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Organizing, Assessing, and Protecting Sustainable Innovation in Established Firms

Master's thesis in Management and Economics of Innovation

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Abstract

Sustainable innovation has become critical for established firms as climate change, resource scarcity, regulation, and shifting stakeholder expectations increasingly challenge existing ways of creating value. However, while firms recognize the strategic importance of sustainability, they often struggle to implement sustainable innovation in practice. Such initiatives are difficult to manage because they involve long time horizons, uncertain returns, systemic effects, high investment needs, and tensions between economic, environmental, and organizational priorities. This creates a central challenge: how can established firms organize, assess, and protect sustainable innovation during uncertainty when its value is often uncertain, long-term, and difficult to measure?

This thesis explores this challenge through a dynamic capabilities perspective, focusing on how firms sense sustainability-related opportunities, seize them through evaluation and resource allocation, and reconfigure structures, routines, and capabilities over time. The study follows a qualitative, abductive research design, combining a literature review with semi-structured interviews in established Swedish companies. The empirical material was analyzed through thematic analysis and a Gioia-inspired approach.

The findings show that sustainable innovation is not managed through one fixed structure, metric, or protection mechanism. Instead, firms balance integration into the core business with separation into exploratory spaces, supported by boundary-spanning roles, cross-functional interfaces, and temporary project structures. The study further finds that ROI remains important but is insufficient, as sustainable innovation is also assessed through strategic fit, customer value, sustainability impact, risk, learning, market access, and future option value. Finally, protecting sustainable innovation during uncertainty often means preserving critical capabilities, knowledge, relationships, and strategic options through slowing down, sequencing, relocating, or reconfiguring initiatives rather than simply continuing or abandoning them.

Keywords: Sustainable innovation, dynamic capabilities, ambidexterity, organizational structure, project assessment, organizational reconfiguration, protection mechanisms.

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1
Introduction

This chapter introduces the thesis by outlining the background and motivation for studying sustainable innovation in established firms. It first presents the increasing importance of sustainable innovation, the challenges firms face when implementing it, and the relevance of dynamic capabilities for understanding these challenges. The chapter then formulates the research problem, states the aim of the thesis, presents the research questions, and concludes by describing the study's limitations.

1.1 Background

Sustainable innovation has become increasingly important as firms face growing pressure from climate change, resource scarcity, stricter environmental regulation, and changing expectations from customers, investors, and other stakeholders (Cillo et al., 2019). However, this development also challenges the traditional understanding of innovation as a primarily economic activity aimed at growth, efficiency, and competitive advantage. Firms are increasingly expected to develop products, processes, services, and business models that reconcile economic, environmental, and social objectives. Cillo et al. (2019) continue to argue that sustainable innovation reflects this broader understanding of innovation, where firms are not only expected to secure competitive advantage, but also to contribute to environmental protection and social well-being. Similarly, sustainable innovation can be understood as the creation of new or improved products, services, processes, and organizational practices that improve performance across the three dimensions of sustainable development: economic, environmental, and social (Kneipp et al., 2019). This means that sustainable innovation is not limited to isolated green initiatives, but instead represents a strategic and systemic challenge concerning how firms create value, reduce harm, and adapt to changing societal and market conditions (Kneipp et al., 2019).

At the same time, the business value of sustainable innovation is not always straightforward. On the one hand, research suggests that sustainable innovation can strengthen competitiveness by increasing value creation, reducing costs, and improving non-financial assets such as reputation, differentiation, brand value, and access to new markets (Hermundsdottir & Aspelund, 2021). These benefits may arise when firms reduce resource use, lower emissions, improve energy efficiency, develop more attractive products, or respond more effectively to stakeholder and regulatory demands (Gürlek & Tuna, 2018; Tu & Wu, 2021). Tu and Wu

(2021) further show that green innovation can enhance competitive advantage through organizational learning, as firms develop and apply new knowledge that helps them turn sustainability strategies into concrete practices. On the other hand, these potential benefits do not automatically materialize. Schaltegger et al. (2012) emphasize that the business case for sustainability must be actively created through business model innovation and strategic integration, rather than assumed as a direct consequence of sustainability efforts. Sustainable innovation can therefore be seen both as an opportunity for efficiency, differentiation, learning, and long-term resilience, and as a managerial challenge that requires firms to convert broad sustainability ambitions into economically and organizationally viable practices.

Despite its strategic importance, sustainable innovation remains difficult to implement in practice. It often requires more than the development of isolated green products or process improvements; instead, it may demand changes in organizational values, routines, technologies, business models, stakeholder relationships, and value-creation logic (Kneipp et al., 2019). Tura (2018) argues that value creation for sustainability-oriented innovation is particularly difficult because firms must manage high levels of uncertainty and complexity, focus on system-level impacts, and balance value creation across multiple actors. These difficulties are reinforced by long time horizons, high investment requirements, unclear commercialization potential, and trade-offs between economic, environmental, and social objectives (Tura, 2018). From a resource-based perspective, Kneipp et al. (2019) show that firms' ability to eco-innovate depends on internal resources, competences, and dynamic capabilities, but that these factors may act both as drivers and barriers depending on the type of innovation. This is especially relevant for radical and systemic innovations, which often require stronger capabilities, more financial resources, external collaboration, and a greater ability to break with existing technological paths than incremental improvements (Kiefer et al., 2019). Implementation barriers are also organizational and behavioral. Gohoungodji et al. (2020) group barriers to green innovation into resource-related, behavioral, informational, technological, regulatory, and organizational categories, emphasizing that resource and behavioral barriers are particularly dominant. Thus, the main challenge is not simply whether firms recognize the need for sustainable innovation, but whether they can develop the capabilities, culture, coordination mechanisms, and long-term commitment required to make it part of organizational practice.

1.2 Problem Formulation

Given the increasing pressure on firms to respond to climate change, resource scarcity, regulatory demands, and changing stakeholder expectations, sustainable innovation has become a strategic priority for organizations seeking to combine economic value creation with environmental and social responsibility (Cillo et al., 2019; Kneipp et al., 2019). Previous research has shown that sustainable innovation can strengthen firms' competitiveness by reducing costs, improving resource efficiency, enabling differentiation, supporting organizational learning, and

creating long-term strategic value (Hermundsdottir & Aspelund, 2021; Tu & Wu, 2021). However, sustainable innovation also introduces significant managerial and organizational challenges. Unlike conventional innovation, it often involves long time horizons, uncertain returns, systemic effects, multiple stakeholders, and trade-offs between economic, environmental, and social objectives (Tura, 2018). This means that firms cannot rely only on traditional innovation routines or short-term financial logic when attempting to develop and implement sustainable innovation.

Dynamic capabilities provide a relevant theoretical lens for understanding how firms address these challenges, as they concern the ability to sense changes in the environment, seize emerging opportunities, and reconfigure resources, routines, and structures in response to changing conditions (Teece et al., 1997; Teece, 2007). Prior research has emphasized that resources, competences, and dynamic capabilities can influence firms' ability to pursue eco-innovation and sustainability-oriented innovation (Kiefer et al., 2019). However, the development and use of these capabilities in practice remains difficult, especially when sustainable innovation requires firms to move beyond existing mental models, dominant business concepts, established routines, and risk-averse organizational cultures (Assink, 2006; Börjesson & Elmquist, 2011).

Although the importance, drivers, barriers, and performance effects of sustainable innovation have received increasing academic attention, less is known about how established firms organize, assess, and protect sustainable innovation in practice. First, there is a need to better understand how firms structure sustainable innovation activities. Second, sustainable innovation often creates value that is long-term, intangible, systemic, or distributed across multiple stakeholders, which makes traditional financial metrics such as return on investment (ROI) insufficient as the sole basis for evaluation (Björk et al., 2023; Bonilla Berrocal et al., 2026). Third, limited attention has been paid to how organizations protect sustainable innovation during periods of financial pressure or uncertainty. Thus, a gap remains in understanding how organizations practically organize for sustainable innovation, how they assess its value beyond narrow financial metrics, and how they maintain or reconfigure such initiatives in bad times.

1.3 Aim

The aim of this thesis is to explore how established firms manage sustainable innovation by examining how they organize, assess, and protect sustainable innovation initiatives over time. More specifically, the thesis seeks to understand how firms structure sustainable innovation in relation to the core business, how they assess the value of such initiatives beyond traditional financial metrics, and how they maintain or reconfigure sustainable innovation during periods of financial pressure or uncertainty. By applying a dynamic capabilities perspective, the thesis aims to contribute to a deeper understanding of how firms prioritize and deploy the capabilities needed to turn sustainability ambitions into implemented and resilient innovation practices.

1.4 Research Questions

Based on the aim of this thesis, the study is guided by the following research questions:

- **RQ1:** How do established firms organize themselves to support sustainable innovation initiatives?
- **RQ2:** How do established firms assess the value of sustainable innovation initiatives beyond traditional financial metrics?
- **RQ3:** How do established firms protect or reconfigure sustainable innovation initiatives during periods of financial pressure or uncertainty?

1.5 Focus

This study is deliberately focused to provide in-depth, context-specific insights rather than statistically generalizable findings. As a qualitative study based on an abductive research approach and a limited number of interviews, the results are not intended to be statistically generalizable to a larger population. Instead, the study provides in-depth, context-specific insights into how selected organizations structure, assess, and protect sustainable innovation. In addition, the sample is limited to a relatively small number of established Swedish companies, primarily accessed through a cooperating organization and the supervisor's professional network, which may introduce a degree of selection bias and limit the diversity of perspectives included. While efforts were made to include respondents in significant organizational roles to ensure relevant and informed insights, the findings remain context-dependent and may not fully capture variations across industries or organizational types beyond those included in the study. Finally, although sustainable innovation is commonly understood as encompassing environmental, social, and economic dimensions, this thesis primarily focuses on environmentally sustainable innovation initiatives. As a result, the social dimension of sustainable innovation is not examined. However, the economic dimension remains relevant, particularly in relation to how organizations assess and justify sustainable innovation initiatives.

2
Theory

In this chapter, the theoretical foundations of the thesis are presented. The chapter covers dynamic capabilities and technological change, evaluation metrics beyond ROI for innovation and sustainable innovation, and the relationship between organizational structure and innovation.

2.1 Dynamic Capabilities

In this section, dynamic capabilities are introduced as a theoretical framework for understanding how firms respond to technological and sustainability-related change. The section discusses technological regimes, and the dynamic capabilities framework, sensing, seizing, and reconfiguring.

2.1.1 The Concept of Dynamic Capabilities

The concept of dynamic capabilities emerged as an extension of the Resource Based View (RBV) to explain how firms achieve and sustain competitive advantage in situations of rapid technological change and global competition (Wang & Ahmed, 2007; Teece et al., 1997; Teece, 2007). While the RBV traditionally concerns the ownership of scarce and difficult-to-imitate assets at a specific point in time, dynamic capabilities focus on the evolutionary nature of firm resources (Wang & Ahmed, 2007; Teece, 2007).

The dynamic capabilities framework was introduced by Teece et al. (1997) to explain how firms achieve and sustain competitive advantage in environments characterized by rapid technological change. While the traditional resource-based view emphasizes firm-specific, valuable, and difficult-to-imitate assets as the primary sources of competitive advantage, the dynamic capabilities perspective highlights the importance of continuously renewing and reconfiguring these assets in response to environmental shifts (Teece et al., 1997).

The relevance of dynamic capabilities is closely linked to Schumpeterian perspectives on innovation and competition. In a "Schumpeterian world" characterized by creative destruction, firms operate under conditions in which technological and competitive advantages are continuously challenged (Teece et al., 1997). Malerba and Orsenigo (1996) distinguish between two distinct patterns of innovative activity: Schumpeter Mark I and Schumpeter Mark II.

The Schumpeter Mark I pattern, described as a widening pattern, is characterized by creative destruction and relatively low barriers to entry (Malerba & Orsenigo, 1996). In such environments, entrepreneurs and new firms play a significant role, and the innovative base is continuously expanding.

In contrast, the Schumpeter Mark II pattern, or deepening pattern, is characterized by creative accumulation, with innovation concentrated in large, established firms and high barriers to entry (Malerba & Orsenigo, 1996). Innovation occurs through the cumulative development of technological and organizational capabilities over time.

Malerba and Orsenigo (1996) argue that these patterns are technology-specific and shaped by the underlying technological regime, defined by opportunity conditions, appropriability, and cumulativeness. Within such regimes, dynamic capabilities provide the managerial mechanisms through which firms navigate technological and competitive change, whether by sensing new opportunities in a Mark I environment or by orchestrating and reconfiguring complex asset bases in a Mark II environment (Teece, 2007).

2.1.2 Dynamic Capabilities as a Framework

Teece et al. (1997) define dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences to address changing environments. The framework is structured around three interrelated dimensions, often referred to as the "3 Ps": processes, positions, and paths (Teece et al., 1997). Processes refer to the way activities are conducted within the firm, including organizational routines and patterns of learning. Positions denote the firm's specific endowments, such as technological assets, intellectual property, complementary assets, and customer base. Paths describe the strategic alternatives available to the firm, which are shaped by its historical development and prior investments, reflecting path dependencies.

Building on this foundation, Teece (2007) further elaborates the microfoundations of dynamic capabilities by disaggregating them into three distinct but interrelated components: sensing, seizing, and reconfiguring.

2.1.2.1 Sensing

Sensing (and shaping) involves scanning, searching, and exploring across technological and market domains (Teece, 2007). It requires interpretative and creative managerial activities aimed at identifying and shaping new opportunities and threats.

2.1.2.2 Seizing

Seizing refers to the ability to mobilize resources to address identified opportunities through high-quality investment decisions and the selection of viable business models (Teece, 2007). This capacity depends on managerial judgment, particularly the ability to override dysfunctional decision rules and biases, such as excessive risk aversion.

2.1.2.3 Reconfiguring

Reconfiguring (or transforming) concerns the semi-continuous enhancement, combination, protection, and reconfiguration of tangible and intangible assets (Teece, 2007). This process of asset orchestration is necessary to prevent structural rigidities that may arise as firms grow and mature.

2.1.3 The Process Model: Sensing, Seizing, and Reconfiguring for Sustainability

The microfoundations of dynamic capabilities; sensing, seizing, and reconfiguring, described by Teece (2007), must be specifically adapted and extended to sustainable outcomes:

- Sensing Sustainability Opportunities: This involves systematically scanning the environment to detect changes in regulations, technologies, and customer demands related to sustainability (Hermundsdottir et al., 2024). It includes expanding the search scope to uncover new green opportunities and proactively seeking knowledge in unfamiliar sustainable markets.

- Seizing Sustainable Solutions: After identifying opportunities, firms must mobilize resources to capture value (Mousavi et al., 2017). This often requires; changes in one's business model, embedding sustainability within the firm's core value proposition and enabling cross-sector collaboration (Hermundsdottir et al., 2024; Mousavi et al., 2017; Firdaus et al., 2026)

- Reconfiguring for Transformation: This stage entails continuously renewing the firm's resource base to move beyond "business-as-usual" practices (Mousavi et al., 2017). Reconfiguration may be incremental or radical and can include establishing new internal divisions or divesting units that no longer align with sustainability objectives (Firdaus et al., 2026).

2.2 Organizational Structure and Innovation

This section presents the theoretical foundations of organizational structure and its relevance for innovation. Organizational structure constitutes a fundamental element of organizational design, shaping how roles, responsibilities, authority, communication flows, tasks, decision-making, coordination, and control are arranged within a firm (Iranmanesh et al., 2021). As such, structure influences how organizations process information, allocate resources, share knowledge, and respond to environmental change. These aspects are particularly important for innovation, which often requires adaptability, knowledge exchange, coordination, and cross-functional collaboration.

There is no universally optimal organizational structure; rather, structural effectiveness depends on the alignment between internal arrangements and

external environmental conditions (Iranmanesh et al., 2021). In dynamic and uncertain environments, such as innovation-driven contexts, structures must enable responsiveness and adaptability, while structures suited to stable environments may restrict innovation when organizations face technological change or shifting market conditions. Furthermore, Decanio et al. (2000) argue that an organizational structure is not static, but evolves over time in response to strategic priorities, technological developments, and environmental pressures. This dynamic perspective highlights that innovation outcomes are partly dependent on an organization's ability to adjust its internal structure to support new processes and capabilities.

2.2.1 Structural dimensions and their relationship to innovation

The literature identifies several core dimensions of organizational structure that influence innovation, including centralization, formalization, specialization, and integration (Kim, 1980; Iranmanesh et al., 2021). These dimensions provide a more nuanced understanding than simple categorizations of organizational forms.

2.2.1.1 Centralization

Centralization refers to the extent to which decision-making authority is concentrated at higher hierarchical levels. According to Kim (1980), high levels of centralization can reduce the autonomy of lower-level employees, thereby constraining the generation and implementation of innovative ideas. Kim (1980) further suggests that hierarchical authority and centralized control are inversely related to innovation, as they limit participation and slow the diffusion of new ideas.

However, the relationship between centralization and innovation is not uniform across all stages of the innovation process. Agbim (2013) argues that while decentralization may enhance idea generation by enabling broader participation, some degree of centralized coordination may facilitate implementation by aligning resources and reducing ambiguity. This suggests that optimal structural configurations may vary depending on whether the organization is engaged in exploration or exploitation activities.

2.2.1.2 Formalization

Formalization describes the extent to which organizational activities are governed by rules, procedures, and standardized processes. Kim (1980) suggests that high levels of formalization are traditionally associated with reduced flexibility and creativity, as rigid procedures can constrain experimentation and limit deviations from established routines.

Nevertheless, formalization can also support innovation under certain conditions. Iranmanesh et al. (2021) find that formalization may positively influence innovation capability by providing clarity, coordination, and consistency during implementation phases. This dual role suggests that formalization can either inhibit or enable

innovation depending on its design and application. Excessive rigidity may suppress creativity, whereas enabling forms of formalization can facilitate the scaling and institutionalization of innovations.

2.2.1.3 Specialization and complexity

Specialization refers to the degree to which tasks are divided into distinct roles requiring specific expertise. While high specialization can lead to fragmentation and siloed knowledge, Iranmanesh et al. (2021) suggest that specialization can also enhance innovation capability by strengthening the depth of expertise within the organization. Similarly, Kim (1980) indicates that professional training and specialization are positively associated with innovation, as they provide the technical capabilities required to develop complex solutions. However, specialization alone is insufficient to drive innovation. The effectiveness of specialized knowledge depends on the organization's ability to integrate diverse perspectives and facilitate cross-functional collaboration. Without such integration, specialized knowledge may remain isolated, limiting its contribution to innovation outcomes (Iranmanesh et al., 2021; Kim, 1980).

