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Green procurement in practice: how buyer-supplier interaction differs across product categories

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Abstract: This study investigates how various buyer-supplier interaction practices support the pursuit of green procurement outcomes and why approaches vary across product categories. The research reports on a single case study of a multinational manufacturing company in the energy sector to explore how environmental objectives are integrated into the procurement of different products. The analysis identifies three distinct interaction practices: collaborative-development exchange, specification-translation exchange, and compliance-based exchange, through which environmental goals were achieved. These practices reflect varying levels of interdependence and resource adaptation, demonstrating that green procurement depends on both what is procured and how buyer-supplier relationships are managed. The study contributes by developing a typology of green procurement interaction practices that links product categories with relational dynamics of exchange, offering theoretical and practical insights into how organisations can align supplier relationships with environmental objectives across their procurement portfolio.

Keywords: green procurement; buyer-supplier relationship; product categories; Kraljic framework; buyer-supplier interface.

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business networks and relationships in sustainable procurement, with a particular focus on environmental sustainability in the manufacturing sector across both developing and developed countries.

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This paper is a revised and expanded version of a paper entitled 'Environmentally sustainable procurement: An exploratory study of Supplier Relationship Management and Resource Interactions in a manufacturing firm.' presented at The Industrial Marketing and Purchasing Group (IMP) conference, Oulu Business School, Finland, 28 August 2024.

1 Introduction

Procurement plays an important role in driving the sustainability agenda, given its position and its ability to influence external organisations in the supply chain (Green et al., 1998; Seuring, 2004). Accordingly, research indicates that focusing on sustainable procurement could provide a transitional route to achieving sustainability (Green et al., 1998; Theron and Dowden, 2017). However, implementing and committing to sustainable procurement remains a major challenge for many organisations (Etse et al., 2023). Progress on sustainability has been slow, mainly owing to the tendency of actors to focus their sustainability practices within their individual business divisions (Laasch et al., 2020). Since firms are affected by the actions of all actors in their supply chains and lack direct control over suppliers' activities, effective supplier relationship management and relational engagement with suppliers are critical for achieving sustainability (Amiri et al., 2024; Bizri and Stegare, 2025). Effective management enables environmental goals to be translated and implemented across organisational boundaries.

Sustainable procurement encompasses social, environmental, and economic factors, while the concept of *green procurement* focuses primarily on the environmental aspect (Min and Galle, 2001). The concept of green procurement is used in this study since the focus is primarily on how environmental awareness is incorporated into the procurement process to ensure that products and purchased materials achieve the environmental goals associated with them (Min and Galle, 2001). The campaign for sustainability in procurement is fuelled partly by the growing number of rules and standards, such as ISO

14001 which specifies the requirements for an environmental management system (EMS) (Erauskin-Tolosa et al., 2020) and ISO 26000, widely adopted standard for monitoring environmental and societal impacts (Popa and Dabija, 2019). They both require businesses to consider sustainability when making purchasing decisions (Grote et al., 2007; Johnsen et al., 2017). Other factors that have influenced green procurement include greater customer awareness and expectations, rivals who value sustainability, and top management commitment (Giunipero et al., 2012; Walker et al., 2008; Walker and Phillips, 2009). Organisations are adopting a green procurement approach in response to these increased pressures (Sarkar, 2012), the standards and policies are intended to deter firms seeking profits at the expense of environmental performance (Johnsen et al., 2017).

Green procurement approaches refer to strategies and practices that integrate environmental considerations into purchasing decisions to minimise negative environmental impacts throughout the product or service life-cycle. These approaches aim to promote sustainability by reducing resource consumption, emissions, and waste while encouraging suppliers to adopt environmental practices. Furthermore, even if firms prioritise economic performance in their businesses, the literature suggests that addressing environmental concerns could deliver both environmental and economic benefits (Hänninen and Karjaluoto, 2017). Environmental activities and performance have also been recognised as influencing a company's strategic position in the marketplace (Zhao et al., 2015). However, while a buyer certifying its suppliers ensures a minimum level of environmental interest (Junquera et al., 2012), it does not guarantee that environmental issues will be prioritised (Hänninen and Karjaluoto, 2017). Equally, environmental consciousness and attitudes do not always manifest clearly in behaviour (Goh and Balaji, 2016). The situation highlights the growing recognition that formal compliance and certification are insufficient; achieving sustainability targets requires understanding how environmental objectives are enacted through buyer-supplier interactions, as procurement policies and sustainability goals may not fully translate into implementation in practice (Taheriruh and Moshtari, 2024).

More recent research has emphasised that sustainability outcomes are shaped by the nature of supplier relationships and by what is exchanged within them (Amiri et al., 2024; Harrison et al., 2023). However, green procurement is often discussed in relatively general terms, even though environmental goals are not implemented in the same way across all procurement situations. The coordination needs, learning processes, and degree of supplier involvement differ, for example, between standardised items and strategic or high-risk components (Garzon et al., 2019).

This creates an important supplier relationship management problem: firms may adopt environmental goals at the policy level, but struggle to translate them into practice unless they align those goals with the interaction requirements of different product categories. While existing studies acknowledge that sustainability outcomes depend on collaboration with suppliers (Paulraj et al., 2008; Touboulic et al., 2014), fewer studies explain how and why buyer-supplier interaction differs across procurement categories when environmental objectives are pursued. Prior studies such as Holma et al. (2022) provide useful insights into inter-organisational interfaces and exchange, but they do not specifically explain how green procurement unfolds differently across product categories.

This study addresses that gap by linking product category characteristics with buyer-supplier interaction practices. Doing so helps explain why some green procurement

efforts remain largely compliance-based, while others require specification, adaptation, or collaborative development with suppliers.

Accordingly, the study seeks to answer the following research question:

> "How do buyer-supplier interactions shape the various green procurement approaches adopted for different product categories?"

The current study builds on two complementary perspectives to explain why sustainability practices vary across procurement contexts. First, product category positioning (Kraljic, 1983) captures how environmental priorities differ depending on the strategic importance and supply risk of the purchased items. Second, the supplier interface framework (Araujo et al., 1999) within the industrial marketing and purchasing (IMP) tradition (Håkansson and Snehota, 1995) offers a lens to address how buyers and suppliers connect, coordinate, and adapt their resources in practice. This framework distinguishes between four types of buyer-supplier interface: standardised, specified, translation, and interactive. Each represents a different form of relational exchange. By combining these two perspectives, the study examines both what is exchanged (the product category) and how it is exchanged (the interaction pattern), thereby linking category-specific procurement conditions with the relational dynamics that enable or constrain green outcomes.

Empirically, we apply a single case study to examine how green procurement is implemented in a multinational manufacturing company and how suppliers' resources are utilised to promote environmental sustainability. The case company is a market leader in innovative technologies in the energy sector, and strives to provide the best solutions for its customers in collaboration with the suppliers in their value chain. Data were gathered through interviews with selected actors involved in procurement and supply chain management in the company and with some of their most important suppliers. The informants comprised ten individuals from the buyer side and three from the supplier side. In addition, we conducted a document analysis drawing on the supplier handbook, internal documents on product categorisation, and documents outlining the buyer's sustainability goals.

The analysis identifies three distinct interaction practices: collaborative development exchange, specification-translation exchange, and compliance-based exchange. Those practices illustrate how environmental objectives are pursued through combinations of supplier interfaces and product categories. These practices explain how sustainability is embedded across procurement contexts and how the depth of interaction shapes environmental outcomes.

