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RESEARCH ARTICLE

The value of data for environmental sustainability as perceived by the customers of a tissue-paper supplier

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Abstract

To manage their increasingly ambitious environmental agendas successfully, companies need better and more versatile data, yet the elements and mechanisms through which businesses and the environment benefit from data remain poorly understood. A single-case-study setting was designed for examining the perceived value of data for environmental sustainability as seen by the customers of a tissue-paper supplier. The findings, from material collected during interviews with customers in 2022, showcase the multifaceted nature of data's value for business operations and associated ability to support decisions and activities that encourage environment-informed choices and environmental improvements. Also, fully exploiting data's potential for environmental sustainability requires greater volume and detail of product-specific data, transparency of value chains and environmental impacts, and data's better management and sharing. The emerging insight related to the value of data strengthens understanding of how companies could, with data, support their customers' environmental performance.

KEYWORDS

customer value, environmental sustainability, forest industry, tissue paper, value of data

1 | INTRODUCTION

Companies have ambitious internal objectives for environment-related sustainability, connected with climate-change mitigation, circular economy, and biodiversity protection. At the same time, they must contend with growing demands of external stakeholders for transparent and accountable activities (Comas Martí & Seifert, 2013). Customers desire traceability of products' value chains and evidence for the environment-related claims made (Rusch et al., 2022), and investors likewise ask for business transparency and data that attest to genuine environmental improvements and sustainability (Herzig & Schaltegger, 2006). Regulators, in turn, seek verified compliance and elimination of greenwashing (European Commission, 2020).

These external pressures, in combination with the internally set objectives, call for companies' better management of their sustainability agendas by all means at their disposal, including versatile use of data to support setting the objectives, identifying improvement opportunities, implementing appropriate actions, and seeing that objectives are met (Busch et al., 2022).

In this connection, data on diverse aspects of business activities, service and product life cycles, and related environmental impacts can inform environment-linked sustainability efforts when the integration, discovery, and exploitation of said data (Miller, 2013) produce valuable insight in support of environmental sustainability (Song et al., 2018). This is the case, for example, when data revealing the carbon footprint of a product are available and influence customers'

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purchase decisions (Pinheiro et al., 2022; Rusch et al., 2022). Other examples involve data sharing between suppliers and customers; for instance, detailing the content and origin of the product can help all parties understand and manage potential biodiversity issues and other environmental risks along the supply chain (Contador et al., 2021). In addition, companies need data for proving their environmental performance to customers, investors, and regulators who demand evidence of progress on clearly defined pathways to significant reduction in greenhouse-gas emissions and who require compliance with the EU's new Corporate Sustainability Reporting Directive (Science Based Targets Initiative, n.d.; European Commission, 2021). When cultivated into information and, further, into knowledge, data can support better, more environment-aware decisions by incumbent companies and by their customers and suppliers.

The intersection of environmental sustainability and digital transformation, encompassing increasing availability and utilization of data, has recently captured scholars' more intense interest (see, e.g., Bai et al., 2020; Cardinali & De Giovanni, 2022). Digitalization and related data are now recognized as gateways to supporting climate-change mitigation, circular economy, and other environment-linked goals (Di Maria et al., 2022; George et al., 2021; Liu et al., 2022), with general discussion pointing to their potential role in a shift toward sustainability – reduced resource-intensity, greater energy-efficiency, waste reductions, and decreased CO₂ emissions (e.g., Chiarini, 2021; Kerin & Pham, 2020; Niehoff, 2022). Specific digital technologies facilitating activities such as collection and utilization of data, alongside the so-called Industry 4.0 in general, are recognized as prospective means of supporting more sustainable business strategies that incorporate new business models, manufacturing practices, and supply-chain solutions (de Sousa et al., 2018; Gupta et al., 2021).

Making data-driven decisions is increasingly relevant not only in companies' internal activities but also in their larger value chains, bringing in suppliers and customers (Dubey et al., 2019; Gebhardt et al., 2021; Gold et al., 2010). Data needs are growing more precisely elucidated, and greater detail is required – the data must cover numerous facets of product life cycles and value networks. These requirements necessitate considerable expansion in the quantities of data needed but also emphasize the requisite of successfully managing and utilizing the data (Gandolfo & Lupi, 2021). Thus far, though, potentially valuable environmental sustainability data have remained scattered and under-utilized (Rusch et al., 2022). Efficient means of collecting, managing, and utilizing said data in business decision-making are still emerging, and common definitions, methods, and rules of the game for utilizing and sharing data are largely absent (Busch et al., 2022; Elias Mota et al., 2020).

In this context, the value that versatile product life-cycle and value-network data offer for realizing environmental gains is poorly understood, and companies lack understanding of the data's ultimate value for businesses and their customers. These shortcomings render it difficult to prioritize data-linked development needs and articulate cases for investing in related innovation and capability development. It is difficult even to point to empirical foundations, since little research has examined the details of the elements and mechanisms

via which data resources create value for environmental sustainability. Although research has pinpointed collaboration as crucial to any move toward sustainability, our review of pertinent literature identified no studies aimed at systematic understanding of how a company could, with the use of data, serve its customers' pursuit of their environmental sustainability targets. In addition, there is a recognized need for further empirical research specifically geared to revealing how digital transformation supports reaching environmental goals (Beltrami et al., 2021; O'Rourke & Lollo, 2021; Rusch et al., 2022).

The purpose behind this paper is to help fill that gap by examining data's value for environmental performance as perceived by the direct customers of a leading European tissue paper supplier. In a study from the perspective of environmental sustainability, we explored the territory of customers' expectations/needs and how they are shifting. Setting out to uncover critical elements and mechanisms of data's value in this context, we addressed the following research question: *How is the value of data for environmental sustainability perceived among business customers of a tissue paper supplier?*

We chose to focus on the value chain behind tissue paper because of its associated complex demands for environmental sustainability, from a range of stakeholders: customers, investors, regulators, and others (Ghosal, 2015; Toppinen et al., 2017). These demands cast the rapidly growing need for environmental-performance-related data into high relief also. The body of data required comprises myriad details that a company may collect, produce, process, and share in relation to its activities, products, and value chains (all the way through to customers and disposal) that could shed light on their environmental impacts and the improvement opportunities. In previous literature on the forest companies (Mäkelä, 2017) it is found that these companies report on the environmental performance of their supply chain only very little. Hence, relying on secondary sources available in reporting data from the companies themselves is not likely to produce sufficiently in-depth insights from the customer interface to facilitate solid analysis, calling for collection of primary data. The case company, Metsä Tissue, had recognized a need to make better use of data to enhance its environment-related performance in the business of tissue-paper manufacture, and it sought to understand how, alongside its customers, it could enhance its utilization of data for environmental sustainability. The findings presented here are output from a joint project with Metsä Tissue carried out in January to June 2022 that included eight interviews with direct customers of Metsä Tissue engaged in retail and professional sales.