2.2.1.4 Integration and link mechanisms

Integration refers to the mechanisms that coordinate activities across organizational units (Kim, 1980). These mechanisms include cross-functional teams, communication channels, liaison roles, and informal networks. Integration is consistently identified as a critical driver of innovation, as it enables the combination of knowledge from different domains.

Recent research further emphasizes the role of informal social relations and link mechanisms in fostering innovation. Iranmanesh et al. (2020) demonstrate that informal interactions and cross-functional linkages enhance knowledge sharing and collaboration, thereby strengthening innovation capability. Similarly, network-based perspectives highlight that internal communication structures influence the speed and effectiveness of innovation diffusion within organizations (Decanio et al., 2000).

2.2.2 Boundary Spanning in Organizations

This section reviews the concept of boundary spanning and its relevance for organizations operating across functional, professional, geographical, and institutional boundaries. The section first conceptualizes boundaries and boundary spanning, before discussing boundary roles as a way for knowledge translation and coordination. Finally, it connects boundary spanning to sustainable innovation by highlighting its role in learning, organizational change, and the movement of ideas across organizational interfaces.

2.2.2.1 Conceptualizing Boundaries and Boundary Spanning

Boundary spanning has become an important concept in organization theory because contemporary organizations increasingly operate across functional, professional, geographical, cultural, and institutional boundaries. In general, boundary spanning refers to the activities through which individuals or groups connect otherwise separated domains in order to enable communication, coordination, knowledge sharing, and joint problem solving (Schotter et al., 2017). According to Schotter et al. (2017), boundary spanning in global organizations consists of communication and coordination activities performed within and between organizations to integrate work across multiple cultural, institutional, and organizational contexts. This definition is particularly relevant in complex organizations, where knowledge and decision-making are distributed across units, locations, and stakeholder groups, making coordination across boundaries a central organizational capability (Schotter et al., 2017).

A key contribution of the boundary spanning literature is that it challenges the view of organizations as clearly bounded and internally coherent entities. Schotter et al. (2017) argue that boundaries are not only formal divisions such as departments, hierarchies, or national borders, but may also be based on language, professional identity, culture, institutional differences, and cognitive frames. Boundaries therefore both divide and identify: they separate groups from each other while simultaneously creating internal cohesion and a sense of "us" versus "them" (Schotter et al., 2017). This dual function explains why boundary spanning can be difficult. Strong internal group identities may support coordination within a unit, but they can also make it harder for outsiders to connect, exchange knowledge, or establish trust (Schotter et al., 2017).

2.2.2.2 Boundary Roles as Knowledge Translation and Coordination

Boundary spanning is often performed by individuals who act as brokers, mediators, translators, or connectors between different groups (Goodrich et al., 2020). Goodrich et al. (2020) describe boundary spanners as actors who operate between knowledge production and knowledge use, particularly in contexts where scientific, practical, and policy-related knowledge must be integrated. These actors may connect knowledge producers and users, organize interaction, mediate between interests, build trust, support co-production, and help transform knowledge into forms that are useful for specific decision contexts (Goodrich et al., 2020). In this sense, boundary spanning is not merely about transferring information, but about making knowledge actionable across different organizational and professional worlds.

The importance of translation is highlighted by Gluch et al. (2013), who show that knowledge is embedded in practices, tools, routines, and professional discourses, meaning that it cannot simply be moved from one group to another without interpretation. For knowledge sharing to occur across community boundaries, actors must be willing to adapt their language and modes of communication to other groups. Their findings show that knowledge sharing was most effective when researchers and practitioners worked together in a concrete pilot project, where shared tasks

and mediating tools created opportunities for interaction and learning (Gluch et al., 2013). However, the same study also shows that arenas for boundary spanning do not automatically create cross-boundary learning. Researchers tended to interact mainly with researchers, while practitioners interacted mainly with practitioners, suggesting that existing professional boundaries can be reproduced even in formal collaboration settings (Gluch et al., 2013).

Cross et al. (2013) add a network perspective by arguing that formal organizational charts often fail to show how work actually gets done. Instead, informal networks of collaboration, influence, advice, and knowledge exchange often determine whether organizational change succeeds. Boundary spanning leadership is therefore defined as the capability to create direction, alignment, and commitment across boundaries in pursuit of a broader goal (Cross et al., 2013). This is particularly important in complex change efforts, where top-down approaches often fail because they underestimate interdependencies between departments and over-rely on formal authority. Boundary spanning networks can help organizations identify connectors, experts, brokers, and energizers who already occupy influential positions in informal networks and can support change across silos (Cross et al., 2013). At the same time, Cross et al. (2013) note that informal networks can also slow change when influential actors resist initiatives or perceive them as threatening, meaning that boundary spanning networks are not inherently beneficial unless they are understood and managed carefully (Cross et al., 2013).

2.2.2.3 Boundary Spanning and Organizational Tensions

Boundary spanning is closely related to innovation, learning, and organizational change because it enables organizations to combine diverse knowledge and translate ideas across different contexts (Cross et al., 2013; Gluch et al., 2013; Schotter et al., 2017). This is particularly relevant for sustainable innovation, since sustainability-oriented initiatives often require input from multiple functions, disciplines, and external stakeholders (Gluch et al., 2013; Goodrich et al., 2020). Schotter et al. (2017) emphasize that in global organizations, the ability to span internal and external boundaries is necessary for coordinating dispersed activities and leveraging knowledge across subsidiaries and local contexts. Similarly, (Goodrich et al., 2020) argue that boundary spanning contributes to more usable knowledge, improved relationships across sectors, and more productive collaboration.

The role of the boundary spanner can also create tensions at the individual level. Goodrich et al. (2020) argue that boundary spanners are often expected to be communicators, facilitators, translators, analysts, relationship builders, and content experts, even though many of these skills are not formally taught or included in job descriptions. This can create role ambiguity and professional strain, particularly when boundary spanning is treated as an additional task rather than a recognized organizational function (Goodrich et al., 2020). Thus, while boundary spanning can improve collaboration and knowledge use, it also requires deliberate training, evaluation, and institutional support to avoid overburdening individuals and making the work invisible (Goodrich et al., 2020).

2.2.3 Organizational Ambidexterity

This section introduces organizational ambidexterity as a theoretical concept to gain an understanding of how organizations manage the tension between improving existing operations and developing new capabilities. The section first conceptualizes ambidexterity through the distinction between exploration and exploitation. It then discusses the main ways in which ambidexterity can be achieved, before connecting the concept to innovation, organizational structure, and networking capabilities.

2.2.3.1 Conceptualizing Ambidexterity

Organizational ambidexterity has gained prominence in the innovation literature as a way of explaining how organizations can manage the tension between exploration and exploitation. According to O'Reilly and Tushman (2013), exploration refers to activities associated with search, experimentation, autonomy, flexibility, and the development of new knowledge, while exploitation refers to efficiency, refinement, control, implementation, and the use of existing capabilities. Ambidextrous organizations are therefore able to pursue new opportunities while simultaneously leveraging and improving existing resources and competencies (Raisch et al., 2009).

The central challenge of ambidexterity is that exploration and exploitation rely on different organizational logics. Exploitation supports short-term performance by improving current products, processes, and routines, whereas exploration supports long-term renewal by enabling experimentation and adaptation to future changes (O'Reilly & Tushman, 2013). Chakma et al. (2024) argue that organizations that focus too heavily on exploitation may fall into a "success trap," where existing competencies create inertia and reduce adaptability. Conversely, excessive focus on exploration may lead to a "failure trap," where experimentation does not translate into stable capabilities or performance outcomes (Chakma et al., 2024).

2.2.3.2 Forms of Ambidexterity

The literature identifies several approaches through which organizations can achieve ambidexterity. According to Raisch et al. (2009), structural ambidexterity involves separating exploratory and exploitative activities into different organizational units. This allows each unit to develop structures, processes, cultures, and performance systems suited to its specific purpose. Exploratory units can be more flexible and experimental, while exploitative units can focus on efficiency, control, and refinement (Raisch et al., 2009). However, structural separation also creates a need for integration, since new knowledge generated in exploratory units must eventually be connected to the existing organization in order to create value (Raisch et al., 2009).

A second approach is contextual ambidexterity. Rather than separating exploration and exploitation into different units, contextual ambidexterity refers to an organizational context in which individuals are enabled to divide their time and attention between alignment and adaptability. According to O'Reilly and Tushman (2013), this approach depends on systems, leadership, and cultures that allow

employees to contribute both to the improvement of existing activities and to the identification of new opportunities. A third approach is sequential ambidexterity, where organizations shift between periods of exploration and exploitation over time as strategic and environmental conditions change (O'Reilly & Tushman, 2013).

Raisch et al. (2009) argue that these approaches should not be understood as mutually exclusive. Instead, ambidexterity often requires a combination of differentiation and integration. Differentiation protects activities with different demands, while integration ensures that knowledge, resources, and outcomes can be recombined across the organization (Raisch et al., 2009).

2.2.3.3 Ambidexterity, Innovation, and Networks

Ambidexterity is particularly relevant for innovation because innovation requires both the generation of new ideas and the ability to implement and scale them. According to O'Reilly and Tushman (2013), ambidextrous organizations are able to compete in mature markets, where efficiency and incremental improvement are important, while also competing in emerging markets, where experimentation and flexibility are necessary. This makes ambidexterity especially valuable in uncertain environments where firms must preserve current performance while adapting to technological and market changes (O'Reilly & Tushman, 2013).

From a structural perspective, ambidexterity may be achieved through differentiated units, temporal separation of activities, or integrative mechanisms that enable both modes of operation within the same organizational context. Tikas (2025) extends this discussion by conceptualizing ambidextrous networking capability as consisting of exploration, exploitation, and engagement. These dimensions capture the organization's ability to acquire new knowledge, apply it effectively, and coordinate collaborative efforts across internal and external networks (Tikas, 2025).

2.3 Evaluation Metrics Beyond ROI in Innovation and Sustainable Innovation

This section reviews the literature on alternative approaches to evaluating innovation beyond ROI. It begins by outlining the conceptual foundations and limitations of financial metrics in innovation contexts, followed by a discussion of multidimensional innovation measurement frameworks. It then explores evaluation approaches specific to sustainable and social innovation, emphasizing the need for qualitative, participatory, business model-oriented, and system-oriented methods.

2.3.1 Conceptual Foundations of Innovation Evaluation

The evaluation of innovation has long posed a challenge for both scholars and practitioners, as innovation processes are characterized by uncertainty, complexity, and long-term development cycles (Björk et al., 2023). Traditional performance

metrics, particularly financial indicators such as return on investment (ROI), have historically dominated managerial evaluation frameworks. However, Björk et al. (2023) argue that such measures are insufficient for capturing the broader and often qualitative value generated by innovation. This limitation becomes especially evident in the context of sustainable innovation, where value creation extends beyond economic performance to include ecological and social dimensions (Boons et al., 2013). Innovation outcomes may therefore be intangible, delayed, systemic, and distributed across multiple stakeholders, making purely financial assessments reductive and potentially misleading (Björk et al., 2023; Boons et al., 2013).

This broader understanding of value also shifts the unit of analysis. Rather than evaluating innovation only as an isolated product, technology, or project, sustainable innovation may need to be assessed in relation to the business model through which value is created, delivered, captured, maintained, and distributed (Boons et al., 2013; Schaltegger et al., 2016; Lüdeke-Freund et al., 2024). Schaltegger et al. (2016) argue that conventional approaches such as philanthropy, corporate social responsibility, and technological product or process innovation are often insufficient for achieving substantive sustainability transformations. Business models therefore become important because they connect innovation to organizational purpose, stakeholder relationships, value creation mechanisms, and the wider social and ecological systems in which firms operate.

2.3.2 Limitations of ROI in Innovation Evaluation

ROI and similar financial metrics are grounded in assumptions of predictability, short-term returns, and measurable outputs. These assumptions are often incompatible with innovation, which Björk et al. (2023) describe as uncertain, difficult to benchmark, and dependent on both quantitative and qualitative forms of assessment. Since innovation processes often involve non-linearity and long development cycles, financial returns may not materialize until well after initial investments are made. Consequently, reliance on ROI can disadvantage early-stage, radical, and exploratory innovation projects that may generate substantial long-term value but lack immediate financial justification.

Financial metrics are also inherently retrospective, as they focus on realized outcomes rather than the processes and capabilities that enable innovation. Björk et al. (2023) emphasize that innovation measurement should include not only results measures, but also input measures and current situation measures that capture innovation potential and ongoing activity. A narrow focus on financial outcomes may therefore overlook critical antecedents of innovation success, such as knowledge development, experimentation, and organizational learning. As a result, firms risk underinvesting in activities that are essential for sustaining innovation over time.

Another key limitation concerns the bias toward quantifiable outcomes. Björk et al. (2023) identify this as an availability bias, where organizations select measures that are already available or easy to calculate rather than those that best capture

innovation impact. This can lead to an overemphasis on efficiency and output metrics, while neglecting more intangible cultural, behavioral, and strategic dimensions of innovation performance.

These limitations are amplified in the context of sustainable and social innovation. Bonilla Berrocal et al. (2026) argue that sustainable innovation involves ecological, social, and economic dimensions, which makes it broader than conventional financial performance. Many outcomes associated with sustainable and social innovation, such as environmental improvement, social inclusion, stakeholder empowerment, and changes in consumption or production systems, are difficult to monetize and cannot be adequately captured through traditional financial indicators. Although monetization-based frameworks such as Social Return on Investment attempt to translate social outcomes into financial terms, Bonilla Berrocal et al. (2026) argue that such approaches risk oversimplifying complex, intangible, and context-dependent forms of impact.

2.3.3 A Multidimensional Perspective on Innovation Measurement

In response to the limitations of financial metrics, the innovation literature has increasingly advocated for a multidimensional approach to measurement. Björk et al. (2023) distinguish between input measures, current situation measures, and results measures, thereby emphasizing that innovation performance should be assessed across enabling conditions, ongoing activities, and achieved outcomes.

Input measures capture a firm's capacity for innovation and include indicators such as the number of ideas generated, resource allocation, and access to relevant competencies (Björk et al., 2023). Since these measures are forward-looking, they provide insight into the organization's potential to innovate rather than only its realized outcomes. *Current situation measures* focus on ongoing innovation activities, including project progression, time allocation, and the distribution of projects across different stages of development (Björk et al., 2023). These measures enable real-time monitoring and management of innovation efforts. *Results measures*, by contrast, assess the outcomes of innovation and may include indicators such as time-to-market or the share of revenue derived from new products. Taken together, these measures are used to assess innovation holistically across multiple organizational dimensions (Björk et al., 2023).

This classification underscores the need to balance leading and lagging indicators. While results measures are necessary for accountability, input and current situation measures are critical for understanding and improving innovation performance over time (Björk et al., 2023). In sustainable innovation projects, this distinction is particularly important because sustainability outcomes may depend on changes in organizational routines, stakeholder relationships, business model activities, and user behavior before measurable ecological or social effects become visible. Focusing exclusively on results may therefore lead organizations to overlook the underlying

drivers of innovation success.

2.3.4 Strategic Alignment and Organizational Context

Metrics are not inherently meaningful; their relevance depends on how well they reflect the organization's innovation objectives (Björk et al., 2023). Firms should therefore "start with strategy, not metrics", ensuring that measurement systems are aligned with the desired direction of innovation efforts. This alignment is particularly important when evaluating different types of innovation. For example, organizations pursuing radical or sustainability-oriented innovation may need to prioritize measures related to experimentation, learning, stakeholder engagement, ecosystem collaboration, and business model transformation. In contrast, firms focused on incremental innovation may emphasize efficiency and time-to-market. Thus, evaluation frameworks must be context-specific and adaptable rather than standardized.

Moreover, innovation measurement is not purely a technical exercise but an organizational one (Björk et al., 2023). It requires cross-functional coordination, clear ownership, and integration with existing performance management systems. This is especially relevant for sustainable innovation, as business models for sustainability often require changes that extend beyond individual projects and involve supply chains, customers, partners, and broader stakeholder networks (Schaltegger et al., 2016). Without organizational buy-in, even well-designed metrics may fail to influence behavior or decision-making.

2.3.5 Evaluating Sustainable Innovation through the Business Model

Sustainable innovation introduces additional complexity to the evaluation process by expanding the scope of value creation beyond economic performance. Boons et al. (2013) define sustainable innovation as innovation that improves sustainability performance across ecological, social, and economic dimensions. This broader definition implies that evaluation must consider multiple forms of value simultaneously.

A central concept in this context is the business model, which provides a framework for understanding how value is created, delivered, and captured. According to Boons et al. (2013), sustainable business models consist of three key elements: the value proposition, the configuration of value creation, and the distribution of costs and benefits. These elements offer a way for evaluating sustainable innovation. Schaltegger et al. (2016) extend this perspective by defining business models for sustainability as models that describe, analyze, manage, and communicate a sustainable value proposition to customers and other stakeholders, how this value is created and delivered, and how economic value is captured while maintaining or regenerating natural, social, and economic capital beyond organizational boundaries.

This implies that evaluation should not only ask whether a sustainable innovation project generates financial returns, but also whether it changes the organization's value logic in ways that contribute to sustainability. The value proposition can be assessed in terms of its contribution to environmental and social goals, in addition to economic benefits (Boons et al., 2013). The configuration of value creation highlights the firm's relationships with stakeholders, including suppliers, customers, partners, and users, emphasizing the systemic nature of sustainable innovation. Finally, the distribution of costs and benefits addresses issues of fairness, responsibility, and long-term viability across the value network.

Recent research further deepens this perspective by conceptualizing business models for sustainability as activity systems. Lüdeke-Freund et al. (2024) argue that sustainable business models can be understood through specific activities, design themes, and value functions. In this view, the sustainability of a business model depends not only on what value is proposed, delivered, and captured, but also on how activities are organized around sustainability-oriented purposes. They identify three overarching value functions: *maintaining value*, *unlocking value*, and *sharing value*. Maintaining value concerns preserving or regenerating natural resources, ecosystem functions, materials, products, and infrastructures. Unlocking value refers to enabling sustainable value creation beyond the focal organization, for example by influencing user behavior, purchasing behavior, or access to sustainable offerings. Sharing value involves ensuring that the benefits of value creation are distributed equitably and responsibly among stakeholders.

These value functions provide useful evaluation dimensions for sustainable innovation projects. Projects can be assessed by how they contribute to resource efficiency, circularity, sustainable market adoption, and broader stakeholder value (Lüdeke-Freund et al., 2024). This shifts evaluation from a narrow assessment of project outputs toward a broader assessment of how the project contributes to sustainable value creation across the organization and its stakeholder network.