This study contributes to the body of knowledge on green procurement by highlighting how sustainability strategies differ by product categorisation according to the widely adopted strategic sourcing framework devised by Kraljic. The research thus complements studies stressing the need for the consideration of sustainability in this framework (Krause et al., 2009; Majidi et al., 2025). It also contributes by linking supplier relationship management and green procurement, showing how environmental outcomes depend on the configuration of buyer-supplier interfaces. The study further contributes theoretically by advancing the IMP approach, applying the resource–interface framework in the context of green procurement, and showing how interaction enables or constrains environmental integration (Johnsen et al., 2017).

The paper is organised as follows. Section 2 discusses the research background on green procurement, as well as the IMP approach on supplier relationships and resource

interfaces. Section 3 explains the research methodology, data collection, and analysis methods. Section 4 captures the findings of the data analysis. Section 5 provides a summary and discussion of the findings. Section 6 concludes the study and provides avenues for further research.

2 Research background

2.1 Green procurement as an interaction process

Green procurement integrates environmental protection awareness into the procurement plan to ensure that products and purchased materials fulfil their environmental goals (Min and Galle, 2001). Zsidisin and Siferd (2001, p.69) defined green procurement as "the set of purchasing policies, actions taken, and relationships formed in response to concerns associated with the natural environment." This definition highlights that environmental purchasing is not only about acquiring environmentally friendly products but also encompasses how buyers and suppliers organise their actions and interactions in pursuit of environmental objectives. Effective supply chain management should incorporate green approaches (Pathan and Kesavaraj, 2024).

Green procurement has been discussed in the literature with reference to various environmental purchasing practices that illustrate how organisations embed environmental objectives into their sourcing decisions and product design (Schreiber et al., 2025). Over time, the literature has shown that green procurement extends beyond compliance or product-level improvements towards integrating sustainability criteria across purchasing and supply management. It increasingly aligns procurement goals with broader environmental strategies, such as waste reduction, energy efficiency, and life-cycle thinking, thereby positioning purchasing as a central function for achieving organisational sustainability (Zandi et al., 2019). Environmental objectives may be achieved through the exchange of products that meet eco-design requirements, through the exchange of information such as environmental reports, or through the joint development of environmental competences and technologies (Rao, 2005; Zsidisin and Siferd, 2001).

Research also highlights that green procurement approaches differ not only in their environmental focus but also in terms of the product categories and the intensity of buyer-supplier interactions, reflecting differences in procurement roles, strategies, and relational dynamics across categories (Delke et al., 2023).

Green procurement differs from other forms of procurement in terms of its environmental focus and in how buyers and suppliers interact. For example, in standardised product categories, environmental expectations are often embedded in contractual requirements or codes of conduct (Zhu and Sarkis, 2004), whereas in strategic or complex procurement categories, buyers and suppliers must engage in continuous dialogue and interactive learning to realise environmental improvements (Touboulic et al., 2014). Purchasing and supply management research demonstrates that these exchanges vary in complexity and interdependence, influencing the level of interaction required between actors (Igarashi et al., 2013). The research thus underscores that green procurement is shaped by product category characteristics and the degree of buyer-supplier interaction.

2.2 Product categories and green procurement conditions

The current research utilises the Kraljic (1983) portfolio matrix as a framework to analyse how different product categories shape environmental practices and interaction practices between buyers and suppliers. The Kraljic matrix is one of the most influential models in purchasing and supply management, designed to align procurement strategies with both internal business impact and external supply risk (Caniëls and Gelderman, 2007; Gelderman and Semeijn, 2006). It categorises procured items into four groups: strategic items (high profit impact, high supply risk), leverage items (high profit impact, low supply risk), bottleneck items (low profit impact, high supply risk), and non-critical items (low profit impact, low supply risk). Each category implies a distinct management approach, such as partnership development for strategic items, price-based leverage for competitive items, risk minimisation for bottlenecks, and efficiency for non-critical inputs (Caniëls and Gelderman, 2005; Kraljic, 1983). Its clarity and practicality mean the matrix has become widely used in differentiating purchasing strategies and managing buyer-supplier relationships.

The Kraljic matrix remains one of the most influential frameworks in purchasing and supply management, enabling organisations to differentiate procurement strategies based on supply risk and strategic importance. Its strength lies in providing a structured basis for managing supplier relationships and allocating resources across procurement categories. However, scholars have also criticised the framework for its static and dyadic assumptions, arguing that it oversimplifies relational complexity and does not fully capture power dynamics, evolving interdependencies, and broader network influences shaping buyer-supplier relationships (Cox, 1996; Dubois and Pedersen, 2002; Hesping and Schiele, 2015). Nonetheless, the matrix has proven highly adaptable and continues to inform both research and practice. Recent research has further reinforced its relevance by linking portfolio positioning to concrete sourcing levers and category management decisions (Fontes et al., 2025). It has also been widely applied and extended in sustainability-oriented procurement, where it helps explain how environmental priorities and sourcing approaches differ across product categories (Jaenglom and Tariq, 2013; Pagell et al., 2010).

Sustainability-oriented research has adapted the Kraljic matrix to incorporate environmental and social dimensions into portfolio strategies. Krause et al. (2009) emphasised that sustainability should be a performance criterion across all four quadrants, while Pagell et al. (2010) showed that sustainability leaders often deviate from traditional portfolio prescriptions, for instance, by treating otherwise commoditised suppliers as strategic partners to enhance environmental and social outcomes. Subsequent studies have further embedded the matrix into green and circular procurement, incorporating environmental indicators, life-cycle criteria, and supplier evaluation mechanisms within each category (Corsini et al., 2024; Garzon et al., 2019). Recent research has also emphasised linking portfolio positioning to concrete sourcing levers and category management decisions, highlighting how category classification guides the selection of specific procurement actions (Fontes et al., 2025). These developments illustrate that the Kraljic matrix remains conceptually robust and adaptable to emerging sustainability and circularity goals.

Although these extensions demonstrate the matrix's versatility, much of the existing literature has primarily used it as a classification tool to differentiate purchasing strategies and tailor supplier evaluation practices. Less attention has been paid to how the

underlying portfolio logic can also explain differences in buyer-supplier interactions in green procurement processes. There is limited research exploring how varying category characteristics, such as supply risk, strategic importance, and technological complexity, affect the form and intensity of interaction between buyers and suppliers pursuing environmental goals. For instance, while strategic green items may require long-term partnerships and joint innovation, non-critical items are often managed through standardised specifications and minimal interaction.

Accordingly, this study applies the Kraljic portfolio matrix not only to categorise product groups within green procurement but also to explain how those categories shape the nature and dynamics of buyer-supplier interaction. This analytical approach clarifies how environmental objectives are implemented differently across categories and why certain procurement relationships evolve toward close, collaborative interaction, while others remain largely transactional and compliance-oriented. Table 1 below highlights related studies with the Kraljic matrix, indicating its robustness and applicability regarding sustainability, circularity, and business networks.