This empirically underpinned study's contribution to theory is twofold. First, we identified the discrete elements of the environmental sustainability value that customers perceive in data, and, second, our work makes the multifaceted nature of data's value in support of environment-informed decisions and environmental improvements explicit. The resulting sense of the value held by data content and the possible uses points to the necessity of reliable product-specific and environment-related data to support better informed decisions within companies and along their value chains. The work's central contribution to practice is in strengthening our understanding of how companies could seize data's power to enhance their customers'



environmental performance. The findings of this empirical study provide in-depth insights, which so far were only rarely presented in literature. The article is structured to present the conceptual background of the research, then outline the research design and a presentation of the most important findings. We then delve into their implications with the discussion section and articulation of our general conclusions.

2 | CONCEPTUAL BACKGROUND

Considering environmental sustainability has become a prerequisite for any business that wants to meet stakeholder expectations and guarantee its operations' long-term success. From a business perspective, the main aim in striving for environmental sustainability is to reduce the negative environmental impacts of corporate activities while strengthening one's economic performance and also factoring in social effects (Khan et al., 2021). Pursuit of sustainability may be motivated by demands from regulators, owners, markets, and other stakeholders just as much as the expected economic benefits and the organization's ethics commitments (Baumgartner & Rauter, 2017). Simultaneously, corporate sustainability has become a more strategy-linked issue, involving not only legal compliance but also gaining a competitive edge and managing the business's reputation (Engert et al., 2016). Companies aim to integrate environmental considerations into their activities across business-function boundaries, from product design and supply-chain management to business development and sales (Meuer et al., 2020). In addition, some stakeholders demand that companies take responsibility for sustainable practices throughout the supply chain (Sarkis et al., 2021; Sodhi & Tang, 2019).

Increasing availability of data, enabled by digitalization, is changing how businesses operate, thus affecting opportunities to influence environmental sustainability. Data can be defined as objective facts about events and observations of the state of the world (Davenport & Prusak, 1998) or as symbols that represent properties of objects, events, and their environments (Ackoff, 1989). It is only after the transformation of data into knowledge by means of understanding said data in context and elaborating on the valuable patterns uncovered that the relevant data can function maximally for environmental sustainability (Ackoff, 1989; Rowley, 2007).

Data can add value by driving transparency, optimization, learning, and deeper understanding of such factors as customer needs (Chen et al., 2015). Data's value with specific regard to environmental sustainability lies in the ability to bring environmental considerations into strategic and operative decision-making in an evidence-based manner for business functions such as product design, production planning, supply-chain management, and business models' development (de Sousa et al., 2019; Langley, 2022). Data afford innovative ways to improve efficiency and, furthermore, monitor and optimize processes and product performances (Niehoff, 2022). This source of information is recognized also for its potential in building transparency among stakeholders (Rusch et al., 2022). The ability of data to aid in setting plausible environmental targets, identifying improvement

opportunities, carrying out actions, and monitoring the development on various fronts makes data-informed operations highly attractive in conjunction with organizations' work toward ambitious objectives they have set for themselves in relation to environmental sustainability, which address climate-change mitigation, circular economy, and biodiversity protection. For companies, the use of data offers particular value for bringing environmental considerations into strategic and operative decision-making across a broad span of business functions, from product design to supply-chain management (de Sousa et al., 2019; Langley, 2022).

In this connection, a body of data that covers diverse aspects of business activities and of product and service life cycles, including related environmental impacts, can yield knowledge for environmental sustainability. Variety of data could support businesses in their environmental efforts by illuminating multiple aspects of those life cycles and the related material flows and emissions, such that they can better assess environmental impacts and identify improvement opportunities (Nascimento et al., 2019; Tseng et al., 2018). In addition, data that reveal patterns in human behavior and needs could facilitate efforts to pinpoint opportunities for sustainable consumption, sound procurement choices, and new business models, while also providing technical input on the systems' performance that may aid in systemic improvements (Gupta et al., 2021; Luoma et al., 2021). Possible data sources range from companies' internal processes to external supply-chain partners and customers (Hartmann, 2016; Ranta et al., 2021). New, better means of accessing and applying environment-related data are being developed constantly. For instance, smart algorithms, connected devices, and Big Data can support resource- and energy-efficient production and consumption (Bohnsack et al., 2022); blockchain technologies serve tracking of materials' path through supply chains; waste-to-resource marketplaces may be established; and digital twins and digital product passports assist in tracing product life cycles.

Creating customer value – with data's potentially crucial contribution to this – is a prerequisite for business success (Flint et al., 1997; Graf & Maas, 2008; Porter, 1996). Robert Woodruff (1997, p. 142) defines customer value as the “customer's perceived preference for and evaluation of those product attributes, attribute performance, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations.” Which attributes, consequences, and goals/purposes are desired gets affected by the product-use situation and can change over time. For instance, users' accumulated experiences, perceptions, preferences, and evaluations (both individual-level and social) affect value creation (Helkkula et al., 2012; Woodruff, 1997). Also, customers assess value relative to their own resources and processes, and they consider resources' integration and sharing between providers and customers (Rintamäki & Saarijärvi, 2021). This factor is especially topical in the case of data: the value creation is a dynamic process (Grönroos, 2008; Tzokas & Saren, 1999) wherein provider and customer create value together through their interaction (Ballantyne, 2004; Grönroos & Voima, 2013). Much hinges on combinations of forces. Customers' strategic focus and operation processes as well as regulation and technology, for

example, may trigger changes in customer-experienced value (Flint et al., 1997). Anticipating what customers will perceive as valuable, in their context and in their terms, is seen as critical to maintaining customer value in a continuously changing world (Hur et al., 2013; Rantala et al., 2019; Rintamäki & Saarijärvi, 2021).

