric as cost”. S1 echoed this disconnect and raised the frustration that often emerges when strategic ambitions are not matched with adequate tools, data or actionable plans:

“Everyone knows there’s something to be done - but what the hell is it actually? The questions have been there for a long time, but are still hard to solve”

Moreover, S2 described how the sustainability work within operations lacks consistent anchoring at the leadership level. While commitment exists, the structural mechanisms needed to embed sustainability into core decision-making remain insufficiently developed: “Within operations, we still have work to do to raise sustainability topics to the leadership level, there’s still some way to go. But the will is there”.

4.2.1.3 Business realities vs. sustainability ambitions

A prominent theme across all three interviews was the presence of structural and systemic challenges that complicate the integration of sustainability into operational logistics (S1, S2, S3). These challenges were often embedded in the very logic of business performance. Customer demands, profitability requirements and infrastructure constraints create friction against the ambition to act more sustainably. S2 described how the company, despite its readiness to transform, is constrained by market realities:

“We as an organization are ready to move forward, but there’s no profitability in it. Then it becomes, should we sell products without profit? That doesn’t work for a profit-driven company, and if our customers don’t want those kinds of products”

S2 further explained that societal transformation is required to unlock sustainable customer choices. In certain markets, infrastructure simply is not available to support alternative fuels or electrified solutions: “There are customers who might be willing to pay a little more, but not double for something electrified. And in some cases, there simply isn’t infrastructure, like if you’re out in the forest”.

S1 pointed to the road to rail transport, but also emphasized why such shifts often fall short: “We’ve replaced road transports with rail for parts of southern Europe, but it’s really hard due to the underdeveloped rail network, inconsistent lead times, and lack of flexibility. Rail is just not viable for customer-specific orders”. In S1’s view, this type of friction is symbolic of the trade-offs logistics must routinely navigate between environmental goals and customer service.

S1 further illustrated how customer expectations force unsustainable decisions: “If a customer demands air freight, it’s hard to say no”. Same with sea freight, they sometimes send containers that aren’t full because the customer can’t wait. These repeated compromises result in fragmented improvements that fail to produce system-level gains:

“Everyone is doing the right things, but the total sum is suboptimal”

Yet, financial and environmental goals are not always in conflict (S2, S3). In many cases, the sustainability initiatives, such as reducing transport volumes, minimizing energy use or optimizing material waste also result in cost savings. As S3 noted: “If we stop air freighting, it becomes cheaper. If we transport less, it becomes cheaper”. However, this overlap has its limits (S2, S3). As sustainability efforts deepen, they increasingly require upfront investments or trade-offs that cannot always be justified within existing cost structures. S3 warned against commodifying sustainability too narrowly:

“Turning sustainability into just another monetary metric must not lead to choosing it away too easily on economic grounds”

One telling example involved the reworking of products: standard products sometimes require disassembly and modification for customer-specific needs, creating waste (S3). He explained: “We try to question: can we buy products without cables? Can we use test cables instead? It’s about optimizing to avoid scrap”. Here, sustainability efforts clash with the standardization needed to manage costs and inventory.

S3 also cautioned against reducing sustainability to just another financial calculation. S3 stressed that treating CO2 solely as a cost factor risks undermining the deeper cultural shift needed for true integration. S3 had the conviction that sustainability must become embedded in organizational values, not only optimized through spreadsheets or cost analyses:

“If we start pricing CO2 in every case, we might miss the point. It needs to be a hygiene factor, not a cost-benefit choice”

4.2.1.4 Data gaps undermining sustainability efforts

Although the presence of sustainability goals were acknowledged, the respondents described a significant gap when it comes to metrics, data and tools that could support day-to-day decision-making (S1, S2, S3).

S1 outlined the department’s ambition to improve sustainability performance through data-driven logistics measures such as reducing air freight and increasing container fill rates, but noted that key indicators remain underdeveloped: “We aim to maximize container fill and reduce air freight, but the relevant metrics are underdeveloped and hard to access”. S1 means that aligning performance tracking with sustainability priorities remains a challenge. S3 illustrated the problem with an anecdote from a previous training session to underscored how embedded financial metrics are in everyday thinking, while environmental metrics remain abstract:

“Someone held up a component and asked, ‘Can you calculate what this costs to make?’ And everyone could. Then they asked, ‘Do you know how much energy it takes?’ and no one had a clue”

The absence of clear, actionable CO2 data was also a recurring frustration (S3). Without this visibility, sustainability becomes difficult to prioritize or integrate into investment and sourcing decisions. S3 explained:

“We know what things cost, we know productivity, but we don’t know how much CO2 we emit. The challenge is making it as natural a part of the process as cost”

S2 also emphasized the difficulty of turning general goals into measurable impact, especially when efforts are connected to the higher corporate level: “We’ve had the conversation with the group: can we break out our emissions separately? But they replied: ‘If we spend all these resources to do that, what will you do with the information?’ And our answer was: ‘Well, we don’t know yet”.

S2 interpreted this response as a missed opportunity. Even if the company accounts for only a small share of company group’s total emissions, S2 argued that tracking local progress could send a strong signal and build internal engagement. Without accessible data, employees remain disconnected from the environmental impact of their decisions, limiting their ability and motivation to contribute (S2).

S1 echoed this concern saying, while sustainability-related performance measures (container fill rates and reducing air freight) exist, they are poorly integrated into standard dashboards and lack effective follow-up mechanisms: “We talk about the right things, but we don’t really measure them in a way that sticks”. S1 further stressed that the absence of visible and reliable metrics undermines efforts to drive continuous improvement: “If we can’t measure it, how do we improve it?”.

Despite these limitations, some progress was noted. S2 pointed out efforts to collaborate with strategy teams to better integrate and monitor operations-related KPIs: "I've started working more with the strategy functions to look at what KPIs exist in operations, how they can be broken down into individual teams, and how they are followed up".

4.2.1.5 Product and process optimization through the R-framework

Among the most tangible efforts to embed sustainability into operations, the use of the R-framework emerged as a central tool for driving resource efficiency, reducing waste, and sparking new ways of thinking across departments (S1, S2, S3). For S3 in particular, the framework represented a practical entry point into sustainability work:

"A lot of what we do starts with the R-framework: can we minimize scrap in the projects we're involved in?". Two examples illustrated this mindset. In one case, a product delivered required modifications, adding or removing parts to fit specific customer needs. S3 questioned the logic behind this: "We can't have 8000 different variants so each one is perfect, but we try to get the thinking going, what can we do to avoid scrapping, and how can we optimize instead".

Another related case described by S3 involved electric products with pre-attached cables that had to be replaced due to size mismatches with customer products. "It can also be about sub-assembly: You take a standard engine that hopefully covers 80-90% of the market. But then the customer might need something a little different, then you might change some smaller parts". These examples, says S3, reveal a shift in mindset toward questioning standard procedures and exploring alternatives that reduce material waste and unnecessary handling:

“It’s about seeing what we can do. Get your eyes open to start thinking about it. Because we haven’t thought about it the same way before. Then it’s been more if it’s expensive products and when we scrap things in a projects”

S2 reinforced this by noting that within operations alone, "We already have 64 R-framework suggestions this year, which is fantastic!" The number indicates both a growing level of engagement and a willingness to experiment (S2). The R-framework also served as a pedagogical tool to initiate broader cultural change (S3). S3 mentioned a Leadership Summit where the framework was used in a cross-functional workshop:

“We had a workshop on the R-framework. Groups from different departments and factories worked together, it sparked something. People began thinking more about what they could do, both small things and bigger ideas in product projects”

The R-framework was also used to manage the end-of-life phase of high-value products. S3 described a past project involving an American product with about 20 million SEK in value planned for phase-out. S3 highlighted how sustainability and cost-efficiency often align and sparked broader discussions around reusability and recovery:

“We asked, what can we do so as little as possible becomes scrap? In the end, we reused valuable components and materials with an after-treatment system in Sweden”

However, the project also revealed the complexity of sustainable decision-making. S3 described while reusing parts locally in Sweden was environmentally preferable in theory, the logistics of transporting heavy materials back across the Atlantic introduced new challenges: “We didn’t know if it was worth shipping the steel back to Sweden, it might be better to recycle it in the U.S”. This according to S3, captures the complex and context-dependent nature of sustainable choices, where theoretical best practices must often be weighed against practical realities like emissions from transport.

Furthermore, not all aspects of the R-framework translate easily across operational domains. S1 offered a perspective, highlighting that while the framework supports product and material-related improvements, its application in logistics is less straightforward: “It’s hard to adapt it to logistics - it’s product-centered”. S1 pointed out that in areas such as transport planning, packaging, and cross-border deliveries, environmental impacts are significant but not directly tied to product design, making the R-framework a less intuitive fit.

S1 offered packaging as another illustration: “Packaging is one of the few areas where we can really make a difference”, S1 explained, noting that regulatory pressures as well as internal ambitions had triggered a shift toward more sustainable materials. Concrete actions included reducing plastic use and exploring alternative packaging solutions. The move, however, has trade-offs:

“We want packaging that signals quality, like Apple”

S1 also reflected on the limits of full material substitution, particularly regarding plastics. Despite a strong desire to improve, he acknowledged: “Plastic will probably always be part of the equation”.

4.2.1.6 Collaboration and cross-functional efforts

Cross-functional collaboration was consistently described as both a key enabler and a persistent challenge in advancing sustainability within the logistics organization (S1, S2, S3). While there was a clear recognition of the value in breaking silos, actual collaboration was often described as limited, heavily dependent on individual initiative and constrained by unclear ownership structures (S1, S2, S3).

S1 highlighted the importance of the newly established Sustainability Council as a step toward more structured and coordinated work. This forum was seen as a necessary response to the fragmented nature of sustainability efforts across the organization, aiming to align departments around shared goals and define responsibilities:

“The Sustainability Council is an important platform for cross-functional collaboration”

S3 similarly acknowledged that collaboration around sustainability is still in its early stages: “We don’t have that many initiatives going in terms of sustainability, there’s still a lot we need to learn. It’s a journey until we get there”. S3 emphasized that while the R-framework had started to spread across departments, there was still a lack of deeper, project-integrated cooperation where sustainability is seen as everyone’s concern, not just the responsibility of certain roles or teams.

Nonetheless, moments of successful collaboration were mentioned, for example the Leadership Summit workshop fostered shared learning and momentum (S3): “Groups from different departments and the factories worked together, cross-functional collaboration between all departments. That made a difference”.

S2 reflected on how visibility and clarity of roles still hinder collaboration. S2 underscored the ambiguity that still surrounds sustainability ownership: “I’ve got more insight now and a bigger team, but people still don’t really know what I do or what they can do”. S2 emphasized the need for clearer communication and integration with strategic planning: “Now I’ve started working more with the strategy functions to see what KPIs exist in operations, and how they can be broken down into individual teams”.

Still, S2 noted that while people often show strong engagement during structured moments like workshops, this does not always translate into sustained collaboration in daily operations:

“Once a workshop is booked, everyone is active. But what happens after, I don’t really know”

4.2.1.7 Cultural shifts and organizational engagement

One powerful force shaping sustainability integration within the company was the emerging cultural shift marked by growing awareness, interest and informal engagement. All senior managers described signs of increased attention to sustainability, but also emphasized the fragility of this cultural momentum and the need for it to be nurtured structurally. S2 described the current state as one of readiness paired with ambiguity. While awareness exists, such as the establishment of a dedicated sustainability team and increased dialogue with group-level functions, it has not yet been institutionalized or consistently championed by leaders:

“Within operations, we still need to bring sustainability to the leadership level, it’s not yet part of the daily agenda”

S2 also reflected on individual engagement and tells how sustainability often remains a parallel activity rather than something woven into daily routines and responsibilities: “I think there’s great engagement, but people don’t have time in their daily work”.

S3 stressed the need for a proactive approach: “We shouldn’t wait for others to act, we

can contribute ourselves”. S3 argued that sustainability needs to be embedded from the outset of project work: "It has to be a clear goal from the start, not something we add later". S3 highlights the importance of integrating sustainability into the goals of operations and projects, rather than treating it as an afterthought.

S3 also emphasized that mindset is the foundation for long-term integration. While initiatives like the R-framework have begun to influence thought patterns, the real challenge lies in fully normalizing sustainability thinking in the operations objectives:

“We haven’t wanted to start with specific KPIs. If we set a goal, it easily becomes something like ‘use the back of the paper,’ which isn’t wrong, but we’d rather focus on getting the thinking in place first”

S2 notes that sustainability is now prioritized with more time, resources and an expanded team. "More people were needed in the team", S2 says. Although S2 has gained deeper insight, there is still uncertainty about her role and what others can do. Collaboration across functions works well, but there is still a need to clarify roles, expectations and ownership throughout the chain.

S1 describe how sustainability is embedded in the department’s mission: “Making sure that we deliver in a sustainable manner is of course included”. Yet S1 reflected on the the difficulty of maintaining alignment across teams when goals such as customer satisfaction, lead times and logistics constraints are in play.

4.2.2 Managers - Logistics

This section presents findings from interviews with logistics managers at the office site. Although they do not hold formal sustainability responsibilities, their roles place them at the intersection of planning and execution, making them key actors in translating strategic ambitions into operational practice. Together, these respondents offer a strategic and cross-functional perspective on how sustainability is understood, operationalized and challenged within logistics leadership roles.

4.2.2.1 Growing strategic awareness and cultural shift

Among the logistics managers, a clear shift toward increased awareness of sustainability was observed. All three respondents (M1, M2, M3, M4) emphasized that sustainability has become more visible in internal communication, leadership forums and cross-functional discussions. M2 described the topic as “Central to the company” and part of its brand identity. Daniel highlighted that “the whole organization is expected to engage”, particularly during quarterly meetings where sustainability is discussed by executive leadership. M4 described the link between logistics and sustainability as indirect but real, particularly through the role of planning. Similarly, M3 noted a broader shift both within the company and externally:

“Generally, there is a greater understanding within the company, society and globally”

To reinforce this cultural movement, a range of internal mechanisms have been introduced. These include app-based internal challenges, improvement idea programs and upcoming

team workshops (M1, M3). M2 emphasized her role in translating corporate strategy into team-level relevance: “As a manager, it’s my job to translate those high-level goals into something we can actually act on”. M1 further described how internal campaigns encouraged employees to reflect on their behavior, “Both privately and professionally”, contributing to a wider shift in mindset.

Recognition structures also play a role in fostering ownership. According to M3, praise is directed not only to teams but to individual employees who initiate change: “The person who has pushed it gets the feedback, not just the whole team”. This strengthens engagement and a sense of agency.

One particularly notable structure is the company-wide improvement initiative requiring each employee to submit seven improvement proposals annually, with at least one related to the R-framework (M1, M2, M3, M4). M1 noted: “We went through our improvement log and there was one proposal related to the R-framework connected to packaging and plastic use”. While this initiative was generally appreciated as a way to encourage engagement, M1 also pointed out the lack of further measurement structures: “No official sustainability measurements are made beyond this”.

M4 also expressed frustration with the limitations of the R-framework, which he described as difficult to apply in logistics, given its strong focus on physical materials and products. However, packaging was mentioned as a key topic. M4 described efforts to reduce plastic use and transition to more company-specific materials. However, the bulky nature of the products means that much of the packaging remains wooden and intended for one-time use. M4 raised questions about the feasibility and sustainability of reusing such materials, particularly when products are shipped to geographically distant regions.

Beyond serving as a reporting mechanism, the R-framework was seen by M2 as a conceptual tool that provides direction in translating sustainability into logistics operations. “The R-framework gives us something to hold onto and allows us to connect logistics to more circular concepts, like Re-fuse, not just for materials, but also flows”.