Table 1 Studies highlighting the use of the Kraljic framework and extending the framework to sustainability, circularity, and business network

Author	*Connection/relation to Kraljic*
Cordell and Thompson (2019)	Discusses the Kraljic matrix as it relates to supplier segmentation. Identifies the matrix as a valuable framework for supplier segmentation.
Corsini et al. (2024)	Builds on the Kraljic matrix creates a decision-support tool for evaluating suppliers based on circularity criteria. This adaptation incorporates circularity dimensions into supplier evaluation.
Dabhilkar et al. (2016)	Examines how the Kraljic matrix is applied within sustainable supply management (SSM), highlighting how sustainability initiatives affect supplier compliance across different Kraljic categories.
Dubois and Pedersen (2002)	Examines the Kraljic matrix and how it relates to understanding business networks and relationships.
Gangurde and Chavan (2016)	Discusses the application of the Kraljic matrix in the context of purchasing strategies, specifically in the boiler industry.
Garzon et al. (2019)	Discusses supplier evaluation in the framework of SSCM and the Kraljic matrix.
Jaenglom and Tariq (2013)	Discusses understanding potential risks across a product's entire life-cycle, utilises the Kraljic model to develop a strategic framework for sustainable supply chain management.
Krause et al. (2009)	Discusses the purchasing function's role and its alignment with the Kraljic matrix.
Majidi et al. (2025)	Discusses the Kraljic matrix as it relates to the integration and advancement of sustainable procurement and supply management.
Pagell et al. (2010)	Discusses the Kraljic matrix in the context of sustainable sourcing, highlighting a shift in SCM practices.
Tip et al. (2021)	Discusses the Kraljic matrix as it relates to extreme supply chain disruption, such as the COVID-19 pandemic.

2.3 Linking product categories and buyer-supplier interfaces

Green procurement approaches can differ across product categories and also in the way interactions between buyers and suppliers are structured and managed. To analyse these interaction practices, this study draws on ideas from the IMP tradition (Håkansson and Snehota, 1995), where business relationships are viewed as ongoing interaction processes through which actors connect their resources and coordinate activities. Within this broader perspective, we adopt the supplier interface framework developed by Araujo et al. (1999), which offers a practical and well-established typology for examining how buyers and suppliers connect and coordinate their resources through different forms of interaction.

The framework distinguishes four types of interfaces: standardised, specified, translation, and interactive. Each represents a distinct configuration of how buyer and supplier activities are linked and how information and resources are exchanged (Araujo et al., 1999; Baptista et al., 2022). This distinction is also consistent with prior research on supplier involvement, where standardised and specified interfaces resemble white-box arrangements, while translation and interactive interfaces allow greater supplier responsibility and resemble, in some cases, black-box arrangements (Araujo et al., 1999; Handfield et al., 1999). These interfaces provide a useful lens on how procurement approaches differ in their extent of coordination, learning, and mutual adaptation when environmental objectives are introduced.

In a standardised interface, knowledge of use and production are largely separate, and exchange occurs through standardised products and specifications (Demsetz, 1991). Interactions are limited and transactional, leaving little opportunity for shared learning or adaptation. Environmental requirements are typically embedded in contracts or certifications. Non-critical items (low impact, low risk) often rely on standardised interfaces to ensure efficiency and cost control rather than collaboration.

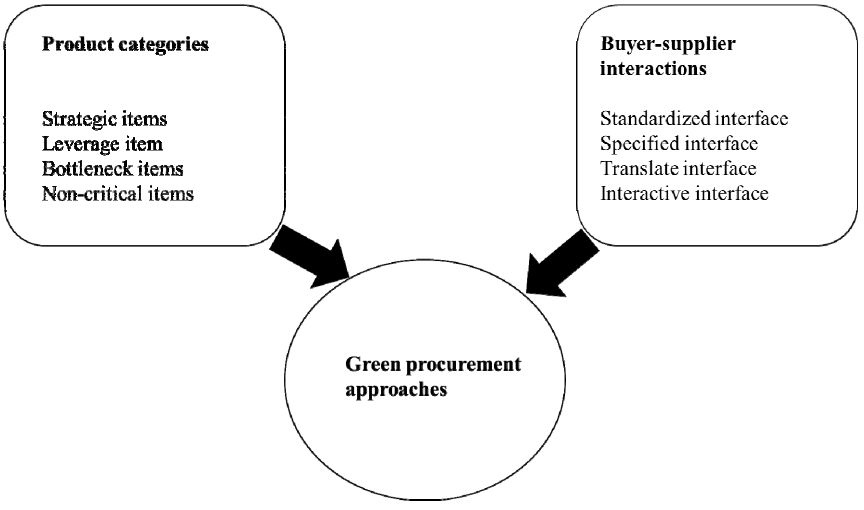
A specified interface introduces greater interdependence. The buyer relies on the supplier as an arm of its operations and is very familiar with the supplier's production system (Marrone, 2010). Interaction remains directed and formal, with the buyer often instructing or training suppliers to meet technical or environmental standards. Leverage items (high impact, low risk) align with this interface, where sustainability goals can be advanced through buyer-driven monitoring and support.

In a translation interface, the supplier translates the buyer's functional requirements into product or process solutions. This form of interaction offers greater flexibility, shared problem-solving, and the need for mutual understanding. A translation interface is often used to manage strategic items (high impact, high risk), reflecting how achieving environmental improvements typically requires close coordination, information exchange, and innovation. This interface permits environmental objectives to be integrated directly into design and development work.

An interactive interface represents the highest level of interdependence and collaboration. Buyers and suppliers jointly define specifications, co-develop solutions, and engage in continuous learning and adjustment (Araujo et al., 2016). This interface allows both parties to combine knowledge and capabilities to pursue shared environmental goals, making it particularly relevant for complex or high-risk categories such as bottleneck items (low impact, high risk). Interactive interfaces thus create conditions for joint innovation, mutual learning, and long-term sustainability outcomes.

Overall, the translation and interactive interfaces have the greatest potential for embedding intensive interaction and shared development. In contrast, standardised and specified interfaces remain more transactional and compliance-oriented. Figure 1 presents the conceptual framework of the study. This research explores how green procurement approaches emerge from the combination of product categories and buyer-supplier interfaces. This framework, therefore, enables a systematic analysis of how different types of buyer-supplier interfaces influence the adoption and implementation of a green procurement approach across product categories.

Figure 1 Conceptual framework



3 Methodology

The current qualitative research adopts an embedded case study design inspired by the systematic combining approach (Dubois and Gadde, 2002). Qualitative research is particularly suitable for exploring why certain practices or perspectives emerge (Bass et al., 2018). Case study research is appropriate for studying inter-organisational interaction processes because it permits a detailed exploration of how practices unfold between buyers and suppliers in context. In short, it can provide the depth, detail, and richness of data required to capture the interaction and relationship dynamics of buyer-supplier exchanges (Dubois and Araujo, 2007; Easton, 2010).

The case organisation is a Finnish manufacturing company selected for its commitment to sustainability and decarbonisation. The company is known for developing innovative technologies that support cleaner and more efficient operations. Its sustainability goals shape its strategic and routine procurement activity. The company is a large multinational organisation with global operations, which enables it to implement structured supplier management, development, and sustainability-related procurement practices.

The study focuses on one business unit within the company's procurement and logistics department. This unit is responsible for sourcing and manufacturing automation,

navigation, and communication equipment, metals, and related components. The unit combines planning, sourcing, manufacturing, and delivery, with the objective of promoting sustainability and efficiency in collaboration with its suppliers.

The suppliers in question are categorised as internal or external. Internal suppliers are subsidiaries of the company, while external suppliers are independent partners. The analysis focuses on active suppliers to the company. Internal documents designate active suppliers as those who have supplied items within the previous two years.