3 | METHODOLOGY

3.1 | The context of the research

The pulp and paper industry, with the tissue-paper industry being no exception, faces complex demands for environmental sustainability, from a wide range of directions. These demands are driven by more extensive awareness of sustainability by customers and other stakeholders, tightening regulatory limits, and globalization of the industry itself (Ghosal, 2015; Toppinen et al., 2017). The multi-tier supply chains, which feature forest management and harvesting, manufacturing, logistics, retail sales, and use of the products, have crucial implications for environmental sustainability (Vidal et al., 2010). This industry uses wood-based fiber, water, energy, and chemicals, all in significant amounts (Lipiäinen et al., 2022). Hence, climate change, resource-efficiency, and sustainable forest management have been among the topics prioritized on the industry's environmental agenda (Ranängen & Zobel, 2014; Tuppura et al., 2016).

Tissue-type papers, such as (for home and away-from-home use) paper towels and toilet paper, are put to cleaning-related and personal use in households' day-to-day life and professional-sales customers' routine operations (e.g., cleaning and facility management, industrial production, and public-sector work). Demand for them is rising steadily in response to changes in consumption patterns. Both virgin and recycled fibers are among the main raw-material inputs, and the goods are typically produced relatively close to the consumption sites, for short transportation distances. The tissue-paper industry's turnover in Europe comes to roughly 10 billion euros annually, accounting for 25% of the global market for these papers (European Tissue Symposium, n.d.). About 75% of the value arises through retail sales, and the rest comes from away-from-home and B-to-B markets such as hotel and restaurant, hospital, and office use (European Tissue Symposium, n.d.).

Against this background, we chose one company to represent firms within this expanding industry offering unique and in-depth insights into value creation based on data. The case company chosen for study in combination with its retail- and professional-sales customers was Metsä Tissue, one of the largest tissue-paper suppliers in Europe (European Tissue Symposium, n.d.), which has nine production units, in Finland, Sweden, Germany, Poland, and Slovakia. With 1.2 billion euros in 2022 sales, Metsä Tissue alone employs approximately 2500 people. The company is part of Metsä Group, a Finnish forest-industry entity that provides a broad range of wood-based products to global markets. The management team at Metsä Tissue recognized a need to make better use of data in support of environmental sustainability, and the company's managers were ready to work with their

customers to understand the potential value of data more fully. Therefore, the case company was receptive to the idea of this timely analysis (Gray, 2018). We saw great value in a non-anonymous case of this nature, for the opportunity – rare in forest-business research – to afford deeper understanding of the emerging convergence of environmental-sustainability and data work. This is especially valuable since both often are perceived as complex and abstract areas with little sound empirical research.

Among Metsä Tissue's customers are retailers but also various clients engaged in professional sales (such as distributors of office supplies). Improving environmental performance is not only a top priority for Metsä Tissue but also crucial for its customers, which face mounting pressure for environmental sustainability from their own stakeholders and, hence, seek proof of environmental improvements in the associated supply chains. Explicit demands for Metsä Tissue arise from, for example, customers' commitments to reducing their greenhouse-gas emissions in line with specific science-based targets (Science Based Targets Initiative, n.d.). In addition, the company has directly committed to varied sustainability targets, among them having entirely fossil-free mills and products by 2030 (Metsä Tissue, n.d.). Operating primarily in Europe, it also must honor EU-level regulatory requirements for corporate environment-related reporting and transparency (e.g., European Commission, 2022).

3.2 | The study's design

To advance understanding of the customer-perceived value of data for environmental sustainability, we chose to conduct an inductive single-case study, for a qualitative design wherein the analysis is strongly grounded in empirical data (Gioia et al., 2013). Case studies are attuned to developing conceptual contributions and nuanced accounts of the phenomenon in a real-world context (Gray, 2018; Voss et al., 2002), especially in fields with relatively little prior attention from empirical science (Bansal et al., 2018). The exploratory approach we applied (Gray, 2018) enabled us to unpack the complex phenomenon of the perceived value from the angle of the case company and its customers by uncovering its unique features and patterns (Bernard et al., 2017). The approach added value for the participants too, as the process unfolded: sparking of insight in real time strengthened scholarly understanding of the context further (Bansal et al., 2018). Furthermore, this way of engaging enabled scientific and practical understanding of the phenomenon to inform each other (Bansal et al., 2018). With its collaborative method, the study genuinely strengthened Metsä Tissue's environment-related data capabilities as relevant individuals from its sustainability, marketing, data-management, and corporate functions were brought into the project.

The full process was designed as a six-month (January–June 2022) collaborative research project with a working group that comprised five members of the sustainability, marketing, and data-management functions and a steering group with four corporate-level managers. In addition, the regional vice-presidents for sales and selected key-account managers were involved in the process, both via

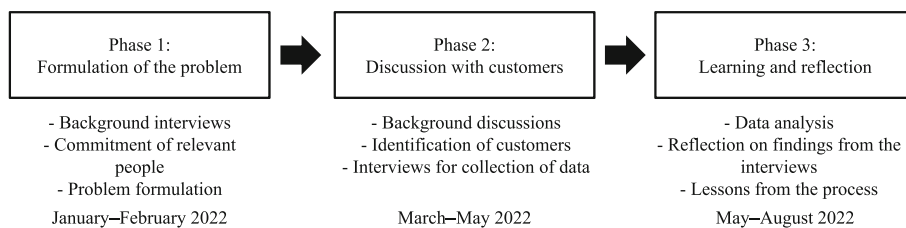


FIGURE 1 A timeline of the work and its phases.

the sales-group meetings and when the customer interviews were being prepared for and conducted.