Because sustainable innovation often involves systemic change and long-term transitions, its outcomes may not be immediately observable (Börjesson & Elmquist, 2011). This reinforces the need for evaluation approaches that are forward-looking, qualitative, participatory, and sensitive to context. Incremental improvements can be measured relatively easily, but radical and system-level innovations require broader and more flexible evaluation frameworks that capture not only economic performance, but also business model transformation, stakeholder value, and contributions to ecological and social sustainability.

2.4 Summary of the Theoretical Framework

This thesis uses dynamic capabilities as the overarching theoretical lens for understanding how established firms manage sustainable innovation. The framework builds on the three capabilities of sensing, seizing, and reconfiguring, and connects them to the thesis' three analytical dimensions: organizing, assessing, and protecting

sustainable innovation. An overview of the theoretical framework, and its connection to the study are illustrated in Figure 2.1.

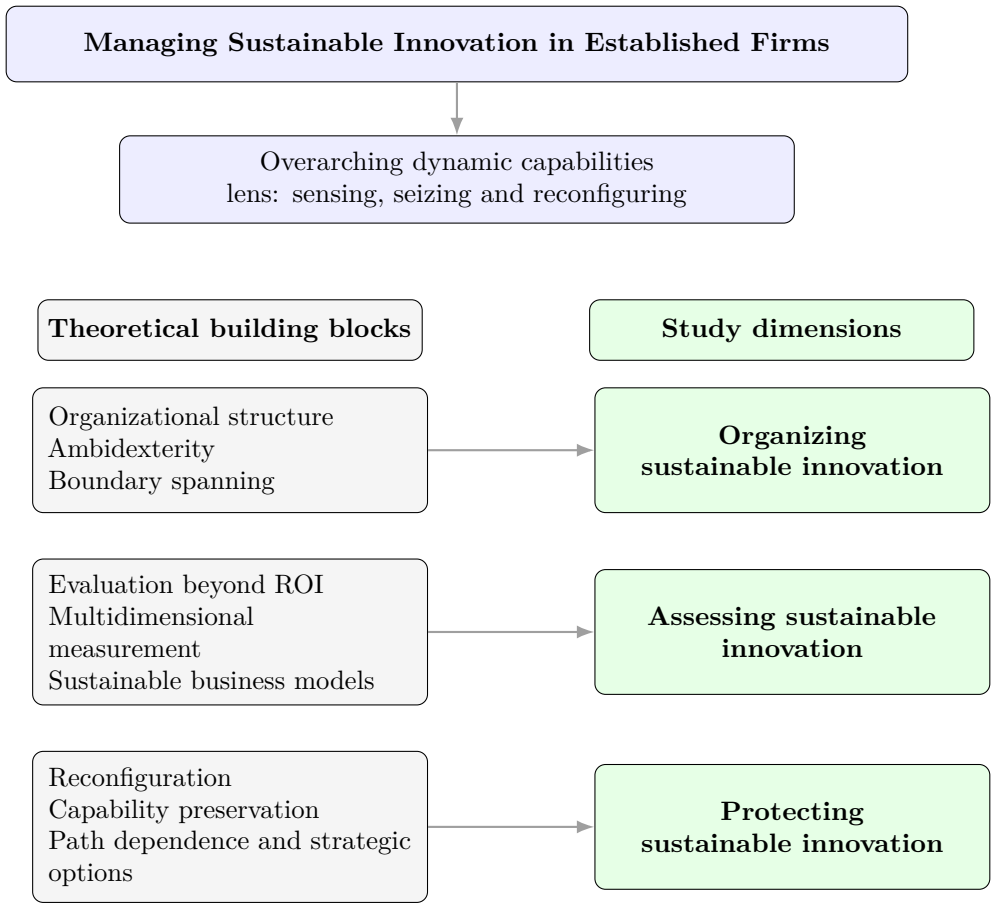

Figure 2.1: An overview of the theoretical framework connecting the main theoretical concepts to the analytical dimensions of the study.

3
Methodology

In this chapter, the methodological approach of the study is presented. The chapter outlines the abductive and qualitative research design, the process used to conduct the literature review, and the design and execution of the interview study. It further describes how the empirical data was analyzed through thematic analysis and the Gioia methodology, before addressing research quality, ethical considerations, and the use of AI as a supporting tool.

3.1 Research Approach

In business research, the research approach refers to the overall strategy guiding a project, encompassing its philosophical assumptions, the relationship between theory and empirical research, and the methods used for data collection and analysis (Bell et al., 2022). As such, defining the research approach constitutes a crucial initial step, since it establishes the foundation upon which all subsequent methodological choices are built. A clearly articulated approach ensures that the researcher's underlying assumptions are consistent with the selected methods, which is essential for producing valid and credible claims about the business world. Without this alignment, there is a risk that the findings may lack coherence or fail to adequately address the research problem, thereby weakening the overall contribution of the study (Bell et al., 2022).

Three primary logics of inquiry are commonly identified in business research: the deductive, inductive, and abductive approaches, each of which differs in how it conceptualizes the relationship between theory and empirical observation (Bell et al., 2022). The deductive approach, often regarded as the most traditional and widely used, begins with existing theory and knowledge within a given domain, from which the researcher derives hypotheses that are then subjected to empirical testing through a structured and linear process moving from theory to hypotheses, data collection, and findings, ultimately leading to the confirmation or rejection of hypotheses and potential revision of theory. This approach is typically associated with quantitative research and a positivist epistemology. In contrast, the inductive approach reverses this logic by treating theory as the outcome rather than the starting point of research, where the researcher begins with empirical observations and develops broader theoretical insights from these findings, often through an iterative process that involves moving back and forth between data and emerging concepts, and is commonly linked to qualitative research and a focus on how individuals interpret

their social world (Bell et al., 2022). The abductive approach, which has gained increasing prominence, seeks to overcome limitations associated with both deduction and induction by adopting a pragmatist perspective, acknowledging that researchers may encounter empirical phenomena that cannot be adequately explained by existing theories. It typically starts with a surprising or puzzling observation and involves a continuous process of engaging with both empirical data and theoretical frameworks often described as "dialectical shuttling" in order to identify the most plausible explanation among competing interpretations (Bell et al., 2022).

Given the purpose of this study, an abductive research approach is adopted, drawing on the concept of systematic combining as described by Dubois and Gadde (2002). According to the authors, this approach represents a distinct logic of inquiry in which the theoretical framework, empirical fieldwork, and case analysis evolve simultaneously, rather than following a linear sequence. Abduction is therefore not simply a combination of deductive and inductive reasoning, but a process aimed at refining existing theories through continuous engagement with empirical observations. Dubois and Gadde (2002) describe this as a nonlinear and path-dependent process, characterized by ongoing movement between the empirical world and the model world. The study begins with preconceptions derived from existing literature, forming an initial framework that is "tight" yet flexible, as it is continuously adjusted in response to empirical findings. In this way, the approach enables a structured but adaptable process in which theoretical constructs are progressively aligned with observed reality.

The selection of an abductive approach is further motivated by its suitability for theory development and for addressing complex research problems. According to Dubois and Gadde (2002), the approach facilitates analytical inference by allowing the researcher to explore interdependent variables within their specific context, rather than relying on statistical generalization. It also supports the discovery of "active data," meaning that the researcher remains open to unexpected findings and previously unrecognized aspects of the phenomenon under study. Moreover, the authors emphasize that the ultimate objective is to achieve a "matching" between theory and reality through continuous interaction with both empirical material and existing literature, often described as dialectical shuttling. This process also provides flexibility to redirect the study when empirical observations challenge initial assumptions, while maintaining logical coherence and parsimony through iterative refinement of the theoretical framework.

A distinction is commonly made between qualitative and quantitative research as two general orientations in business research. According to Bell et al. (2022), these approaches differ in their relationship to theory, epistemological stance, and ontological assumptions. Quantitative research is typically deductive, focused on testing existing theories, and grounded in a positivist view of an objective social reality. In contrast, qualitative research is generally inductive, emphasizing theory generation, and is associated with an interpretivist perspective that views reality as socially constructed through human interaction. In this study, a qualitative approach is considered appropriate due to its focus on gaining an in-depth understanding of

behavior and meaning within a specific context, rather than producing generalizable results. It is particularly suitable for exploratory research and for addressing "how" and "why" questions, where insight into processes and interpretations is central.

According to Bell et al. (2022), qualitative research typically follows a set of interconnected steps, although the process is iterative rather than strictly linear. It begins with broad research questions, followed by the selection of relevant sites and participants to ensure rich and meaningful data. Data collection is then conducted, often through interviews or observations in natural settings, after which the material is interpreted to identify patterns and meanings. This leads to conceptual and theoretical development, where research questions may be refined and additional data collected to deepen emerging insights. Finally, the findings are written up, presenting the conclusions of the study. This iterative process allows for continuous interaction between data and theory, ensuring that the research remains grounded in the empirical context.

3.2 Literature Review

To ensure a rigorous and transparent foundation for the study, the literature review followed a structured and systematic process to identify and evaluate existing research on dynamic capabilities, sustainable innovation, organizational structuring, ambidexterity and evaluation of sustainable innovation. Since this study followed an abductive approach, the initial literature review was carried out at an early stage, prior to the development of general research questions and the design of interviews. According to Dubois and Gadde (2002), an abductive research process involves an ongoing interaction between engagement with existing literature and empirical data collection as mentioned. Accordingly, the literature review was not a one-time activity but was revisited continuously and developed in parallel with the interviews as new insights and perspectives emerged throughout the study.

The literature search was conducted using academic databases provided by Chalmers Library, mainly Scopus, as well as an AI tool called Research Rabbit and Google Scholar. Search terms were derived from the research focus and applied both individually and in combination to capture a broad yet relevant range of studies. Wildcards were also used to capture variations of key terms related to the thesis by allowing searches to include different word endings and related forms, such as "innovation", "innovative", and "innovating" (Bell et al., 2022). The keywords used included, but were not limited to: Dynamic Capabilities, Sustainable Innovation, Organization Structures, Ambidexterity, Evaluating Sustainable Innovation.

Following the initial search, a multi-stage screening process, which was described by Bell et al. (2022), was applied. Titles and abstracts were reviewed to assess relevance to the thesis. The remaining articles were then examined in full to evaluate their methodological quality and theoretical relevance. This thorough reading determined which specific frameworks and theories were utilized to form the basis of the theoretical framework of the thesis.

3.3 Interview Study

According to Bell et al. (2022), interviews in business research are generally divided into three types: structured, unstructured, and semi-structured interviews. Structured interviews, also referred to as standardized interviews, follow a fixed set of questions asked in the same order to all respondents, usually with closed-ended response options and are mainly associated with quantitative research due to their emphasis on comparability and reduced interviewer influence. Unstructured interviews, in contrast, are highly flexible and informal, relying on broad themes rather than predetermined questions with the interviewer adapting both the wording and sequence of questions during the conversation. This format is typically used in qualitative research to explore topics in greater depth. Semi-structured interviews combine elements of both approaches by using an interview guide based on key themes while allowing flexibility in question order and the inclusion of follow-up questions depending on the respondent's answers. In this study, semi-structured interviews were chosen because they provide a balance between structure and flexibility, ensuring that relevant topics are consistently covered while still allowing room for new and unexpected insights to emerge during the interviews. As noted by Bell et al. (2022), this makes them particularly suitable for qualitative research aimed at understanding how individuals interpret their social world, as well as for addressing "how" and "why" questions that require depth and exploration of underlying meanings and processes.

Two interview guides were developed in line with the abductive research design and the evolving nature of the study. The first interview guide was used in the exploratory phase and was primarily aimed at gaining a broad understanding of the interviewees, their organizations, the surrounding context, and how they work with sustainable innovation. This interview Guide can be found in Appendix A. In this initial stage, the questions were deliberately formulated in a broad and open manner in order to encourage participants to describe their experiences freely without being guided toward specific theoretical concepts. Although the themes were indirectly connected to ideas later associated with dynamic capabilities, this terminology was intentionally avoided to prevent steering the interviewees in a particular direction or imposing pre-existing frameworks on their responses. Instead, the focus was on allowing relevant aspects of practice to emerge naturally from the data.

As the study progressed, a second interview guide was developed for a more in-depth phase of data collection. This guide was structured around three main thematic areas derived from the emerging analysis and relevant theoretical perspectives. This interview guide can be found in Appendix B. The questions in this stage were more focused but still formulated in a general way to allow interviewees to interpret and elaborate on the themes in their own terms. This design also enabled the use of follow-up questions during the interviews, allowing for further probing and clarification of important points raised by the respondents. In this way, the

second interview guide supported a more targeted exploration of key issues while still maintaining the flexibility required in a qualitative, abductive research process.

The study primarily applied a purposive sampling approach, as described by Bell et al. (2022), whereby participants were selected based on their relevance to the research purpose and their roles and responsibilities in relation to sustainable innovation. In this study, this meant that established, larger companies were included and that respondents held senior or specialized positions connected to sustainability, innovation, strategic development, business technology, product management, or industry practice. These roles gave them insight into how sustainable innovation is structured, assessed, prioritized, and protected within their companies, while also providing authority or influence in decisions related to innovation and organizational development. The respondents were therefore considered suitable representatives of their respective companies' innovation work, rather than only individual informants, ensuring that the empirical material was closely connected to the analytical focus of the study. At the same time, the sampling process was also influenced by practical access considerations, referred to by Bell et al. (2022) as convenience sampling, as the final selection of participants was partly constrained by availability through the cooperating organization and relevant contacts identified through the supervisor's network.

Both authors attended all interviews, which were conducted via Microsoft Teams. The interviews lasted between 45 minutes and two hours, with variation mainly depending on the respondents' availability as well as their ability and willingness to reflect in depth and provide detailed, well-developed answers, often complemented by broader discussions of the topics. All interviews were conducted in Swedish, as this was the native language of all participants, which facilitated more natural and nuanced communication. For each interview, one of the authors took the lead by guiding the conversation through the main questions from the interview guide, while the other ensured that the session was recorded and actively contributed by following the discussion and preparing relevant follow-up questions to encourage more elaborative responses when appropriate. Prior to each interview, permission to record was explicitly requested from the participants.

The recordings were primarily used for transcription purposes and to allow both authors to re-listen to the interviews afterward, which supported a more accurate and thorough interpretation of the empirical material. TurboScribe was used to transcribe all interviews based on the recorded files. After the transcription process, the transcribed texts were manually reviewed by both authors, while simultaneously re-listening to the recordings to ensure accuracy and consistency between the spoken data and the written output. This verification process was carried out before initiating the analysis and proved to be time-consuming. However, it was a necessary step to ensure the reliability and correctness of the empirical data collected.

Table 3.1 presents an overview of all conducted interviews, organized in chronological order. The companies included in the study can be characterized as leading actors

within their respective industries, with some holding global positions while others are more prominent within the Swedish market. All companies originate from Sweden, and the majority operate on an international scale, employing several thousand individuals. For the first four interviewees in Table 3.1, both the initial interview and the in-depth interview was conducted. For the last interviewee in Table 3.1, a hybrid between the two was used to cover as much as possible in one session. The names of both the interviewees and the companies have been anonymized through the use of fictional pseudonyms created by the authors to enhance the readability and interpretability of the findings. These pseudonyms are presented in the "Company" column and in parentheses within the "Role of Interviewee" column in Table 3.1.

Table 3.1: Overview of interview participants

Company	**Industry/Sector**	**Role of Interviewee**	**Date**	**Time (min)**
ComTel	Telecommunications	Global Director of Sustainable Innovation (Karl)	Feb 20 Apr 23	115
SteeL	Steel Manufacturing	Head of Strategic Facility Development (Hassan)	Mar 6 Apr 9	160
NordEst	Real Estate	Chief Business Technology Development Officer (Max)	Mar 27 Apr 29	90
Adv-Ice	Automotive & Industrials	Experienced Practitioner & Consultant (Dragan)	Mar 27 May 4	135
E-Truck	Electric Trucks	Product Management & Customer Experience (Bengt)	Apr 24	90

3.4 Data Analysis

The qualitative data collected through the semi-structured interviews was analyzed using thematic analysis, a widely applied method in business research for identifying, analyzing, and interpreting recurring patterns within qualitative datasets (Bell et al., 2022). The purpose of the analysis was to systematically reduce and structure a large amount of empirical material into meaningful categories that could support the interpretation of organizational practices and processes related to sustainable innovation. In line with the study's abductive research approach, the analysis followed an iterative process characterized by continuous movement between empirical observations and existing theoretical perspectives, referred to by Bell et al. (2022) as "dialectical shuttling".

To ensure a systematic and transparent analytical process, the study adopted the Gioia methodology, which provides a structured three stage framework for developing grounded theoretical insights from qualitative data through progressive coding stages (Bell et al., 2022). Figure 3.1 demonstrates the data analysis process further

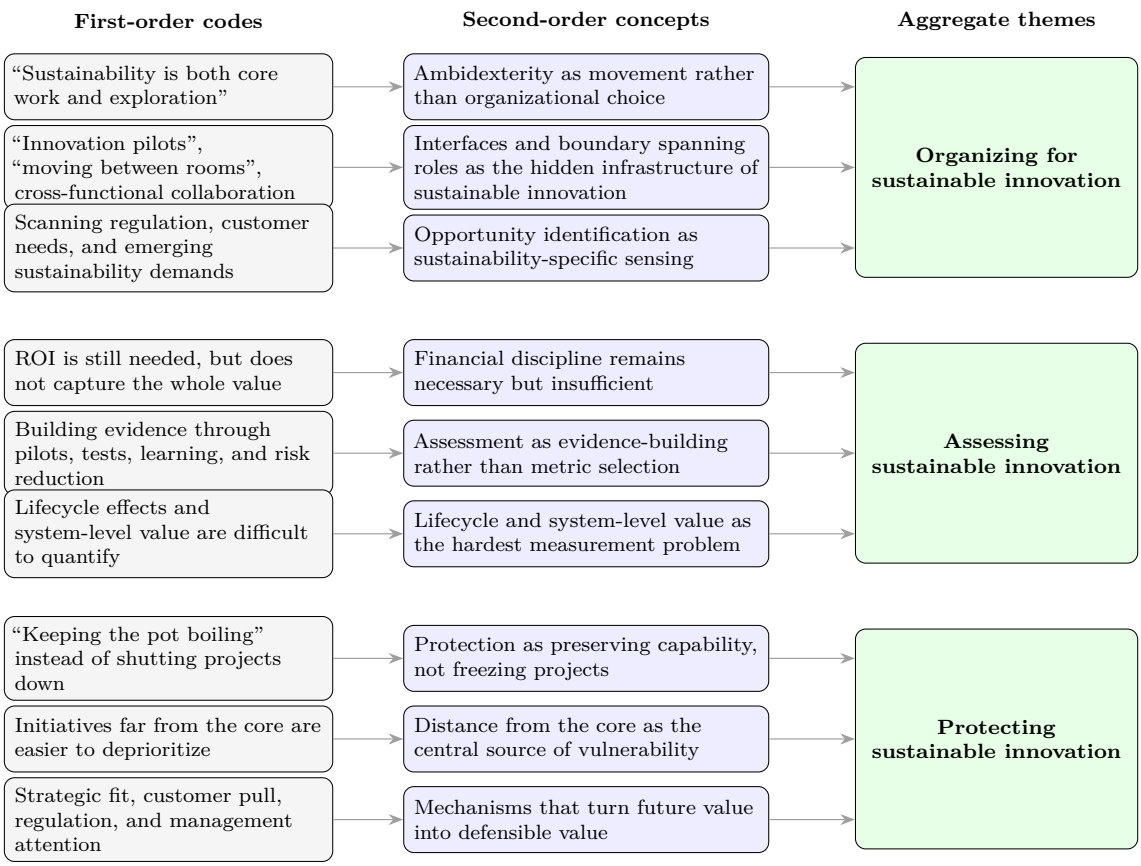

Figure 3.1: Gioia data structure showing examples of illustrative first-order codes, second-order concepts, and aggregate themes.

used in this paper, although all of the first-order codes identified are not illustrated in the figure. The coding process was conducted in three progressive stages. The first stage consisted of first-order analysis, where interview transcripts were broken down into smaller units of meaning through open coding. At this stage, emphasis was placed on preserving the participants' own terminology through the use of in-vivo codes, allowing the analysis to remain closely connected to the respondents' lived experiences and organizational realities (Bell et al., 2022). Several recurring expressions emerged during this process. For example, one participant described the innovation process as a "baton being passed", illustrating how sustainability initiatives moved sequentially between departments depending on technical feasibility and operational readiness. Additional examples included "keeping the pot boiling", used to describe maintaining minimal activity in projects to enable rapid restart when market conditions improved, and "parking tickets, but no speeding tickets", which reflected leadership practices aimed at encouraging experimentation without excessive managerial control. These expressions represented examples of what Bell et al. (2022) describe as "active data," namely unexpected empirical insights that were not predefined by the initial theoretical framework but became analytically significant during the coding process.