This study identified cases of green procurement approaches related to various product categories in this context. Those categories represent distinct situations where sustainability goals are integrated into procurement and supplier collaboration. We analysed the interactions between the buyer and its suppliers relating to green procurement in various product categories.

3.1 Data collection

The primary data collection method for this study is semi-structured interviews, supported by secondary sources such as company documents and online materials (Perry, 1998). The documents included information freely available on the company website, such as sustainability statements, supplier requirements, and the supplier handbook, as well as the annual report and internal documents provided by the buyer, including category descriptions. Reviewing these materials revealed how the company's strategies are translated into practice (Hänninen and Karjaluoto, 2017).

In addition, the authors held informal discussions with company personnel and suppliers to deepen their understanding of procurement routines. One of the authors had several telephone conversations with operational purchasers, the senior supply chain manager, and three major suppliers. The aim was to prepare the ground for formal interviews by understanding the procurement approaches and buyer-supplier interactions, including product categories and relationship patterns.

The interviews were conducted between November 2022 and December 2023. In total, 13 participants were interviewed: ten from the buyer firm and three from key supplier firms (see Table 2). The respondents from the buyer included operational and strategic purchasers, supply chain planners, and managers. Supplier respondents represented major external partners who regularly supplied key components and had collaborated with the buyer for over ten years. The interviews thus provided insights into how environmental objectives are integrated into procurement processes spanning a variety of products and revealed a range of buyer-supplier relationship practices.

The interview guide was developed based on the research framework and refined after preliminary discussions with procurement staff. It covered topics such as buyer-supplier relationships, resource and knowledge sharing, and green procurement approaches. Interviews were conducted via Microsoft Teams and lasted between 15 minutes and one hour. Semi-structured interviews allowed for flexibility in the follow-up questions (Halinen and Törnroos, 2005) and offered the respondents opportunities to describe their experiences (Easterby-Smith et al., 2012).

The purposive sampling approach adopted helped select participants with relevant experience in procurement and supply chain management (Saunders et al., 2012). That ensured that the respondents could provide informed perspectives on green procurement and resource interaction. The selected participants collectively could speak to an extensive range of purchasing activities at the strategic and operational levels.

Table 2 Demographic representation of respondents

Job titles	*Location*	*Years of experience*	*Responsibilities*	*Time of interview*
		Buyers		
Operation purchaser	Finland	3–4 years plus	Routine purchasing of materials and services	November 2022
Operation purchaser	Finland	3–4 years plus	As above	December 2022
Operation purchaser	Italy	8 years	As above	December 2022
Strategic purchaser	Germany	17 years plus	Supplier selection and development; collaboration with strategic and high-potential suppliers	March 2023
Supply chain planner	Finland	14 years	Supply planning and inventory optimisation for service, cost, and timeliness	December 2022
Supply chain logistics manager	Germany	8 years	Coordination of logistics and supplier compliance with safety and environmental standards	February 2023
Strategic purchaser trainee	Finland	2 years plus	Supplier selection and collaboration (trainee role, similar to strategic purchaser)	March 2023
Team lead for purchasing	Finland	8 years plus	Oversight of purchasing operations and supplier coordination	April 2023
Senior manager, materials management, supply chain	Finland	20 years plus	Coordination of procurement, warehousing, and distribution; managing supplier relationships and sustainability practices	November 2023
Manager operations purchasing	Netherlands	10 years plus	Supervision of daily procurement operations and purchasing efficiency	December 2023
		Suppliers		
Logistics coordinator	Netherlands	7 years plus	Warehousing, delivery, and customer communication	June 2023
Department head	Germany	18 years	Supply chain management and relationship management with buyers	June 2023
Clerical executive, industrial supply chain	Germany	13 years	Order handling, delivery coordination, and pricing communication	October 2023

The supplier participants were major active suppliers, identified by the strategic purchaser as key partners based on the value and volume of their transactions and the number of active purchase orders. These suppliers serve as the main contact points in their product categories, working directly with the buyer on procurement matters. Their long-term collaboration experience meant they could speak to how green procurement

approaches are executed in routine buyer-supplier interactions. Table 2 shows the demographic representation of the buyer and supplier respondents.

3.2 Data analysis

The analytical process was guided by the principles of systematic combining (Dubois and Gadde, 2002), involving continuous movement between theoretical ideas and empirical observations. Interviews revealed differences in procurement approaches and interaction practices across product categories. The Kraljic (1983) matrix framework allowed us to group products according to their characteristics and thus structure these insights. Within each category, we examined how buyer-supplier interactions unfolded and how environmental considerations were integrated into procurement decisions.

All interviews were transcribed and reviewed by the research team to ensure accuracy and shared understanding. The analysis aimed to provide a holistic interpretation of the case (Stake, 2005). The transcripts and notes were coded to identify themes related to green procurement approaches, supplier interfaces, and interaction practices, and were compared across categories to trace similarities and differences (see Table 3). The analysis of the interview content included the conversational qualities of the interviews to expose underlying meanings (Kvale and Brinkmann, 2009).

Data were organised around key dimensions to explore how different types of relationships and resource combinations supported or constrained sustainability goals. This categorisation remained closely linked to the data (Patton, 2015), ensuring that the emerging themes reflected their relevance and recurrence in the interviews. Through this iterative analysis, broader patterns emerged regarding how environmental goals were pursued through different forms of buyer-supplier interaction across procurement categories.

The analysis followed the principles of systematic combining (Dubois and Gadde, 2002), going back and forth between theory and the empirical data. The Kraljic matrix was used to structure the product categories, while the buyer-supplier interface framework helped interpret how interactions were organised within and across those categories.

This iterative approach allowed new insights from the data to inform and refine the framework (Dubois and Gadde, 2002), helping to explain how buyer-supplier interactions shape the implementation of green procurement across product categories and providing a foundation from which to address the main research question.

4 Findings

Our findings show that the case organisation applied different green procurement approaches across its product categories, and these were enacted through different forms of buyer-supplier interaction. By examining the categories comparatively, we can see how sustainability approaches varied according to supply risk, strategic importance, and the form of interaction through which environmental objectives were pursued.

4.1 Product categories shaping sustainability procurement practices

The interviewees consistently relayed procurement practices by reference to specific product categories, which influenced green procurement strategies. We found the Kraljic matrix useful to categorise those products in relation to supply risk and strategic importance, and how sustainability considerations are embedded differently across categories.

4.1.1 Strategic items

Engines, monitors, and communication equipment were categorised as strategic items, reflecting both high supply risk and high strategic importance. These products were critical to operations and service delivery, and interviewees described them as integral to the overall functionality of the final product. Sustainability approaches were more embedded here than in other categories, largely because the procurement of strategic items required close collaboration between buyer and supplier. Joint product development was common, with sustainability considerations integrated into design and production processes. Intensive supplier relationship management was central to securing both operational reliability and sustainability outcomes.

4.1.2 Bottleneck items

Gearboxes, navigation equipment, and similar products were categorised as bottleneck items. These goods were characterised by high supply risk, often due to limited suppliers, technical complexity, or custom-made requirements. Procurement delays for bottleneck items could immediately halt operations, making securing availability the primary concern. Interviewees noted that strong and often exclusive supplier relationships were necessary to mitigate this risk. At the same time, sustainability considerations for bottleneck items were more challenging to enforce, particularly if products represented new technical innovations and established practices were lacking. This duality of high operational dependency, combined with evolving sustainability approaches, made bottleneck procurement one of the most sensitive areas in terms of balancing risk and sustainability goals.