The project followed a three-stage process (shown in Figure 1) in which the first stage focused on setting objectives for the work and obtaining commitment from informants / research participants at Metsä Tissue. This phase's problem formulation included nine background discussions with key internal informants, two working-group meetings, and a meeting of the steering group. Phase 2 brought customers into the picture, to engage in generating joint understanding of data's value for environmental sustainability by means of interviews. Additionally, that phase utilized, for preparation for the customer interviews, two working-group meetings, a sales-group meeting, and one steering-group meeting as well as, for reflection on the interim results, a joint meeting of the working group and the sales group. The work in the final phase assessed the opportunities and challenges identified in the customer interviews, shared the findings with customers, and articulated lessons from the process for future business development and customer engagement. Phase 3 featured two further working-group meetings and one meeting each of the sales and the steering group. In addition, an internal workshop was held, and the team solicited the internal participants' anonymous input on the lessons from the process.

Metsä Tissue's customers differed in their commitment to environmental sustainability, not all had so far specifically prioritized developing their data sources and data management, and some lacked resources at the time of the study to devote to such matters. We directed our attention to the set of customers that seemed prepared to discuss the topic. Focusing on those customer companies ready to discuss the core topic facilitated collecting valid, reliable future-oriented insight as to rapidly evolving needs, thus enabling the company to tackle these needs proactively and develop the capabilities required. The technique facilitated delving beyond commonly cited factors (e.g., carbon-footprint data) and forming vital knowledge for the future.

3.3 | Data collection

Potential interviewees were chosen on the basis of their systematic work on sustainability and for having expressed interest in discussing the utilization of data for environmental sustainability with their suppliers. Prospective interviewees (involved in retail and professional sales) were identified in cooperation with Metsä Tissue's vice-presidents responsible for regional sales and its key-account

TABLE 1 The informants of the study and their roles.

Interviewee	Role at the company	Company's sales type
A	Managing director	Professional (cleaning- and hygiene-product supplier)
B	Sustainability manager	Professional (supplier of cleaning, hygiene, and office products)
C	Sustainability director	Retail
D	Sales director	Professional (cleaning- and hygiene-product supplier)
E	Sustainability director	Professional (office supplier)
F	Sustainability director	Retail
G	Sustainability manager	Professional (office supplier)
H1 ^a	Sustainability manager	Retail
H2 ^a	Sustainability specialist	Same as above

^aInformants H1 and H2, from the same customer company, participated in a joint interview.

managers. Attention was given to involving customers from all six regions where the company does business (European markets), for eliciting views from multiple markets. Potential interviewees were then contacted by the corresponding key-account managers, and their interest in participating was confirmed. The individuals contacted represented the customer entity's business-management or sustainability function (this depended on the size of the company). Some customers, facing pressures from inflation and supply-chain disturbances at the time of the study, could not prioritize the topic at the time of the study. In the end, nine informants, from eight customer companies, participated in the interviews. They are listed in Table 1.

All extracts reproduced below are from the interviews held with customers in phase 2 (in April to May 2022), which were audio-recorded and transcribed (yielding around 50,000 words of text). They were carried out in the form of interactive Microsoft Teams sessions adhering to a protocol developed for purposes of systematic data collection. To enhance comparability further, one of the researchers facilitated the interviews, encouraging participants to express their thoughts on the three main open questions guiding the conversation. Accordingly, the process, which was carried out in either English or Finnish and took 38–58 min per interview, focused on these central

issues: (1) which drivers were shaping the need for and use of data at the companies; (2) what kind of specific data, for what specific need, was perceived to be the most valuable; and (3) what potential business value said data represented.

In addition to the lead researcher, one or two representatives of Metsä Tissue were present for all interviews: the customer's key-account manager and a sustainability specialist. They were there not to participate actively but to hear the customer's needs and thoughts. Before all sessions, we made the background and rationale for the interview explicit in relation to serving both research interests and the company's efforts to improve in the relevant area, and we assured the participants of confidentiality, to give room for open dialog also addressing sensitive issues and possibly controversial topics. We made sure to address any questions or concerns the informants might have had about the procedure or the use of the results. Our dataset comprises one interview per company, with the main decision-maker who dealt with the demands imposed on suppliers for environmental sustainability. For one of the interviews, two representatives of the customer firm were present, and the rest had one interviewee.

3.4 | Data analysis

Our empirical research employed inductively oriented and content-driven data structuring and analysis informed by the Gioia methodology (Gioia et al., 2013; Magnani & Gioia, 2023). An inductive method for systematically analyzing qualitative data in a manner that maintains openness to discovering new concepts and ideas, it offers the further benefit of enabling the informants' voices to feature prominently in the reporting on the research (Fontana, 2020; Fontana et al., 2021; Gioia et al., 2013). This technique is suited well to exploring the constructs and themes associated with data's perceived value for environmental sustainability, and it supports rich results elucidating the concepts identified from the data. As our research objective was to probe the interviewees' perceptions about the value of data, our empirical data corpus contains only primary data from the interviews conducted in phase 2. Any further data sources, like publicly available reports, were not considered since the contents presented in there are unfit for this research project.

Our coding and analysis yielded not a definitive list or a ranking of value attributes but a set of examples that highlight interesting perceptions grounded in empirical data from an evolving field wherein several key concepts are still to be defined. We used features of the Microsoft Office suite that facilitate data analysis by allowing the wording used by the informants to guide how we organized and coded the data. This tool supported the team's easy iteration over the original data, thereby helping guarantee deep insight as to the characteristics of the data.

The first stage built on developing first-order codes (concepts) from the research data while staying relatively close to the original material. The second stage led to processing these into second-order codes (themes) and, further, into a coherent set of aggregate dimensions. For the first-order coding, the full body of research data was

assessed, such that we could identify value-related aspects by using open coding that relied on the informants' discourse. Here, one researcher performed the analysis, and another checked the coding to verify the reliability of the assessment. Similar aspects that emerged were combined to constitute the set of concepts, or first-order codes. In the second phase, the researchers started grouping those codes by theme in accordance with their similarities by iterating between the first-order codes and the raw interview transcripts; this allowed us to identify themes that were firmly grounded in the data. Via several iterations, a set of themes developed. Finally, the latter, our second-order constructs, were organized into more abstract aggregate dimensions useful for explaining the phenomenon. For fuller understanding of the perceived value of data for environmental sustainability, we examined the relationships among the elements identified and consulted the literature to support further reflection on the findings (Gioia et al., 2013). We could then employ this structure for describing the findings in detail and strengthen the resulting description with further quotes from the informants.