The second stage involved second-order analysis, where the researchers searched for patterns, similarities, and relationships among the first-order concepts in order to develop more abstract and theoretically informed themes (Bell et al., 2022). During this phase, empirically grounded concepts were aggregated into broader organizational patterns that could be connected to the theoretical framework. For instance, concepts related to "innovation pilots", "moving between rooms" and cross-functional collaboration were grouped into the second-order theme "Interfaces and Boundary Roles," reflecting organizational mechanisms that facilitate integration between different knowledge domains. Another example concerned a recurring pattern of how innovation initiatives positioned further from the core business were perceived as more vulnerable during periods of uncertainty, leading to the second-order theme "Distance from the Core as Vulnerability". This stage of analysis enabled the researchers to connect participants' experiences to theoretical constructs (Bell et al., 2022).

In the final stage, the second-order themes were synthesized into aggregate dimensions that formed the overarching analytical structure of the study (Bell et al., 2022). These dimensions represented the broader strategic processes through which organizations managed sustainable innovation. The first aggregate dimension, "Organizing for Sustainable Innovation," captured how firms balanced exploratory innovation activities with core operational demands through ambidextrous organizational arrangements. The second dimension, "Assessing Sustainable Innovation," reflected how organizations evaluated innovation initiatives by considering long-term strategic value, sustainability objectives, and uncertainty in addition to traditional profitability measures. The third dimension, "Protecting Sustainable Innovation" encompassed the mechanisms organizations used to safeguard innovation activities during periods of uncertainty.

To enhance the trustworthiness and transparency of the findings, a clear audit trail was maintained throughout the coding process, enabling the researchers to trace how individual interview quotations contributed to higher-order themes and aggregate dimensions (Bell et al., 2022). In accordance with established quality criteria for qualitative research, the emerging interpretations were continuously reviewed to ensure confirmability and reduce the influence of researcher bias on the analytical outcomes (Bell et al., 2022). Ultimately, the thematic analysis enabled the study to connect empirical findings back to the research questions and broader discussions within management and sustainable innovation literature, thereby "closing the circle" of the research process (Bell et al., 2022).

3.5 Research Quality

This section addresses the overall research quality of the study by reflecting on key methodological and ethical considerations. It includes a discussion of the chosen research design and its implications, ethical principles guiding the study, and the use of AI as a supporting tool in the research process, in order to ensure transparency.

3.5.1 Methodological Reflection

The choice of an abductive research approach was motivated by the dynamic and evolving nature of the research topic. Sustainable innovation has attracted increasing scholarly attention in recent years. However, the literature remains relatively immature, as research is still developing in parallel with rapidly evolving organizational practices. In this context, an abductive approach was considered appropriate, as it allowed for a continuous interaction between existing theoretical frameworks and empirical insights from companies. This enabled the study not only to explore how current theories relate to practice but also to critically reflect on and problematize these frameworks in light of real-world experiences. By moving iteratively between theory and data, the approach provided flexibility to capture emerging perspectives and nuances that may not have been fully addressed in prior research.

At the same time, certain methodological limitations can be identified. One potential improvement would have been to include a larger number of interviews, either by covering a broader range of industries or by incorporating multiple actors within the same industry to allow for more detailed comparisons. However, this was not feasible within the scope of the study due to time constraints and limitations in access to relevant respondents through the available professional networks. As the study required participants with specific experience and insight into sustainable innovation, the sampling process was dependent on both availability and the researchers' ability to reach suitable informants within the timeframe of the thesis. As a qualitative study based on a limited number of cases, the findings are not intended to be broadly generalizable. However, this is consistent with the purpose of qualitative research, which emphasizes in-depth understanding of specific contexts rather than statistical generalization (Bell et al., 2022). Although the number of respondents was limited,

the length of the interviews and the two-step interview process strengthened the depth and quality of the empirical material. By first conducting an introductory interview and later following up with a more in-depth interview, the study allowed for a deeper exploration of each respondent's reflections on their organization's ability to organize, assess, and protect sustainable innovation. This supported the reliability of the study by enabling a more consistent and thorough data collection process, while validity was strengthened by ensuring that the empirical material remained closely aligned with the research aim. Thus, the study aims to contribute with analytical insights that may be transferable to similar contexts, while acknowledging the limitations inherent in the chosen research design.

3.5.2 Ethical Considerations

Ethical considerations have been an important aspect throughout this study, particularly in relation to the collection and handling of empirical data from interviews. In line with Bell et al. (2022), efforts were made to avoid any potential harm to participants, including psychological, social, or professional risks. To ensure this, confidentiality and anonymity were maintained by not disclosing identifiable information about either individuals or organizations in the final thesis. Furthermore, participants were informed about the purpose of the study, how the data would be used, and their voluntary role in the research prior to participation, thereby adhering to the principle of informed consent. They were also made aware of their right to withdraw from the study at any time and to refrain from answering questions they perceived as sensitive. No form of deception was employed, as transparency was considered essential for maintaining trust and integrity in the research process.

In addition, the study adhered to relevant data protection regulations, including the General Data Protection Regulation (GDPR), as highlighted by Bell et al. (2022). All interview recordings and transcriptions were stored securely and were only accessible to the researchers. The recordings, which were made with participants' consent, were used solely for transcription and analytical purposes and were handled with care to protect participants' privacy. TurboScribe, the software used to transcribe the interviews, prioritizes data protection by ensuring that user data is private, encrypted, and not used to train AI models. Ethical considerations also extended to the overall research process, including ensuring accurate representation of participants' views, avoiding misinterpretation, and maintaining academic integrity in the use of sources in the literature review. Given the abductive nature of the study, where continuous interaction between theory and empirical data occurs, particular attention was paid to fairly representing the empirical material while remaining open to new interpretations, ensuring that the analysis remained both ethically sound and methodologically rigorous.

3.5.3 Use of AI

AI was used as a complementary tool intended to support and improve the efficiency and quality of the research process. TurboScribe was used for transcription of

interviews, Research Rabbit to identify and explore relevant academic articles, and ChatGPT during the literature review to summarize research papers. This helped by quickly gaining an initial understanding of each paper and assess whether it was relevant for further in-depth reading or not. In addition, ChatGPT was used for language assistance, including improving grammar, syntax, and suggesting synonyms to enhance clarity and readability.

That said, AI tools were used primarily as support tools. The authors are fully responsible for the content and structure of the study. The main text, analysis, and discussion were independently written by the authors.

4
Findings

This section presents the empirical findings from the interviews. The findings are structured according to the three themes used in the deep-dive interviews: (1) how organizations organize sustainable innovation while still running the established business, (2) how sustainable innovation is evaluated when traditional ROI logic is insufficient, and (3) how sustainable innovation is protected when organizations face pressure.

4.1 Organizing for sustainable innovation

The first theme concerns how the organizations create room for sustainable innovation while still maintaining and improving their established operations. The interviews show that the respondents did not describe this as a simple choice between either separating innovation from the core or integrating it into daily operations. Instead, the organizations used different combinations of separation, integration, networks, interfaces, and temporary project structures. The degree of separation also varied over time: some initiatives began outside the core, then moved into ordinary operations when they became mature enough to scale; other initiatives remained embedded from the beginning because they were inseparable from product performance, production capability, or customer needs.

4.1.1 Sustainable innovation as both core work and separate exploration

A clear finding is that sustainable innovation is not always organized as a separate "innovation department." ComTel was the clearest example of a company where a respondent rejected the idea that innovation should be confined to a single department, instead emphasizing that innovation is most effective when addressed cross-functionally across the entire organization. Karl explained that ComTel does not have one unit called the innovation department that does all innovation while everyone else continues with normal work. Instead, innovation is spread across product areas and technical domains. In each of these areas, there is some form of innovation assignment, but not necessarily the same process or structure.

> **ComTel / Karl**: "There is some kind of innovation assignment in all those units. I can promise you it does not work in the same way in all of them. It is very much driven by the specific business area."

According to the interviewee, the bulk of innovation at ComTel occur inside the core product organization. Karl described a long-standing expectation that the company must innovate continuously in order to remain relevant. In his view, this has become embedded in ComTel's culture, contributing to its 150-year survival and serving as an important reason for its continued relevance and competitiveness.

> **ComTel / Karl**: "Innovation is not a separate domain. Rather, it is, in a way, a hallmark of future survival. Continuous innovation is therefore essential."

Besides the integrated innovation processes linked to different product segments, ComTel also has a more formal research division, which works several years ahead of the rest of the organization.

> **ComTel / Karl**: "Sometimes it starts as research that is three to seven years ahead of the rest of us. They study whether something could be possible, often hand over patents, and then the product organizations continue with what becomes relevant."

Alongside this, ComTel also has local "innovation garages", which work more like maker spaces or grassroots prototyping environments. These garages are not the only source of innovation, but they create a different kind of space for employees to explore ideas outside the core business.

E-Truck reflected a different approach. Bengt described E-Truck as something that originally emerged from an innovation lab within the current parent company. The work began in "Connected Solutions Innovation Lab", where the parent company explored digital services around their products and tested hypotheses related to electric vehicles, charging, and the surrounding service ecosystem. From this setting, E-Truck was formed around areas such as battery systems, depot charging, public charging, charging management systems, and calculations for optimizing charging and total cost. This meant that the initiative began in a more exploratory space, but later became a separate company and was then partly moved into the ordinary parent organization.

Bengt described this as a form of absorption or assimilation, since the initiative was initially separated in order to explore a new ecosystem around electric trucks and energy, but when some services became more mature, they needed to be integrated into the part of the organization that could scale them. This suggests that separation was not necessarily a permanent solution. Instead, separation created space for exploration, while later integration created scale and long-term organizational ownership, as described by the interviewee:

> **E-Truck / Bengt**: "You could say that it is a separate business that still generates ideas and solutions that the parent company uses. In this case, the choice was to absorb it, or assimilate it."

A further variation was found in NordEst. As a state-owned property company, NordEst operates in a project-based setting, where much of its work is carried out through temporary, one-off projects involving internal functions and external stakeholders. This helps explain why innovation is organized as a company-wide and network-based process rather than as a traditional department where all innovators are gathered in one place. Since 2015, NordEst has worked with innovation as its own process, and since 2016 it has been included on the board and management agenda. One person works full-time as innovation process leader, while innovation pilots are distributed across the core business. These pilots are not separated from operations, but include employees such as energy engineers, operating technicians, and project managers who dedicate part of their time to innovation while remaining embedded in their regular organizational context.

> **NordEst / Max**: "We have chosen to cut out innovation as a company-wide process, and there we have a network organization instead. [...] The innovation pilots are in the core business and have this as an additional assignment. They may spend around ten percent of their time on it."

Max further described the innovation process as anchored in management through a process owner in the executive team and one full-time process leader, while the broader capacity is distributed across around seven to ten innovation pilots. These pilots cover different functions and geographies, and each has an agreement with their manager to spend roughly 10-20 percent of their time supporting the innovation process.

> **NordEst / Max**: "Innovation for us is a process that is open to all employees, all colleagues in the whole company."

SteeL was described as even more tightly linked to core operations. Hassan explained that product innovation and production development are closely connected to the Chief Technology Officer (CTO) organization, market needs, customer application development, and operations. SteeL does not appear to have a separate "innovation box" for customer-linked steel development. Instead, customer needs are translated through technical functions, testing labs, product development, and operations. Hassan confirmed that customer-driven initiatives are part of the main SteeL organization rather than being handled by a separate innovation unit.

> **Interviewer**: "If I understand you correctly, these new initiatives with the customer do not happen in a separate innovation box. They are still part of SteeL and the parent company."
>
> **SteeL / Hassan**: "Yes, that is the right interpretation. [...] The strength has been that the Knowledge Service Center has been so close to production, and that product development has also been close to production."

At the same time, SteeL also uses separate project organizations when the scale of

change is large enough. For major transformations such as the new electric steelworks in two locations, Hassan described how the normal organization would not be able to carry the whole change alone. These initiatives require dedicated structures, large investment programs, and coordination across sites. Thus, SteeL combines embedded innovation in daily production and product development with separate structures for major technology shifts.

4.1.2 Interfaces, boundary roles, and organizational links

The interviews show that the connection between exploration and core business is often maintained through roles and interfaces rather than through one formal structure. Each organization had specific people, functions, or forums that linked new ideas to established operations.

At NordEst, the most explicit linking mechanism was the network of innovation pilots. Their role is to monitor research calls, capture ideas from employees and partners, bring promising ideas into the organization, and stimulate projects around the company. Max described this as a way to make innovation visible and actionable at employee level. It is not only a budget or a process, but also a set of people who translate opportunities into organizational activity, as described in this quote:

> **NordEst / Max**: "They also stimulate and clarify that there is an opportunity here, to try to trigger projects around the organization."

NordEst also connects internal innovation work to a broader external ecosystem. Max repeatedly emphasized that the organization works closely with various external stakeholders.

> **NordEst / Max**: "We work a lot with our customers, the universities. We have the privilege of being close to all the intellectual capital at the universities."

The process leader's work is therefore partly to connect threads between internal needs and external knowledge or financing. In Max's words, this requires organizational competence in understanding how the innovation system works, creating contacts, handling financiers, and combining internal and external project leadership. Max also emphasized that the innovation pilots are mainly ambassadors and guides rather than a separate line organization. Their role is to make the process visible, talk about innovation in different settings, and help colleagues understand how an idea can be taken forward, both internally and in relation to suppliers and partners.

At SteeL, the main interface is the sequence between market, CTO, customer-facing engineering, product development, and operations. Hassan described this as a baton being handed from one function to another. The CTO organization listens to market and customer needs and supports customers in engineering, forming technology, welding, testing, and application development. When a promising concept has been developed, it has to become process-technically possible in the plant. At that point,

operations and plant development take over with project managers, mechanical engineers, electrical engineers, automation engineers, and other specialists needed to implement the solution.

Hassan also described physical proximity as an important but easily overlooked interface. The fact that the "Knowledge Service Center", product development, and production were historically located close to each other created informal connections. He described how people from different parts of the system can solve future product opportunities through informal contact. This proximity appears to matter because product innovation in steel requires quick loops between customer application, material development, and production feasibility.

> **SteeL / Hassan**: “Do not underestimate that proximity. You go to the lunchroom and meet the whole system. Even there, a future opportunity or product can be solved by connecting people.”

At E-Truck, Bengt’s own role functioned as a boundary-spanning role between customer experience, business development, and product development. He described moving “between rooms” and translating knowledge about customers’ daily work into opportunities and potential solutions. The organization needed to understand customers’ jobs-to-be-done, pain points, and gain creators, and then use those insights to shape services around electric trucks and charging. Bengt also described the need for a playbook so that employees with less experience in product development can still carry out structured customer research and iteration.

> **E-Truck / Bengt**: “If you have worked for three years but do not have experience of product development, then you need support in a playbook. This is how you do customer research. These are the people and competencies you need to bring in.”

ComTel’s interfaces were more diverse. Their former innovation incubator was created partly because the local "innovation garages" and other grassroots spaces could generate ideas that had no obvious receiving organization. Karl explained that large organizations are "often rigged for current cash cows and stars". If a new idea builds on the company’s capabilities but is not part of the current core business, it can die because no one has budget, people, or responsibility for it. The incubator was a structured mechanism for receiving and evaluating such ideas.

> **ComTel / Karl**: “In all large companies, the question is what you do with innovation ideas that come from inside, build on what the company does, and use what the company knows, but are not core business right now. [...] Either the idea dies, or if someone is really passionate, they resign and leave. The idea of the incubator was to capture that type of idea and have a structured framework to evaluate it.”

Although the interviewee emphasized the importance of such a structure, ComTel’s incubator was discontinued two years ago, for reasons discussed later in the findings

by the interviewee.

4.1.3 How sustainable innovation opportunities are identified

The sources of sustainable innovation opportunities differed across the organizations. Some opportunities emerged from customers, some from regulation, some from technology development, some from internal efficiency needs, and some from broad societal or market shifts. The respondents described several drivers at the same time rather than one single trigger.

E-Truck's entire business was described as driven by the transition toward electrification and sustainability. Bengt explained that truck electrification changes the service ecosystem. An electric truck is not only a vehicle; it also requires depot charging, public charging, charging management, routing, cost calculations, emissions reporting, and sometimes circular use of batteries. This creates new opportunities, but also new demands on how to support customers.

> **E-Truck / Bengt**: "The whole business is driven by the sustainability movement. A lot of laws are coming. If the original equipment manufacturer (OEM) does not help with the electric transformation, there will be penalties. [...] We need to figure out how to make customers think that an electric truck is attractive. We cannot think in the same way as when selling a traditional vehicle."