4.1.3 Non-critical items

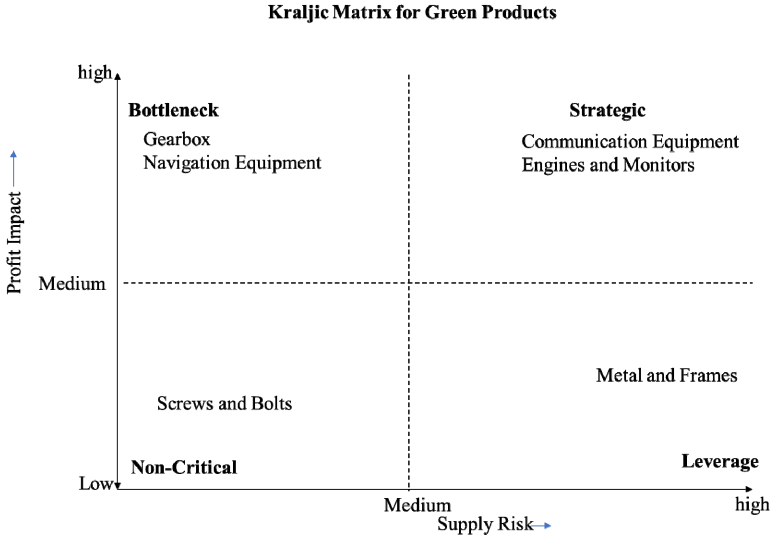
Products such as screws, bolts, and other widely available components were categorised as non-critical. For these items, cost efficiency was the main concern, and sustainability considerations remained limited. They were typically sourced through catalogues of pre-approved suppliers, which streamlined the process and reduced administrative effort. If a specific screw or bolt was temporarily unavailable, production was rarely disrupted, as substitutes were easily accessible. Interviewees emphasised that delays in procuring these items did not create major risks, reinforcing their classification as low impact and low risk.

4.1.4 Leverage items

Metals, frames, and similar items were categorised as leverage items. These goods were strategically important but carried relatively low supply risk because they were available from multiple suppliers. The buyer reported being able to use its strong bargaining position to influence supplier behaviour and advance its sustainability goals. In practice, suppliers were expected to adapt specifications in line with requirements (e.g., environmentally responsible sourcing and documentation on material recycling). The leverage position thus enabled sustainability goals to be pursued while maintaining cost efficiency.

Figure 2 presents the positioning of these product categories within the Kraljic matrix, illustrating how procurement strategies differ according to both supply risk and strategic importance.

Figure 2 Product categories positioned in the Kraljic matrix (see online version for colours)



4.2 Green procurement approaches and buyer-supplier interactions across categories

Having established the procurement categories in Subsection 4.1, we now turn to how sustainability was approached within each category and how buyer-supplier interactions unfolded. Comparing these category-specific patterns also allowed us to identify broader exchange types through which green procurement was enacted. To structure this part, each category is presented in two steps:

1 Green procurement approaches were a standard part of the buyer firm's operations, as clearly stated in its supplier handbook and other procurement documents. The handbook required suppliers to comply with environmental and safety regulations, use an EMS such as ISO 14001 or EMAS, and report the environmental impacts of its operations, products, and services. The ISO 14000 family covers a comprehensive set of standards related to environmental management. Within this family, ISO

14001 is the certifiable standard that stipulates the requirements for establishing and maintaining an EMS. The eco management and audit scheme (EMAS) scheme builds on ISO 14001 by adding stricter requirements, such as mandatory environmental reporting and performance improvements strategies. 14001 and EMAS are complementary standards (Ratiu and Mortan, 2014) and implementing both standards has been shown to improve corporate environmental performance (Erauskin-Tolosa et al., 2020). The buyer supported suppliers' actions to conform with those requirements through supplier development activities, audits, and follow-up actions. These general expectations translated into different forms across procurement categories (e.g., compliance requirements, use of materials, refurbishment, packaging, and training).

2 Buyer-supplier interactions: We applied the buyer-supplier interface framework (Araujo et al., 1999) to analyse how procurement practices unfolded in interactions with suppliers. Each procurement category was associated with a different interface, which shaped how resources were connected and how sustainability was pursued. We analysed interactions through the interface framework, which shows how resources were connected and how procurement approaches were enacted collaboratively.

The approach unveiled both the practical side of sustainability and the relational dynamics shaping procurement outcomes. It also allowed us to identify which interfaces or sustainability approaches appear across categories, illustrating the importance of connecting findings closely to the empirical data.

4.2.1 Green procurement of non-critical products (e.g., screws and bolts)

The procurement of non-critical products was primarily governed by the suppliers' adherence to minimum environmental requirements, such as ISO 14001 certification and supplier pre-qualification. These purchases were transactional and focused on cost efficiency, with sustainability mainly impacted by ensuring that products did not contain harmful materials. Suppliers were required to certify that products contained no asbestos, hazardous substances, or radioactive elements in their base materials or components. Procurement of non-critical items focuses on cost-effectiveness. Suppliers typically adhere to pre-approved item catalogues based on the buyer's specifications.

The operation purchaser responsible for buying screws, bolts, and metal items, and frames mentioned:

> "For the standard goods, we select the standard, and then we just need to make sure that our screws, bolts, and nuts supplier is delivering according to that standard."

Interactions in this category followed a standardised interface. Suppliers were chosen from a pre-approved pool that met established sustainability standards, and the final purchase decision was most strongly influenced by cost-effectiveness. Compliance documentation rather than collaboration was the main lever governing sustainability. In this interface, green process practices were evident in supplier selection and certification, while green product practices ensured that supplied items complied with environmental criteria through not containing harmful substances. The relationship remained

transactional, with little scope for green supplier practices such as auditing the suppliers or guiding suppliers to launch their own EMS.

4.2.2 Green procurement of leverage products (e.g., metals and frames)

Those interviews addressing leverage products revealed a stronger role for environmental considerations, particularly in materials and packaging that mitigate environmental impacts. Suppliers were required to use cardboard instead of plastics in packaging and to disclose information on the environmental impacts of their operations, including emissions, energy use, and packaging materials. The buyer's relatively strong market position enabled it to influence supplier compliance with environmental standards, although supplier development activities were less prominent than in more strategic categories. In practice, the buyer relied on a mix of formal agreements and specifications, combined with informal exchanges such as calls and meetings, to ensure suppliers met environmental requirements. The same operation purchaser responsible for screws and bolts and metal, and frames mentioned:

> "Yes, we sit down with the suppliers to plan specifications of goods to be produced. We make some improvements or changes to the scope of supply, then we need to communicate and make sure the suppliers understand and can manufacture the component accordingly."

Procurement practice for leverage products reflected a specified interface, where suppliers customised products to meet buyer specifications. The buyer coordinated with suppliers to ensure that specifications aligned with environmental requirements. Green product practices were evident in the requirement for environmentally friendly raw materials and packaging, while green process approaches included ISO 14001 or EMAS certification of suppliers. However, there was little evidence of sustainable supplier practices in this category; the buyer did not, for example, bring suppliers together to share expertise or send auditors to appraise environmental performance beyond that required for certification.