4 | FINDINGS

Our findings, presented below in line with the structure of the Gioia analysis depicted in Figure 2, shed light on how the study's informants perceived the value of data for environmental sustainability. The views of the informants reveal that data's perceived value for environmental performance has two fundamental elements: First, the interviewees called attention to specific traits of the data and related data management required: availability of reliable detail-level product-specific data and increased transparency of product value chains, coupled with the establishment of viable systems for data management and integration solutions that support managing and sharing the related data. Second, they identified various uses for data that should encourage environment-associated improvements. Among these uses are the creation of added value for the customers' own customers (i.e., the second tier) and for consumers, contribution to better business decisions, and guaranteed compliance with regulations (also strengthening stakeholder trust). The sections below examine informants' views of these various elements in detail.

4.1 | The data's nature and availability, alongside management and sharing of data

4.1.1 | Detailed product-specific data and transparency of product value chains

Informants stressed the customers' need for detailed product-specific data and increasing transparency of the full product value chains and their environmental impacts. While a significant portion of the various environmental impacts is created outside the customer's activities, the customer companies are, to an increasing extent, deemed responsible for the value chains in their entirety. Such data would equip them to

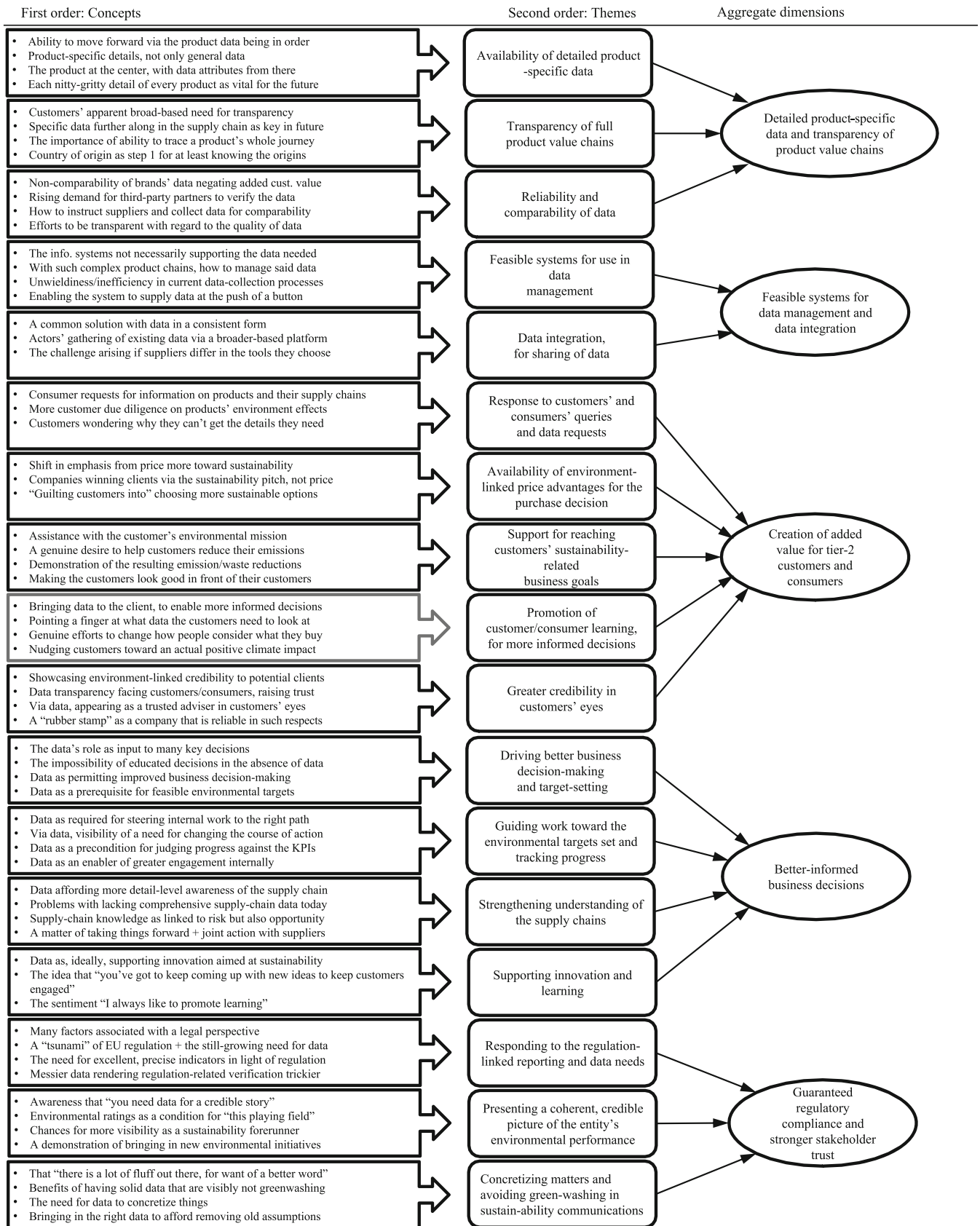


FIGURE 2 The data structure (based on the Gioia method).

choose more sustainable product alternatives, set environment-related policies for their product portfolio, comply with regulations that are in the pipeline, and educate their own customers in more sustainable purchasing. Therefore, the participants need access to comprehensive data, with finer granularity, pertaining to the products' materials and their origin especially, as informant F, a retailer's sustainability director, noted: *“There is a need for increasingly detailed data [...] the scope, quantity, and themes of data are expanding all the time; all the time, there are new data that need to be collected.”* For instance, awareness of the manufacturing conditions can reveal opportunities for environment-related improvements.

In the case of the tissue-paper market, the transparency envisioned would entail some ability to trace the journey of the paper from the forest and the mill to use – and even to the second and third cycles in the product's “life,” when doing so is feasible. This supports understanding the product's sustainability along its entire journey. However, the informants recognized how tricky it is to make comprehensive product-specific data available. Acknowledging the challenges, one informant pointed out, *“It is more about starting the process [than having 100% correct numbers]. Just start asking and nudging the next level of companies [before you in the chain] to gather that data”* (B, a sustainability manager for a customer selling to professionals).