Bengt explained that end-customer demand is central. End-customers buying transport services may require a certain carbon footprint or a yearly reduction in emissions. In that case, transport companies need data and reports, and E-truck can provide calculations and tools that support those requirements. Thus, sustainability becomes an opportunity because it creates new customer needs around charging, cost optimization, and emissions documentation.

At ComTel, sustainable innovation opportunities are primarily identified through the business-critical issue of energy consumption in customer use. Karl explained that most emissions linked to ComTel's products occur when customers operate the company's network equipment.

> **ComTel / Karl**: "Around 90 to 95 percent comes from when our customers use the products, and the largest share is all the energy they consume."

At the same time, energy consumption represents one of the largest operating costs for ComTel's customers. This means that sustainability-related innovation opportunities are not only identified through environmental concerns, but also through areas where customers face significant operational and financial pressure. Improving the energy efficiency of network equipment therefore becomes both a sustainability priority and a business-critical innovation opportunity. Karl described ComTel's ambition that, by 2027, its products should be 50 percent more energy

efficient compared with a 2021 baseline. In his account, the first release of 5G also marked an important shift, as it broke the historical trend in which each new mobile generation increased capacity while also increasing energy consumption.

For ComTel, the opportunity is not only for improved environmental performance. Reducing energy use also reduces operators' operating expenses. Karl explained that even if an operator does not care about emissions, energy consumption is a major cost item, which means that sustainability and commercial value reinforce each other in many projects.

> **ComTel / Karl**: "Regardless of whether they care about emissions or not, energy consumption is a very large part of an operator's OPEX. Reducing it hits the bottom line."

At SteeL, opportunities arise both from customer application development and from the need to reduce emissions in production. In the customer-facing part, SteeL works with customers to develop steel qualities and applications that improve strength, weight, durability, safety, and material efficiency. Hassan described this as a long process where SteeL may know the final application of the steel even if there are suppliers between SteeL and the end customer. For example, the final customer may be a car manufacturer, but the development may go through an intermediate supplier.

SteeL's production-side opportunities are driven by the large carbon footprint of steelmaking and by the transition from blast furnaces and fossil fuels toward electric steelmaking and electrified processes. Hassan explained that SteeL knows how to become fossil-free in one of their productions units, but the implementation depends on timing, capital, customer demand, technology maturity, and how much value the sustainable product can carry in the market.

Max from NordEst said that sustainability opportunities are not primarily driven by regulation. Instead, they are driven by the long-term expectations of the state owner, the needs of customers, and the business logic of using existing resources more intelligently. The clearest example was space utilization. NordEst manages a large property portfolio, and Max described a shift from constructing new buildings to reusing, optimizing, and maximizing what already exists. Sensors, data, and digital twins became tools for understanding how for example campus environments are actually used.

Max described one insight from the utilization work as especially important: much of the built environment is underused. NordEst had roughly 3.4 million square meters, and in 2019 usage during daytime was a little above 30 percent. Max framed this not only as a property issue but as waste in the value chain. Sustainable innovation, in this case, meant finding ways for universities to use space more efficiently and avoid unnecessary new construction.

Max also described sustainability as one of the main reasons why NordEst built its innovation work in the first place. However, sustainability is not a formal

requirement for every innovation initiative. Rather, sustainability and digitalization were described as major underlying trends.

4.1.4 Reconfiguring routines, structures, and responsibilities

A recurring finding is that sustainable innovation often changes routines and responsibilities because the organization cannot simply continue working in the same way. However, the respondents described these changes differently depending on the type of innovation.

E-Truck's situation involved a change in how they sell and support trucks. Bengt explained that electric trucks require a new logic because the product is tied to charging infrastructure, route planning, energy prices, and new customer decisions. According to the respondent, it is not enough to say that the truck is sustainable. It also has to work for the customer. Therefore, instead of only selling a vehicle, the organization needs to support the customer's total cost of ownership and the practical ability to operate electric transport. This requires new contracts, new services, and new ways to think about customer value.

> **E-Truck / Bengt**: "We cannot write contracts as before. We need a different perspective because we have not done it before. Then you need an innovation approach to every aspect."

At NordEst, Max described reconfiguration as a change from a narrow central innovation group toward a broader network organization. Initially, a small team of specialists helped drive innovation quickly, but over time the organization realized that the work needed to be spread more broadly. This reduced speed in some respects, but increased organizational learning and ownership. Max framed this as a conscious trade-off between a fast specialized unit and a broader internal capability:

> **NordEst / Max**: "In the beginning, we had a very central team with specialists, and that gave speed. But it also meant that the circle was too small. We needed to spread the capability and curiosity in the organization. [...] Then the speed may be lower, but more people understand what we are doing and can carry it forward."

Max described this broader organization as a deliberately protected zone for testing ideas that do not fit ordinary routines. The normal business is expected to continue improving through established processes, while the innovation process creates room to challenge existing ways of working, business models, and assumptions.

NordEst also reconfigured its business logic around space. Helping a customer rent only the space it actually needs may reduce revenue in the short term. However, Max described the long-term relationship and the future attractiveness of the campus as more important than maximizing one lease today. This requires the organization to think beyond individual rental contracts and instead work together with customers on long-term estate planning, for example, campuses. It also creates opportunities to

release space for other actors, for example life-science companies around university campuses:

> **NordEst / Max**: "If we optimize together with the customer, we can free up buildings and premises for other actors, instead of ending up with a campus full of holes."

SteeL's reconfiguration is especially visible in production. Hassan described how large sustainability shifts require the organization to synchronize resources and avoid scattered initiatives. A classic approach would be to tell the entire organization to reduce emissions and then let each unit do something. Hassan argued that this risks everyone doing small things without a coordinated order of priority. Instead, he therefore helped create a clearer sequence:

> **SteeL / Hassan**: "We had to gather and synchronize what to put our resources and money into. What gives the most? What is most important? When? In what order? What requirements do we actually need to meet?"

Hassan also emphasized that changing production technology can create dependence on supplier knowledge. When switching from one technology to another, the organization may not yet have the operational know-how internally. Supplier expertise can help with the technology, but that expertise often stops before the practical operation of the equipment. This means that reconfiguration is not only about purchasing new equipment; it is also about transferring and building operational competence. He stated:

> **SteeL / Hassan**: "If you change technology, you become a little dependent on the supplier's know-how. But that know-how often ends before operation. They know how to deliver the technology, but we have to learn how to run it."

Dragan described reconfiguration in broader terms. He argued that sustainable innovation almost always requires changes to existing processes, business models, or value calculations. If an idea is immediately understood by everyone, it may be incremental rather than genuinely innovative. At the same time, if people do not understand it, it could either be an innovation or simply a bad idea. For him, this creates a need for organizations to tolerate uncertainty and constructive discomfort in the process of changing how work is done.

4.2 Evaluating sustainable innovation beyond ROI

The second theme concerns how organizations evaluate sustainable innovation when the value is not captured by short-term financial returns alone. A central finding is that the respondents viewed financial logic as incomplete when it was too narrow, too short-term, or disconnected from broader forms of value, including customer value, learning, market access, risk reduction, lifecycle effects, and strategic positioning.

4.2.1 ROI remains important, but is often too narrow

Several respondents emphasized that sustainable innovation still needs to make business sense. Bengt at E-Truck was explicit that profitability matters. He argued that sustainability has to be financially sustainable as well. In the context of electric trucks, this means that the customer must be able to operate profitably. If an electric truck is more expensive and has lower range than a conventional truck, the surrounding services and business model must compensate by reducing operating costs, enabling new use cases, or creating customer value in other ways.

> **E-Truck / Bengt**: "The whole thing is about total cost of ownership. How do we make the electric truck attractive for the customer?"

Bengt described the electric truck as a value proposition that cannot be justified by environmental benefit alone. A truck may cost significantly more and may have lower range or performance in some use cases. Therefore, the organization has to show additional value: cheaper depot charging compared with public charging, access to city centers at night, avoidance of certain fees, a better driver environment, lower emissions reporting burden, and strategic alignment with customers' sustainability demands, as stated by the below:

> **E-Truck / Bengt**: "If the vehicle is three times as expensive and maybe performs less in some ways, then the value proposition has to explain why it is still attractive."

In Bengt's view, sustainability can strengthen the value proposition, but it cannot carry it on its own. Rather, sustainability functions as an additional benefit on top of a product offering that must already make sense in terms of customer needs, performance, cost, and usability. A sustainability label may therefore increase the attractiveness of a product, but it is not sufficient to persuade customers if the underlying value proposition is weak.

At SteeL, Hassan described sustainability investments as falling into different categories: opportunities, threats, and requirements. If a new environmental requirement must be met in order to continue producing, the investment may initially appear only as a cost. However, if competitors cannot meet the same requirement, compliance can later become a competitive advantage. This means that the financial value may not be visible at the moment of investment.

NordEst provided the clearest contrast to strict ROI logic. Max argued that if a project's ROI can be calculated in a normal way, it may not belong in the innovation process at all. In that case, it should instead be handled as ordinary business development. Innovation projects, as he described them, exist because they are too far from immediate realization or too uncertain to fit normal business-case logic, which he refers to as "the delta". Their purpose is often learning, capability building, or opening a future pathway.

> **NordEst / Max**: "If you can calculate ROI, then it is not an innovation project. Then it is business development.[...] We go in with innovation money to cover the delta. It is still not economically viable, but we do it

for the learning and to understand the process."

Dragan went further and challenged how organizations define financial sustainability in the first place. He argued that most organizations do not understand the full economic consequences of products, resources, or innovations over their entire lifecycle.

> **Adv-Ice / Dragan**: "We say that we should move from a linear to a circular economy, but we have not even done the homework on the linear economy. [...] No one can systematically describe all the economic transactions from raw material extraction to disposal for a product. If we had that, then we would at least have a linear economy."

In his view, many sustainability decisions are evaluated using fragmented budgets and narrow accounting categories, which makes it impossible to see long-term value. For example, comparing the cost of incinerating a material in existing infrastructure with the cost of recycling it in factories that do not yet exist produces a distorted comparison, because one side includes establishment costs while the other side benefits from sunk infrastructure.

4.2.2 Evaluation criteria and decisions in practice: desirability, feasibility, viability, impact, risk, and evidence

Although the organizations used different language, several respondents described evaluation as broader than financial return. Bengt at E-Truck described a structured approach based on desirability, feasibility, and viability. He emphasized the need to replace purely subjective judgments with evidence and confidence levels. For him, innovation work should involve a kind of bookkeeping where the organization collects evidence about whether a problem is real, whether a solution can be built, and whether it can become a viable business.

Bengt further described evaluation as a staged process. New opportunities may come from strategic input, customer problems, or market foresight. The team may then conduct a pre-study, proof of concept, or pilot. Findings are presented to leadership groups and sponsors, and there may also be peer review from other people in the organization. The decision to continue is therefore not only a financial decision. It is also a decision about evidence, strategy, customer need, and organizational belief in future value.

> **E-Truck / Bengt**: "You have strategic input with a question like: can you investigate this and see how it would fit? Then you present it to leadership groups that make strategic decisions about whether to continue or not. [...] You need stakeholder mapping, sponsors, peer review, and collective intelligence. It is not enough that one person thinks it is a good idea."

ComTel's former incubator had a more formal evaluation model. Karl described it

as working like an accelerator, with a funnel, investment steps, and criteria at each stage. Sustainability was one of the recurring criteria and was essential throughout the investment process:

> **ComTel / Karl**: "The sustainability part always had a 20 percent weight at every investment point. It was with us the whole way."

Other criteria changed in importance across stages. Early in the process, whether the idea solved someone's problem could matter more than global market size. Later stages required stronger evidence of scalability and commercial potential. Karl also mentioned a risk perspective: teams were asked to think about whether the innovation could be used in harmful ways, for example by asking how a criminal actor might misuse an AI tool.

In ComTel's core product development, however, the evaluation logic is less separated from technical performance. Sustainability becomes one design parameter among many, together with performance, weight, material, cost, capacity, and energy consumption. Karl described sustainability as increasingly integrated in the product requirements rather than handled as a separate category. If customers demand lower emissions, recycled materials, or better energy performance, this may affect product decisions even when it adds cost. However, the product still has to meet ComTel's quality and commercial expectations.

> **ComTel / Karl**: "In the core business, it is not labelled sustainable innovation. We have made a new product, and sustainability is one of the criteria."

SteeL's evaluation logic was described as operational and timing-based. Hassan said that formal evaluation of sustainability initiatives is often connected to whether a project is a business opportunity, a threat, or a requirement. He also emphasized that SteeL already knows many of the technical steps needed for decarbonization, but that implementation depends on timing and the organization's capacity to carry the investment. If an existing asset is becoming obsolete or needs major reinvestment, that can become the moment to choose a lower-carbon technology instead of reinvesting in the old one.

> **SteeL / Hassan**: "We will continue using liquified petroleum gas (LPG) until we see that the value of the sustainable product can carry the investment, or until the old facility becomes obsolete and needs reinvestment. [...] Then we take the step to electrify or change fuel, instead of investing a large amount in the same old technology."

For SteeL, the evaluation logic was also described as closely tied to business cases and strategic decisions rather than a completely separate set of sustainability criteria. Climate impact and risk reduction are important, but cost and payback time often remain decisive in production-related decisions, which is exemplified by their delays in implementation efforts.

NordEst evaluated innovation partly by learning and strategic relevance. They had a clear example of this. The organization is paying the additional cost of taking down an old building and trying to reuse its components in other projects. Max did not present this as a project with a straightforward return:

> **NordEst / Max**: "We are not just taking the nice surface materials that everyone can reuse. We are doing the difficult work. [...] We cover the additional cost and do it for learning - to understand and take the process forward together with many partners."

The project was justified because it helps the organization learn how a circular construction process could work and what barriers need to be solved, resulting in potential future benefits.

4.2.3 Long-term value, market access, and strategic positioning

A recurring finding is that respondents evaluate sustainable innovation partly as a way to secure future relevance. This may include customer relationships, market access, brand position, readiness for future regulation, or the ability to participate in new ecosystems.

Bengt described several E-Truck initiatives as bets on a future that is not yet profitable. Long-haul electric transport was his clearest example. At present, it is not economically defensible yet, but E-Truck expects that it will become more relevant in three to five years. Therefore, the organization invests in services and infrastructure knowledge before the market is fully mature.

> **E-Truck / Bengt**: "It is a projection and a bet on the future. We believe we have to do this, and we believe the world understands that we have to do this. [...] We are building services now and scaling this up because we know that in three years long-haul will start to take off, and maybe in four or five years it will be profitable."

This decision is not only about current sales, but about the expectation that the world must move toward electrified transport and that customers, regulators, and infrastructure providers will gradually make this possible. He also connected this to charging infrastructure and battery systems. In his account, battery energy storage creates an additional circularity logic, because used vehicle batteries can potentially be refurbished and used in stationary energy systems.

At NordEst, long-term value is closely tied to the relationship with their customers. Max explained that helping customers use less space can look unattractive if viewed as a single lease, because it may reduce rental income. However, if the organization takes a longer view, it strengthens the relationship, improves the total cost for customers, and makes NordEst more relevant as a partner. It also helps avoid inefficient campus development, where buildings are vacated in scattered ways and

become difficult to reuse. This is described by Max as:

> **NordEst / Max**: "What is difficult for us as property owners is if this happens in scattered ways, and we get a campus like Swiss cheese, with objects that are hard to do something else with."

SteeL's long-term value is partly tied to customers' future requirements for low-carbon steel and partly tied to regulatory costs. Hassan described a shift in language from "fossil-free" toward "carbon-neutral" or "low-carbon emission products," reflecting that the market and political context are changing. SteeL has products such as "Zero" and "Fossil-free", but Hassan also emphasized that the green transition is not moving as fast as many expected and that the company has to follow the development of demand.

For SteeL, climate was also described as the sustainability area with the greatest financial significance. One reason is that free emission allowances are gradually being reduced and are expected to disappear around the middle of the next decade. The transformation is therefore also a way to avoid future cost exposure and increase the share of premium products, including CO2-reduced steel that can be sold at a higher market price than standard steel.

At ComTel, long-term value is tied to continued technology leadership. Karl described ComTel's patents, R&D investments, and research capabilities as part of how the company stays relevant. He mentioned that ComTel has a large patent portfolio and significant annual R&D spending. For him, these are not separate from sustainability. Energy efficiency, material choices, and network performance are part of remaining competitive in a market where customers require both quality and lower energy use.

4.2.4 The difficulty of measuring returns and lifecycle value

Several respondents highlighted that the hardest returns to justify are those that are indirect, long-term, systemic, or located outside the unit making the investment. This appeared in all company interviews.

Dragan argued that the economic function in many organizations is fragmented. Budgets are divided into project cost, operating cost, product cost, launch cost, disposal cost, and other categories. This makes it difficult to follow the value of an innovation across time and across organizational boundaries. He argued that firms often optimize fragments of the economy rather than the value of a product, material, or asset over its full life:

> **Adv-Ice / Dragan**: "If I innovate something today, I have not found anything in the finance department that lets you follow the business value along the line."

Dragan exemplifies the quote through a project that could not be funded because the unit carrying the cost did not capture the future benefit. In an automotive context, he described how a small hardware cost and a project investment could

have enabled over-the-air updates and reduced future service campaign costs, but the project was blocked because the financial logic was attached to the wrong budget. He also described a small product change, such as adding a plug to an oil filter, that could save service time over the life of the vehicle but was difficult to justify because the savings occurred later and elsewhere.

> **Adv-Ice / Dragan**: "The investment and the saving do not sit in the same place. Then the organization says no, even though the total value over time is obvious."

NordEst faced a similar issue in relation to buildings and space. The cost of experimenting with circular reuse is immediate, while the learning may affect future projects, procurement routines, collaborations, and industry standards. Max described their material reuse project as not economically viable today, but valuable because the organization learns how to handle the process. In the sensor and utilization work, the value also depends on system effects: reducing unnecessary new construction, optimizing campuses, lowering university costs, and improving long-term planning. These effects are not easily captured by a narrow project ROI.

> **NordEst / Max**: "The ordinary innovation project may cost a few hundred thousand at most. Sometimes it is not even money, but that we sanction time."

For SteeL, measuring value is complicated because product innovation can create sustainability benefits outside SteeL's own production. High-strength steel may require certain production steps, but enables the customer to build lighter vehicles, use less material, increase payload, improve safety, or extend product life. Hassan therefore described sustainability not only as lower emissions in production, but also as reduced scrap, lower material use, and better customer application performance.

> **SteeL / Hassan**: "If we can reduce the amount of our products that end up in the scrap bin, we have created a larger sustainability effect than perhaps optimizing electricity use in one asset. [...] If the same amount of iron can become a stronger and thinner product, then the customer can use less material or carry more load. That is also sustainability."