4.2.2.2 Activation through workshops and decision support

Workshops were described as a forthcoming top-down initiative aiming to activate the sustainability agenda at team level. M1 explained that logistics managers were instructed to arrange short workshops (about 20 minutes) where members of the sustainability team would also participate. While not yet implemented, these were viewed as opportunities to make sustainability more concrete and distribute responsibility:

“That’s what’s good about us doing this and having workshops in the future, that it’s not just up to me to come up with ideas, but the whole team can help out”

M3 emphasized that her team already has both knowledge and time to engage in sustainability, but requires better tools and options: “It would be easier with more different modes of transport to use”. M3 stressed the need for support mechanisms that help in customer dialogue and cross-functional decision-making:

“It’s primarily about having support for decisions and being able to fall back on it”

M3 mentioned that the company now has access to detailed CO2 emissions data on a weekly basis, which could open new possibilities for both internal assessments and customer engagement:

“Most likely, the companies booking the transports will say yes because there’s often not much of a price difference, it could be an idea moving forward”

4.2.2.3 Concrete transport improvements and procedural interventions

Transport logistics stood out as the area where sustainability could be most directly influenced (M1, M3, M4). M1 and M3 pointed to efforts to reduce air freight and increase container fill rates as key examples. “There’s a lot we can do with transportation, fill rates, transport choices, electric options, etc”, M3 explained.

One important procedural change involved the introduction of formal approval for air freight bookings. As M1 described it: “Nowadays, approval from the responsible person is required to book air transport, which makes it more difficult to make routine decisions”. This change was intended to avoid sales-driven or impulsive choices. “It adds a layer of friction that makes people think twice, which is exactly what we want”, M1 added. M1 also noted that rapid planning changes risk triggering sustainability setbacks, such as additional trucking or emergency air freight, though these effects are not visible in logistics KPIs:

“It doesn’t end up in our books but in the factory’s, because they procure the materials and may need to fly between suppliers. It would have been good to get a better connection, when we make major changes and plans, to link it to increased transportation costs”

M4 was on the same topic about planning as M1. Better planning leads to improvements in both classical KPIs and sustainability metrics. However, disruptions are frequent, making it difficult to maintain a high level of sustainability performance:

“You could increase capacity with a factor of three and it still wouldn’t be one hundred percent reinforced”

M4 further states that efforts are ongoing to address the demand side, for example by increasing stock levels in key warehouses, but this only partially addresses the structural issue of fragility in logistics chains.

M3 shared a similar experience: her team was once measured on air freight, but the KPI was removed since the department lacked sufficient influence over transport decisions. Customer demands and sales pressure often override sustainability preferences. “It didn’t feel fair to hold the team accountable for a key figure they couldn’t influence”. Still, M3 pointed to successful trials, like the train deliveries to Italy as promising, even if the rail infrastructure remains unreliable: “When the offer came, they knew it was necessary to investigate, you can’t keep driving trucks across all of Europe”.

4.2.2.4 Competing priorities and lack of mandate

Despite these signs of progress, numerous challenges still obstruct the integration of sustainability into logistics decision-making. A common concern across all interviews is that sustainability consistently ranks below other operational priorities such as inventory management, delivery accuracy and cost (M1, M2, M3). M1 captured the dilemma succinctly:

“Front office or production won’t accept that we don’t do our regular job. I can’t ignore the numbers this week just because I’m focusing on sustainability”

M3 added that daily pressures often force short-term decisions:

“There’s always something happening, like late production or pressure from the customer and the sales department”

M3 and M1 also emphasized a lack of formal sustainability metrics in their teams’ day-to-day responsibilities, making it difficult to monitor or reward progress (M1, M3, M4). Although their teams occupy central positions in the logistics flow, they lack both control over inputs and the mandate to reject unsustainable practices (M2, M3). M1 reinforced this perspective by describing how planning decisions that indirectly affect emissions fall outside the team’s scope of measurement, creating a disconnect between cause and consequence. M2 described the position in the chain as constrained:

“We’re in the middle between the customer and the delivery, influenced by those before and after us”

When asked whether they had the skills and resources needed to address sustainability challenges effectively, M4 responded with ambivalence. The real issue, M4 said lies in what the team is actually able to influence:

“In relation to our capabilities, the issue is discussed a lot. We’re struggling with how we can set relevant, achievable goals in sustainability. If we were in complete control ourselves, perhaps we could have had more influence”

This lack of metrics not only makes it hard to follow up but also contributes to a sense of detachment. M1 described how emissions-related impacts often fall outside their measurement scope:

“It doesn’t end up in our books but in the factory’s”

M2 and M3 both highlighted how their teams lack the mandate to reject unsustainable decisions. M3 gave examples of customers requesting inefficient deliveries, which logistics cannot always refuse:

“There’s not even a dialogue when the customer holds the power”

The absence of measurable KPIs is compounded by a lack of clarity about what actions are impactful. M2 described how M2’s team had tried to investigate their leverage but struggled to find meaningful entry points. They were left with smaller behavioral shifts

like reducing emails or turning off lights, efforts she deemed symbolic in nature. “It’s not enough”, M2 said. M2 further shared: “We want to do something for sustainability, but we have no way to do so in our daily work”.

The logistics managers also pointed to structural and procedural challenges (M1, M2, M3). M1 elaborated on how internal planning processes also act as constraints. M1 provided a detailed account of the Factory Response Lead Time (FRLT), a planning tool used to freeze production orders 15–17 days in advance. This stabilizes the order book and helps avoid waste such as overstaffing or overbooking. While FRLT reduces operational risk, it also limits agility and complicates last-minute sustainability-driven changes.

“The further in advance we freeze the plan, the harder it gets to change it, even if it’s for a good reason like sustainability”

The managers also mentioned that while improvement reviews are planned annually under the logistics senior management teams, there is currently no recurring self-assessment or feedback loop on sustainability performance (M1, M2, M3). Moreover, while logistics has representatives in the corporate Sustainability Council, the connection has weakened: “We haven’t heard from them in a while”.

4.2.2.5 Structural fragmentation and cross-functional gaps

Cross-functional misalignment was another theme across interviews. M1, M2 and M3 described how functional silos make it difficult to implement integrated solutions. For example, proposals to increase inventory levels in order to avoid air transport might be blocked by finance for budgetary reasons or by engineering due to part number changes. M1 concluded:

“These issues are usually cross-functional within the company; it’s hard to just work on it in logistics, you need to bring together something bigger”

M2 similarly emphasized that the organization needs a broader systems perspective:

“We need to elevate the flow thinking, a sustainability mindset across the entire chain”

A dominant theme across the interviews was the challenge of working across departmental boundaries. Even when logistics sees an opportunity for improvement, implementation is often hampered by cross-functional misalignment or decision-making silos (M1, M2, M3). M1 described the chain of actors involved in transport planning, from supply chain to procurement to company group logistics and how each handoff dilutes visibility. Planning changes can trigger unintended consequences, such as express deliveries or air freight, but these impacts often go unnoticed due to the system’s complexity:

“It is difficult to track the impact of a single transport since it is reported as a lump sum for all deliveries”

Cross-functional misalignment was another theme across interviews. M1 and M2 stressed how integrated sustainability improvements require alignment across logistics, procure-

ment, production, finance and engineering. For example, proposals to increase inventory levels in order to avoid air transport might be blocked by finance for budgetary reasons or by engineering due to part number changes. M1 reflected:

“These issues are usually cross-functional within the company; it’s hard to just work on it in logistics, you need to bring together something bigger”

M2 emphasized the need for systems thinking:

“We need to elevate the flow thinking, a sustainability mindset across the entire chain”

M3 gave a concrete example of when sustainability was deprioritized because other departments intervened:

“It itches in my fingers to, for example, want to fill a container, but other departments are also involved in the work, and it becomes a compromise”

These cross-functional challenges often lead to friction, delays or watered-down solutions. Even when a sustainable option is known, internal consensus is often too weak or slow to enable action.

4.2.2.6 Conceptual gaps and the need for credible tools

The final theme relates to how sustainability is conceptualized and communicated, both internally and externally. M2 expressed concern about the lack of clarity in what emissions figures actually mean:

“Is 6000 tons of CO₂ a lot or a little, or maybe nothing or a lot?”

M2 stressed that in order for sustainability to compete with established business metrics, it must be tied to something relatable and consequential:

“Cost is something you can relate to, but CO₂ is hard to form a relationship with”

M2 also pointed out that the company still lacks calculation tools that would allow teams to weigh sustainability alongside cost or delivery precision: “So we’re not where we should be”.

M3 noted that the emissions data they do have is not always trusted or actionable in practice: “It’s difficult to use in daily operational decisions and know if it’s true and accurate. The problem is that it can be questioned”.

Both M2 and M3 emphasized the importance of having tools that are not only technically correct, but also meaningful and embedded in existing routines. M2 concluded:

“The most important thing is that you can see ‘now we’ve done things,’ and that it shows in the results”

Without trustworthy, operationally relevant, and context-aware tools, even the best intentions are likely to remain unrealized. The managers agreed that future efforts must be built on credibility, usability, and integration, otherwise, sustainability will remain conceptually important but practically peripheral (M1, M2, M3).

4.2.3 White collar associates - Logistics

This section presents findings from interviews with white-collar professionals in the logistics department at the office site. The respondents, do not carry formal sustainability mandates but are closely involved in core logistical processes. The insights offers a nuanced picture of constraint and potential within operational roles.

4.2.3.1 Disconnection between strategic goals and operational reality

A central challenge in working with sustainability was the perceived disconnection between corporate goals and operational realities (A1, A2, A3). While the company's sustainability ambitions were recognized as important, they were also seen as abstract and difficult to translate into day-to-day responsibilities. A1 described how he is familiar with the three pillars of sustainability (people, climate and resources), but finds it difficult to relate them to his daily tasks. The connection is, in his view, mostly indirect and unclear, leading to a sense of disempowerment:

“You don't see your part in it - you feel a bit helpless and can't influence much”

This sentiment was mirrored by A2, who stated that sustainability is “always in mind” but “doesn't appear on our agenda”. While A2 is aware that sustainability goals exist at the corporate level, there is little or no guidance on how they should be integrated into her role. “You know it exists”, she said, “But it feels far away”. Similarly, A3 emphasized that although sustainability is occasionally addressed in meetings, it is not actively embedded in his day-to-day responsibilities. In A3's view, the clearest link to sustainability in his own role is load factor, which relates to transport efficiency, yet even this is often overshadowed by more immediate concerns like customer satisfaction and delivery timing. Like A2 and A1, A3 described a situation in which awareness of environmental impact exists, but rarely leads to concrete action due to lack of structure, time, or mandate.

The gap is further widened by the fact that consequences of operational decisions are rarely made visible to those who make them (A1, A2, A3). A1 gave the example of how late planning changes could result in emissions-intensive solutions, such as last-minute trucking or air freight, yet this impact is not captured in his performance metrics: “We don't see the consequences. It ends up on someone else's report”. A2 similarly reflected on how upstream instability in planning often results in unsustainable delivery choices, but that A2's team lacks both the mandate and the tools to influence what happens earlier in the chain: “We're not the ones booking it. We can only suggest”.

4.2.3.2 Lack of measurable tools and decision support

Another major theme described by the respondents was the lack of quantifiable tools and structured decision support for sustainability (A1, A2, A3). Without relevant metrics or

decision models that include environmental considerations, it becomes difficult to compare alternatives or justify sustainability-related choices. A1 emphasized the importance of linking sustainability to measurable data and decision-making logic: “If you put a value on sustainability, it would be easier”.

A1 explained that numerical representation makes it possible to integrate sustainability into planning processes and gain organizational buy-in. However, the current system primarily tracks cost and delivery performance, while sustainability remains largely invisible:

“It’s easier to compare numbers than apples and oranges. We’re supposed to be sustainable, but what you can compare to is just the price for the customer, it becomes skewed“

A3 also noted that one of the most prominent challenges is the lack of clear guidance or metrics. He means that while sustainability is occasionally discussed, it is not anchored in daily routines. A3 saw value in being more informed about his own impact and decision-making role. A3 explained that while logistics bookings display cost data, no real-time emissions information is available at the point of decision. A3 considered this a missed opportunity for awareness-building. In his words:

“You don’t see the emissions - you see the cost”

A3 also expressed a desire for clearer instructions and expectations. In A3’s view, part of the challenge is not just awareness or willingness, but structure. For sustainability efforts to be consistent, all departments need clarity on both intent and action:

“You can’t do it one day and then not the next. Everyone should know the purpose, the impact, and have time to act”

A2 added that emissions data is increasingly available, especially from freight providers who report CO2 values regularly. However, this information is not presented in a way that supports real-time decision-making or customer dialogue. A3 also mentioned the case of a large shipment to China where 55 square meters of material for which no emissions data was communicated to the customer, despite its potential usefulness. A3 saw this as a missed opportunity to promote learning and accountability. A3 argued that such data could be used more actively to drive change:

“You can inform the customer about the emissions, present it in context for better understanding“

A1 proposed several ways to strengthen decision support. One suggestion was to revise customer prioritization logic to incorporate environmental performance. A1 explained that today’s customer prioritization is largely based on economic factors, but that new sustainability-based criteria could be introduced. For example, customers who consolidate shipments, use low-emission transport modes or operate sustainably in their own production could be given preferential treatment. This would both reward sustainable practices and align external partnerships with the company’s internal goals:

“It would be interesting to introduce a new priority related to sustainability”

A1 further advocated for multidimensional metrics, not only focusing on direct CO2 emissions but also capturing broader environmental impacts: “Step 1 could be direct CO2 emissions, but perhaps also developing steps 2 and 3 to find metrics that highlight the parts that don’t have a direct impact”.

4.2.3.3 Unclear roles and limited decision-making authority

Even when sustainability opportunities were identified, both A1, A2 and A3 felt limited in their ability to act on them. The issue was not only lack of time or information, but more fundamentally a lack of mandate and ownership. A1 reflected on how planning decisions that may affect sustainability are often governed by parameters defined higher up in the hierarchy:

“Much of the decision-making is done higher up in the hierarchy, it’s not just our decision-making that drives the process”

This hierarchical distance weakens the sense of responsibility among employees and reinforces the view that sustainability lies outside their control. A2 experienced something similar. While A2 acknowledged that they might have more influence than A2 thinks, A2 often feels constrained by customer preferences, technical constraints and internal handovers: “We’re not the ones booking it. We can only suggest”.

A2 explained how customer behavior, such as fragmented ordering patterns leads to partial shipments and missed opportunities for container optimization, but A2’s team has limited influence over these dynamics.

A1 also pointed to the lack of structural feedback related to sustainability work, which further undermines motivation and initiative. Even when sustainability is discussed in theory, employees receive little practical guidance, making it harder to stay engaged in long-term goals. But A1 believes there are no conditions in the current measurements to provide feedback at this stage. This sense of powerlessness reinforces a reactive rather than proactive mindset, limiting the potential for bottom-up sustainability contributions:

“You don’t see your part in it, you feel a bit helpless”

A3 noted that sustainability often remains a side-topic, lacking strong follow-up or action plans. The risk, A3 implied, is that without clearer ownership, even promising ideas risk becoming passive information rather than shared responsibilities.

4.2.3.4 Dominance of economic drivers over sustainability considerations

Cost efficiency and customer satisfaction were consistently reported as the dominant drivers in operational decisions, often at the expense of sustainability (A1, A2, A3). Even when more sustainable alternatives were known or available, they were typically not prioritized if they conflicted with economic goals. A2 described the situation succinctly:

“Money rules everything and how quickly the products can be delivered to the customer”

A2 explained that customers often request faster transport and are willing to pay for it, which overrides sustainability preferences internally. This behavior leads to emissions-heavy solutions such as air freight or urgent trucking, especially when combined with late order changes or fragmented purchasing patterns:

“We can’t say no to faster transport if the customer is paying for it”

Time and competing priorities also emerged as recurring challenges. A3 described the work environment as hectic, often driven by urgent customer needs or technical issues, leaving little room for reflective or proactive sustainability efforts. Sustainability, A3 observed, tends to get pushed aside in the face of more pressing tasks:

“There are many other priorities. It’s easy for other things to take over”

Another issue A2 raised was the preference for dedicated transport, even when space is underutilized. For high-value products, customers often avoid shared shipments to minimize risk, resulting in low fill rates: “Customers prefer their own transport with 70% air instead of shared shipments”. A1 supported this view and added that internal decision logic is often shaped around what matters most to the customer:

“Ultimately, it’s the customer who benefits, and since their financial metrics are what matter most, these are the metrics that drive decisions”

4.2.3.5 Gaps in communication and cross-functional collaboration

In the interviews, limited communication emerged as a major constraint to sustainability engagement (A1, A2, A3). While corporate visions and goals were acknowledged, respondents felt that they were not followed by sufficient operational guidance. A2 remarked:

“There’s a lot of what should be done, but not so much how”

A2 expressed a desire for more targeted, practical communication about what is being done within the company and how different teams contribute. Without such visibility, sustainability efforts feel fragmented and disconnected: “There is not much communication about what is being done within the company regarding sustainability”.