Per the interviewees, the data available for each product should not be general or averages but that product's actual context-specific data, enabling comparison between distinct products and finding of sustainable alternatives. Informant C, working as the sustainability director for a customer carrying out retail sales, stressed, *“I would like to have data on the product and a comprehensive view [of] its various sustainability impacts: the product in the center, and then it has data attributes.”* More specifically, the interviewees expressed a desire for products' content details, data related to their origin, and quantification of environmental impacts. Relevant product-content data would cover the product's materials and composition (e.g., any recycled material), corresponding details for the packaging, and even “product recipes” revealing the chemicals used. The origin data should identify the sources of at least the product's most critical materials, so that issues such as possible biodiversity risks can be identified. Finally, the environmental-impact data should address carbon footprints at the very least, but the informants detect increasing focus also on biodiversity-related data. Circular-economy data too are of interest, though they were not emphasized in the interviews (there was probably a sense of limited applicability of circularity in the tissue-paper domain).

Informants sought reliability and comparability of product-specific and environment-related data both, to support greater environmental sustainability. In current conditions, the data's reliability, particularly in the case of product-specific details, is seen as a challenge. While some standards for life-cycle assessment and methods of calculating carbon footprints have been developed, the product-related environmental data available today are typically not comparable; the background assumptions, definition of boundaries, and other variations render the data practically unusable. Informants also cited a need for

transparency of the data sources (e.g., clear statements of whether the calculations applied product-specific standardized impact assessments with real data versus average data for a larger product group), and they saw an increasing need for third parties to verify and improve the quality of the environment-related data.

4.1.2 | Workable data-management systems and data integration

The interviewees stressed that practical data-management systems and integration mechanisms for managing and sharing environment-related product and business data are required for efficient collection, management, and use of data to support environmental sustainability. They concluded that their respective companies' existing data-management systems are not suited to managing the burgeoning volumes of product-specific data or serving solid management decisions rooted in up-to-date environment-related data. The aim, as one informant described it, should be *“the data [coming out of] the system with the push of a button, such as the financial data, so that we could check with the management team once a quarter where we are going in terms of our emission targets for this year”* (H1, sustainability manager for a retail-sales customer). Informants pointed out that their product-management systems were created for purposes very different from working with sustainability data; therefore, managing environment-related data requires large amounts of manual effort: *“It is very precise data that is needed, but our information systems do not necessarily support that data; [for that reason] we have to do a lot of manual work”* (F, the retail-entity sustainability director quoted above). The informants articulated a need extending beyond their company's boundaries, for effortless sharing of data along their supply chains. In place of the current practice involving questionnaires and Excel sheets shared by e-mail, establishment of joint data platforms and interfaces between data-management systems were cited as opportunities for efficiently sharing of data, decreasing the duplication of work, and improving the data's quality.

4.2 | The variety of potential uses for data

4.2.1 | Creation of further value, for second-tier customers and end consumers

Informants saw the data described above as a promising tool for responding efficiently to their own customers' and to consumers' environment-related questions and data requests: consumers *“keep asking more questions and demand [...] transparency – they want to know where the products come from, where and how they are manufactured and under what conditions, and how the environment has been taken into account”* (H1, speaking from the perspective of a retail customer's sustainability manager). As things stand, addressing these questions and requests is time-consuming since the data are scattered across various systems, must be specifically requested from suppliers,



or might not be available at all. Some informants stated that, rather than respond to these requests on an ad hoc basis, they must proactively prepare themselves for impending data needs. For instance, informant B (the professional customer's sustainability manager) stated, "We're trying to look into our crystal balls, trying to be looking ahead and see the customer demands [...] so that when [our] customers ask [for] some data, we can say, 'Yes, we have that.'" Informants also saw the power of environment-related performance data for bringing related attributes into the sales discussions with second-tier customers alongside price and directly broadening the perspective behind consumers' purchase decisions. Several interviewees claimed to have noticed a shift in their customers' focus, from price toward sustainability, and that vendors are bringing environmental data to the table to support sales pitches: for instance, the informant quoted above emphasized that "sales reps would love not having [price be] the only focus in a customer meeting," stressing that "we have other values to bring to the table." E-commerce was recognized as enhancing the opportunities to bring environmental data into customers' and consumers' decision process. It was identified equally as a potential source of data on consumer behavior/preferences and as a route to encouraging environment-friendly purchasing patterns.

Armed with environmental-performance-related data, vendors can also better serve their customers' work toward sustainability-based business goals, such as meeting emission- and packaging-related targets. One informant mentioned infographics as an especially impactful way to concretize how much single-use plastic a customer could avoid by switching to a more sustainable alternative. By actively identifying, recommending, and providing sustainable product alternatives, vendors can help their customers reduce their emissions and improve their engagement with the environment. Informant B offered the example of "looking to a customer's company mission and say[ing], 'I've seen that you have a goal here – you want to reduce this. I know how I can help you with that.'" This ties in with the previous point: granting one's own customers and the end consumers access to the data is said to promote learning that favors more environmentally informed decisions. The informants recognized themselves as playing an important role in educating their own customers, and they acknowledged that the more environmentally aware those customers are, the better the decisions that are likely to follow. "If they [customers] had data about their hand towels or their toilet roll, and the exact consumption and the exact carbon footprint and anything else that would reinforce that decision, I only think it creates a much more compelling argument, which then a decision will be made from," stated informant D (sales director for a professional-sales entity). Via data, the way they think about products might change, and they could be nudged toward more sustainable purchasing decisions.

Additionally, the interviewees saw data as valuable for strengthening credibility in customers' eyes. Data transparency in communication with customers and end users is perceived as building mutual trust and helping convince both established and new clients. A vendor that provides environmental data for its products and operations is likely to gain the status of a trusted adviser to its customers. Also, customers deeming any given vendor committed to environmental issues hinges on active provision of data, as informant A noted: "The more we can demonstrate

to potential clients our environmental credibility, the more we can grow our business" (managing director, professional-sales customer).

4.2.2 | Input to better-informed business decisions

The participants regarded availability of reliable product-specific and other environment-related data as able to drive better business decisions and target-setting related to their companies' environmental sustainability. They recognized said data as necessary input to viable business targets (whether for carbon reduction or product-portfolio improvements) and to company policies (e.g., on packaging and raw-material purchases). These data are required also for a well-reasoned foundation for investment logic and to aid in assessing business decisions: "Decisions must be based on data so that we know what the relevant issues are and what kind of strict but appropriate goals we should aim for" (informant H1).