At the same time, some returns were described as harder to justify. For SteeL, preventive resilience measures against physical climate risks, such as heavier cloudbursts, flooding, the location of operations, or the dimensioning of stormwater systems, can be difficult because they mainly reduce future risk rather than producing an immediate commercial return.

> **E-Truck / Bengt**: "Right now, there are political short-term wins that put sticks in the wheels for sustainable long-term opportunities."

This quote exemplifies E-Truck's difficulties because some initiatives depend on future infrastructure, future energy prices, customer adoption, regulation, and market learning. Bengt explained that many things can almost always be traced back to

economic value in the end, but the timing and causal link are not simple. Brand, customer attractiveness, future market position, and readiness may matter before the financial return is visible.

4.3 Protecting sustainable innovation in bad times

The third theme concerns what happens to sustainable innovation when organizations face pressure such as financial constraints, uncertainty, geo-political tensions, changing market conditions, or operational demands. The interviews show a difference between core sustainability innovation and more peripheral or exploratory innovation. Initiatives that are strongly tied to core competitiveness, customer requirements, regulation, or long-term survival are more likely to be protected or integrated into ordinary operations. Initiatives that are more exploratory, more distant from the core, or without a clear receiving organization are more vulnerable.

4.3.1 Slowing down rather than abandoning

A repeated finding is that sustainable innovation is often not abandoned in bad times. Instead, it may be slowed down, moved, narrowed, or reconfigured. Bengt described this clearly in relation to E-Truck. From the outside, one might interpret the movement of digital services from E-Truck into another company, that shares the same parent company as E-Truck, as a shutdown.

> **E-Truck / Bengt**: "It can look like things are being shut down, but I would rather describe it as accelerating and braking. You can slow down, move something, or let it live somewhere else."

Bengt suggested that it could instead be understood as integration into the core organization, which is better equipped to scale. The initiative continues, but the form and speed change. He explains:

> **E-Truck / Bengt**: "A standalone unit is not built to scale in the same way. The core organization is built to scale, so it has to move there if it is going to grow."

Bengt also pointed out an observation he had seen in other organizations. Companies are rarely throwing promising ideas away entirely. Instead, companies move them into locations where they can survive at a lower speed until conditions improve. This can mean fewer people, less consultant support, more reliance on internal employees, or a slower roadmap. In his own work, he saw part of his role as making himself redundant by building structures and transferring knowledge so that the organization could continue without him.

SteeL had a similar strategy. Hassan described how the company may slow down initiatives and maintain readiness rather than fully stop them. This is especially relevant when green demand or policy support is uncertain. He describes this process as:

> **SteeL / Hassan**: "We keep the pot boiling, but we do not do much more. We do not make new soup or add new ingredients. We keep it warm so that we know we can start when the company and the market are right."

At NordEst, Max did not describe a specific crisis shutdown in the same way, but the structure itself contains mechanisms that may protect innovation during difficult conditions. Innovation has a yearly budget, a process owner, a full-time process leader, board and management visibility, and a network of innovation pilots embedded in the core.

> **NordEst / Max**: "We needed to create some kind of free zone or testbed where you can experiment.[...] We clearly said from management: here we can test, and we expect things to fail. That is a sign that we dare to stretch the boundaries."

This illustrates that the organization also expects some projects to fail, which reduces the need to justify every experiment as a normal investment.

4.3.2 What becomes vulnerable: distance from the core

The findings suggest that when sustainable innovation initiatives are positioned outside the core business, they become more vulnerable to de-prioritization. The most apparent example of vulnerability was ComTel's former incubator. Karl explained that the incubator was shut down during a period of reductions, when around 2,000 people were being laid off in Sweden. He described the official explanation as being that the incubator had delivered good results and that there was no longer an obvious need to support that type of enterprise-focused adjacent innovation. However, his own interpretation was that in a savings situation, the incubator was de-prioritized because the incubator only took in initiatives that had no place in the core business.

Karl was clear that the closure did not significantly affect innovation inside the core business. The people designing and developing for example radio equipment continued their work. The incubator's role was different: it created a path for ideas that built on ComTel's capabilities but were not current core business. Therefore, its closure removed a structured mechanism for adjacent innovation, but it did not remove the core innovation engine.

> **ComTel / Karl**: "The incubator's role was to find candidates for commercialization in new areas that build on the core business but are not the core business itself."

This distinction helps explain why some sustainable innovation is protected and some is vulnerable. When sustainability is embedded in core product requirements, customer needs, or direct operational costs, it is more difficult to cut. More speculative or adjacent activities, however, require stronger organizational protection because they are easier to de-prioritize. This is further explained by Karl:

> **ComTel / Karl**: "If it is not make-or-break for the company, then evaluating and defending that innovation becomes much harder when there is less money or other priorities. [...] That is probably the hardest battle to fight: when resources are scarce and you need to weigh one thing against another."

Dragan described this vulnerability in more general terms:

> **Adv-Ice / Dragan**: "When things get tough, the first thing you cut is often the future: innovation, development, investment. [...] It is like not seeing the connection between the baby and the high-performing adult. You remove the early stage and later wonder why nothing came out."

In his view, organizations often cut future-oriented innovation and investment first when times become difficult because the financial system does not recognize the future value being destroyed.

4.3.3 Aspects that protect sustainable innovation

Respondents described several aspects that help sustainable innovation survive pressure. The first is embedding it into the core business. When sustainability is part of product requirements, customer demands, operational efficiency, or regulatory survival, it is less likely to be treated as optional. According to the interviewee at ComTel, their energy efficiency work is protected because it is also a performance and customer-cost issue. He states:

> **ComTel / Karl**: "This is not a side project. Energy efficiency is part of the product and part of why customers buy from us."

Similarly, SteeL's steel transition is protected because emissions reductions are tied to future competitiveness and market access.

> **SteeL / Hassan**: "If the requirement is that you need to reduce emissions to remain in the business, then it becomes something you have to do."

E-Truck's charging services gain organizational stability once they are incorporated into the ordinary service portfolio. By becoming part of the established offering, the initiative is absorbed into the core business and embedded within existing structures, processes, and commercial responsibilities.

A second aspect is a dedicated budget or protected mandate. NordEst has a yearly innovation budget of around 20 million SEK for innovation activities and research collaboration. Max described this as important because it signals that the organization is allowed to use resources for projects that is not a part of the core business. The budget can fund employee time, interim replacements, investments, and project costs.

> **NordEst / Max**: "It can mean that we finance a colleague's working time so they can load up with their idea for half a year instead of doing

only their normal tasks."

A third aspect is leadership signaling. Max described how management explicitly created permission to experiment and fail.

> **NordEst / Max**: "The CEO said: I will hand out parking tickets, but no speeding tickets. It was a very clear signal from management."

The signaling of this quote demonstrates that employees should not ask for permission for everything. The purpose was to create a free zone where people could challenge the existing way of thinking.

> **NordEst / Max**: "You are expected to challenge our existing way of thinking. We do not want you to ask for permission all the time."

A fourth aspect is evidence and rational persuasion. Karl argued that when resources are scarce, the organization has to be convinced that the upside is large and the risk manageable. Frameworks matter, but individuals still make decisions. He described the organization as a well-oiled machine populated by humans, meaning that decisions are structured but still depend on people's judgment, priorities, and risk tolerance:

> **ComTel / Karl**: "When resources, time, people, or priorities are scarce, it becomes about convincing someone rationally that the upside is very large and the risk is manageable."

A fifth aspect is using consultants and temporary roles as a buffer. Bengt described how organizations may keep core competence internally while reducing external support when they need to slow down. Consultants can accelerate the work in growth phases and then be removed when the organization wants to reduce speed without losing the entire capability. However, this only works if knowledge has been transferred to employees.

> **E-Truck / Bengt**: "That is why knowledge transfer becomes important. Otherwise the capability leaves when the consultant leaves."

A sixth aspect is networked capability. NordEst's innovation pilots and SteeL's production/customer/CTO loops spread responsibility across the organization. This can make innovation less dependent on one central team.

> **SteeL / Hassan**: "In some sense, everyone has two jobs: the normal job and the improvement work."

At SteeL, however, Hassan also noted that the removal of an earlier suggestion system may have reduced bottom-up idea flow from operators and night shifts. In his view, people in operations often see practical improvements, and the organization needs channels to capture them.

4.3.4 Transitions under uncertainty

The respondents described uncertainty as a factor that influences the timing, pace, and framing of sustainable innovation, rather than removing the need for such initiatives. At E-Truck, uncertainty surrounding the electrification transition was particularly important. Political uncertainty has not supported this transition, as electrification has been deprioritized at the governmental level, contributing to a slower industry-wide transition.

> **E-Truck / Bengt**: "They lower oil prices or change signals, and that affects the market even though the long-term direction is clear."

SteeL faces uncertainty about demand and the green transition. Hassan described how the company continues its conversion from blast furnaces to electric steelmaking, but also that some parts of the broader sustainability system are moving more slowly than expected. He mentioned uncertainty around large hydrogen-related investments and the need to follow customer demand. This affects when downstream investments become justified.

> **SteeL / Hassan**: "Right now, the big sustainability projects are creaking a bit. SteeL continues the conversion from blast furnace to electric steelworks, but the surrounding system is not moving at the same speed everywhere. [...] You cannot be too far ahead of demand. You have to hang on to market development."

Hassan also described a pragmatic decision logic under uncertainty: if the best solution is too expensive or risky, the organization may choose a second-best solution that is good enough and keeps the transition moving. In difficult times, this means innovation can be adapted rather than abandoned. The organization may limit ambition, sequence investments, or keep technical readiness while waiting for market conditions.

> **SteeL / Hassan**: "Sometimes alternative A is the best, but if A means that you risk failing, you may have to choose alternative B."

ComTel's uncertainty is handled through structured decision-making, but the interviewee could not provide one general answer. He said that almost every forward-moving activity includes uncertainty, and the organization has to weigh uncertainty against expected benefit. Sometimes the result is that an initiative is not worth it; in other cases, the upside is large enough to proceed despite high uncertainty.

At NordEst, tougher conditions were described as sharpening prioritization rather than removing innovation. Max said that the organization has become more careful in ensuring that initiatives genuinely carry toward the long-term strategy and that the learning is made explicit.

> **NordEst / Max**: "Tougher times have made us ensure to a greater extent that we really carry toward our long-term strategy. It has sharpened the prioritization."

Dragan framed uncertainty and pressure as a leadership problem. In his view, organizations often demand results without creating the conditions that make results possible. He argued that leaders should create conditions, and that conditions create results. When companies lack a critical capability, they often buy it externally instead of releasing or developing internal capability. This can create short-term progress but may weaken long-term organizational learning.

5

Discussion

This chapter discusses the findings in relation to the theoretical framework. The discussion is organized around cross-case concepts that emerged across the empirical material. The central argument is that sustainable innovation in established firms is managed through a continuous balance between organizing, assessing and protecting. These three activities are interdependent: how an initiative is organized affects how its value can be assessed, how it is assessed affects whether it can be protected, and how it is protected affects whether the organization can reconfigure its capabilities over time.

5.1 Organizing for sustainable innovation

The findings show that sustainable innovation is not supported by one best organizational form. Rather, the organizations combined integration, separation, network structures, temporary projects and boundary-spanning roles depending on the maturity of the initiative, the type of uncertainty involved and the degree of connection to the core business. This section discusses these findings in relation to ambidexterity, organizational structure and dynamic capabilities.

5.1.1 Ambidexterity as movement rather than organizational choice

A central finding is that the tension between exploration and exploitation was not solved through a fixed choice between separation and integration. Instead, sustainable innovation moved between different organizational locations over time. Some initiatives needed distance from the core in early phases because they required experimentation, ecosystem understanding or protection from short-term operating logic. Other initiatives were embedded from the beginning because they were inseparable from product performance, operational efficiency, customer value or production feasibility. In other situations, temporary project structures were needed because the transformation was too large, capital-intensive or cross-functional to be absorbed by ordinary routines.

The ambidexterity literature helps clarify why this concept matters. O'Reilly and Tushman (2013) distinguish exploration, which involves search, experimentation, autonomy and flexibility, from exploitation, which involves efficiency, refinement,

control and implementation. Sustainable innovation in the empirical material contained both logics at the same time: organizations needed exploratory space to understand new technologies, ecosystems and customer problems, but they also needed exploitative routines to scale, standardize and commercialize the solutions. This supports the ambidexterity perspective, but it also shows that the balance is fragile. If initiatives remain too close to exploitation, they risk being absorbed by current routines before their new logic has been understood. If they remain too far into exploration, they risk becoming experiments without ownership, implementation capacity or measurable contribution. This reflects Chakma et al. (2024) distinction between the success trap, where existing capabilities create inertia, and the failure trap, where exploration does not translate into stable capabilities or performance.

This finding supports the idea of ambidexterity, where organizations must pursue exploration and exploitation simultaneously (Tikas, 2025). However, the empirical material suggests that ambidexterity should not only be understood as the coexistence of separate exploratory and exploitative units. It should also be understood as a capability to move initiatives between organizational modes. Separation is useful when uncertainty is high and the organization needs freedom to search. Integration becomes more important when the initiative needs scale, ownership, commercial infrastructure or operational routines. Networked structures are valuable when the challenge is not only to create an innovation, but to spread understanding and capability across the organization. Project-based structures become important when ordinary line structures are too narrow to coordinate large transitions.

This adds a temporal dimension to the structural view of ambidexterity. The question is not only whether a firm should separate or integrate sustainable innovation, but when it should separate, when it should integrate, and what interface should allow the initiative to travel between the two. This is consistent with Iranmanesh et al. (2021), who emphasize that there is no universally optimal organizational structure, and with Teece et al. (1997), who argue that firms' strategic alternatives are shaped by their processes, positions and paths. It also extends the distinction between structural, contextual and sequential ambidexterity. Structural ambidexterity separates exploration and exploitation into different units, contextual ambidexterity enables individuals to balance alignment and adaptability in the same context, and sequential ambidexterity describes shifts between exploration and exploitation over time (O'Reilly & Tushman, 2013; Raisch et al., 2009). The findings do not fit only one of these forms. Instead, they suggest that established firms combine them: they separate when ideas need protection, embed when innovation is inseparable from current operations, use networks when learning must be spread, and shift over time when scaling becomes more important than experimentation. The findings therefore suggest that established firms organize sustainable innovation through a portfolio of organizational locations rather than through one stable structure. The value of each location depends on whether it fits the initiative's uncertainty, maturity and scaling needs.

The cross-case finding also clarifies why both embedded and separated innovation can fail. Embedded innovation may become efficient and close to customers, but it can also become locked into current product roadmaps, current revenue models or operational priorities. Separated innovation may create room for experimentation, but it can become isolated if no receiving unit is prepared to scale or own the result. Thus, the main organizational challenge is not choosing one side of the ambidexterity tension. It is designing the pathway between exploration and exploitation. In this respect, the empirical material supports the argument that ambidexterity is not a fixed structural solution, but an ongoing managerial capability that requires differentiation and integration to be continuously adjusted (Raisch et al., 2009).

5.1.2 Interfaces as the hidden infrastructure of sustainable innovation

A second finding is that sustainable innovation depended less on the formal existence of an innovation unit and more on the quality of interfaces between functions, knowledge domains and decision arenas. Across the empirical material, relevant knowledge was distributed across customers, operations, technology specialists, sustainability experts, suppliers, financiers, public actors and end-users. Sustainable innovation therefore emerged in the connections between these actors rather than inside one isolated unit.

The boundary-spanning literature gives a stronger vocabulary for this finding. Schotter et al. (2017) define boundary spanning as communication and coordination activities that integrate work across organizational, cultural, institutional and functional contexts. This is highly relevant for sustainable innovation because the relevant boundaries in the findings were not only formal departmental boundaries. They were also boundaries between professional languages, time horizons, customer and supplier perspectives, sustainability and financial logics, and exploratory and operational routines. In this sense, sustainable innovation did not only require more meetings between units. It required actors and practices that could make knowledge meaningful across different communities.

This finding aligns with the literature on integration and link mechanisms. Kim (1980), Iranmanesh et al. (2021) and Decanio et al. (2000) emphasize that cross-functional teams, communication channels, liaison roles and informal networks are central to innovation because they allow knowledge to be combined across specialized domains. The findings extend this point by showing that integration mechanisms are especially important in sustainable innovation because sustainability-related opportunities often begin as incomplete signals. A regulatory shift, a customer requirement, a resource-efficiency problem or a research opportunity does not automatically become an innovation project. It must be translated into a problem that the organization can understand, resource and act upon.

The empirical material shows several forms of such translation. Innovation pilots, customer-facing business developers, technology specialists, production interfaces,

research units, incubator-like structures and informal proximity all served as ways of connecting weak signals to organizational action. These interfaces had different forms, but they performed a similar function: they converted sustainability-related uncertainty into something that could be evaluated and developed. This corresponds closely to Goodrich et al. (2020) view of boundary spanners as knowledge brokers who do not merely transfer information, but make knowledge actionable for specific decision contexts. It also supports Gluch et al. (2013), who argue that knowledge is embedded in practices, tools and professional discourses and therefore needs translation when it moves across community boundaries. In dynamic capability terms, these boundary-spanning interfaces helped connect sensing to seizing. They allowed the organization to detect opportunities, interpret them in relation to customer and operational needs, and mobilize resources around them (Teece, 2007).

A key finding is that organizations need not only idea-generation mechanisms, but also receiving mechanisms. Ideas that do not fit current budgets, ownership structures or product roadmaps may disappear even when they are technically promising or strategically relevant. This is particularly important for sustainable innovation because many initiatives are adjacent to the current core: they may build on existing capabilities but require new business models, partnerships or assessment logics. Without a receiving structure, such ideas risk becoming organizationally homeless. Boundary spanning theory nuances this by showing that a receiving mechanism is not only a formal owner. It is also a translation space where the idea can be reformulated so that another part of the organization understands its relevance, risk and possible contribution.

The findings also show that interfaces can be formal, informal or spatial. Formal roles and processes create accountability and make it easier to allocate resources. Informal communication and physical proximity can accelerate knowledge-sharing and problem-solving. Networked roles can spread innovation capability across the organization. This resonates with Cross et al. (2013), who argue that formal organization charts often fail to show how work actually gets done, because informal networks of collaboration, advice and influence can be decisive for organizational change. However, the findings also support the more cautious side of this theory. Informal networks can create speed and flexibility, but they can also create fragility if important knowledge, legitimacy or decision-making power is concentrated in a few individuals or if influential actors resist the change.