Moreover, sustainability is rarely a topic in cross-functional collaboration (A1, A2, A3). Gustav argued that without cross-functional alignment, sustainability ends up being reactive rather than strategic. A2 mentioned some interactions with other functions to optimize shipments, but sustainability is typically not part of those conversations. A3 further touched on the fragmentation of communication. While there is frequent contact with front office, transport providers, customs and chambers of commerce, broader coordination with other functions only happens when problems arise. A3 noted that it would be beneficial to have more cross-functional collaboration on sustainability topics, not only during crises.

In A3's view, responsibility is often misplaced. While last-mile logistics is where environmental effects materialize, the real potential for sustainable impact lies earlier in the chain. A1 shared the impression that his function are seen as marginal in sustainability discussions, but simply because their contributions are harder to quantify.

4.2.3.6 Untapped potential for sustainability improvements

Despite the challenges described, the respondents expressed motivation and openness toward contributing to sustainability improvements (A1, A2, A3). Their interviews revealed a number of ideas, reflections, and real-world examples that point to untapped potential within their respective roles. A2 emphasized that many decisions with sustainability implications are made by habit, without reflection: "You don't think about it".

A2 argued that simply raising awareness and asking the right questions can lead to a change in perspective. A2 and A3 described several improvements already made in their area, such as eliminating unnecessary paper documentation and reducing air freight for heavier goods. A2 pointed out that such changes show what is possible when the right structures are in place.

A1 and A2 stressed the importance of embedding sustainability into existing systems rather than separating it as an isolated concern. They argued for sustainability metrics and logic to be fully integrated into prioritization models and decision frameworks, making environmental factors a routine part of operational choices. A1 expressed:

"If treated separately, some may view sustainability as less important. A separate focus might lead to reduced attention or lower prioritization"

A1 and A2 also pointed to the motivational power of feedback and visibility. A2 noted how even small "wins", such as sustainable transport choices or successfully implemented ideas - tend to spread within teams and inspire further action. She explained:

"Seeing what your actions result in in the end can help people engage more consistently"

Importantly, both A1 and A2 highlighted the role of the company's improvement idea program, which requires each employee to submit seven improvement suggestions per year, one of which must relate to the R-framework. They viewed this initiative as a meaningful way to encourage everyday engagement with sustainability and broaden perspectives across roles.

This structured encouragement, combined with the respondents' personal motivation and creativity, suggests that the organization already has latent capacity for sustainability-driven transformation, provided that the necessary support, mandate, and feedback loops are in place.

4.2.4 Associate - Operations engineering

This section is based on interviews with Associate within the Operations engineering function, as well as two cross-functional associates focusing on human rights and Business

development. The respondents coordinate and improve production flows and work cross-functionally across sites. Their roles offer insight into how sustainability is approached in the interface between planning, engineering and execution.

Business development

4.2.4.1 Cultural re-framing: From specialist function to shared responsibility

For the manufacturing engineering function, sustainability is increasingly viewed not as a discrete task for environmental specialists, but as a foundational principle that much like quality, must be embedded across all parts of the organization (A4). This was central in A4's reflection, who drew parallels between the way companies used to handle quality and the current state of sustainability. Quality, A4 noted, was once managed by a single department, often disconnected from operational decision-making, until it became clear that true quality must be built into every function and role. A4 argued that sustainability is now on a similar journey, that requires cultural transformation and not just technical compliance:

“Sustainability has become more like quality, it’s something everyone needs to be influenced by, all pulling in the right direction”

This cultural perspective positions sustainability as something that must be practiced in everyday decisions and project structures. As A8 expressed, it is about fostering a company culture that is motivated to move forward. A4 emphasized that isolated sustainability efforts will not scale unless the whole organization gets involved. It is not enough, A4 argued, true impact comes when everyone takes part, from design engineers to project leads to logistics managers:

“It’s not enough to have one or two people working on sustainability, that will never be enough. Everyone has to help out”

A4 also pointed out that sustainability is not easily codified into a single decision or specification, but rather emerges from countless everyday choices:

“Sustainability is hard to specify in a drawing, it’s about the small everyday decisions”

A5 echoed this line of thinking, although from a slightly different angle. In A5's current role, A5 has no formal sustainability mandate, nor are there any clear project KPIs that relate to environmental performance. Still, A5 sees an opportunity to act, particularly in the early phases of product introduction. For example, A5 described how the choice to reuse components or minimize scrapping can have a significant environmental effect, even if it is not captured by any formal metric.

“I try to reduce the negative impact when we introduce new products. That could mean not scrapping things unnecessarily and making use of existing resources”

A6 also shared this broader cultural view, describing how attitudes toward sustainability have evolved over the years. While A6 used to face resistance or indifference when raising environmental topics, he now finds that the issue is welcomed, if still somewhat under-

prioritized: “People are more willing to engage”, A6 said, but the conversation has not yet translated into widespread structural change.

4.2.4.2 Emerging engagement through dialogue and individual initiative

Even in the absence of formal mandates or established routines, sustainability considerations are beginning to surface in the daily practices of Manufacturing Engineering, often through local discussions, individual observations, and problem-solving during ongoing projects (A4, A5, A6). Rather than being externally enforced, these moments of engagement typically emerge from engineers’ and managers’ own reflections as they encounter inefficiencies, logistical contradictions or missed opportunities.

One example involved the logistics of sourcing components from distant locations such as Australia or India. In a project where a supplier in Australia had failed to deliver on time, the result was that the team had to fly in materials to avoid production delays. Reflecting on the situation, A4 realized that if the supplier had instead been located in Germany, they could have avoided the costly and emission-heavy air freight altogether. Situations like these, A4 explained, were not driven by environmental concern from the outset, but became entry points for sustainability thinking through lived experience:

“It’s not typical to start from sustainability, but when you work on a project and see something’s wrong, that’s when it comes naturally”

Another example came from internal discussions about relocating production between countries. A4 questioned whether simply shortening transport distances necessarily led to better sustainability outcomes, especially if material sourcing in the new location came from more carbon-intensive suppliers:

“When we start talking about moving production from Sweden to Brazil, I ask does, this actually improve CO2? Or are we just shifting the problem?”

This type of "bottom-up" sustainability logic was echoed by A5, who emphasized that change often starts with internal dialogue. In A5’s team, sustainability has no formal project role, but the conversations are there. A5 described how discussions about integrating environmental concerns into project deliverables are becoming more common, even if they have yet to result in new standards or metrics. According to him, the power of simply starting to talk about sustainability should not be underestimated:

“It’s good to start talking about it, because then it will begin to fall into place more naturally”

A5 added that the challenge is not having the conversation, but knowing how to translate it into concrete actions:

“We talk about it, sure, but what do we actually do with it?”

A example of this kind of engagement is the company’s continuous improvement program, employees are required to submit five suggestions per year, one of which must relate to

the R-framework. While none of the respondents saw this as a game-changer, they all pointed to it as an important enabler (A4, A5, A6). It serves both as a reminder to reflect and as a mechanism for surfacing sustainability opportunities in areas that might otherwise be overlooked.

A4 gave an example from a recent workshop where his team had attempted to assess how relocating production from Sweden to India or the U.S. might affect the CO₂ emissions. The idea did not come from corporate leadership, it originated in the team itself. A4 mean, while they lacked the data to draw any firm conclusions, the very act of raising the question reflected a shift in mindset: Sustainability is no longer seen as someone else's concern, but something worth investigating, even at a local level.

A6 emphasized that these small, informal moments, when people pause to think differently about an old routine are what sustainability needs more of. A6 spoke positively about the R-framework as a way of helping teams think more holistically about their impact and choices. Yet A6 also stressed that these reflections often remain under the radar unless management creates space to recognize and build upon them.

4.2.4.3 Trade-offs: sustainability fails to enter the business case

One of the most persistent tensions revealed in the interviews was how sustainability often fails to influence concrete decisions, especially when economic incentives or operational priorities are at stake (A4, A5, A6). All three respondents described situations where environmental concerns were acknowledged, but ultimately overshadowed by financial arguments.

A4 offered an example from a production relocation project. A decision had been made to move manufacturing to another continent based on cost savings and proximity to customers. On paper, the move made sense: it would reduce expenses and lead times. But the CO₂ implications of this shift were never fully explored. A4 questioned whether such decisions should be allowed to proceed without examining the environmental consequences:

“We’re moving production because it’s cheaper and closer to the customer. But then we should at least ask - how did it affect the CO₂?”

A4 noted that while sustainability and cost often align, there are also cases where the two come into conflict. In these situations, there is no systematic way to account for the environmental cost: “We save money, but if CO₂ emissions go up, shouldn’t that be part of the project evaluation?”. A4 further suggested that one way forward would be to assign a monetary value to CO₂ emissions, thereby giving sustainability a concrete weight in decision-making. Without this, A4 argued, CO₂ remains an invisible externality:

“We’ve talked about assigning a cost to CO₂ emissions. Like, if emissions go up by 1000 tons but we save a million kronor, what’s that worth?”

A5 encountered similar dilemmas. A5 described how product development often fails to include sustainability as a requirement. While quality, safety and cost are routinely

evaluated, environmental concerns are treated as optional rather than integral:

“In general, sustainability is not part of the business case. If the product is 30% more expensive with sustainability in mind, do we pass that on to the customer or absorb the cost?”

A5 also raised the issue of value perception, how difficult it is to weigh long-term environmental benefit against short-term financial metrics. For example, a supplier offering lower emissions may also charge more, but there’s no common model to compare that trade-off meaningfully. Without this comparability, sustainability is hard to defend in executive forums. A6 reinforced this picture, noting that although sustainability has become more accepted culturally, it still struggles to command attention at the decision-making table:

“It doesn’t get the space it deserves, financial goals and traditional KPIs still take precedence”

4.2.4.4 Data gaps and the struggle to quantify impact

The most consistently articulated challenges were the lack of robust, actionable data to quantify sustainability impacts in manufacturing (A4, A5, A6). Although there is general awareness of the importance of environmental performance, the ability to measure it is still limited.

A4 described how his team had attempted to compare CO₂ emissions for production in different countries. The idea was to understand the environmental implications of relocating manufacturing to a new region. However, their analysis stalled quickly due to a lack of available data. While they could calculate the financial savings of such a move, they had no information about the relative carbon intensity of the manufacturing processes involved:

“We don’t know what the emissions are for producing a product in different factories. We know the cost difference, but not the CO₂”

A4 emphasized that this lack of data limits the ability to make informed trade-offs. If a production site in Brazil offers cheaper output but emits substantially more carbon due to coal-based electricity, such insights remain hidden unless the company actively quantifies them. According to A4, generating this kind of insight should not be overly difficult. With access to the bill of materials and supplier data, a basic calculation model could be built:

“With a bill of materials, and information from suppliers, it shouldn’t be that hard to estimate the footprint”

This data gap also applies to material inputs. A4 gave the example of castings, noting that Sweden’s foundries that are powered largely by hydropower and other clean energy sources, among the lowest-emission producers in the world. In contrast, similar components sourced from coal-powered plants in Brazil could emit 20 to 30 times more CO₂. Yet these emissions are not systematically tracked or considered when making supplier

decisions. A4 reflected on how difficult it becomes to act responsibly when the data is missing:

“Sometimes it’s hard to know what’s good and what’s bad. And when you don’t know, it’s hard to factor that into the project”

A5 confirmed that this limitation is not just about emissions from suppliers or logistics, but also relates to internal operations. Even though sustainability is part of the larger company narrative, A5 noted that engineers and project managers often have no visibility into how their work impacts environmental outcomes, nor any tools to measure or benchmark progress. A5 described sustainability as something that is conceptually important, but not yet operationalized in ways that teams can act upon.

A6 added that although data is not outright blocked or hidden, it is fragmented and incomplete. There is little clarity around where data should come from, how it should be used, or what level of precision is acceptable. A6 also noted that even when teams want to work with CO2 metrics, there is no platform or process to support them.

4.2.4.5 Lack of anchoring in projects, metrics and organizational follow-up

All respondents described how sustainability is not yet anchored in the formal structures that govern projects, performance measurement or organizational follow-up (A4, A5, A6). As a result, environmental considerations often remain on the periphery of operational and technical decision-making.

A5 highlighted that while sustainability is widely discussed, it is rarely translated into concrete project deliverables. In the list of expected outcomes and success criteria, aspects like cost, delivery time and product quality dominate. Environmental performance, on the other hand, remains optional or undefined:

“We’ve discussed including sustainability in project deliverables, but it’s not there yet”

A5 described how this disconnect makes it difficult for teams to prioritize sustainability in practice. Without clearly defined goals, measurement tools or assigned responsibilities, environmental ambitions often fall through the cracks. This is further complicated by the lack of KPI ownership within individual departments. A5 pointed out that even when there are overarching sustainability goals at the company group level, they do not cascade down in a way that is actionable:

“The 2030 goals are clear, but we haven’t translated them into how our production should actually look to reach them”

A6 shared similar concerns. While A6 recognized the clarity of the top-level ambitions, such as the company’s goals for 2030 and 2050, A6 noted that these are not yet fully broken down into operational targets. This gap, he argued, weakens the connection between strategy and execution. There are no regular checks to ensure alignment, nor systematic follow-up on sustainability-related actions. A6 described this as a missed opportunity:

“It doesn’t get tracked the same way. You don’t see it followed up in projects like other goals”

A4 also reflected on the lack of structured feedback and follow-up. Although he and his team had discussed sustainability in workshops and occasionally raised questions about emissions in relation to production relocations, there was no formal process for capturing or acting on these discussions. A4 noted that sustainability is often treated as an external concern, rather than an integral part:

“We’ve looked into it, but there’s no system that tells us to include sustainability in the project calculations. It’s not part of the toolbox yet”

4.2.4.6 Potential for integration if structures support it

Although the interviews revealed structural and cultural limitations, they conveyed a shared sense of optimism: the foundation for effective sustainability integration is already partially in place. What is missing is alignment, direction and activation. All three respondents expressed a readiness to work more actively with environmental issues, provided that the organization supplies the right tools, follow-up and incentives (A4, A5, A6).

A5 emphasized that the core challenge was not lack of time or personnel, but the prioritization and structural support. In A5’s view, sustainability could be better integrated into daily operations without requiring massive resources, if it were only treated with the same weight as other performance areas: “It’s not that we need more people or time. It’s about priorities”. A5 and A8 also stressed the importance of visualizing environmental performance, pointing out that many teams lack a clear view of their baseline impact. Without such insights, improvement becomes difficult and engagement remains abstract:

“If we don’t know how we’re doing, it’s hard to know what to improve. Visualization is key”

A4 echoed this need for orientation and transparency. A4 suggested that the tools needed to calculate CO₂ emissions, such as a bill of materials or supplier-specific data already exist within the organization. What’s required is to connect the dots and make environmental metrics available at the point of decision. A4 speculated that future solutions, potentially powered by AI, could help automate the process of calculating environmental impact from existing product data. This would empower teams to make more informed decisions and to weigh sustainability alongside traditional business drivers.

A6 emphasized the role of organizational signals and follow-up routines. While A6 felt there was broad openness to sustainability efforts, he noted that there is little structural reinforcement to keep the momentum going. For sustainability initiatives to be implemented meaningfully, they need to be formalized, followed up at least “A couple of times per year” and tied to project evaluations (A6). A6 also noted that while no one actively blocks sustainability efforts, the absence of clear direction means that action often depends on personal initiative. This leads to inconsistency and slows organizational learning:

“It’s not blocked, but no one’s telling us exactly what to do either. There’s no freed-up resources or money to work on it”

4.2.4.7 Cross-functional view - (Human Rights)

In addition to the department-specific perspectives presented above, a complementary view was offered by a sustainability associate (A7) working cross-functionally with human rights. A7’s role centers on ensuring ethical and socially responsible practices throughout the company’s supplier and customer networks, with strong guidance and support from the group level.