In addition, data aid in steering the work toward the environmental targets set and support tracking of progress. Measuring how well the targets are met and reporting to the management on the company's environmental performance calls for readily available, up-to-date, and verifiable environment-related data. Informants explained that data are crucial for genuinely guiding business activities toward the targets and, furthermore, enabling leaders to make a change of course when needed. Interviewee H1 provided an illustration here too: "We have science-based climate goals and a carbon-neutrality target year, so data is essential so that we can monitor and see where we are going [...]. If we don't have data, or if we only get data once a year, it's very difficult to lead that work in the right direction."

Data that are genuinely product-specific and clearly connected to environment factors also assist in enriching understanding of the company's supply chains, and the informants identified supply-chain transparency as an increasingly important topic. Commitment to science-based climate targets, for example, obliges companies to make sure their suppliers are committed to climate-related improvements. They saw data as demonstrably enabling not only better risk management but also identification of improvement and collaboration opportunities in the supply chains: "When we have better data on what kind of partner A is in relation to partner B, then we could move forward with that partner, A, because it has tried to do things better" (C, the aforementioned sustainability director for a retail customer).

Data may also support company-internal innovation and learning. Some informants cited this facet of their approach to sustainability as especially important. They did not specify what innovation emerging via the data might look like, however, and they noted that building on the data is hardest for pioneers.

4.2.3 | Evidence of compliance with regulations and bolstering of stakeholders' trust

Participants readily acknowledged environment-related data's value for supporting their ability to respond to regulatory requirements,

helping them to comply more easily with stricter requirements for data collection and reporting. In the markets where the operations of the informants' companies were concentrated, EU regulation is impelling ever-increasing requirements for product- and environment-related data: *"It's a huge regulatory tsunami [from the EU] and the need for new data and reporting"* (informant F). Among the topical regulatory instruments mentioned are the new Corporate Social Responsibility Directive, expanding the reporting requirements; the proposed directive on corporate-sustainability due diligence, calling for companies to take responsibility for their global value chains; and a circular-economy package tightening the restrictions applied to environmental claims, to limit greenwashing.

The informants saw high-quality data as also affording a coherent and credible picture of the company's environmental performance. At listed companies especially, gaining the trust of investors demands this: *"I don't see it as possible to get very far by repeating set phrases [related to the company's environmental performance]. The data really need to be out there for investors too, so that they believe that your story is coherent and credible"* (H1). Part of the communication with investors is participation in third-party systems for rating corporate-responsibility performance, such as EcoVadis's. This too calls for extensive provision of data.

In sum, the interviewees perceived environment-related data of consistently high quality as helping concretize things and avoid greenwashing in sustainability communications. Data attest to the legitimacy of what the company is saying and are necessary for avoiding a market flooded with greenwashing: *"It's good to have some really good strong data so that people can see it's not greenwashing"* (A, from the perspective of a managing director). Informants recognized a need for digestible, simple customer-facing communication about data that maintains a focused message: *"When you get specific with people's exact usage, then that's when it becomes really powerful"* (D, the sales director quoted above). Not only customers but also employees ask for concrete examples of what the company has done for the environment (for example, how much plastic waste has been avoided). In addition, some informants listed attracting talent as another potential source of value cultivated via the data: *"Employees also start to expect a certain level from their employer, such that they too need to get data to prove that - not just sentences like what is being done but the kind of data that makes them believe that we are actually doing things"* (H2, a sustainability specialist with a retail-sales customer). In addition, data can exert an effect on public opinion. This dovetails with the findings related to data's power to drive learning. One informant stressed the importance of bringing the right information to the public so that, for instance, old assumptions can be dismantled.

When asked about the monetary value of data supportive of environmental sustainability, the informants were unable to quantify it. This type of data was addressed simply in qualitative terms, as the future of the business, crucial for business goals, key to creating new client relationships, and the difference between gaining and losing business.

5 | DISCUSSION

5.1 | Implications for theory

The project participants found that successfully supporting businesses' environmental sustainability necessitates meeting several conditions related to the content and reliability of data and how the data are managed and shared. The presence of these characteristics enables utilizing the data in a wide range of decisions and activities - in the business itself, in its value chains, and among stakeholders - that support environmental-consideration-based choices and operations that entail improvements. The spectrum extends from introducing environment-linked attributes for purchasing choices to tracking progress toward set environmental targets. We can connect these elements to two levels in the hierarchy of perceived customer value that Woodruff (1997) identifies as essential when customers are assessing the value of products: the characteristics, which he calls "attributes and attribute performances," and the uses of data, which he describes as "desired consequences in use situations." While that hierarchy was developed primarily with regard to products, our findings indicate that it meshes well also with assessing the value of data for customers.

Importantly, Woodruff's hierarchy has a third level: customers' goals and purposes. These affect the desired consequences in use situations and, further down the line, the attributes and attribute performances. In our analysis, the clustering of the decisions and activities that data could support revealed the higher-level goals and purposes of the informants and their organizations for the utilization of data for environmental sustainability. First, data can serve as a resource enabling creation of added value for the tier-2 customers and, in turn, consumers. Second, the informants perceived data as able to support better environmental-factor-informed business decisions and improve the management of corporate responsibility. Also, there is recognized value in data for supporting regulatory compliance as EU rules grow stricter and for gaining stakeholder trust (which influences drawing in investors, attracting talent, and swaying public opinion). While the importance of the goals varies somewhat among the informants, the first two of these goals were strongly emphasized.

The findings reveal an apparent need for greater quantities and detail of products' value-chain data and related environmental impacts, to provide transparency and reveal the environmental performance of full supply chains; this conclusion is consistent with prior literature (Elias Mota et al., 2020; Gandolfo & Lupi, 2021; Rusch et al., 2022). Research has found this type of data to be increasingly crucial for meeting transparency needs and complementing sustainability reporting in communication of companies' sustainability commitments and efforts to stakeholders (Engert et al., 2016; Stewart et al., 2018). Likewise, many of the challenges emphasized by the findings in relation to data availability and reliability are recognized well in the literature. Gaps or inaccuracies in even the simplest supply-chain data, such as factory locations, are among the factors identified as hindering their use, and another is limited comparability of product-



specific environmental data across buyers and suppliers (Comas Martí & Seifert, 2013; O'Rourke & Lollo, 2021).