These forms should therefore not be seen as substitutes, but as complementary. Formal structures help sustainable innovation survive beyond individual enthusiasm, while informal and spatial links allow knowledge to move quickly across boundaries. The organizational challenge is to institutionalize boundary-spanning enough to make it reliable, without making it so rigid that it loses the flexibility needed for exploration. This reflects the dual role of formalization described by Kim (1980) and Iranmanesh et al. (2021): formalization may inhibit creativity when it becomes rigid, but it may enable innovation when it clarifies roles, responsibilities and handovers. The boundary-spanning literature sharpens this point by showing that the work also

needs recognition and support. Goodrich et al. (2020) emphasize that boundary spanners can face role ambiguity because they are expected to communicate, translate, facilitate, build relationships and understand content, often without formal training or evaluation. This creates a risk that sustainable innovation depends on invisible work that is crucial for the organization but poorly protected as a capability.

5.1.3 Opportunity identification as sustainability-specific sensing

The findings suggest that sensing sustainable innovation opportunities is not only a matter of scanning for technologies, regulations or market trends. It is also a matter of translating sustainability pressure into business, operational and customer problems that the organization can act upon. Across the empirical material, opportunities emerged from customer demand, end-customer requirements, energy use, regulation, circularity, resource utilization, operational cost pressure, infrastructure shifts and long-term market expectations. These signals became meaningful only when they were connected to the organization's existing capabilities and future strategic needs.

This supports Hermundsdottir et al. (2024), who argue that sensing sustainability opportunities involves scanning changes in regulations, technologies and customer demands, while also expanding the search scope toward unfamiliar sustainable markets. The findings add that sensing is interpretative, not only informational. A sustainability signal does not have the same meaning in every organization. In some contexts, it is interpreted through customer operating costs and adoption barriers. In others, it is interpreted through product performance, energy efficiency, asset utilization, production transformation or circular resource flows. This is consistent with Malerba and Orsenigo (1996), who argue that innovation patterns are shaped by technological regimes and accumulated capabilities.

Boundary-spanning theory further nuances this point. If boundaries are also cognitive, professional and identity-based (Schotter et al., 2017), then sensing is not only about finding external signals, but also about making those signals legible internally. A sustainability requirement from a customer, a research call, or a regulation can remain weak if it is interpreted only in one professional language. It becomes actionable when someone can translate it into technical requirements, customer value, investment logic, operational consequences or strategic risk. This explains why opportunity identification in the findings was closely connected to boundary roles and interfaces rather than only to formal scanning routines.

The important cross-case finding is that sustainable innovation becomes easier to justify when environmental value and business value are connected through the same mechanism. Energy efficiency can reduce emissions and customer operating costs. Better utilization of existing assets can reduce environmental impact while improving resource productivity. Material efficiency can improve product performance while reducing resource use. Low-carbon production can become a requirement for future

market access. In these situations, sustainability is not treated as an add-on to the value proposition; it becomes part of what the product, service or system is expected to deliver. This supports Mousavi et al. (2017) and Hermundsdottir et al. (2024), who argue that seizing sustainable solutions requires sustainability to be embedded in the firm's value proposition.

However, the findings also show that sensing does not automatically lead to action. Some opportunities are visible before they are economically viable, technically mature or supported by infrastructure and customer demand. This is especially relevant in capital-intensive settings, where the organization may know the long-term direction but still need to align investment timing, asset cycles, policy development and market readiness. Sustainable sensing therefore includes judging the timing of an opportunity, not only identifying its existence. This connects sensing directly to seizing and reconfiguring: organizations must decide not only what future they see, but when and how much they should commit to it.

5.1.4 Reconfiguring routines, responsibilities and capability ownership

The findings show that sustainable innovation often becomes difficult because it changes routines, responsibilities and capability ownership. It is not only a question of developing a greener product or process. It may require new commercial routines, new capabilities, new customer conversations, new production competences, new partnerships, new evaluation criteria and new ways of distributing costs and benefits. In this sense, sustainable innovation is a reconfiguration problem.

This aligns with Teece (2007), who define reconfiguring as the enhancement, combination, protection and renewal of tangible and intangible assets in order to avoid structural rigidities. It also aligns with Mousavi et al. (2017) and Firdaus et al. (2026), who argue that sustainability-oriented reconfiguration requires firms to move beyond business-as-usual and renew their resource base. The findings add that this renewal is often organizationally uncomfortable because it redistributes who must learn, who must decide, who must pay, and who becomes responsible for implementation.

A repeated finding is the tension between speed and capability-building. A small central team or external expert can move quickly, but the knowledge may remain concentrated. A networked or embedded approach may be slower, but it can spread ownership and make the capability more durable. This reflects the structural tension discussed by Kim (1980) and Agbim (2013): decentralization can support participation and idea generation, while centralization can support coordination and implementation. For sustainable innovation, the relevant question is therefore not whether centralization or decentralization is better, but what kind of capability the organization is trying to build.

The boundary-spanning perspective adds that capability-building is not only a matter

of distributing tasks, but also of distributing interpretive capacity. If boundary roles remain informal and person-dependent, the organization may appear to have strong collaboration while actually relying on a small number of translators. This supports Goodrich et al. (2020), who argue that boundary spanners need recognition, resources and support, and it also connects to Cross et al. (2013), who show that informal networks can both enable and constrain change. The empirical material therefore suggests a nuanced position: organizations should not bureaucratize boundary work to the point that it loses flexibility, but they also cannot leave it entirely invisible if they want sustainable innovation capability to survive over time.

Capability ownership is particularly important when firms rely on suppliers, consultants or external partners. External actors may provide speed, specialized knowledge or access to technologies, but they do not automatically create internal capability. If the organization cannot operate, adapt and renew the knowledge after the external actor leaves, the innovation remains fragile. This sharpens the dynamic capability perspective: reconfiguration is not only about acquiring resources, but about absorbing them into routines, responsibilities and decision-making processes. Sustainable innovation therefore becomes more resilient when organizations treat projects as vehicles for learning, not only as vehicles for delivery.

5.2 Assessing sustainable innovation

The second empirical area concerns how organizations assess the value of sustainable innovation. The findings do not suggest that financial metrics should be abandoned. Instead, they show that traditional financial metrics become insufficient when used alone, especially when the value of sustainable innovation is delayed, systemic, uncertain or distributed across several stakeholders. Assessment therefore needs to combine financial discipline with strategic, environmental, customer-related and capability-building forms of value.

5.2.1 Financial discipline remains necessary but insufficient

The findings support the argument that ROI and similar financial metrics are too narrow when used as the only basis for evaluating innovation. This is consistent with Björk et al. (2023), who argue that innovation outcomes are uncertain, difficult to benchmark and dependent on both quantitative and qualitative forms of assessment. It is also consistent with Boons et al. (2013), who emphasize that sustainable innovation creates value across both economic and environmental dimensions, often through the wider business model rather than through a single project return.

The business model perspective adds an additional explanation for why narrow ROI logic is insufficient. If sustainable innovation changes how value is created, delivered, captured, maintained or distributed, the relevant unit of assessment is not only the individual project. Schaltegger et al. (2016) argue that product, process, corporate social responsibility or philanthropic approaches may be insufficient for sustainability transformations unless they are connected to the business model. The findings

reflect this because several initiatives were valuable not only as technical solutions, but as changes in customer relationships, stakeholder coordination, resource use and long-term value logic.

At the same time, the empirical material does not support the idea that sustainable innovation should be exempt from economic reasoning. Across the findings, respondents emphasized profitability, cost, customer adoption, market access, operating expenses, risk and investment timing. The issue is therefore not that ROI is irrelevant. The issue is that ROI becomes misleading when it is calculated too narrowly, too early or within the wrong system boundary. A sustainable innovation may not show an attractive short-term project return, but it may create future access to customers, reduce lifecycle costs, improve resilience, create regulatory preparedness, strengthen customer relationships or build capabilities that the organization will need later.

This means that financial discipline should be broadened rather than removed. Sustainable innovation still needs to demonstrate why it matters, what it enables, and how it contributes to the organization's strategic direction. However, the business case must often include more than immediate revenue and cost reduction. It must also include customer value, avoided risk, learning, option value, environmental impact and the strategic consequences of not acting. In this sense, the findings support the recommendation by Björk et al. (2023) that organizations should start with strategy rather than metrics. The relevant metrics depend on what kind of sustainable innovation is being assessed and what type of value it is expected to create.

5.2.2 Assessment as evidence-building rather than metric selection

A second finding is that the organizations assessed sustainable innovation through evidence-building rather than through one stable metric. The empirical material repeatedly points to criteria such as desirability, feasibility, viability, sustainability impact, risk, learning and strategic fit. These criteria are not independent checkboxes. They develop over time as uncertainty is reduced. Early-stage initiatives may need evidence that the problem is real, that customers or users care, that a technical path exists and that the initiative is aligned with the organization's direction. Later-stage initiatives require stronger evidence of feasibility, scalability, ownership, financial logic and implementation capacity.

This way of assessing innovation fits the multidimensional measurement perspective of Björk et al. (2023). They distinguish between input measures, current situation measures and results measures, emphasizing that innovation performance cannot be understood only through final outcomes. The findings show why this matters in sustainable innovation. If organizations assess early initiatives only through results measures, they risk eliminating ideas before learning has occurred. If they assess mature initiatives only through learning measures, they risk continuing projects

without sufficient strategic or economic relevance. Assessment must therefore change as the initiative develops.

The empirical material also shows that evidence can be qualitative as well as quantitative. Pilots, customer dialogues, technical tests, lifecycle reasoning, strategic arguments and internal learning can all function as evidence, even when they cannot be translated directly into a financial number. This is not a weakness if the evidence is explicit and linked to decision criteria. Rather, it helps organizations avoid the availability bias described by Björk et al. (2023), where firms prioritize what is easy to measure instead of what is important to understand.

This also means that evidence-building should not be limited to internal project indicators. Since business models for sustainability often involve customers, suppliers, partners, users and other stakeholders, assessment may need to capture whether these actors are actually being connected around a viable value logic (Schaltegger et al., 2016). The findings support this because several initiatives became assessable only when technical evidence was combined with customer needs, operational feasibility, stakeholder requirements and implementation ownership. In this sense, evidence-building is also a way of testing whether a sustainable innovation can become part of a wider business model rather than remain an isolated experiment.

The implication is that the main assessment challenge is not to find the perfect metric. It is to build a credible evidence portfolio that matches the maturity and uncertainty of the initiative. Such a portfolio should clarify what is known, what remains uncertain, what assumption is being tested, what value might be created and what capability is being built. This also makes assessment more useful for protection, because initiatives with visible evidence are easier to defend.

5.2.3 Long-term value, market access and strategic positioning

A third finding is that the value of sustainable innovation often appears through long-term positioning rather than immediate project returns. In the empirical material, sustainability-related initiatives were connected to future market access, customer requirements, resource efficiency, regulatory preparedness, brand and legitimacy, learning and the ability to remain relevant as industries change. These forms of value are difficult to capture through traditional ROI calculations because they often concern future eligibility rather than current profitability.

This supports Boons et al. (2013), who argue that sustainable business models should be evaluated through the value proposition, the configuration of value creation and the distribution of costs and benefits. A sustainable innovation may create value not only because it generates revenue directly, but because it changes the organization's position in a value network. It may help customers meet their own sustainability goals, make the firm a more attractive partner, enable access to future contracts or reduce exposure to future regulation.

The activity-system view of sustainable business models adds further nuance to this point. Lüdeke-Freund et al. (2024) distinguish between maintaining value, unlocking value and sharing value. This is useful for interpreting the findings because long-term value was not only about future revenue. It could also concern maintaining material, product, infrastructure or resource value; unlocking sustainable value by making low-carbon or resource-efficient alternatives usable for customers; and sharing value by distributing benefits and responsibilities across stakeholders. The assessment problem is therefore not only whether an initiative pays back, but what kind of sustainable value function it performs in the wider system.

The findings also suggest that assessment should distinguish between different strategic roles of sustainable innovation. Some initiatives are opportunities because they open new markets or strengthen differentiation. Some are requirements because they are necessary to maintain legitimacy, customer access or regulatory compliance. Some are threats if the organization fails to act and becomes locked into outdated assets, technologies or business models. Some are options because they create knowledge and readiness for a future that has not yet fully materialized. These categories matter because they should not be assessed in the same way. A requirement may deserve investment even if its direct return is modest. An option may deserve limited protection because it preserves future flexibility. An opportunity may need stronger evidence of customer value and scalability.

This broader view of assessment connects directly to the dynamic capabilities framework. Sensing identifies possible futures; seizing requires resource allocation and business model choices; reconfiguring ensures that the organization changes before current capabilities become rigid (Teece, 2007). Assessment is therefore not a neutral calculation after opportunities have been found. It is part of the capability through which the organization decides which future to prepare for.

5.2.4 Lifecycle and system-level value as the hardest measurement problem

The most difficult assessment problem concerns lifecycle and system-level value. Sustainable innovation often affects emissions, resources, costs and benefits beyond the boundaries of the individual project or firm. This creates a measurement problem because the result depends on where the boundary is drawn. A solution may look expensive within one business unit but valuable across the lifecycle. A new process may appear less efficient than an established infrastructure because the established infrastructure has already been paid for. A circular or low-carbon solution may create value for customers, society or future users, while the cost is carried by the innovating organization.

This difficulty is consistent with Bonilla Berrocal et al. (2026), who argue that sustainable and social innovation outcomes can be complex, intangible and context-dependent, and that monetization may oversimplify forms of value that are

not easily translated into financial terms. It also connects to Boons et al. (2013), since sustainable business models involve not only value creation and capture by the focal firm, but also the distribution of costs and benefits across stakeholders.

The value functions proposed by Lüdeke-Freund et al. (2024) help clarify why this is difficult in practice. Maintaining value may appear in reduced waste, longer product life or avoided resource extraction, while unlocking value may appear through customer access, changed use patterns or market development. Sharing value may appear through stakeholder benefits that are not captured by the focal firm. These effects are central to sustainable innovation, but they often fall outside conventional project accounting. The findings therefore support a business model-oriented assessment logic, where lifecycle and system-level effects are made visible even when they are distributed across actors, time periods and organizational boundaries.

The findings therefore suggest that evaluating sustainable innovation is also an exercise in boundary-setting. Organizations must decide whether they are assessing project-level return, customer-level value, system-level impact, lifecycle cost, strategic positioning or capability development. Different boundaries can lead to different conclusions about the same initiative. This does not mean that assessment becomes arbitrary, but it does mean that assumptions must be made explicit.

For this reason, lifecycle and system-level value should not be forced into a single ROI calculation too early. Scenario reasoning, qualitative impact assessment, lifecycle perspectives, stakeholder analysis and staged experimentation may be more appropriate when outcomes are uncertain or distributed. This also reflects Börjesson and Elmquist (2011), who emphasize the importance of developing innovation capabilities under uncertainty and changing conditions. In sustainable innovation, the ability to evaluate what cannot yet be fully measured becomes part of the innovation capability itself.

5.3 Protecting sustainable innovation

The third empirical area concerns how sustainable innovation is protected during financial pressure and uncertainty. The findings show that protection does not always mean continuing an initiative unchanged. It can also mean slowing down, sequencing, relocating, narrowing scope, transferring ownership, preserving knowledge or keeping technical readiness alive until timing improves. This section discusses protection as a dynamic capability rather than as a simple commitment to continue or abandon projects.

5.3.1 Protection as preserving capability, not freezing projects

A central finding is that sustainable innovation is protected when organizations preserve the underlying capability, not necessarily when they preserve the project

in its original form. During uncertainty, initiatives may need to be adjusted. The organization may reduce pace, change scope, wait for market readiness, move the initiative closer to the core, use external support temporarily, or keep knowledge alive while postponing larger investments. These actions should not automatically be interpreted as failure. They may be ways of maintaining strategic readiness while avoiding premature commitment.

This interpretation aligns with Teece (2007), who describe reconfiguring as the continuous renewal, protection and recombination of assets. The word protection is important here. Dynamic capabilities are not only about moving quickly toward new opportunities; they are also about preserving valuable resources and options under changing conditions. In sustainable innovation, such resources may include customer relationships, technical knowledge, data, internal legitimacy, external partnerships, patents, pilot results, production learning or understanding of future market requirements.

The findings therefore suggest that protection should be selective and capability-based. Not every sustainable initiative should continue unchanged simply because it has a sustainability label. Organizations need to ask what would actually be lost if the initiative disappeared. If the loss is only a project with weak strategic relevance, discontinuation may be reasonable. If the loss is a capability, relationship, option or knowledge base that will be needed for future transformation, protection may be justified even if the immediate business case is weak. This distinction helps avoid both overprotection and underprotection.

5.3.2 Distance from the core as a central source of vulnerability

A repeated finding is that sustainable innovation becomes vulnerable when it is distant from the current value logic of the organization. Distance can be organizational, financial, temporal or cognitive. An initiative may be organizationally distant if no unit owns it. It may be financially distant if its value is not visible in current accounting systems. It may be temporally distant if the payoff lies far in the future. It may be cognitively distant if decision-makers do not understand how the initiative connects to customers, operations or strategy.

Ambidexterity theory helps explain why this distance is both necessary and dangerous. Exploration often needs autonomy, flexibility and protection from current performance demands (O'Reilly & Tushman, 2013). However, if that autonomy is not connected to a future exploitation path, the initiative can become exposed when resources are reduced. This nuances the value of structural ambidexterity. Separate units may protect exploration in the short term, but they do not automatically protect the initiative in bad times unless there are linking mechanisms, shared strategic intent and a plausible route into the core (Raisch et al., 2009). The empirical material therefore supports ambidexterity theory, but also shows its practical weakness: exploration can become defensible only when the organization

can explain how it may later contribute to exploitation, reconfiguration or strategic renewal.

This helps explain why sustainable innovation can be threatened even in organizations with strong sustainability ambitions. The problem is not always lack of commitment. It can be lack of translation. If an initiative cannot be connected to product performance, customer value, regulatory preparedness, market access, resource efficiency or capability-building, it becomes easier to cut during pressure. In this sense, vulnerability is created before the downturn occurs. It is created when initiatives are organized without interfaces, assessed with too narrow criteria or left without a clear owner. This also connects to the success-trap logic discussed by Chakma et al. (2024): organizations may continue improving what already works while underprotecting adjacent opportunities that are needed for future adaptation.

This finding also shows why assessing and protecting cannot be separated. If evaluation systems recognize only short-term financial outputs, then early-stage, systemic or capability-building initiatives have little protection. Björk et al. (2023) warn that innovation measurement can become biased toward what is easy to measure. The findings show the practical consequence of that bias: what is difficult to measure may become difficult to defend. Protection therefore depends on whether the organization has already built a language for explaining future, systemic and capability-related value.