A7 described how practices such as risk assessments, supplier audits, and corrective action plans are well established. Suppliers are required to sign a Code of Conduct covering key areas such as labor conditions, migrant worker protections, and ethical business practices. In addition, they must score above 60 in the company’s Supply Partner Assessment, which evaluates performance across all three sustainability pillars. A concrete example of this work is the Sustainable Minerals Program, which targets high-risk raw materials such as cobalt. The program addresses issues including child labor, military-linked supply chains, human trafficking, and forced labor, and includes sector-specific concerns, such as reputational risks in specific industries, where customers may have acquired wealth through illicit or unethical means. The associate also emphasized the scale-related trade-offs involved in working within a large corporate group: “We are so big as an organization it can be cumbersome to reach some results”. Despite this, A7 underscored that the group-level support enables robust and proactive sustainability work, especially when it comes to human rights and compliance efforts. A7 further presented the company’s internal sustainability dashboard, which includes ten key performance indicators (KPIs) used to track progress in priority areas.

4.3 Production site

This section presents findings from the production site, where sustainability is embedded in manufacturing and daily operations. The analysis is based on interviews with employees across two hierarchical levels, managers and associates. By comparing these perspectives, the section explores how sustainability is interpreted, practiced and constrained in production-based roles.

The analysis is organized thematically to reflect how sustainability is understood, practiced and constrained in production-focused roles, with attention to both challenges and operational opportunities.

4.3.1 Managers

This section is based on interviews with managers at the production site. The respondents reflect on how sustainability is incorporated into production planning, investment decisions and improvement work. The findings highlight both strategic developments and tensions between sustainability goals and economic constraints.

4.3.1.1 Local strategy alignment

One manager explained that at the factory, there is a strong sense of historical engagement with sustainability efforts (especially concerning reporting and EU taxonomy), even before the company-wide strategy was introduced (S4). This readiness has created a foundation for accepting and integrating broader sustainability goals. A local sustainability strategy created specifically for the factory has been developed, and is cross-checked with the central strategy to ensure alignment, which is seen as positive for maintaining consistency while retaining contextual relevance.

“We’ve been working for a long time with these types of questions, so we are used to it”

However, another manager highlighted that there could be drawbacks with having a local strategy, as they express a desire for more top-down governance to create standardized approaches across different factories to ensure alignment (M6). They argue this would enable better benchmarking and internal learning, and avoid reinventing the wheel at each factory. The same manager also noted that the organization itself is internally perceived as a development and sales company rather than heavy manufacturing, and thus the production process is overlooked sometimes in certain discussions.

“Production is easily overlooked - sometimes it doesn’t go all the way when you talk about problems”

All managers agree that environmental topics have increasingly become a part of daily conversations, which they see as a positive cultural shift (S4, M5, M6). From energy audits to material reuse assessments, sustainability is increasingly embedded in improvement projects. While this does not always translate into large-scale projects, it reflects a growing baseline awareness that supports incremental improvements. One manager also noted that the R-framework has been integrated into the standardized improvement

routine (M5). Another manager added that even though they are used to working with sustainability issues, the R-framework has helped foster a shared vocabulary and increase awareness around sustainable improvements (S4).

4.3.1.2 Data challenges and KPIs

As explained on all accounts, the KPIs at the factory mainly concerned yearly reductions in energy consumption, recycling and waste management. They were pleased with the progress made so far, but that challenges exist in improving performance towards the KPIs. A recurring theme across managers is the difficulty in obtaining detailed and actionable data, especially regarding energy consumption (M6, S4). Although the factory tracks energy use and recycling, lack of granular data has hindered deeper analysis. As one manager explained: *“Data day by day isn’t enough - patterns have to be identified across different products, machines and customers”* (M6). Improvements are underway though, including a focused improvement project to map energy distribution, which is expected to improve decision-making and target-setting (M6, S4).

4.3.1.3 Standardized routines and balancing trade-offs

Sustainability investments are acknowledged to come with financial trade-offs (S4, M5). One manager emphasized that transitions to greener energy and fuels are often more expensive than conventional options (S4). This has led to delays in implementation when the business case is unclear. A clear example was the denial from product development to increase testing and development of environmentally friendly fuels just a couple of years ago due to the associated costs and deemed infeasibility - a situation that has since changed and been implemented.

“After the adjustment, it was realized that it wasn’t as difficult and expensive as initially thought”

Another manager gave additional examples of trade-offs when investing in new projects, as there was a lack of clear processes in how to balance financial and environmental aspects - this usually leads to cheaper options being chosen: *“the sustainable thinking has to be woven into the standardized processes”*(M5). Despite these challenges, there is a growing recognition that sustainable operations will require up-front investments. As one manager noted, understanding that *“a transition to greener operations will cost money”* is crucial for progress (S4).

4.3.2 Associates

This section presents findings from interviews with employees at the production site. The respondents are closely involved in hands-on production coordination and improvement initiatives. Their perspectives reveal how sustainability is understood, practiced and constrained at the operational frontline.

4.3.2.1 Sustainability as part of the job

Across interviews, employees described sustainability not as a separate initiative but as something increasingly embedded in their day-to-day work. For example, one production

leader described how sustainability considerations, particularly energy consumption and material waste, are now part of equipment purchasing decisions (A12). Another employee described how preventative maintenance such as proper lubrication has the main driver of reducing stoppage time, although this naturally synergizes with sustainability objectives to reduce energy consumption and extend equipment lifespan. They explained: *"The durability and energy efficiency of the machines is key in maintenance for both economic and environmental reasons"*. They also add that the increased focus on sustainability doesn't affect maintenance very much due to this synergy, but that the awareness around it is generally increased.

While this integration was often informal, some respondents described growing efforts to formalize sustainability within existing routines. One example was the introduction of R-framework principles into maintenance work, which aligned naturally with the department's existing mindset (A11). A noteworthy example from an employee's experience was the resale of a large machine component. Previously, such items would be scrapped, but he initiated a new routine to assess whether older equipment could be reused or sold, aligning with the "reuse" and "repair" principles of the R-framework. This sparked internal conversations about developing broader resale procedures and demonstrated the untapped potential of individual-driven initiatives.

Still, the application of sustainability practices varies across departments. One production leader observed that some parts of the factory are less engaged due to a perception that their processes have limited environmental impact, leading to reduced motivation (A12). However, in areas such as EMOB (a testing department), sustainability challenges are more evident due to high energy demands, particularly when repeated testing is required because of early-stage product issues (A12).

4.3.2.2 Data access and KPIs

A major theme among all interviewees was the difficulty in accessing relevant and detailed sustainability data. Several noted that although energy usage is tracked at the site level, the lack of sub-metering on specific machines, unclear compressor efficiency, and insufficient insights into systems like ventilation made it hard to drive department-level improvements (A13). Even when site-wide KPIs existed, such as a target of 2% annual energy reduction and 99.9% recycling, they often did not filter down to all departments (A12). There were no formal sustainability related KPIs in place at the team levels even when the team role clearly influenced the site-wide KPIs, although one employee expressed an ongoing work to develop such indicators. Employees described a desire for more structured metrics that are tailored to their areas of responsibility and operational conditions, to allow for more proactive work and targeted improvements rather than waiting for top-down initiatives or sporadic feedback.

4.3.2.3 Organizational support and cultural momentum

All interviewees agreed that organizational leadership supported sustainability and related initiatives, but they pointed to gaps between strategic intent and operational execution. One person described leadership support as well-intentioned but occasionally slow, with an example of annual goals arriving late which delays follow-up (A12). Another pointed to strong symbolic leadership, such as participation in summits and strategy

days, but emphasized that the practical "how" of implementing sustainability often remains unclear (A11).

Despite these gaps, employees appreciated the visible and inclusive communication efforts. Recognition programs like "Month's Improvement" and internal transformation awards were highlighted as motivating, helping to build credibility and momentum (A11, A12, A13). Company-wide activities such as strategy days and leadership summits were positively perceived, offering space to align goals and celebrate progress.

A recurring challenge was the tension between long term sustainability work and short term production pressures. Employees described time constraints as a big challenge to engaging more deeply in sustainability initiatives. As one respondent put it: *"The hard thing about sustainability is that it's not in the here and now - what stings now is what we manage first. It struggles to compete with the day-to-day issues"* (A11). Similar reflections came from another employee who noted that although many ideas are generated, they often cannot be pursued due to time limitations and delivery priorities (A13).

"There's not always enough time for all the sustainability initiatives. Sometimes you come up with things that could be done, but there just isn't time to follow through"

4.3.2.4 Conditions for enabling progress

Interviewees emphasized that while sustainability is increasingly embedded in everyday tasks, more could be done to support its consistent implementation in operational routines. A recurring point was the need for clearer priorities and processes that allow sustainability to be treated as part of regular work, not as an "extra task" to be addressed only when time allows. As one respondent noted, technical competence is not the issue - the challenge lies in the lack of time and momentum to drive initiatives forward amidst other pressing demands (A11).

Another interviewee explained that while teams are generally open to sustainability work and willing to act on well-motivated ideas, progress often depends on individual initiative rather than structured support. The absence of dedicated time or resources makes it difficult to maintain long-term focus, especially when other performance indicators like delivery and productivity dominate the agenda (A13). There was also concern that sustainability efforts rely too heavily on informal engagement and voluntary interest, which risks creating inconsistencies between departments.

Finally, one employee suggested that sustainability efforts could extend beyond the production floor and into the surrounding environment, such as by utilizing underused factory grounds for ecological initiatives like beekeeping or biodiversity zones (A13). While not central to manufacturing operations, such projects were seen as meaningful ways to build employee engagement and signal the company's broader commitment to sustainability.

5

Analysis & Discussion

5.1 Organizational enablers and challenges

This section addresses RQ1 by analyzing organizational enablers and challenges to sustainability integration, using the theoretical concepts introduced in Chapter 2. The themes highlight how structural, procedural, and cultural factors enable or constrain implementation across functions and levels. The analysis forms a foundation for the assessment framework presented in Section 5.2.

5.1.1 Enablers

This section presents the key organizational enablers that support sustainability integration in the case company. Based on the thematic analysis, the enablers reflect enabling factors such as strategic alignment, cultural synergies, and existing structures that facilitate sustainability-related action across functions and levels.

5.1.1.1 Strategic framing and leadership commitment

A key enabler of sustainability integration at the company is the clear strategic framing provided by its sustainability vision, and the internal adoption of a definition of sustainability. As described in the result, the framing at the company is encompassed by the environmental, resource, and people dimensions. This framing aligns neatly with the TBL philosophy described by Elkington (1997), and helps create a shared language for sustainability across the organization while providing a conceptual foundation for aligning initiatives with strategic priorities. Notably, human rights and social responsibility are explicitly included within the people dimension, indicating that the company views respect for human rights not only as a compliance obligation, but as a core part of its long-term sustainability strategy. This contributes to a coherent and credible social sustainability agenda, and reinforces the the company's overall TBL alignment.

Leadership commitment is another critical enabler at the company, with several respondents emphasizing that sustainability enjoys visible support at the senior management level and is increasingly treated as a long-term strategic imperative. S3 articulated this shift in expectations: "Earlier, companies didn't compete on quality, now it's a hygiene factor. I believe it will be the same with sustainability. Eventually, no one will buy products that aren't sustainable". This statement introduces an important concept relevant to maturity assessment: the evolving role of sustainability as both a competitive differentiator and a future baseline. In maturity assessments such as described by Hynds et al. (2014), companies are assessed more favorably when they go beyond compliance and use sustainability strategically to create value and gain a competitive advantage. However,

if sustainability expectations continue to rise and become embedded in regulations, customer demands, and industry standards, the line between strategic leadership and mere compliance may shift. This implies that what is currently considered leading may over time become the minimum standard. For maturity assessment, this highlights the need to recognize that the frontier of sustainability is not fixed, but moves as expectations evolve. Thus, the ability to anticipate and respond to this shift may itself become a market of maturity.

Together, the presence of a clear vision, senior leadership support, and an internally accepted TBL approach constitutes a solid strategic platform for sustainability. However, the perceived strength and clarity of this platform vary across the organization. While some respondents, particularly at more senior levels, expressed confidence in the sustainability direction, others especially in operational roles were less certain about how the vision connects to their work. A3, a junior level employee, explained: “you know it exists, but it feels far away”, suggesting that the framing may feel abstract or disconnected from daily tasks, potentially amplified by a lesser level of experience at the company. In contrast, other associates with longer tenure or who have participated in improvement initiatives describe sustainability as more tangible and tied to their work routines. This variation indicates that familiarity with the company’s internal structures and history may influence how easily employees can relate strategic goals to their own roles. It also points to a need for the sustainability strategy to better be translated into clear mandates, operational and communication routines, and performance indicators that make sustainability a tangible part of everyday priorities. Addressing this is important in order to avoid the pitfall of symbolic integration described by Kurdve et al. (2014).

These dynamics have important implications for maturity assessment. A strong vision and visible leadership commitment are necessary but not sufficient indicators of integration. For a sustainability strategy to move beyond symbolic or top-level alignment, it must also be actively interpreted, reinforced, and operationalized at multiple levels of the organization. In maturity terms, this highlights the need to look beyond formal strategies and assess how well sustainability is understood, prioritized, and supported in everyday decisions across functions and roles.

5.1.1.2 R Framework and its role in integrating and assessing sustainability

The R framework has played an increasingly prominent role in the case company’s efforts to integrate sustainability, with a majority of respondents mentioning that it has provided both guidance and terminology for framing sustainability related activities across different departments. Empirical findings suggest that the framework is generally appreciated for its ability to make sustainability more tangible and operationally relevant, especially in engineering and manufacturing contexts where physical resources and production flows are central. It has been referred to in connection with projects involving material reduction and various process optimizations, and also as being an integral part of this year’s sustainability goals. The framework’s pedagogical qualities have also contributed to its traction within the organization. Several employees across all managerial levels highlighted how the R framework greatly helped raise awareness and create a shared language for discussing sustainability, which supports internal engagement and facilitated dialogue across functions. In this regard, the framework not only functions as a technical

tool but also as a cultural enabler by supporting the movement of a more sustainability aware environment in the organization.

While the characteristics of certain improvements align with the principles of the different R strategies in Potting et al. (2017) hierarchy, it's not always clear if they were initiated as a result of the framework itself. Rather, the framework appears to sometimes serve as a lens through which existing or emerging sustainability work is framed or categorized. This distinction is important, particularly seeing as a recurring theme in the empirical findings is the perception that the framework is most naturally suited for product-related contexts such as manufacturing, where physical materials are more heavily involved. In functions like logistics, the applicability was generally described as less straight forward. Respondents noted that the product-centered logic of the framework does not always capture the complexity of sustainability decisions in these areas, where factors such transport emissions, packaging arrangements, or route planning play a central role. As such, when the framework is a requirement in the strategic goals, a potential pitfall is introduced where initiatives are associated with higher-value R strategies than they actually represent due to the mismatch with the operational practices. This could lead to an inflated perception of impact or maturity if not critically examined, especially when the assessment or metrics rely on self-reporting or symbolic alignment with the framework. This indicated that while the R framework offers valuable insights, it may need to be complemented with additional perspectives or other tools to fully address sustainability across the organization.

Despite these challenges, the R framework offers structural advantages in the organization. The hierarchical design naturally encourages employees to consider not just whether sustainability is addressed, but also how it's addressed, and with what degree of impact. This aligns with broader themes in sustainability maturity models, which assess not only outcomes but also the underlying approach and degree of integration into decision-making structures. Drawing a parallel between the R framework and the maturity stages - such as the ones described by Hynds et al. (2014) - is therefore analytically useful as both involve gradients of ambition, impact, and a structural anchoring. In this context, the way the R framework is used within the organization may itself be indicative of maturity level, let alone the actual R strategies that are being most used. In less mature levels, the framework may be referenced symbolically or applied in a compliance oriented manner, aligning with the early stages of Hynds' maturity stages (Jefferson Hynds et al., 2014). In contrast, more mature parts of the organization might use the framework to proactively rethink design choices and embed sustainability considerations into performance metrics, aligning with the higher maturity stages. Thus this makes the R framework not only a tool for driving sustainability in the organization, but also a potential diagnostic instrument for how systematic and credible the integration of sustainability is in operations.