Our findings render it obvious that, if the environment-related data are to create value for environmental performance, they must guide a variety of activities and decisions – significantly better than they do at present. Environment-critical decisions are made in numerous business functions, from design to operations, and span all the way to consumers. If utilized well, environment-related data would be flexibly applied to meet multiple needs, serving quarterly management updates, specification of procurement policies, provision of consumer-facing details of the environmental impacts of their consumption, and so forth. Companies are starting to integrate environmental data into their product- and supply-chain management systems; however, most still lack efficient ways to collect, manage, and utilize environment-related data. The state of affairs appears not to have advanced from that identified in prior literature (O'Rourke & Lollo, 2021; Ren et al., 2019).

The findings imply that the focus in applying environment-linked data is shifting from company-level compliance-driven annual reporting to multifaceted utilization of data in work affording sustainable product value chains and product portfolios, coupled with endeavors to nudge consumers toward sustainable purchasing choices. Creating value of this nature from data throughout and between product value chains calls for the products' providers and their customers to co-create meaningful and easily verifiable environment-related data and value through interaction aimed at data's versatile utilization. Regarding value creation as a co-creative and interactive process conducted between suppliers and customers reflects the contemporary way of thinking about customer value (Ballantyne, 2004; Grönroos & Voima, 2013). This process is dynamic also (Flint et al., 1997), shifting as associated priorities, regulations, and data needs change. Our findings attest to data's multidimensional nature and dependency on the context of making use of the data; this conclusion is supported also by earlier studies (Macdonald et al., 2016; Tzokas & Saren, 1999).

5.2 | Management implications

Our main practical contribution lies in strengthening the understanding of how companies could, with data, better support their customers' environmental sustainability. With a customer-driven approach to the value of data, companies can better prioritize their data-development initiatives in line with the customers' developing needs and continuously deliver customer-recognized value. The insight pertaining to the perceived customer value of data could serve to motivate and guide companies' further exploration of opportunities in this domain, alongside other value chains' contexts. Also, there is a recognized need to anticipate what customers will consider valuable, from their standpoint and in their terms, if companies are to continue creating value for their customers in a constantly changing world (Rantala et al., 2019; Rintamäki & Saarijärvi, 2021). Through a forward-looking approach to customer expectations and needs, efforts focused on environment-related data could shift from

compliance to more strategic use of data – that is, to bringing the customers value. Companies would benefit simultaneously from systematic cultivation of solid capabilities related to environmental performance data, also to better approach corporate sustainability from an employee engagement perspective and reap related benefits (Karatas-Ozkan et al., 2022). Such endeavors involve data-management systems but also skills in analyzing data and practices whereby the players utilize data to support environmentally informed decisions. Advances of this nature are a necessary component for a strong backbone to data's utilization and for overcoming the challenges identified from our research material – most prominently, data-accountability and incompleteness problems, limited coverage of the value chains, the difficulty of gathering the data required, and lack of common definitions and methods. Today, in contrast, handling (internal or external) environmental-performance-related data requests is labor-intensive, and the data-management systems do not support efficient collection, management, or sharing of data. Hence, any data sit idle, lacking value for the business and the environment both. Diverse touchpoints for product-specific data along value chains (data interfaces, data platforms, approachable user interfaces, etc.) would enable efficient sharing and improve data's usability in many types of relevant business decisions.

5.3 | Limitations and further research

Our work is not without its limitations. First, the analysis was based on the views expressed by the informants. All retail- and professional-sales customers participating in the study assigned high priority to environmental sustainability and saw opportunities for data to support it. For this reason, the findings reflect perspectives on data's value primarily within companies that could be called pioneers of environmental sustainability. Second, the customers involved displayed variation, especially with regard to the utility of data for bringing value. Their perspectives depended on such contextual elements as the customer company's ownership and markets. Third, the value of data is likely to be perceived differently from person to person within any given company, and individuals have both their own goals and shared, collective ones (Macdonald et al., 2016). The issues and opinions raised by the informants can be seen as specifically topical for them at the time of the research, and one could expect these to shift as foci of interest evolve and as priorities among various development needs shift over time. In addition, it should be noted that three of the interviews were conducted in a language not native to the interviewees. Though recognizing the potential downside to this, we wanted the research team to be properly engaged throughout the data-collection process.

For broader understanding of how companies may, with data, support their customers in working toward environmental sustainability, research could explore several areas for further study. Scholarship could benefit from concrete empirical cases of data supporting better environmentally informed decisions (by both humans and AI) for businesses and their larger value chains via assessment of the related environmental and business value. Researchers could also cultivate

understanding of how data-derived insight addressing consumers' behavior and preferences could serve efforts to encourage environment-related decisions and associated improvements. Increasing demands and standards for sustainability reporting might also pave the way for more transparency and details regarding reported company making these reports suitable and reliable sources of data also for research. Expanding the view to analyzing how value from data can be co-created between suppliers and customers and how that value is shared among the actors would be worthwhile. Herein, research rooted in marketing research could provide inspiration (e.g., Mubushar et al., 2021). Finally, a wider perspective overall – encompassing matters such as social sustainability – would be welcome.

6 | CONCLUSIONS

Our study responded to a need for exploring data's value in the context of environmental sustainability as perceived by the customers of the case company and for examining exactly how the data support value (for the businesses involved and in environmental terms). We were able to highlight vital elements and mechanisms. By assessing the characteristics and possible uses of data that could facilitate sustainability alongside the link to customers' goals, we shed light on this value as a multifaceted concept even when attention is restricted to the customers' perspective. We found that, as our informants highlighted, diverse decision-making points in business operations and consumers' life could benefit from better availability of reliable environment-related data. Clearly, the need to cultivate sustainability-supporting value from data is constantly growing, as are associated expectations – business-function-internally, throughout the companies' value chains, and among their stakeholders. The business world urgently requires far better capabilities of working with environment-related data, covering data management, practices, and skills in analyzing and utilizing data.

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