4.2.3 Green procurement of strategic products (e.g., engines, monitors, communication equipment)

When buying strategic products, the case company integrated sustainability more deeply into its procurement routines. Approaches included encouraging refurbishment instead of replacement, supplier audits, and measures to reduce waste in production. The case firm emphasised the reduce, reuse, recycle strategy (known as the 3Rs), including refurbishment projects where used parts were upgraded rather than discarded. Product life-cycle considerations were also central, as products were designed to last longer to reduce waste and scrap. The buyer favoured local suppliers to minimise logistics distances, and procurement processes involved electronic purchase orders and warehouse optimisation to reduce paper and energy use whenever possible. The buyer also worked with suppliers to strengthen their environmental capabilities by instituting training and workshops, and compliance with sustainability requirements was monitored. Our case study revealed that the buyer used audits to foster supplier development and ensure compliance with green procurement goals. The senior manager of the materials management supply chain stated:

> "So, there are a lot of monitors … somewhat developed together with the suppliers. So, you can consider environmental issues when you develop that. And then … for example, we conduct a supplier validation. We also conduct auditing: our supplier development engineers go to the supplier, and they do the validation. And basically, they are making sure that the suppliers are complying with this regulation. So, I think that the development is happening … we have a healthy level of communication."

Strategic products were managed through a translation interface, which allowed suppliers to interpret requirements and co-develop solutions with the buyer. Green product approaches included the use of environmentally friendly raw materials, refurbishment instead of replacement, and the adoption of the 3Rs strategy. Green process approaches involved localisation by favouring sourcing from nearby suppliers, supported by electronic ordering and warehouse optimisation. In some cases, suppliers owned the intellectual property rights for their products, giving them latitude in product design. Green supplier approaches were also more developed in this category, including supplier training, workshops, due diligence, and follow-up actions to ensure compliance with sustainability standards. Consequently, sustainability had become embedded in long-term partnerships, with green procurement approaches and resources aligned through ongoing joint problem-solving.

4.2.4 Procurement of bottleneck products (e.g., gearboxes, navigation equipment).

The bottleneck products category in the case company highlighted the importance of risk mitigation, with sustainability addressed mainly through logistics and close collaboration. Efforts included eco-friendly packaging, shipment consolidation, digital ordering, and targeted supplier development programs to eliminate non-conformity. There was a notable focus on environmentally conscious logistics, including warehouse optimisation, consolidated shipments, and prioritising sea freight over air transportation whenever possible. Collaborative development also enabled the use of renewable energy solutions or, in some cases, biodegradable materials.

The case further showed that when items were critical but purchased in low volumes, the buyer was often in contact with suppliers daily, sometimes treating them like partners despite their small size. The supply chain logistics manager and the senior manager of the materials management supply chain mentioned:

> "There are also, however, other suppliers' examples, like gearboxes needed for production. There are some specific suppliers producing specifically for the needs of the buyer, so the technical people from the buyer sit with the technical people from the supplier, trying to find the best way to manufacture these parts. The supplier relationship is stronger. For these suppliers, some strategic purchasers are always in direct contact with them."

A senior manager in materials management stated:

> "Some of our suppliers are kind of … small volume, and we are not that interested in them. And some of the players are really important, almost like a partner. We have a supplier, for example, producing gearboxes … a really small-sized supplier. That's a risk, of course, but you need to have a different type of relationship with that kind of supplier compared to another."

Table 3 Overview of product categories, associated buyer-supplier interfaces, green procurement approaches, and illustrative examples

Product/category (Kraljic)	*Buyer-supplier interface*	*Green procurement approach*	*Examples from interviews and documents*
Screws and bolts (non-critical parts) easy to procure; suppliers widely available. The cost of managing suppliers is higher than the cost of the parts.	*Standardised interface:* suppliers selected from pre-approved pool; transactional and cost-driven; limited contact beyond compliance.	Compliance-based: ISO/EMAS certification, supplier pre-qualification, documentation checks. Suppliers required to certify absence of hazardous substances (e.g., asbestos, radioactivity). Sustainability is monitored mainly through paperwork, with no supplier development.	"The supplier shall ensure that the product complies with all applicable environmental criteria" (supplier handbook). "Suppliers shall have ISO procurement certificates" (supplier handbook).
Metals and frames (leverage parts) low supply risk; many suppliers available. The buyer has high bargaining power in the market.	*Specified interface:* buyer specifies requirements; coordination through meetings/calls; buyer leverages market position.	Joint specification of goods, environmentally friendly raw materials, sustainable packaging (cartons vs. plastics), disclosure of emissions/energy use. Compliance ensured through ISO/EMAS.	"Suppliers and procurement teams work closely to ensure components meet detailed specifications, involving telephone calls, meetings" (strategic purchaser). "The supplier shall also ensure that the product complies with all applicable environmental criteria" (supplier handbook).
Engines and monitors (strategic parts): high supply risk; fewer suppliers in the market. Often supplied only upon buyer request.	*Translation interface:* suppliers co-develop solutions with the buyer; greater freedom to interpret requirements; partnership-based.	*Integrated approach:* refurbishment instead of replacement; 3Rs (reduce, reuse, recycle); reusable packaging; life-cycle focus; localisation of suppliers; warehouse optimisation; consolidated shipments. Supplier development through audits, training, and workshops.	"I never replace something when we can… refurbish projects… less waste… We use as little plastic as possible, or if we use plastic, it's reusable" (senior manager material management, supply chain). "Suppliers are required to provide certifications" (operation purchaser). "We try and move more towards consolidation… Instead of many trucks, we try to use only one" (supply chain logistic manager). "Localization; we procure or find the source of supplies close to where they are needed" (senior manager material management, supply chain). "We are doing the supplier validation… auditing… development engineers go to suppliers and do validation" (strategic purchaser).

Table 3 Overview of product categories, associated buyer-supplier interfaces, green procurement approaches, and illustrative examples (continued)

Product/category (Kraljic)	*Buyer-supplier interface*	*Green procurement approach*	*Examples from interviews and documents*
Communication equipment (strategic parts) economically significant; high supplier risk due to limited availability. Often procured on the buyer's request.	*Translation interface:* collaborative design and validation; sustainability integrated early in development.	Supplier validation, due diligence, and training. Efficiency in procurement through single-batch purchasing and consolidated shipments. Environmental compliance embedded in product design.	"The supplier shall ensure that the product complies with all applicable environmental requirements" (supplier handbook). "Making a single-batch purchase and not many batches" (operation purchaser). "Supplier to use one shipment for several orders" (operation purchaser). "We conducting due diligence on their suppliers" (operation purchaser).
Gearboxes (bottleneck parts): few suppliers available; secure supply is critical.	*Interactive interface:* close technical collaboration; buyer's engineers and strategic purchasers in daily contact with suppliers.	Green procurement through the co-design of specialised parts, eco-friendly packaging, and digital ordering. Supplier development teams intervene to resolve non-conformities and sustain supply.	"There's a clear instruction and guideline on how goods should be packed, for example, boxes instead of plastics" (supply chain logistic manager). "Consolidating the shipments, combining the shipments" (supply chain logistic manager). "If the supplier is unable to keep up with these sustainable practices, the supplier development team helps, and when it is fixed, the non-conformity is closed" (strategic purchaser).
Navigation equipment (bottleneck parts): few suppliers available; secure supply is critical.	*Interactive interface:* highly interdependent relationship; joint development of specifications; buyer provides support to sustain supplier capacity.	*Environmentally friendly logistics:* consolidated shipments, preference for sea freight over air, digital ordering. Buyer invests in supplier training and workshops; preference for suppliers prioritising sustainability.	"The supplier shall also ensure that the product complies with all applicable environmental criteria" (supplier handbook). "Purchasing smarter: not buying one piece but trying to combine purchases and shipments" (team lead purchasing). "Instead of sending by air, it can be sent by sea" (team lead purchasing). "Purchases are made digitally, no paper involved" (team lead purchasing). "Working with stakeholders who have sustainability at the top of their agenda, too" (team lead purchasing).