5.1.1.3 Cultural engagement and local initiatives

Beyond strategic ambitions, one of the most promising enabler of sustainability integration at the company lies in the emerging cultural engagement at local and departmental levels. Several respondents, particularly from production and logistics, described how sustainability is becoming embedded in everyday thinking, even in the absence of formal

mandates or KPIs. At the production site, team leaders and associates conveyed a sense of shared responsibility: “Sustainability is part of the job now”. This shift signals the early development of a sustainability-oriented culture grounded in continuous improvement and operational awareness.

Employee-driven initiatives also reflect this cultural momentum. For instance, the improvement program that requires each employee to submit at least one sustainability-related proposal per year was widely recognized as a way to stimulate bottom-up engagement. M3 described how the initiative has helped normalize sustainability in operations: “It’s not about big things, it makes us think about how we work and where we can improve”. These low-threshold contributions create a structure in which sustainability becomes part of ongoing dialogue and reflection.

Workshops and internal dialogue forums, such as the Leadership Summit and the Sustainability Council, have also contributed to growing cultural change. S3 recalled the impact of cross-departmental meetings: “That made a difference. After that, ideas started to come”. Similarly, A4 noted that talking about sustainability has become more natural: “It’s good to start talking about it, because then it will begin to fall into place more naturally”. These cultural shifts may seem incremental, but they represent the foundation for broader behavioral change that Hajmohammad et al. (2013) view as prerequisites for transformational change.

This emerging engagement also resonates with Lean thinking, where continuous improvement and shared ownership are considered cultural cornerstones (Womack and Jones, 1997). Several respondents described how existing Lean structures, such as visual management, improvement boards, and daily control meetings could serve as platforms for sustainability integration. A5 emphasized the role of visualization: “If we don’t know how we’re doing, it’s hard to know what to improve. Visualization is key”. This insight aligns with Sroufe (2017) view that sustainable performance management is strengthened when environmental and social metrics are embedded into routine quality systems. In this way, cultural engagement is not only supported by informal motivation, but also by existing operational logic, offering a potential bridge between daily practice and long-term sustainability ambition.

Taken together, these examples point to a growing cultural readiness within parts of the organization. While still uneven and fragile, the early signs of local initiative-taking and shared sustainability thinking suggest that the company is beginning to build the kind of engaged, bottom-up culture that maturity models associate with long-term transformation. To fully realize this potential, cultural engagement must be supported by systems that reward, track and scale local efforts, ensuring that sustainability becomes not just a shared value, but a consistent practice.

5.1.1.4 Shared value and lean alignment

A potentially significant enabler of sustainability integration lies in the natural alignment between Lean principles and environmental performance goals. Several respondents described how cost-reduction efforts such as minimizing air freight, optimizing inventory levels, or refining planning routines often result in lower emissions as a by-product. As

respondent S3 observed: “If we stop air freight, it becomes cheaper. If we transport less, it becomes cheaper”. These operational adjustments not only contribute to a reduced carbon footprint but support the company’s existing targets for cost efficiency and delivery performance. This synergy is reflected in literature terms as the "Lean and Green" effect, where process efficiency and environmental benefits are mutually reinforcing Hajmohammad et al. (2013); Dües et al. (2013); Piercy and Rich (2015). This alignment enables sustainability to be framed not as an external imposition, but as a value-adding logic already embedded in the operational thinking. When waste is minimized in the broadest sense, including time, energy, transport and excess materials, both economic and environmental outcomes improve. As such, Lean can act as a bridge between sustainability and core business objectives, potentially lowering resistance and enhancing internal legitimacy for sustainability initiatives. However, this integration is often opportunity-driven rather than systematically pursued, suggesting potential for more deliberate alignment strategies in the future.

This integration is further supported by the company’s already established Lean culture, which emphasizes continuous improvement, flow efficiency and visual management. The interviews highlight how Lean practices such as improved planning and flow simultaneously benefit delivery performance and environmental outcomes. This connection is consistent with the foundational Lean thinking by aiming to eliminate non-value-adding activities such as overproduction, waiting time and unnecessary transport. These are called Lean muda in the literature Liker (2004); Shah and Ward (2007). Potentially, when sustainability goals are framed in terms of waste reduction, the synergy between environmental and economic outcomes becomes more tangible. In this context, Lean does not merely coexist with sustainability, it provides a shared operational language that can anchor sustainability efforts within existing improvement systems. This alignment reduces the need to introduce parallel structures or competing priorities, and instead enables integration through familiar methods and metrics. However, as with other areas of alignment, this potential is not always fully leveraged, suggesting room for more intentional sustainability framing within Lean initiatives.

This view aligns with Liker (2004) view of Lean as a holistic system encompassing operational, cultural and strategic elements. Within this framing, Lean offers a structured logic for scaling sustainability across levels, from boardroom ambitions to shop floor routines. Embedding sustainability indicators into Lean governance mechanisms, such as XPS planning boards and tiered meetings, allows environmental goals to be translated into the operational language of performance. Kurdve et al. (2014) emphasize that XPS provide a natural foundation for this kind of integration, where sustainability becomes part of the company’s “way of working”. In this sense, Lean can act as a strategic lever for embedding sustainability across functions and hierarchies. When used deliberately, it can guide transformation beyond incremental efficiency gains and toward a more systemic shift in how value, waste and performance are defined.

However, this alignment remains largely informal and inconsistently leveraged. Several respondents noted that while certain improvements do yield both economic and environmental gains, these outcomes are rarely made visible, explicitly targeted or systematically tracked. As A6 remarked: “It doesn’t get tracked the same way”, pointing to the lack of sustainability metrics in core performance dashboards. As a result, even when green

outcomes occur, they risk being perceived as incidental rather than intentional. This challenge is echoed in the literature, where this lack of integration is identified as a major challenge with sustainability implementation Kurdve et al. (2014); Rothenberg and Frits (2017); Hajmohammad et al. (2013) emphasize, “what is measured gets done”, yet sustainability is often measured separately, inconsistently or not at all. Without embedded visibility in key systems, sustainability continues to compete on unequal terms with traditional performance dimensions.

While Lean principles provide natural synergies with sustainability, they also present structural limitations. Rothenberg and Frits (2017) warns that Lean’s emphasis on efficiency and short-term performance can unintentionally deprioritize long-term environmental concerns. This tension was echoed by several respondents. S3 reflected on the risk of turning sustainability into “just another metric”, easily sacrificed under cost pressure. M1 likewise acknowledged: “I can’t ignore the numbers this week just because I’m focusing on sustainability”. These reflections illustrate how, in the absence of integrated KPIs and governance mechanisms, Lean routines may unintentionally reinforce short-term economic logic.

In conclusion, while the current use of Lean to support sustainability remains largely informal, the underlying systems offer a strong platform for deeper integration. If routines such as planning and performance follow-up include environmental metrics like CO2 emissions and resource efficiency, they can shift from coincidental alignment to systematic sustainability integration. As Poltronieri et al. (2018) and Sroufe (2017) argue, sustainable performance depends on embedding environmental and social dimensions into the same systems used for cost, quality and delivery, making sustainability a natural part of operational success. This transition requires not only technical adjustments but a maturity shift: from isolated green actions to an integrated mindset where sustainability is continuously tracked and improved. Lean can serve as a concrete enabler of this shift, offering a practical way to embed sustainability within the company’s established culture of operational excellence.

5.1.1.5 Strategic support from group level

A further enabler supporting sustainability integration at the company is the strategic and infrastructural support provided by the broader corporate group. As a subsidiary within a global industrial organization, the company benefits not only from shared sustainability goals, but also from access to common tools, digital platforms and internal networks that support capability building and provide a baseline from which local adaptations can evolve. This is particularly evident in the area of human rights, where the company receives strong guidance, clear policies, action plans, and dedicated support from group-level experts. S2 emphasized this structural advantage, noting that the company likely “wouldn’t have had the muscles to handle sustainability on that scale” if it had operated independently. This support strengthens the internal rationale for long-term investments by anchoring sustainability within a broader corporate agenda.

However, while group-level support creates favorable conditions, its practical uptake and integration vary. Some teams actively use available tools and frameworks, whereas others report difficulties aligning them with their operational context. This reflects that group-

level initiatives, while potentially powerful, must be coupled with contextual adaptation to be effective at the business unit level. As emphasized in literature by Sroufe (2017). Without local ownership and operational relevance, even well-designed platforms risk remaining underutilized or symbolically adopted. This challenge is particularly evident in areas with strong interdependencies, such as logistics. Several respondents described how decision-making power remains centralized at the group level, limiting local visibility and action. This structural separation makes it difficult for teams to access emissions data, evaluate transport alternatives or influence supplier selection. The result is a perceived gap between responsibility and control, a sense of dependency without agency, which constrains proactive engagement with sustainability.

Still, the presence of a coherent group-wide sustainability agenda plays an important legitimizing and motivating role. It reinforces leadership commitment, facilitates inter-organizational learning, and signals, both internally and externally, that sustainability is a strategic priority. Importantly, this alignment also provides critical structural scaffolding for business units progressing in their sustainability maturity. As Hynds et al. (2014) emphasize, external enablers such as shared policies, digital infrastructure and governance mechanisms can significantly accelerate organizational maturity when they reinforce local efforts.

In summary, group-level support serves as a key enabler of sustainability maturity at the company, offering strategic coherence and shared resources. However, its effectiveness ultimately hinges on the presence of local adaptability and operational ownership. To unlock its full potential, group-level platforms must be complemented by decentralized mandates, data visibility and context-sensitive integration, ensuring that strategic ambitions translate into local impact.

5.1.2 Challenges

This section outlines the main challenges that hinder sustainability integration across the organization. The themes capture structural fragmentation, lack of ownership, and competing priorities, illustrating how systemic and cultural constraints limit the translation of sustainability ambition into operational practice.

5.1.2.1 Difficulty identifying concrete actions

A recurring theme across the organization is the widespread agreement that sustainability is an important strategic priority, yet this consensus sometimes fails to translate into clearly defined actions. While awareness of the company's sustainability goals is generally high, many employees report uncertainty about how those goals apply to their specific context. This difficulty in identifying what and how to improve, appears consistently across hierarchical levels and functions. The challenge is particularly visible in departments where sustainability outcomes are indirect or hard to quantify. In logistics for example, employees expressed a desire to contribute to sustainability efforts, but struggled to define relevant initiatives within the constraints of their roles.

Without clear targets, metrics, or established practices to follow, sustainability risks becoming a background concern rather than an active dimension of decision-making, which

was a commonly cited factor behind this challenge. On the other hand, financial and traditional performance objectives were described as well-established and prioritized, while sustainability goals were often perceived as abstract or disconnected from routine decision making. Several interviewees also noted that environmental data was either unavailable or not integrated into their systems used to manage performance, making it difficult to build business cases for improvement or to evaluate the effect of their actions.

The findings suggest that while the company has succeeded in raising awareness and generating engagement around sustainability, there is a gap in operational anchoring. A clear desire for tools, measurable outcomes, and role-specific guidance was expressed, especially as you move down the hierarchical levels. This highlights an important dimension for assessment, as a large risk is introduced as a result, where opportunities for improvements could be missed - not due to lack of will, but due to absence of structure.

5.1.2.2 Customer preferences and market constraints

Another notable challenge to sustainability integration at the company stems from external market conditions, particularly among customer preferences. Several respondents highlighted the difficulty of promoting or implementing sustainable solutions in cases where the customers do not actively request them. This issue is especially prominent in logistics, where more sustainable alternatives often involve a mix of increased lead times and reduced flexibility. Respondents described scenarios where proposed sustainability improvements such as consolidated shipments, climate-optimized routes, or alternative transport modes, were technically feasible but commercially unviable. Customers frequently prioritize delivery speed, cost efficiency, or reliability over environmental impact. In other words, traditional performance objectives are still heavily valued over environmental impact when it comes to transports. As one respondent put it: “we can’t say no to faster transports if the customer is paying for it”. This dynamic does directly impact the company’s ability to make sustainability an integrated part of its offering when it comes to transports to customers. This constraints not only decision making in specific projects, but also the broader ability to steer the operational strategy toward sustainability in logistics.

From a theoretical view, this situation reflects the tension discussed in the concept of sustainability as a dimension of quality. As discussed in the theory chapter, frameworks like that discussed by Martin et al. (2020) propose a broader concept of quality that not only includes customer satisfaction, but also impacts on environment or society. In this view, a product might be considered high-quality from a user standpoint or performance perspective, but still be problematic from an environmental or societal standpoint if it contributes to long term degradation. In the case company, this product-level tension also exists, but they also face an almost inverted challenge in logistics: the organization is increasingly capable of delivering more environmentally sustainable solutions, yet these offerings are often not perceived as higher quality by customers when it comes with a slight trade-off in traditional quality dimensions. This highlights the differing definitions of quality depending on perspective, that what aligns with environmental or societal values may conflict with what customers prioritize in purchasing decisions. As a result, there exists a disconnect between the company’s internal sustainability ambitions and the market’s readiness to value those ambitions in commercial terms.

This misalignment has some implications for sustainability maturity assessment. When evaluating maturity, it is important not only to assess internal capabilities but also to understand the degree of external support or resistance that the organization faces. A company might be capable of offering sustainable alternatives but still operate in a commercial environment that discourages such offerings. Recognizing this factor helps provide a more realistic assessment of sustainability maturity while highlighting where barriers exist that limit the organization's room to maneuver sustainability integration.

5.1.2.3 Data access and KPI misalignment

A critical challenge with sustainability integration at the company is the absence of accessible, reliable and actionable sustainability data, as well as a misalignment between environmental indicators and existing key performance indicators (KPIs). Across multiple departments, respondents expressed frustration over the lack of visibility and measurability when it comes to environmental impact. S3 summarized the issue succinctly: "We know exactly what things cost, how the company is doing financially, what productivity we have, but we don't know how much CO2 we emit". This disparity in measurement reflects what Kurdve et al. (2014) identify as a fundamental obstacle in sustainable production systems: what is not measured is not managed. Environmental data was sometimes technically available, or from standard calculations, but it also introduced questions whether its reliable or not. M3 expressed this skepticism: "It's difficult to use in daily operational decisions and know if it's true and accurate. The problem is that it can be questioned". This lack of confidence in data quality undermines its legitimacy in decision forums and reinforces a cycle where sustainability is talked about, but not operationalized.

Another significant challenge is the lack of integrated KPIs. As described in literature, most performance management systems emphasize cost, delivery and quality, while sustainability metrics are often tracked separately (Kurdve et al., 2014; Rothenberg and Frits, 2017; Hajmohammad et al., 2013). This absence of embedded indicators often results in environmental concerns being deprioritized in practice. Without concrete metrics, sustainability risks being sidelined in decision-making processes, overshadowed by well-established financial and operational KPIs.

Several respondents also noted challenges in accessing specific emissions data, particularly when transport services are managed through external group entities. The inability to isolate or control emissions data at the business unit level limits operational relevance and weakens accountability. As one respondent explained, even when group-level systems exist, it is difficult to act on the data in local decision-making contexts.

Furthermore, existing systems often fail to visualize sustainability trade-offs at the point of decision. A3 described this shortfall in transport planning systems: "You don't see the emissions - you see the cost". Similarly, A4 explained how environmental consequences of sourcing decisions are invisible: "We don't know what the emissions are for producing a product in different factories. We know the cost difference, but not the CO2". This invisibility contributes to a narrow evaluative framework, where decisions are made primarily based on cost, time and quality. As A5 put it: "Sometimes it's hard to know what's good and what's bad. And when you don't know, it's hard to factor that into the project".

These challenges point to a disconnect between the company's established operational systems and its sustainability goals. Rothenberg and Frits (2017) notes that while lean and environmental objectives often align, their full potential is only realized when sustainability is formally integrated into strategy and performance systems. Without such integration, environmental impact remains peripheral to how success is measured and managed.