5.3.3 Mechanisms that protect sustainable innovation

Several mechanisms were found to protect sustainable innovation by making future value more defensible during periods of pressure. The first mechanism is embedding sustainability into the core business. When sustainability is linked to product requirements, customer demand, operational efficiency, regulatory survival, future competitiveness or market access, it becomes part of business continuity rather than a separate initiative. This connects to Mousavi et al. (2017) and Hermundsdottir et al. (2024), who argue that sustainable solutions need to be embedded in the firm's core value proposition. It also reflects the business model perspective of Boons et al. (2013) and Schaltegger et al. (2016), where sustainable innovation is evaluated through how value is proposed, created, delivered and captured.

A second mechanism is dedicated budget or protected mandate. Separate resources, innovation budgets and formal mandates can create space for experimentation before an initiative can be justified through ordinary business-case logic. This is important because early-stage sustainable innovation often involves uncertainty, delayed returns and learning outcomes that are difficult to measure directly. However, protected resources need to remain connected to strategic priorities. If they become isolated from the core organization, they may be perceived as optional during financial pressure. This reflects Björk et al. (2023), who argue that innovation measurement and management systems must be aligned with strategy and organizational context. It also connects to ambidexterity theory, where separation can protect exploration

but must eventually be linked to integration and scaling (O'Reilly & Tushman, 2013; Raisch et al., 2009).

A third mechanism is leadership signaling. The findings show that sustainable innovation is protected not only through budgets and structures, but also through signals that create permission to experiment, challenge existing routines and accept failure. Leadership signaling creates legitimacy for exploration and makes employees more willing to engage in uncertain initiatives. This supports Björk et al. (2023), who emphasize that innovation depends not only on financial outcomes, but also on organizational and cultural conditions.

A fourth mechanism is evidence and rational persuasion. Sustainable innovation becomes easier to defend when the organization can show what has been learned, what risks have been reduced, what customer needs have been confirmed and what future value is being prepared. Evidence does not remove uncertainty, but it makes uncertainty more manageable and easier to discuss. This aligns with Björk et al. (2023), who argue that innovation should be evaluated through input measures, current situation measures and results measures rather than only final financial outcomes. The business model perspective further adds that evidence should not only concern project-level return, but also how the initiative contributes to maintaining, unlocking or sharing sustainable value across the wider value network (Lüdeke-Freund et al., 2024).

A fifth mechanism is using consultants and temporary roles as a buffer. External expertise can help organizations accelerate sustainable innovation in growth phases, while still allowing the organization to reduce pace when pressure increases. This can protect the initiative because the organization can adjust external support without necessarily abandoning the underlying direction. However, this mechanism only works if knowledge is transferred internally. If too much capability remains with external actors, the organization may appear to progress while remaining dependent. This reinforces Teece et al. (1997) and Teece (2007), who emphasize the importance of integrating, building and reconfiguring internal and external competences over time.

A sixth mechanism is networked capability. Sustainable innovation becomes more resilient when responsibility is distributed across functions, operational roles, boundary-spanning roles and cross-functional interfaces rather than concentrated in one central team or individual champion. Networked capability may slow down decision-making, but it also makes innovation less fragile. This reflects Kim (1980), Agbim (2013) and Iranmanesh et al. (2021), who emphasize participation, integration mechanisms and cross-functional coordination as important for innovation. Boundary-spanning theory further explains why this matters: knowledge often needs to be translated across professional, functional and organizational boundaries before it becomes actionable (Schotter et al., 2017; Goodrich et al., 2020).

Taken together, the findings suggest that sustainable innovation is best protected when these mechanisms reinforce each other. Core embedding creates strategic

relevance, but may not protect adjacent innovation. Dedicated budgets and mandates create room for exploration, but may become isolated without links to strategy. Leadership signaling creates permission to experiment, but needs routines and resources to become durable. Evidence and rational persuasion make future value understandable, but require decision arenas where such evidence is taken seriously. Consultants and temporary roles can preserve momentum, but only if knowledge is transferred internally. Networked capability spreads ownership, but depends on functioning integration and boundary-spanning mechanisms. Protection is therefore not one mechanism, but a combination of strategic relevance, resources, leadership, evidence, capability retention and distributed ownership.

5.3.4 Reconfiguring under uncertainty

The findings show that uncertainty affects the timing, scope and sequencing of sustainable innovation, but it does not remove the need for transformation. In several parts of the empirical material, the long-term sustainability direction was relatively clear, while the timing of investments, demand, infrastructure, policy signals or technology maturity remained uncertain. This creates a management problem: moving too slowly can lead to lock-in and lost opportunities, but moving too early can create excessive cost, stranded investments or solutions that the surrounding system is not ready to absorb.

Reconfiguration under uncertainty therefore requires timing capability. Organizations need to recognize when to commit, when to wait, when to keep an option alive and when to accept a second-best solution that preserves momentum without creating unacceptable risk. This is not a passive strategy. Waiting can be capability-preserving if the organization maintains knowledge, relationships and readiness. It becomes capability-eroding if the organization simply postpones learning.

This connects to Teece (2007) because reconfiguration is not only internal asset renewal; it is also orchestration in relation to external conditions. Sustainable innovation often depends on ecosystems, including customers, suppliers, regulators, infrastructure providers, energy systems and other market actors. When these systems move at different speeds, firms must reconfigure in a way that keeps them aligned with the transition without becoming either too early or too late.

The broader implication is that protecting sustainable innovation is not about shielding every project from pressure. It is about protecting the organization's ability to continue learning and adapting under pressure. In this way, protection becomes the bridge between assessment and reconfiguration. Assessment identifies what value and capability are at stake. Protection keeps the relevant capability alive. Reconfiguration turns that capability into changed routines, structures and strategic positions.

5.4 Practical implications

The findings provide several practical implications for established firms managing sustainable innovation. First, managers should treat organizational location for sustainable innovation as a strategic design choice rather than as a fixed structure. Sustainable innovation may need to be embedded, separated, networked or project-based depending on its maturity and uncertainty. The practical question is not only where an initiative should be placed today, but how it can move when its needs change. An initiative that begins in an exploratory space should have a path toward ownership and scaling. An initiative embedded in the core should still have access to exploratory mechanisms when it challenges current routines.

Second, organizations should invest in interfaces, not only in innovation projects. Cross-functional handovers, boundary-spanning roles, innovation pilots, customer translators, production links, informal networks and receiving structures are what allow sustainable innovation to travel across the organization. Managers should therefore ask who translates sustainability signals into organizational problems, who receives ideas that do not fit current roadmaps, and who has authority to connect exploratory work to operational ownership.

Third, assessment systems should be broadened into staged evidence portfolios. Rather than relying only on ROI, organizations should make explicit what type of evidence is needed at different stages. Early initiatives may require evidence of learning, customer need, strategic relevance and technical possibility. More mature initiatives require evidence of scalability, ownership, financial logic and implementation capacity. This makes assessment more useful as a management tool and reduces the risk that early-stage sustainable innovation is rejected because its value cannot yet be fully measured.

Fourth, firms should define protection criteria before pressure increases. Sustainable innovation should not be protected simply because it is sustainable, but because it preserves a capability, market position, customer relationship, knowledge base or strategic option that would be difficult to rebuild. Managers can therefore distinguish between initiatives that create immediate efficiency, initiatives that are strategically necessary, initiatives that build future options and initiatives that can be paused without losing critical capability.

Fifth, sustainable innovation should be managed as capability-building rather than only project execution. Managers should ask what each initiative teaches the organization, where the knowledge will be stored, who will own it after the pilot or project phase, and how external expertise will be absorbed internally. This is particularly important when firms depend on suppliers, consultants or ecosystem partners. External collaboration can accelerate sustainable innovation, but it does not replace the need to build internal dynamic capabilities.

Finally, the three areas of organizing, assessing and protecting should be managed

together. A problem that appears financial may actually be caused by narrow assessment boundaries. A problem that appears technical may be caused by weak ownership. A problem that appears strategic may be caused by missing interfaces between exploration and exploitation. A problem that appears to reflect weak sustainability commitment may instead reflect an inability to translate sustainability into customer value, operational criteria or future capability. The practical contribution of the findings is therefore a diagnostic logic: managers should ask where the initiative is located, who connects it, what evidence supports it, what capability it builds, how uncertainty is handled and what must be protected if conditions worsen.

5.5 Further research

This study provides qualitative insights into how selected established organizations organize, assess and protect sustainable innovation, but several areas would benefit from further research. The empirical material in this thesis is based on a limited number of respondents from established organizations, many of them operating in industrial or infrastructure-related contexts. Thus, future studies could examine a broader and more varied sample of organizations.

Second, longitudinal research would be valuable. The findings indicate that sustainable innovation changes location and meaning over time: initiatives may begin in exploratory spaces, become integrated into the core, slow down, narrow in scope or remain alive as capability-building efforts. A longitudinal study following specific sustainable innovation initiatives from early sensing to implementation, scaling or termination could provide deeper understanding of when organizations decide to separate, integrate, protect or abandon an initiative. This would also make it possible to study whether early assessment criteria actually predict later value, and how organizations learn from initiatives that do not become commercial successes.

Third, further research could examine how sustainable innovation is protected under resource constraints. The findings show that protection does not always mean continuing an initiative unchanged; it can also involve slowing down, transferring ownership, preserving knowledge or waiting for better timing. More research is needed on how organizations decide which sustainability-related capabilities to keep alive during downturns, strategic shifts or market uncertainty. This would be especially relevant in industries where sustainable transformation requires large irreversible investments, long development cycles or dependency on infrastructure and policy development.

Finally, future research could explore the role of external ecosystems more deeply. Several findings indicate that sustainable innovation depends on actors outside the focal organization, including customers, regulators, suppliers, infrastructure providers, energy systems and end-users. Further research could therefore study how organizations coordinate sustainable innovation across value chains and ecosystems, and how uncertainty in one part of the system affects decision-making

in another. This would be particularly useful for understanding transitions such as electrification, circular construction and low-carbon industrial production, where no single organization controls all conditions for success.

6

Conclusion

The aim of this thesis was to explore how established firms manage sustainable innovation by examining how they organize, assess, and protect sustainable innovation initiatives over time. By applying a dynamic capabilities perspective, the study has analyzed how firms sense sustainability-related opportunities, seize them through evaluation and resource allocation, and reconfigure structures, routines, responsibilities, and capabilities under changing conditions. Overall, the findings show that sustainable innovation is not managed through one single organizational structure, evaluation model, or protection mechanism. Instead, it is managed through the continuous interaction between organizing, assessing, and protecting. How initiatives are organized affects how their value can be assessed, how they are assessed affects whether they can be protected, and how they are protected affects whether firms preserve the capabilities needed for future sustainable innovation.

In relation to RQ1, the study shows that established firms organize for sustainable innovation through movement between integration and separation, rather than through a fixed organizational choice. Sustainable innovation often needs to be connected to the core business in order to access resources, legitimacy, technical knowledge, customers, and implementation capacity. At the same time, separation can be necessary when initiatives are uncertain, exploratory, cross-functional, or not yet mature enough to fit existing structures and routines. The central challenge is therefore not whether sustainable innovation should be integrated or separated, but how firms create movement between exploration and exploitation over time. Boundary-spanning roles, innovation pilots, project structures, informal networks, handovers, and cross-functional interfaces are crucial in this process. These mechanisms form the hidden infrastructure that allows sustainability-related ideas to be translated across functions, connected to business needs, and eventually turned into implemented innovation.

In relation to RQ2, the study shows that established firms assess sustainable innovation through broader and more dynamic criteria than traditional financial metrics alone. Financial discipline remains necessary, but ROI is often too narrow to capture early-stage, long-term, systemic, or capability-building forms of value. The findings indicate that assessment is less about selecting one perfect metric and more about building credible evidence over time. This evidence may include desirability, feasibility, viability, sustainability impact, risk, strategic fit, customer value, learning, market access, and future option value. The study also shows that sustainable innovation often creates value beyond the boundaries of a single project,

department, or firm. Therefore, assessment must consider not only project-level returns, but also lifecycle effects, system-level impact, stakeholder relationships, and business model transformation. In this sense, assessing sustainable innovation is also an exercise in defining the right boundaries for value.

In relation to RQ3, the study shows that protecting sustainable innovation during financial pressure or uncertainty does not necessarily mean continuing all initiatives unchanged. Instead, protection should be understood as preserving critical capabilities, relationships, knowledge, and strategic options. In practice, this may involve slowing down, sequencing, narrowing scope, relocating initiatives closer to the core, transferring ownership, maintaining partnerships, or keeping technical readiness alive until timing improves. Initiatives become particularly vulnerable when they are distant from the current value logic of the organization. This distance can be organizational, when no unit clearly owns the initiative; financial, when its value is not visible in current accounting systems; temporal, when the payoff lies far in the future; or cognitive, when decision-makers struggle to see how the initiative connects to customers, operations, or strategy. Protection must therefore be selective and deliberate, based on what would actually be lost if an initiative disappeared. If the loss is only a weak project with limited strategic relevance, discontinuation may be reasonable. If the loss is a capability, relationship, knowledge base, or strategic option needed for future transformation, protection may be justified even when the immediate business case is uncertain.

Taken together, the findings show that sustainable innovation in established firms is best understood as an ongoing dynamic capability rather than as a separate sustainability activity or a fixed innovation process. Firms must be able to sense opportunities by interpreting external pressures, customer needs, regulatory shifts, technological developments, and operational problems. They must be able to seize these opportunities by building evidence, allocating resources, and connecting sustainability to viable business models. They must also be able to reconfigure routines, responsibilities, ownership, and capabilities so that sustainable innovation can move from isolated experiments to organizational practice.

The central conclusion of this thesis is that there is no one-size-fits-all model for managing sustainable innovation in established firms. Sustainable innovation cannot be reduced to a specific structure, metric, or protection mechanism; it must be adapted to the organization's context, maturity, strategic priorities, and external pressures. The most important finding is therefore not that firms should always integrate or separate sustainable innovation, rely on or move beyond ROI, or protect all initiatives at all costs. Rather, successful firms build the capability to make these choices deliberately. They know when to create space for exploration, when to connect initiatives to the core business, when to broaden evaluation beyond short-term financial returns, and when to slow down, relocate, or preserve initiatives during uncertainty. In short, sustainable innovation is managed best when firms treat it as a dynamic organizational capability: something that must be continuously organized for, assessed, and defended over time.

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A

Appendix A - Initial Interview Guide

Understanding Sustainable Innovation in the Organization

1. How does your organization define sustainable innovation?
   - Has this definition changed over time?

2. What role does environmental sustainability play in your innovation projects today?

Drivers and Motivations for Green Investments

3. What typically motivates your organization to invest in environmentally sustainable innovation?

4. Are these investments mainly driven by internal strategy or external stakeholders?

5. Has there been projects where investments (subventions) have been driven by external actors, such as governments or other institutions?

6. What are the biggest internal debates when deciding to invest in a sustainable innovation?
   - Is there a conflict between short-term ROI and long-term sustainability?

7. Can you describe a recent sustainability-related opportunity or threat your team identified? How did that process start?

Resource Acquisition and Allocation

8. What types of resources are most critical for sustainable innovation in your organization?
   - (e.g., financial, human, technological, organizational)

9. Do sustainability projects compete with "traditional" innovation projects?

Capability Development for Sustainable Innovation

10. What organizational capabilities do you believe are necessary to successfully pursue sustainable innovation?

11. How has your organization developed these capabilities over time?

12. When the organization lacks a critical capability for a green project, how does the organization acquire them?
- Internally, hire experts, or partner with outsiders (e.g., NGOs, universities, competitors)? Why?
- What makes these collaborations difficult or on the contrary fruitful?

13. Are there organizational capabilities you feel are still missing?

Reconfiguring Resources and Business Models

14. Have sustainability-driven initiatives required changes to existing processes or business models?

15. How easy or difficult has it been to reallocate resources away from established practices?

16. Has there been resistance from existing units or managers? Or profitability concerns from existing business?

17. Can you give any examples where old business models were hard to abandon?

18. How does the organization balance exploitation of current models with exploration of sustainable ones?

19. Sustainable innovation often requires "unlearning" old routines. What has been the biggest challenge in changing the way people work to support these new goals? Have you had to create new units or "spin-offs" to protect these projects from the main business?

Outcomes and Value Creation

20. Have there been difficulties measuring returns on sustainability investments?

21. How do you evaluate the success of sustainable innovation initiatives?

22. What types of value do these projects create for the organization, other than the financial value?

Reflection and Forward-Looking Perspective

23. Looking ahead, how do you see your organization's approach to sustainable

innovation evolving?

24a. What would need to change for sustainable innovation to become more effective? Ask for examples!

24b. What would need to change for sustainable innovation to become more impactful? Ask for examples!

24c. What would need to change for sustainable innovation to become more attractive? Ask for examples!

25. If you could change one thing about how your organization allocates its "innovation budget," what would it be?

Closing Question

26. Is there anything we haven't covered regarding the challenges of managing resources for sustainability that you think is critical?

B

Appendix B - In-Depth Interview Guide

Organizing ambidexterity for sustainable innovation

1. How is sustainable innovation generally organized in your organization?

2. To what extent is sustainable innovation separated from day-to-day operations, and to what extent is it integrated with the core business?

3. What kinds of roles, functions, or interfaces help connect sustainable innovation efforts to the core business?

4. How are new sustainable innovation opportunities usually identified in your organization?

5. Once such an opportunity is identified, how does the organization typically decide whether to act on it?

6. What kinds of organizational support are usually needed for sustainable innovation to progress?

7. Have sustainable innovation efforts required changes to existing routines, structures, or responsibilities in your organization?

8. How does your organization balance exploitation of the current business with exploration of more sustainable alternatives?

Evaluating sustainable innovation beyond ROI

9. How does your organization generally evaluate sustainable innovation initiatives?

10. To what extent does short-term ROI shape decisions around sustainable innovation?

11. What other criteria matter when evaluating sustainable innovation initiatives?

12. In your organization, how are initiatives justified when short-term returns do not exist but long-term value is potentially high?

13. Have your organization's KPIs, decision criteria, or investment logic changed in order to better support sustainable innovation?

14. What kinds of returns from sustainable innovation are hardest for your organization to justify the investment?

15. How do you view the role of evaluation logic during project selection versus after implementation, when reviewing whether the expected returns were actually achieved?

Protecting or reconfiguring ambidexterity in bad times

16. What typically happens to sustainable innovation efforts when the organization faces bad times?

17. In your view, how vulnerable are sustainable innovation structures in difficult times?

18. Are there mechanisms in your organization that help protect sustainable innovation efforts from short-term pressures?

19. How does decision-making around sustainable innovation change under uncertainty?

20. Have you seen cases where sustainable innovation was not abandoned, but instead adapted to fit tougher conditions?

Closing questions

21. Which of these tends to be the biggest challenge in practice: creating space for sustainable innovation, evaluating it, or protecting/adapting it under pressure?

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