Interactions in this product category were shaped through an interactive interface, where the buyer and supplier collaborated closely on product development and process improvements. Both parties in this interface worked to co-develop specifications or improve existing products. Suppliers collaborated directly with the buyer's engineers, developers, and strategic purchasers to bring designs to life. Green supplier approaches were reinforced through audits, training, and workshops to ensure that products and processes aligned with sustainability requirements. The intensity of cooperation made it possible to align resources to progress sustainability goals in a way that was not present in other categories.

Table 3 summarises how the different products were categorised in terms of procurement importance, supply risk, and green procurement approach. It shows that each product category aligns with a particular procurement strategy and that sustainability considerations differ accordingly. For example, non-critical items rely mainly on compliance and cost efficiency, while strategic and bottleneck items involve deeper forms of partnership, training, and supplier development.

Across the categories, three broader exchange patterns emerged: compliance-based exchange, specification-translation exchange, and collaborative-development exchange. These patterns reflect differences in how environmental objectives, supplier involvement, and coordination unfolded across procurement contexts. While the buyer-supplier interfaces describe how interaction was structured, the exchange types capture the broader sustainability-oriented pattern enacted through those interactions.

5 Discussion

This section discusses how buyer-supplier interactions support green procurement outcomes in the product categories examined.

The analysis combines the dual perspectives of product category positioning (Kraljic, 1983) and buyer-supplier interfaces (Araujo et al., 1999) to explain why sustainability approaches varied across procurement settings. The case findings demonstrate that interaction practices evolved according to the strategic importance and the specific supply risk of products, shaping both the form of collaboration and the way environmental objectives were pursued.

Three empirically grounded interaction practices in the form of exchanges were identified: collaborative-development, specification-translation, and compliance-based exchanges. Each illustrates a different configuration of environmental goals, interaction practices, and resource exchange.

5.1 The collaborative-development exchange

The collaborative-development exchange was the most intensive form of sustainability-oriented interaction in the case context. This practice aimed to embed environmental objectives into product and process design by collaborating closely with suppliers, forming the foundation for how sustainability became intertwined with technological and relational development. It was most visible in the strategic and bottleneck categories (e.g., engines, monitors, and gearboxes), where the buyer relied on long-term partnerships and where technical interdependency was pronounced. The interactive interface enabled joint development, shared problem-solving, and mutual

capability building between the buyer's engineers, procurement personnel, and supplier teams. Sustainability was achieved through activities such as refurbishment projects and collaboratively employing technologies to reduce environmental impact, such as renewable energy solutions or biodegradable materials. In addition, the implementation of the 3Rs strategy, along with supplier training and audits, played a key role. Those activities required iterative adaptation and trust-based coordination, leading to the co-creation of technical and relational capabilities and improvements in environmental performance.

This type of collaboration reflects how interactive interfaces enable the integration of sustainability into core supply relationships (Araujo et al., 1999). It also aligns with findings showing that supplier involvement in product development can foster environmental innovation and learning (Melander and Pazirandeh, 2019). Our study confirms that inter-organisational relationships and interactions are promoted when the buyer and supplier undertake environmental initiatives jointly (Murfield and Tate, 2017). The ability and willingness of the buyer to extend green procurement approaches and help a supplier to become more environmentally sustainable are facilitated when there is an interactive relationship between them (Ye et al., 2021).

5.2 Specification-translation exchange

The specification-translation exchange captured situations where the buyer set detailed environmental requirements that suppliers then interpreted and implemented internally. In contrast to the highly collaborative approach above, sustainability here is advanced through structured translation rather than joint development. The process requires clear specifications and routines governing how the supplier should deliver products. The buyer has well-defined requirements and seeks to maintain control over the process to ensure consistency. This approach was observed in the leverage category (e.g., metals and frames), where the buyer maintained bargaining power but depended on supplier translation to achieve compliance.

The specified interface involved moderate coordination and selective adaptation, aligning with prior research showing that structured coordination can support sustainability diffusion (Krause et al., 2009). Green procurement in these categories focused on environmental specifications for materials, packaging, and emissions disclosure (ISO/EMAS). Suppliers absorbed these requirements into their processes through meetings, document reviews, and follow-up communications.

Resource exchanges were mainly technical and procedural; information flowed between buyer and supplier, but relational integration was limited. The situation reflects the translation mechanism described in the interface framework, where codified knowledge must be interpreted to fit local processes (Araujo et al., 1999). Technically, adaptations require mixed interfaces between organisational and technical resources (Jahre et al., 2006). Our data exemplify how suppliers sometimes devised alternative manufacturing methods; however, that is a challenging undertaking involving a lengthy implementation process. For example, the buyer in our case could not take advantage of all the suppliers' development initiatives, because it would have to involve coordination with multiple departments such as research and development (R&D) and the technical team – a process that is complex and lengthy. This finding is in line with Baraldi et al. (2012), who stated that if each resource is embedded in only one individual direct

interface (buyer-supplier) but includes a complex set of indirect interfaces with other resources (e.g., designers and technicians), implementing changes is problematic. Furthermore, Yan and Nair (2016) argued that intense involvement can lead to problems with flexibility and trigger coordination issues that adversely affect innovative performance. Therefore, the buyer would rather adopt the specified interface for some product categories.

5.3 Compliance-based exchange

The compliance-based exchange within procurement was the least interactive approach to sustainability. It was most frequently observed in transactions involving non-critical categories (e.g., screws and bolts), where efficiency and reliability took precedence over collaboration. No customisation or adaptation is needed in this exchange type; consequently, transaction costs remain low.

Table 4 Buyer-supplier interaction practices for green procurement

Interaction practice	*Green procurement focus*	*Nature of buyer-supplier interaction (interface perspective)*	*Observed product categories and resource exchange*
Collaborative-development exchange	Intended to embed sustainability in product and process design through joint development, refurbishment, and 3Rs initiatives. Activities included local sourcing and supplier development via audits, training, and workshops.	Interface: interactive. marked by high involvement and partnership-based collaboration, continuous dialogue, and mutual learning between technical and procurement teams.	Observed in the strategic and bottleneck categories (e.g., engines, monitors, gearboxes). Resources were exchanged through co-design of components, supplier training, and adaptation of production and logistics routines, enabling environmental goals to become integrated in operations.
Specification translation exchange	Intended to translate buyer-defined environmental requirements into supplier processes while maintaining efficiency. Focused on environmental specifications for materials, packaging, and emissions (ISO/EMAS).	Interface: specified translation. Involves moderate coordination, where the buyer defines requirements and suppliers translate them with limited feedback.	Observed in leverage and selected strategic categories (e.g., metals, frames). Resources were exchanged through review of specifications and documentation, with adaptation mainly at the technical level and limited joint development.
Compliance-based exchange	Intended to ensure minimum environmental standards are met efficiently through formalised supplier requirements and certification (ISO 14001, EMAS).	Interface: standardised. Characterised by low involvement and transactional coordination, focusing on document-based verification.	Observed in non-critical and some leverage categories (e.g., screws, bolts). Resources were exchanged primarily through standardised documentation and compliance forms, with minimal interaction beyond verification.