These insights point to a systemic measurement gap that hampers both reflection and improvement. To address this, the company will need to invest in environmental KPIs that are as specific, timely and relevant as traditional business metrics, making sustainability a visible and comparable performance dimension. From a maturity assessment perspective, the presence or absence of integrated KPIs and accessible data serves as a key indicator of how well sustainability is operationalized. If sustainability lacks representation in project evaluations or planning tools, the unlikeliness to influence operational behaviour is increased, as described by Kurdve et al. (2014). Sroufe (2017) also stress the importance of sustainability being embedded into management systems that support decision-making, while Martin et al. (2020) further stress that sustainability performance must be understood in terms of broader value creation. A mature sustainability system is therefore not just one that tracks emissions, but one where data is credible, comparable, and actively used for decisions alongside traditional quality dimensions.

5.1.2.4 Resource constraints: time and knowledge

Another form of constraints to further progress in sustainable operations is found in limited knowledge and time. These constraints appeared across roles and departments and point to a wide organizational challenge: sustainability is seen as important, but it's not yet fully embedded in the operational logic of the business. Time was a consistently mentioned challenge, as employees at all levels described how sustainability often competes with more immediate production or delivery pressures. Even though sustainability ideas emerge rather frequently, they are often sidelined, exemplified by one associate who described sustainability as less tangible and perceived as work for the future. Thus the issue is not one of motivation, but of prioritization, and a lack of integration into routine workflows and performance systems.

Knowledge and clarity were also highlighted as critical gaps by many employees who described a difficulty in sometimes understanding what a "sustainable" decision actually looks like in practice. Similar to the issues with data access, this was particularly evident in terms of balancing environmental performance with costs, delivery performance, or customer expectations. One associate captured the uncertainty in saying that "everyone should know the purpose, the impact, and have time to act". This hesitation could stem from absence of training and clear examples or expectations, even when the intent is strong overall. The challenge is further intensified in logistics by the difficulty of making trade-offs between sustainability and other business priorities. Even when emission data is available, it was often described as abstract and hard to translate into actionable insights. One respondent asked the rhetorical questions "We save money, but if CO2 emissions go up, shouldn't that be part of the project evaluation?", while another raised the question "If emissions go up by 1000 tons but we save a million kronor, what's that worth?". The dilemmas point to the broad issue of not having tools that quantify environ-

mental impact in comparable or monetary terms, which leads to sustainability struggling to compete with traditional objectives such as cost or lead times. At the same time, there is a risk in framing sustainability issues solely through a lens of financial optimization. Equating sustainability measures like CO₂ to a cost variable may risk overlooking the deeper organizational transformation required for meaningful sustainability integration - a concern that was echoed by respondent (S3). This ties further to the insights by Martin et al. (2020) and the multidimensional view on quality and value. At the case company, this extends the conversation about external preferences from customers to internal decision making. Even when a logistics solution or product modification is environmentally preferable, it may still be deprioritized because traditional definitions of quality dominate external - and consequently internal - decision making. Without mechanisms to include ecological and societal value in the assessment of quality, sustainability considerations risk being excluded.

From a maturity assessment perspective, these findings suggest that resource constraints must be interpreted carefully. It is not enough to look at visible actions or outcomes - the conditions under which the actions are expected to take place are equally important. The identified challenges of time and knowledge are not signs of low ambition, but more so structural limitations that shape what is realistically possible. This means that apparent passivity or uneven engagement may reflect a lack of enabling conditions rather than lack of interest or awareness. When setting expectations for progress, these internal constraints need to be acknowledged, as an assessment that overlooks them risks drawing misleading conclusions about commitment or capacity. A more meaningful understanding of maturity may instead come from asking not just whether sustainability is happening, but if people across the organization have the foundation for translating strong motivation and awareness into action: clear priorities, relevant knowledge, and supportive systems/tools.

5.1.2.5 Siloed structures and fragmentation (Cross functional)

A recurring challenge across the empirical material is the systemic fragmentation that occurs between departments. Although sustainability is widely recognized as a cross-functional challenge, the organization remains largely structured around vertical silos, with limited horizontal coordination. This reflects what Sroufe (2017) describes as organizational fragmentation, where departmental priorities and structures impede integrated sustainability efforts. Several respondents emphasized that sustainability initiatives frequently stall at the interfaces between the functions. One illustrative case involved proposals to increase inventory to reduce air freight, which were blocked either by finance due to cost constraints or by engineering due to the complexity of part structures. These examples underscore the difficulty of navigating the different competing logics in the absence of integrative mechanisms or shared priorities. This can be seen in many cases at the company, sustainability is not yet embedded in cross-functional planning or collaboration routines. Respondents described that interaction between departments often occurs reactively when problems arise, rather than as part of the continuous improvement or sustainability dialogue. This ad hoc engagement reinforces what Hajmohammad et al. (2013) refer to as sustainability “falling between the cracks”, where shared responsibility results in diffuse ownership and inaction.

The issue is further exacerbated by unclear roles, fragmented mandates, and limited decision authority. Even highly motivated individuals often lack the formal power or structural access needed to influence sustainability decisions. As M3 noted, she wanted to fill a container more sustainably, but coordinating across departments led to a compromise: “It was difficult because other departments were involved. It ended up in between”. These dynamics reflect more than operational inefficiencies, they point to an underlying power asymmetry, where functional boundaries and hierarchies shape who gets to act, and who remains dependent on others. In this context, sustainability suffers not just from ambiguity, but from a lack of agency within the organizational structure. Without clearly defined mandates and authority, responsibility becomes diffuse and execution becomes limited on informal negotiation. This creates not only frustration, but a structural vulnerability, where environmental ambitions are easily displaced by dominant functional logics. If left unresolved, such fragmentation poses a strategic risk where sustainability initiatives stall, dissipate or are deprioritized under competing short-term pressures.

That said, early signs of progress are emerging. The Sustainability Council represents an attempt to create a structured platform for cross-functional collaboration. Similarly, initiatives such as the Leadership Summit have generated momentum across departments. However, as S2 observed: “Once a workshop is booked, everyone is active. But what happens after, I don’t really know”. These reflections highlight that while cross-functional engagement exists, it remains episodic and fragile, lacking sustained mechanisms for follow-through. One avenue to address this fragmentation is to embed sustainability into existing cross-functional routines and governance structures. Given the company’s established Lean practices, these may serve as a natural platform for coordination. Rather than adding parallel processes, environmental goals could be integrated into shared planning and improvement systems, reducing functional friction and promoting alignment.

In conclusion, cross-functional fragmentation constitutes a major challenge to sustainability integration. Even where ambition and initiative are present, the absence of structural alignment, shared metrics and joint accountability often renders sustainability a secondary or disconnected concern. This pattern is characteristic of organizations in the Improving stage of sustainability maturity, where intent is visible but integration mechanisms remain weak (Hynds et al., 2014). Overcoming this will require a shift from parallel functional activities to truly integrated processes, anchored in clear roles, mutual accountability and system-wide visibility of environmental trade-offs.

5.1.2.6 Strategic alignment across hierarchical levels

Despite strong strategic intentions and a growing awareness of sustainability across the company, some disconnections persist between the hierarchical levels. These disconnects challenge the organization’s ability to translate top-level ambitions into operational behavior and practical outcomes.

At the senior level, sustainability is firmly established as a strategic imperative. Leaders describe it as a long-term business necessity, with some comparing its evolution to that of quality - a once competitive differentiator that has now become a baseline requirement. Senior managers emphasize that climate, resources, and people must all be considered in a balanced sustainability agenda, and there is a visible effort to communicate these pri-

orities throughout the organization. However, they also acknowledge that the challenge lies in transforming these high-level goals into operational relevance.

The challenge becomes particularly evident at the managerial level, where mid-level leaders are tasked with bridging the gap between vision and execution. Managers frequently described the difficulty of operationalizing sustainability goals without sufficiently clear mandates, KPIs, or structured support. In many cases, sustainability is not embedded in the systems or routines they rely on to make decisions. While improvement initiatives do occur, they are often driven by personal commitment rather than formal guidance. Trade-offs between sustainability and more traditional targets like cost, lead time, or efficiency tend to be resolved in favor of the latter, especially when environmental metrics are not part of the decision framework.

The disconnection is further pronounced at the associate level. Employees understand and talk about sustainability as something very important, but express uncertainty about what actions are expected of them or how their tasks relate to the company's broader goals. This contributes a sense of attachment, and even when employees are motivated to contribute, the absence of role-specific guidance, data access, or tools aiding with decision-making becomes a limiting factor.

What emerges is not necessarily a communication problem, but a systemic gap in vertical integration. While each level is committed in its own way, the structures needed to link them aren't sufficiently developed at this point. In this sense, sustainability is experienced differently across the hierarchy: aspirational at the top, ambiguous in the middle, and peripheral at the bottom. Efforts such as the Sustainability Council and the R-framework aim to bridge these gaps, but their success depends on whether they can create structured engagement beyond the leadership level. Some respondents noted that such initiatives sometimes lose clarity as they cascade through the organization, especially when responsibilities are not clearly assigned or when communication remains high-level, although the recent expansion of council participation is a step in the right direction.

From a maturity assessment perspective, these findings underscore the importance of evaluating not only the presence of strategic vision, but also the extent to which that vision is internalized and enacted throughout the organization. While disconnects across hierarchical levels are evident, they should not be interpreted as a failure of leadership. As Hynds et al. (2014) emphasize, true maturity is achieved when leadership, technical systems, and cultural understanding are aligned. A lack of integration across levels may just as likely reflect gaps in system support and a combination of the previously described challenges. Developing the thought further, mature organizations demonstrate coherence between vision and action not by relying on top-down pressure alone, but by ensuring that enabling structures and shared values support sustainability at every level.

5.2 Maturity assessment framework

This section outlines the framework's structure and underlying logic, including its thematic pillars, analytical dimensions, maturity scale, and potential applications. Rather than offering a one-size-fits-all solution, the framework provides a context-sensitive tool for self-assessment, organizational reflection, and capability development - aligned with the company's strategic direction and operational needs.

5.2.1 Capturing operational reality: From strategic gaps to structural support

The preceding chapters have highlighted a recurring tension between the company's high-level sustainability ambitions and the realities of operational execution. While strategic goals are clearly articulated, the materialization in day-to-day decision-making is limited. As demonstrated in the empirical findings, this gap is reinforced by several interconnected challenges. In short, the vision is present, but there is a need for a more systematic and structured approach to integration.

As the previous analysis of organizational enablers and challenges has shown, these gaps are not due to a lack of ambition but a result of structural and procedural shortcomings. Addressing them requires more than general guidance - it calls for an assessment framework that is tailored to the specific characteristics of the organization. Such a framework must account for the unique context in which the company operates, such as the enablers and challenges in the previous analysis. It should also be intuitive and familiar enough to resonate with existing ways of working. Leveraging established internal tools and visualizations can help minimize the learning curve and facilitate meaningful engagement with assessment across the organization.

At the same time, the framework must enable a structured evaluation of the factors that influence sustainability integration - both those that progress and those that constrain it. This involves not only capturing the company's current state, but also guide reflection on how sustainability can become more deeply integrated in daily practices, processes and decisions. To address this need, a tailored framework for evaluation has been developed. Grounded in the empirical findings from this case study, the framework captures the operational realities described by employees across departments and roles. It draws directly on the specific enablers, challenges and organizational dynamics identified in the analysis and is designed to provide a structured and context-sensitive evaluation of the current maturity level in different areas of sustainability work.

5.2.2 Framework structure

Inspired by the Triple Bottom Line and the UN's sustainability goals, the framework leverages the company's own sustainability strategy framing: the pillars of Climate, Resources and People. Within each pillar, focus areas have been defined to reflect the company's ambitions in tangible terms. To assess progress, these areas are evaluated through the lens of a foundation critical for any company's success in integrating sustainability: Strategy & Leadership, Processes & Tools, and Culture & Engagement, each capturing a critical aspect of sustainability integration.

Viewing the focus areas through this foundational lens enables a comprehensive and diagnostic understanding of what supports or hinders integration across functions and levels. In addition, the framework includes a four-level maturity model, supported by tailored indicators for each focus area. These indicators help translate abstract maturity concepts into observable practices, supporting self-assessment and organizational learning.

The framework consists of six integrated components:

- **Vision:** Provides a guiding statement that positions sustainability as a fundamental principle within operational decision-making. It sets the normative ambition of the framework.
- **Pillars:** Represent the strategic structure of the company’s sustainability agenda, Climate, Resources, and People, serving as thematic anchors for assessment.
- **Focus Areas:** Translate each pillar into concrete domains of operational relevance. They reflect key sustainability challenges and priorities.
- **Assessment Dimensions:** Offer a cross-cutting lens to evaluate each focus area through three organizational perspectives: Strategy & Leadership, Processes & Tools, and Employee & Engagement.
- **Indicators:** Provide qualitative descriptions of observable behaviors and practices at each maturity level. They enable reflective self-assessment and make maturity evaluation tangible.
- **Maturity Model:** Defines a four-level progression scale from ad hoc to fully embedded practices, supporting structured assessment, comparison, and developmental planning.

Through this structure, the framework does not offer a ready-made solution for implementation, but a diagnostic platform for understanding where the company stands in its sustainability journey. It supports a shared language for maturity assessment and lays the foundation for targeted improvements.

The following sections outline the structure and logic of the Sustainability Maturity Assessment Framework, including its core components, the theoretical foundations guiding the design, and illustrative examples of how the framework may be applied in practice.

5.2.2.1 Description of the framework’s architecture

The maturity assessment framework developed in this study, visualized as the “Sustainability House”, is intentionally tailored to the organizational reality of the company. Its design draws directly from the empirical insights gathered during the case study and is shaped by theoretical principles from sustainability integration, maturity modeling, and continuous improvement literature. The conceptual architecture is illustrated in figure 5.1.

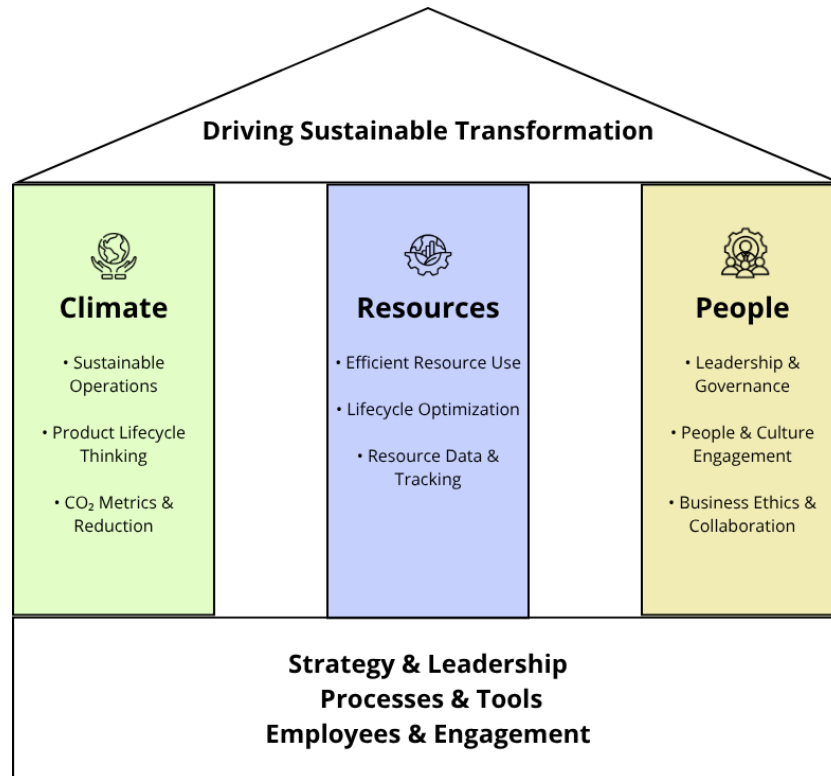


Figure 5.1: Description of the Sustainability House structure.

At the top of the house sits a clear sustainability vision, expressing the long-term aspiration of *Driving Sustainable Transformation*. Beneath the vision, three structural pillars, Climate, Resources and People, reflect the company’s internal framing of sustainability, as confirmed in interviews (e.g., “Sustainability for us is Climate, Resources and People” - S2), and align with established models such as the Triple Bottom Line (Elkington, 1997; Sroufe, 2017). Each pillar contains a set of focus areas, which translate strategic ambitions into operational domains.

Crucially, the entire framework is supported by a foundation consisting of three cross-cutting assessment dimensions: Strategy & Leadership, Processes & Tools and Culture & Engagement. These dimensions represent the core organizational capabilities that enable sustainability work to be governed, implemented and embraced across all focus areas. Rather than listing isolated methods or systems, the foundation emphasizes the enabling conditions required to achieve maturity, making the house not only structurally complete, but operationally grounded.

The “house” visualization itself was chosen for its symbolic and communicative strength. It suggests that sustainability integration is not a linear process but a structural one: pillars must be jointly developed and reinforced to support the overarching vision. This architectural metaphor draws inspiration from established production systems such as the Toyota Production System (TPS), which is often represented as a house to illustrate the interplay between standardization, improvement culture and strategic objectives (Kur-dve et al., 2014). Similar house-based models are commonly used in company-specific production systems (XPS) to communicate the alignment between operational principles

and organizational vision. Compared to circular or layered models, the house metaphor underscores the idea of organizational architecture, where different components must align and interact coherently. It also distinguishes between foundational elements (e.g., governance, metrics) and overarching aspirations (vision), allowing users to see both the structural and strategic dimensions of their maturity.

Together, the vision, pillars, and foundation form the structural core of the Sustainability House. The following sections describe how it is brought into practice through clearly defined focus areas, analytical dimensions, maturity indicators and assessment scales.

5.2.2.2 Focus areas

Each pillar of the Sustainability House is operationalized through a set of nine focus areas, presented in figure 5.2. These areas define the specific domains in which sustainability maturity is assessed. They are designed to translate high-level ambitions into operational categories that reflect real organizational dynamics.

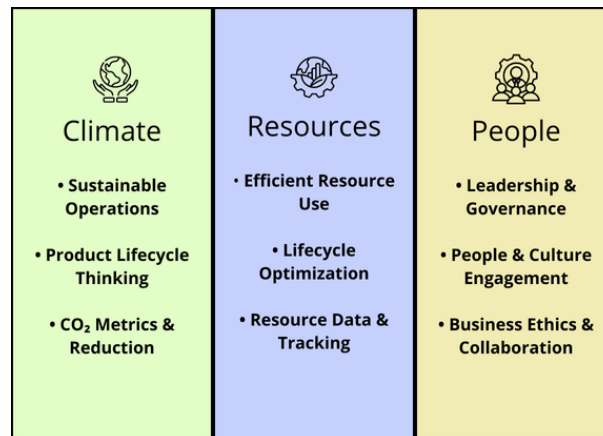


Figure 5.2: The focus areas for the pillars.

The selection of focus areas is not abstract constructs, but grounded in the empirical analysis. The themes identified in section 5.1 Organizational enablers and challenges capture key organizational factors that shape the company’s ability to realize its sustainability goals. These themes are not treated as standalone insights. Instead, they have been intentionally mapped onto the company’s existing sustainability pillars: Climate, Resources and People, to enhance diagnostic precision and internal relevance. This alignment ensures analytical coherence and supports practical applicability within the company’s sustainability agenda.

At the same time, the limitation of focus areas reflects a conscious prioritization. While other themes emerged from the interviews, such as external stakeholder pressure and regulatory trends, the final selection was limited to those directly affecting internal operational maturity. This decision was made to preserve the framework’s focus on diagnostic clarity and organizational applicability.

As table 5.1 illustrates, the mapping confirms strong empirical coverage across all nine focus areas. For example, themes such as Strategic Framing, Triple Bottom Line and

Leadership Commitment and Strategic Support from Group Level correspond closely to the Leadership & Governance and Business Ethics & Collaboration focus areas, addressing how top-down vision, structural legitimacy and group-wide initiatives support or limit strategic anchoring. Similarly, Cultural Engagement and Local Initiatives reflects progress within People & Culture Engagement, emphasizing the importance of employee-driven improvement efforts and Lean-based routines as cultural enablers of sustainability.

Table 5.1: Mapping of analytical themes to sustainability focus areas

Theme (from 5.1)	Mapped Focus Area	Pillar
5.1.1.1 Strategic Framing, Triple Bottom Line and Leadership Commitment	Leadership & Governance, Business Ethics & Collaboration	People
5.1.1.5 Strategic Support from Group Level	Leadership & Governance, Business Ethics & Collaboration	People
5.1.1.3 Cultural Engagement and Local Initiatives	People & Culture Engagement	People
5.1.1.4 Shared Value and Lean Alignment	Sustainable Operations, CO2 Metrics and Reduction	Climate
5.1.1.2 Framework and Its Role in Integration and Assessment	Product Lifecycle Thinking	Climate
5.1.2.3 Data Access and KPI Misalignment	Resource Data and Tracking	Resources
5.1.2.4 Resource Constraints: Time, Knowledge and Tools	Efficient Resource Use, Lifecycle Optimization	Resources
5.1.2.5 Siloed Structures and Fragmentation	All focus areas (cross-cutting challenge)	All
5.1.2.6 Strategic Alignment Across Hierarchical Levels	All focus areas (cross-cutting challenge)	All

Within the Climate pillar, Shared Value and Lean Alignment illustrates how efficiency efforts can reinforce Sustainable Operations and CO2 Metrics and Reduction. In parallel, Framework and Its Role in Integration and Assessment aligns closely with Product Lifecycle Thinking, reflecting efforts to embed sustainability into product and process development.

The Resources pillar draws on themes that reveal operational constraints. Data Access and KPI Misalignment points to difficulties in tracking environmental performance indica-

tors, supporting the inclusion of Resource Data and Tracking. Meanwhile, Resource Constraints: Time, Knowledge and Tools underscores organizational capacity gaps needed to act on sustainability ambitions, which are reflected in both Efficient Resource Use and Lifecycle Optimization.

Several cross-cutting themes, including Siloed Structures and Fragmentation and Strategic Alignment Across Hierarchical Levels, affect all pillars. These reflect challenges related to collaboration, unclear ownership, and weak vertical translation of strategy into operations, dynamics that permeate the entire framework and influence sustainability integration at every level. They justify the need for a modular but systemically coherent framework, in line with Hynds et al. (2014), who emphasize the importance of integrated, system-wide maturity models.

In summary, the thematic mapping confirms that the selected focus areas form a coherent and actionable diagnostic structure. They bridge strategic ambition with operational reality, enabling a maturity-based assessment that is both empirically grounded and organizationally aligned.

5.2.2.3 Foundational lens applied across focus areas

To support a structured and consistent interpretation across the framework, the model integrates three cross-cutting dimensions:

- **Strategy & Leadership**
- **Processes & Tools**
- **Employees & Engagement**

These dimensions ensure that maturity is not assessed solely based on thematic progress, but through a structured analysis of strategic intent, system capabilities, and cultural anchoring. Rather than serving as standalone categories, the dimensions function as diagnostic lenses that are applied to each of the nine focus areas.

The selection of these three dimensions were identified as recurring factors throughout the case study interviews and are consistently highlighted in the literature as essential enablers of sustainability integration. By narrowing the assessment to these three categories, the framework achieves both analytical clarity and practical usability, focusing on the organizational capacities that matter most for translating ambition into action.

For example, achieving maturity in CO2 Metrics and Reduction requires clearly defined strategic targets and mandates (Strategy & Leadership), robust data systems and reporting routines (Processes & Tools), and a shared understanding of climate impact among team members (Employees & Engagement). The same diagnostic logic applies to the other focus areas.

This structure reflects a central insight from both theory and empirical analysis: that successful sustainability integration depends not only on the thematic content of an area, but also on how well it is governed, operationalized and embedded culturally. This multi-dimensional understanding of maturity aligns with established sustainability literature.

Sroufe (2017) highlights the need for alignment between strategic priorities, operational systems and organizational behavior. Hynds et al. (2014) further define maturity as a combination of leadership commitment, technical infrastructure and employee engagement. Without cultural reinforcement and process integration, Poltronieri et al. (2018) warn, sustainability efforts risk becoming symbolic rather than transformative. Accordingly, the three chosen dimensions, Strategy & Leadership, Processes & Tools, and Employees & Engagement, mirror these categories and provide a structured lens through which the enabling conditions for sustainability integration can be assessed.

By embedding these three dimensions into the assessment of each focus area, the framework enables a more nuanced and actionable evaluation of maturity. It highlights not only what needs to be improved, but also how and where - whether through leadership alignment, system development or cultural reinforcement. Furthermore, the application of a common diagnostic structure across all domains supports cross-functional benchmarking and system-wide comparability, enhancing the framework's utility as both an analytical and developmental tool.

5.2.2.4 Maturity indicators per focus area

To ensure practical applicability, the framework is supplemented with a set of tailored maturity indicators for each of the nine focus areas. Without such indicators, assessment frameworks risk remaining too abstract to guide real-world decision-making. Structured along the three analytical dimensions, Strategy & Leadership, Processes & Tools, and Employees & Engagement, these indicators offer concrete criteria for evaluating sustainability maturity across the organization. Examples of indicators are shown in table 5.2, and a more detailed list can be found in appendix A.2.

The three assessment dimensions reflect the work of Sroufe (2017), who emphasizes the alignment between strategic intent, system infrastructure and cultural readiness. Hynds et al. (2014) similarly highlight the importance of a multi-dimensional maturity approach encompassing leadership, process capability and employee engagement.

The focus on qualitative, context-specific indicators is informed by Poltronieri et al. (2018), who argue that maturity must be assessed through embedded routines rather than formal statements. This operational layer reinforces the Triple Bottom Line logic already embedded in the framework's structure Elkington (1997), while the indicator are inspired by Lean practices and routines, such as visual management, continuous improvement, cross-functional collaboration and frontline-driven improvement efforts Womack and Jones (1997), making the framework both theoretically grounded and operationally actionable.

Together, these foundations lend both academic credibility and practical relevance to the maturity indicators. More importantly, they provide the organization with a toolset to diagnose its current state, facilitate learning and prioritize development efforts in a structured and consistent manner.

Table 5.2: Examples: Maturity indicators per focus area.

Pillar	Focus Area	Example Maturity Indicator
People	Leadership & Governance	Sustainability KPIs integrated into executive dashboards; leadership accountability for sustainability outcomes
People	People & Culture Engagement	90% employee training completion rate on sustainability topics; role-specific responsibilities defined
People	Business Ethics & Collaboration	Regular supplier audits; adherence to updated Code of Conduct
Climate	Sustainable Operations	CO2 data integrated into logistics and production decisions
Climate	Product Lifecycle Thinking	Lifecycle assessments conducted for all new products
Climate	CO2 Metrics and Reduction	Quarterly CO2 reporting with operational targets
Resources	Efficient Resource Use	Tracking of material use and waste reduction initiatives
Resources	Lifecycle Optimization	Reuse and recycling targets for product end-of-life
Resources	Resource Data and Tracking	Dashboards for energy, water, and material use at key decision points

5.2.2.5 Maturity scale (Staircase)

To support structured and consistent evaluation across the nine focus areas, the framework applies a horizontal maturity scale consisting of four defined levels: Beginning, Improving, Succeeding and Leading. These levels reflect a natural progression, from fragmented, ad hoc activities to fully embedded, strategically aligned practices and are visualized in figure 5.3.

The staircase model is based on the four-level maturity structure developed by Hynds et al. (2014), originally designed to assess sustainability integration across industrial organizations. It has been adapted to reflect the empirical diversity observed at the case company, where departments and functions operate at varying degrees of maturity. The model outlines a progressive evolution from basic regulatory compliance to fully integrated and strategically driven sustainability practices. Compared to more abstract five-level frameworks (e.g., CMMI or ISO-aligned models), this four-stage structure provides a clearer strategic lens, emphasizing how sustainability shifts from obligation to opportunity. By combining theoretical robustness with contextual relevance, the model supports internal reflection and capability development while remaining sensitive to functional differences.

Each maturity level is associated with distinct qualitative indicators that describe the organization's capabilities in a given focus area. The framework deliberately employs

narrative criteria rather than numerical scoring. This reflects the complex and non-linear nature of sustainability work, which often defies reduction to checklists or metrics (Sroufe, 2017). By describing observable behaviors, practices and perceptions at each stage, the scale enables a more nuanced and reflective form of assessment. Instead of asking whether a certain feature exists, the framework explores how it is used, trusted and embedded. For example, rather than checking whether CO2 data is available, the scale examines whether such data is integrated into decision-making and perceived as credible, an issue repeatedly highlighted in interviews. This qualitative approach enhances learning, fosters dialogue and promotes engagement across teams and roles.



Figure 5.3: Sustainability maturity levels and description (Source: (Hynds et al., 2014)).

Application and interpretation of the scale

Each indicator within the framework is assessed using a four-level maturity scale, ranging from *Beginning (1)* to *Leading (4)*. This scale provides a structured basis for evaluating the degree to which sustainability is integrated into a given focus area. The individual ratings across indicators are then averaged to generate a composite maturity score for each focus area. These focus area scores can subsequently be aggregated to generate overall maturity levels for the corresponding pillar, offering a multi-level overview of strengths and weaknesses. In addition, each focus area is assigned an established target level, defined on the same five-point scale. These targets should be ambitious yet realistic, reflecting the strategic priorities of the organization while accounting for operational constraints. The gap between current and target levels provides a diagnostic signal of where to focus attention and resources.

Following the assessment, suggested improvement actions should be formulated to guide the next steps. These may include, for example, developing executive KPIs, enhancing employee training, refining cross-functional roles or integrating CO2 dashboards into decision-making routines. The improvement suggestions should represent a mix of short-term enablers and long-term capacity-builders, forming a practical roadmap for moving from today's baseline toward a more mature, embedded sustainability practice. An example of the assessment is shown in table 5.3 and table 5.4. The full template for the self-assessment is provided in table A.2, while an overview template for the average ma-

turity level per pillar is presented in table A.3.

Ultimately, the maturity staircase serves not only as an assessment model, but also as a developmental pathway. It enables teams to identify their current state, understand what progress looks like, and prioritize actions that advance sustainability integration over time.

Pillar	Focus Area	Indicator	Current Level (1-4)	Target Level (1-4)	Motivation for Current Level	Improvement Actions
People	Leadership & Governance	Executive ownership of KPIs	2	4	Sustainability is acknowledged at leadership level but not yet fully embedded in decision processes.	Define executive sustainability KPIs and regular leadership reviews.

Table 5.3: Example of maturity assessment and improvement plan per focus area.

Level	Item	Current Level (1-4)	Target Level (1-4)	Notes / Aggregation logic
Indicator	CO2 data integration in transport planning	2	4	Lacks integration into planning tools; data not trusted
Indicator	Emission visibility in supplier evaluation	3	4	Partially considered but not consistently
Focus Area	Sustainable Operations	2.5	4	Average of indicators above: $(2 + 3) / 2$
Focus Area	Product Lifecycle Thinking	3	4	Based on 3 assessed indicators
Focus Area	CO2 Metrics & Reduction	2	4	Based on 2 indicators
Pillar	Climate (all Focus Areas)	2.5	4	Mean of 3 focus areas: $(2.5 + 3 + 2) / 3$

Table 5.4: Example of maturity aggregation from indicators to pillar level.

6

Reflections

This chapter reflects on the key findings of the study. It discusses the organizational enablers and challenges, evaluates the practical relevance of the proposed framework, considers research design limitations, and outlines unexpected insights that emerged during the research.

6.1 Reflections on enablers and challenges

The enablers and challenges covered in the analysis reveal how different dimensions of the TBL are emphasized within the company's sustainability efforts. Social aspects, such as employee well-being and human rights across the value chain, appear well integrated which explains their limited presence in the challenges analysis. By contrast, environmental sustainability remains a more challenging area where integration is complicated by the challenges outlined in the analysis. Economic aspects emerged more subtly, yet often shaping the context in which environmental efforts operate. However, rather than an explicit resistance, economic priorities such as cost-efficiency or customer value expectations tend to set the baseline for what is considered feasible. This dynamic can make sustainability goals dependent on their alignment with traditional business logic, reinforcing the need to frame green initiatives in a way that also delivers economic value.