The standardised interface structured these relationships around documentation, certifications, and supplier pre-qualification, rather than ongoing dialogue. Environmental outcomes were pursued through enforcing adherence to minimum requirements such as ISO 14001 or EMAS certification, hazardous-substance declarations, and catalogue-based ordering from pre-approved suppliers. The exchange of resources occurred through standardised information flows, certificates, audit reports, and compliance forms, replacing direct engagement between the buyer and suppliers.

These findings align with research on symbolic compliance, where environmental standards are formally adopted but rarely drive capability development (Junquera et al., 2012). Such arrangements provide administrative efficiency but limit opportunities for environmental learning and joint improvement, as noted in studies on low-involvement procurement (Haake and Seuring, 2009).

5.4 Summary of the discussion section

The case shows that green procurement evolves through differentiated interaction practices rather than a uniform approach. As product importance and supply risk increase, buyer-supplier interfaces become more interactive, and the exchange of resources shifts from compliance documentation to integrative collaboration. The typology developed here provides a relational view of green procurement, linking the Kraljic portfolio logic (product-based differentiation) with the interface framework (categories of buyer-supplier interactions). This framework helps explain why sustainability integration varies across categories and highlights that deeper environmental value creation depends on the depth of interaction and resource combination between buyers and suppliers. The patterns observed in this case are summarised in Table 4, which outlines how sustainability objectives were pursued and how resources were exchanged through various interfaces and product categories.

The empirical patterns in this case aligned largely with the established interface categories rather than producing new interface types. However, the sustainability context shaped the content of interaction within those interfaces through practices such as environmental auditing, refurbishment, packaging redesign, emissions-conscious logistics, and supplier capability development. Thus, rather than proposing new interface categories, the study shows how existing interfaces are enacted differently when environmental objectives are central.

6 Implications of the study

6.1 Theoretical implications

This study contributes to sustainable and green procurement research by extending the understanding of how buyer-supplier interaction patterns differ across product categories. The findings demonstrate that as product criticality and interdependence increase, buyer-supplier interfaces become more interactive, and the exchange of resources shifts from standardised documentation towards integrative collaboration. The findings support earlier claims that product category characteristics influence environmental priorities (Weidema et al., 2006). They also demonstrate the patterns of buyer-supplier interactions for different product categories. More specifically, the study shows that green

procurement cannot be understood only through environmental criteria or supplier selection practices, but also through the form and depth of interaction through which environmental objectives are enacted across procurement categories.

This relational perspective complements recent work linking category positioning with sourcing levers (Fontes et al., 2025), by showing how the implementation of sustainability practices depends not only on category strategy but also on the structure of buyer-supplier interaction. Furthermore, the study addresses a gap in sustainable procurement literature, which often relies on stakeholder, social-exchange, or institutional theories (Ye et al., 2021) that offer limited insights into interaction processes (Johnsen et al., 2017).

A further theoretical contribution lies in showing how green procurement and supply management offer opportunities to complement the IMP approach. The study distinguishes between buyer-supplier interfaces as structural forms of interaction and the exchange types identified in the analysis as broader sustainability-oriented procurement patterns. The interaction practices identified in this study (collaborative-development, specification-translation, and compliance-based exchanges) could guide examinations of other interaction practices and buyer-supplier interfaces for the IMP community (Araujo et al., 1999). A corollary benefit would be extending the research on the influence of similar interfaces on how organisations combine, adapt, and utilise resources (Baptista et al., 2022; Holma et al., 2022; Taheriruh et al., 2025). The study also shows how environmental objectives reshape buyer-supplier interaction within established interfaces through practices such as environmental auditing, refurbishment, packaging redesign, emissions-conscious logistics, and supplier capability development. That would enable IMP researchers to theoretically articulate how environmental initiatives require different interaction practices and strengthen the bridge between sustainability literature and the IMP tradition (Harrison et al., 2023).

6.2 Practical implications

The current study offers several practical implications. The findings show that managers should adapt green procurement approaches to the interaction practices dominating different product categories. In categories where environmental goals are achieved through close collaboration, such as refurbishment projects, applying the 3Rs strategy, joint development of renewable or biodegradable solutions, or supplier training and audits, buyers benefit from investing in more interactive types of interface. Those interfaces allow technical teams, designers, and procurement personnel to work with suppliers on shared environmental challenges, build mutual capabilities, and integrate sustainability into core design and production processes. The case demonstrated that environmental improvement was strongest where buyers were willing to combine resources with suppliers and support their development initiatives, confirming that deeper engagement enables suppliers to become more environmentally sustainable.

In categories where the buyer's bargaining power is strong or where products must be highly consistent, environmental goals can be advanced through well-defined specifications and follow-up routines.

The study showed how suppliers translate requirements governing materials, packaging, or emissions disclosure through meetings, document reviews, and selective adaptation. However, implementing changes was often slowed by the need to ensure buy-in from designers and technicians. For non-critical categories, standardised interfaces

based on ISO or EMAS certifications, hazardous-substance declarations, and catalogue-based ordering provided administrative efficiency but limited opportunities for environmental learning. Managers could therefore use the typology developed in this study to judge where interactive collaboration warrants the investment, where structured specification is sufficient, and where standardised requirements could ensure baseline environmental compliance without unnecessary coordination costs.

7 Conclusions

This study examined how environmental objectives are pursued in different procurement contexts by linking product category characteristics with buyer-supplier interaction practices. In doing so, it showed that green procurement outcomes depend not only on what is purchased, but also on how environmental objectives are enacted through buyer-supplier interaction. The analysis drew on the Kraljic portfolio model (Kraljic, 1983) and the buyer-supplier interface framework (Araujo et al., 1999) to identify three distinct interaction practices: collaborative-development exchange, specification-translation exchange, and compliance-based exchange. We then demonstrated how these practices shape the realisation of green procurement outcomes in a multinational manufacturing firm.

This study is based on a single case, which limits the generalisability of the findings and reflects the specific characteristics of one organisation and its supplier relationships. This study reflects sustainability practices largely based on voluntary CSR logic. However, emerging mandatory ESG and due diligence regulations may increase enforcement expectations, particularly in bottleneck categories where supplier substitution is difficult. In line with our findings, enforcement in such cases may rely more on mechanisms such as monitoring, audits, and supplier development through closer buyer-supplier interaction.

Future research could examine multiple firms and industries to assess whether similar interaction practices emerge across different procurement contexts and organisational settings. Comparative studies may help clarify how variations in supply risk, category importance, and organisational capabilities influence the structure of buyer-supplier interaction and the implementation of sustainability practices. Longitudinal research could also explore how interaction practices evolve over time in response to changing sustainability ambitions, regulatory pressures, and organisational learning. In particular, future studies could examine how emerging mandatory ESG and due diligence requirements influence interaction patterns, especially in bottleneck categories where supplier substitution is limited. Further research may also refine and extend the typology developed in this study by examining its applicability across different sectors and by exploring how relational dynamics shape the range and effectiveness of sustainability-related procurement practices.

Declarations

All authors declare that they have no conflicts of interest.

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