Overall, the enablers and challenges reflect the issues most relevant and contested within the organization. From a TBL perspective they highlight where the company is mature and where operational systems have yet to catch up with strategic ambitions, underscoring the need for a tailored assessment framework that reflects these specific challenges.

6.2 Reflections on the framework

The proposed framework offers a structured foundation for assessing sustainability maturity. However, it should be seen as a starting point - a pilot version that requires further development and contextual understanding. The maturity indicators within each focus area will need to be validated and refined in collaboration with relevant stakeholders in the organization to ensure both alignment and acceptance. This refinement should also be a continuous effort, to reflect changes in either strategic priorities, operational realities, or emerging sustainability challenges. Additionally, the practical implementation of the framework (how assessments are conducted, what questions are asked, and how subjectivity or bias is minimized) falls outside of the scope of this study and remains an important area for further investigation. Having robust assessment methods and consis-

tency in interpretation are critical factors that will ultimately determine the impact of the framework in practice.

6.2.0.1 Illustrative Use Cases: Applying the Framework in Practice

To demonstrate how the framework may be applied in real-world settings, this section outlines illustrative use cases from within the organizational context of the case-company. While the framework is primarily diagnostic in nature, its value lies in how it can be actively applied within organizational settings to support sustainability integration. Below are two illustrative use cases, derived from the empirical data, demonstrating how the model can be used to initiate reflection, dialogue and targeted action.

1. Team-Based Workshop Assessment

A cross-functional team, such as representatives from logistics, manufacturing engineering and sourcing, can use the framework in a facilitated workshop to assess their current maturity in one or more focus areas. By jointly reading and discussing the qualitative indicators at each maturity level, team members can compare perceptions, uncover gaps and identify concrete steps toward improvement. For example, participants may realize that while CO₂ data exists, it is not yet influencing decision-making, suggesting a gap between technical availability and cultural integration. This kind of structured dialogue promotes shared understanding, builds ownership and can feed directly into local improvement initiatives or governance reviews.

2. Self-Assessment in Line Functions

Line managers or process owners may use the framework as a reflective tool to assess their own area's sustainability maturity. By reviewing the maturity indicators independently or with their teams, they can identify strengths and weaknesses in relation to strategy alignment, process support, and cultural engagement. For instance, a manufacturing engineering manager might recognize that lifecycle thinking is present in concept but lacks formal integration in decision protocols. This insight can help prioritize improvement efforts and guide requests for support or alignment with corporate goals.

These use cases illustrate how the framework can enable learning, alignment and context-aware action. Its structured yet flexible format allows adaptation to different organizational levels and settings, from strategic planning to daily operations. Together, the framework forms an integrated and adaptable tool designed to bridge the gap between strategic ambition and operational practice in sustainability work.

6.3 Case study limitations

Conducting a single-case study enabled an in-depth exploration of how sustainability integration unfolds within a specific industrial context. The chosen company offered a rich empirical setting, particularly through its ongoing transformation initiatives and clearly stated sustainability ambitions. However, the case study approach inherently limits the generalizability of the findings. While the insights may be transferable to similar industrial firms, they remain context-dependent and should be interpreted with caution when applied beyond this setting. The empirical material was primarily drawn from interviews with employees across the logistics, operations engineering, production and sustainability

departments. This cross-functional spread provided valuable perspectives on both strategic intentions and operational realities. Nevertheless, certain organizational functions, such as product development, sales and finance, were not included in the study. As a result, potential challenges or enablers linked to early-stage design decisions, customer interaction, or financial governance were not captured. Including these perspectives could have further enriched the understanding of cross-functional sustainability integration and the applicability of the maturity assessment framework.

6.4 Unanticipated findings

Beyond the core research questions, additional themes emerged during the study. These unanticipated findings point to dynamics that could be valuable to explore further in future research.

6.4.1 Small company within a large corporate group: A double-edged reality

A notable and interesting finding was the dual role played by the company's position as a small business unit within a large corporate group. This organizational setup, common in today's global industry due to ongoing consolidation and acquisitions - proved to be both a valuable asset and a limiting factor for sustainability integration. The group affiliation acts as an important enabler, providing access to shared resources, reporting structures, and long-term sustainability targets. At the same time, the corporate structure introduced challenges related to governance and influence. This tension underscores a broader challenge for industrial firms operating under similar conditions: How to balance the benefits of corporate scale with the need for local ownership and adaptability. Addressing this requires not only structural clarity but also deliberate mechanisms that empower site-level actors to interpret and act on sustainability goals in ways that are contextually grounded and operationally viable.

6.4.2 Sustainability: The silent quality in the eyes of the customer?

In the operational context of the case company, there's a clear momentum towards embedding sustainable considerations into daily operations. However, this internal drive is not mirrored by strong external pressure, particularly from customers. Instead, customer priorities remain centered on traditional dimensions like price, performance or reliability. This creates a dissonance in how quality is perceived and prioritized. In line with Martin et al. (2020), the company's efforts reflect an understanding of quality that goes beyond the individual end-user (quality-as-society-values). Still, customer perceptions remain focused on traditional value drivers, making it difficult to position sustainability as a meaningful quality attribute.

For clarity, the issue can be interpreted through the lens of the Kano model (Kano et al., 1984), illustrated in figure 6.1. The customer may currently see sustainability as an *indifferent* quality - something that does not noticeably affect satisfaction if present or absent - or in the worst case as a *reverse* quality. At the same time, internally within

the company, sustainability is treated as a *necessary* quality, essential for compliance and long-term resilience.

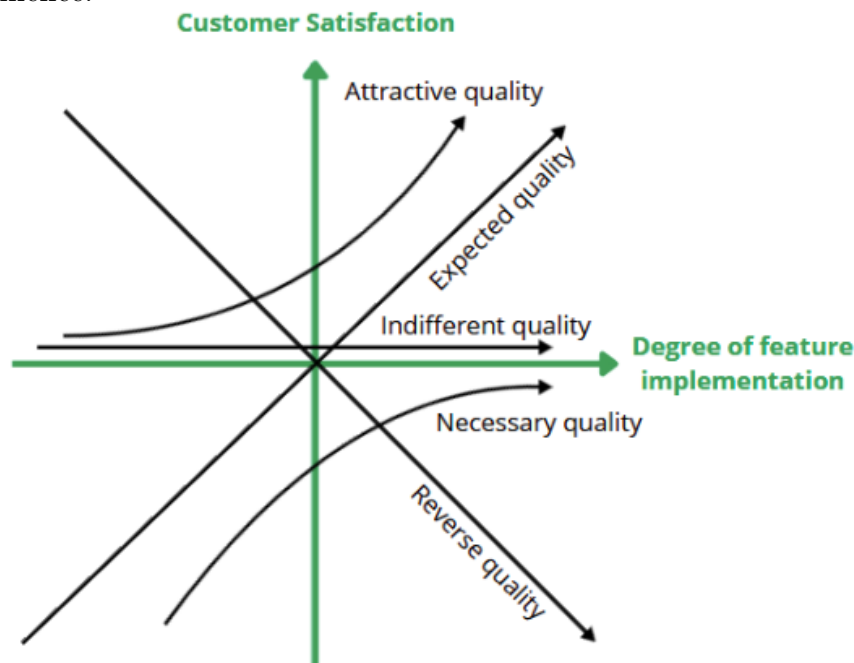


Figure 6.1: The Kano model

The key question lies in how to elevate sustainability to the status of an *attractive* or *expected* quality in the eyes of the customer, and highlights an area for further research. How can sustainability be repositioned as a source of differentiation or added value, rather than a constraint? The question becomes of great relevance for companies that seek to reach higher maturity stages, as the very essence of a highly mature organization is using sustainability not just to comply, but to compete and to shape the standards others aspire to.

7

Conclusion

This study set out to explore the organizational enablers and challenges that influence the integration of sustainability practices in an industrial firm (RQ1), as well as how sustainability maturity assessment can be used and tailored to support this integration (RQ2). The findings related to RQ1 indicate that sustainability integration is made possible in the case company by several organizational enablers such as strong strategic leadership, employee engagement, and the use of guiding tools like the R framework. These enablers contribute to a framing of sustainability as a shared responsibility within the organization rather than an isolated initiative. Lean practices were also found to support the integration and may serve as a strong foundation for embedding sustainability. Challenges with sustainability integration were also identified, with a prominent challenge being the lack of broken-down sustainability KPIs at team or departmental levels, limiting the ability for employees to act on high-level sustainability goals in their daily work. This is reinforced by limited access to relevant data, making it difficult to evaluate the impact of sustainability related efforts. The scope for advancing sustainability initiatives is at times also constrained by the customers' expectations, in particular when sustainability performance is not in demand. These challenges also cause traditional performance metrics such as cost, quality and delivery precision to continue to carry more weight in operational tasks.

In addressing RQ2 - how sustainability maturity assessment can be used to support integration - the study highlights the importance of tailoring the assessment framework to reflect operational realities. The proposed framework is designed to align with the company's existing logic and systems while addressing the key enablers and challenges within the organization. This ensures that the framework is both theoretically sound and useful in practice, allowing it to serve as an evaluation tool and a guide for development. Thus it supports organizations in identifying gaps and opportunities for progress and ultimately enabling sustainability to evolve as an integrated and continuously improving part of operations.

Finally, this study contributes to research by applying sustainability maturity principles in a real-life industrial context, offering empirical insights in how the principles can be used in practice while enriching the theoretical understanding of sustainability integration. For the case company, the identified enablers and challenges, along with the developed framework, provide a practical foundation for assessing current practices and guiding operational improvements toward effective sustainability integration.

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A

Appendix

The Appendix contains supplementary materials that support and complement the core content of this thesis. These materials include the interview guides used during both phases of data collection, as well as the self-assessment framework - including focus area, foundational lens and the following maturity indicators. Together, these documents offer transparency into the methodological process and provide additional context for the empirical foundation of the study. By making these materials accessible, the appendix contributes to the study's overall credibility and enables readers to further explore the structured approach behind the data collection and analysis. It also serves as a practical reference for researchers and practitioners interested in conducting similar assessments in industrial settings.

A.1 Interview guide

This interview guide was used during both phases of data collection and served as a foundation for semi-structured interviews with employees across different departments and hierarchical levels. The guide was designed to explore individual perspectives, experiences, and organizational conditions related to the integration of sustainability in daily operations.

1. Can you tell us about your role at this company and how long you've been working here?
2. Can you tell us about the current strategy and goals for the company, in terms of sustainability?
3. What does sustainability mean to you in your work position? What established measurements or KPIs do you work towards and use to assess how well you and your department are doing in terms of sustainability?
Follow-up: What is missing?
Follow-up: What strengthens the work today?
4. Do you feel that you and your department have the necessary skills and resources (e.g. time, tools, knowledge) to effectively work with sustainability initiatives? Can you provide examples?
5. What is your perception of how the sustainability strategy and goals influence your daily decision-making, operations, and processes?
Follow-up: Explore enablers and challenges.
6. Can you describe any specific challenges you have encountered during the integration of the sustainability strategy, and how these were addressed (or not addressed)?

7. How do you perceive the role of your management in driving and supporting sustainability initiatives? Are there specific actions or behaviors that make a difference?
8. Do you get consistent feedback or recognition for working toward or achieving sustainability goals?
Follow-up: How are you evaluated – as an individual, as a team, and by management?
(These questions aim to uncover to what degree employees feel that they have the possibility to work with sustainable initiatives at all. They might be locked into certain decisions, have no influence, or no autonomy to drive the matter.)
9. Do you conduct any kind of self-assessment – individually, as a team, or otherwise?
10. How do you collaborate with other departments or teams when working on sustainability initiatives? What works well, and what could be improved?
11. What is your perception of sustainable initiatives in terms of “top-down” communication?
12. What suggestions do you have for improving the integration of sustainability in your daily operations? What changes would you like to see implemented?
13. What potential challenges do you see to implementing a new sustainability assessment tool in your business?
14. Can you describe any opportunities or benefits that such a tool could bring to you and your team?

A.2 Self-assessment template with maturity indicators

The following table is intended to be used as a practical self-assessment tool based on the maturity indicators developed in this study. It allows respondents to rate their current maturity level (1–4) for each indicator and to briefly describe the reasoning or provide a motivation for their rating.

Table A.1: Self-assessment template for sustainability maturity

Focus Area	Foundational Lens	Maturity Indicator	Level (1–4)	Motivation / Comment
Leadership & Governance	Strategy & Leadership	Sustainability objectives are clearly defined, cascaded, and monitored by top management.		
Leadership & Governance	Processes & Tools	Governance structures and decision forums include sustainability as a recurring agenda item.		
Leadership & Governance	Employees & Engagement	Managers across levels actively promote sustainability and create space for bottom-up input.		
People & Culture Engagement	Strategy & Leadership	Employee sustainability engagement is linked to corporate strategies and values.		
People & Culture Engagement	Processes & Tools	Structured programs exist for sustainability awareness, onboarding, and training.		
People & Culture Engagement	Employees & Engagement	Employees are encouraged and recognized for initiating sustainability improvements.		
Business Ethics & Collaboration	Strategy & Leadership	Ethical principles include environmental and social sustainability dimensions.		
Business Ethics & Collaboration	Processes & Tools	Mechanisms exist to evaluate partners' sustainability performance and risks.		
Business Ethics & Collaboration	Employees & Engagement	Ethical dilemmas and sustainability concerns are openly discussed in teams and projects.		
Sustainable Operations	Strategy & Leadership	Operational sustainability targets are aligned with corporate sustainability goals.		
Sustainable Operations	Processes & Tools	Process controls, audits and KPIs include sustainability criteria (e.g. energy, waste).		
Sustainable Operations	Employees & Engagement	Operators and engineers understand how to reduce environmental impact in day-to-day work.		
Product Thinking	Strategy & Leadership	Sustainability is considered in design governance and product strategy decisions.		
Product Thinking	Processes & Tools	LCA or similar tools are used in development to assess lifecycle impact.		
Product Thinking	Employees & Engagement	Cross-functional teams reflect on lifecycle trade-offs during development.		
CO ₂ Metrics and Reduction	Strategy & Leadership	Quantified CO ₂ reduction goals are defined, owned, and followed up by decision-makers.		
CO ₂ Metrics and Reduction	Processes & Tools	Reliable CO ₂ data is integrated into tools used for planning and reporting.		
CO ₂ Metrics and Reduction	Employees & Engagement	CO ₂ considerations are routinely discussed in operational reviews and decisions.		
Efficient Resource Use	Strategy & Leadership	Resource efficiency is prioritized in investment decisions and continuous improvement.		
Efficient Resource Use	Processes & Tools	Data on material/energy usage is tracked, visualized, and used to guide actions.		
Efficient Resource Use	Employees & Engagement	Teams proactively identify and act on resource-saving opportunities.		
Lifecycle Optimization	Strategy & Leadership	Business models and strategies consider total environmental impact over lifecycle.		
Lifecycle Optimization	Processes & Tools	Tools and methods exist to assess end-of-life, reuse, or remanufacturing potential.		
Lifecycle Optimization	Employees & Engagement	Employees understand and support lifecycle-based decision-making.		
Resource Data and Tracking	Strategy & Leadership	Clear accountability exists for resource-related KPIs and data quality.		
Resource Data and Tracking	Processes & Tools	Systems provide accurate, timely data on materials, energy, and waste flows.		
Resource Data and Tracking	Employees & Engagement	Users trust, understand, and apply resource data in operational work.		

Table A.2: Sustainability self-assessment: Pillars, Current Levels, Motivations, and Improvement Actions

Pillar	Focus Area	Current Level (1–4)	Target Level (1–4)	Motivation for Current Level	Improvement Actions
People	Leadership & Governance				
People	People & Culture Engagement				
People	Business Ethics & Collaboration				
Climate	Sustainable Operations				
Climate	Product Lifecycle Thinking				
Climate	CO2 Metrics and Reduction				
Resources	Efficient Resource Use				
Resources	Lifecycle Optimization				
Resources	Resource Data and Tracking				

Table A.3: Summary of maturity assessment per pillar

Pillar	Total Sum	Maturity Level (1–4)
People		
Climate		
Resources		



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