Purchasing realized absorptive capacity as the gateway to sustainable supply chain management

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Abstract

Purpose – Companies' ability to build sustainable supply chains and achieve strategic sustainability objectives largely depends on their supply network characteristics and the nature of the relationships with strategic suppliers. This poses the question of how purchasing departments can help to translate this sustainability commitment into performance benefits. The authors focus the attention on buyer-supplier information sharing practices and study how the availability of information interplays with the purchasing realized absorptive capacity (PRAC) to positively impact performance (operational, environmental and social).

Design/methodology/approach – The study collected data from 305 procurement executives in four European countries and tested the hypotheses empirically using structural equation modeling. Mediation analysis is used to test the effect of PRAC on the relationship between buyer-supplier information sharing and performance.

Findings – The results show that increasing buyer-supplier information sharing is sufficient to obtain a positive impact on operational performance. To improve purchasing sustainability performance, companies need to develop their PRAC to adequately transform and exploit external information and identify opportunities in the environmental and social areas. Thanks to these purchasing capabilities, organizations can overcome potential trade-offs between different performance dimensions.

Originality/value – In the context of collaborative buyer-supplier relationships, this study is one of the first to propose purchasing knowledge management capabilities (i.e. PRAC) as a key factor to improve multiple performance dimensions. Additionally, it captures different sustainability aspects, concluding that organizations can improve purchasing operational, environmental and social performances by implementing appropriate information sharing mechanisms with suppliers and developing their PRAC.

Keywords Buyer-supplier relationships, Information sharing, Purchasing realized absorptive capacity, Operational performance, Sustainability performance

Paper type Research paper

1. Introduction

The fast-changing competitive environment puts firms under considerable pressure to adapt and continuously improve their operations and supply chains. Most business sectors are highly dynamic and subject to uncertainty in terms of volumes, technologies, demand trends and institutional context (Wong *et al.*, 2011). The ability to compete in a dynamic environment increasingly implies acknowledging and pursuing multiple objectives in terms of efficiency, effectiveness and sustainability (Markman and Krause, 2016). Not only firms need to satisfy customers' requirements, but they should also respond to stakeholders' requests for

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environmentally and socially sustainable operations (Mani and Gunasekaran, 2018). In the last decades, more and more firms have integrated sustainability into their business strategy (Wu *et al.*, 2014). Nonetheless, the linkage between commitment to sustainability and classic operational performance is not yet fully explored, with a significant emphasis on the role of suppliers (Miemczyk and Luzzini, 2019). In order to improve performance, sustainability commitment needs to be operationalized effectively within firms and across their supply networks (Villena and Gioia, 2018).

While most research focuses on external stakeholders' actions and sustainability adoption, internal organizational capabilities have been somehow disregarded (Riikkinen *et al.*, 2017). Despite the breadth of sustainability literature, further empirical evidence is needed to understand how firms might overcome the potential trade-offs between sustainability and operational performance. In this study, we investigate both the external and internal facets of organizational capabilities, which might play a key role in sustainability deployment and trade-off management.

On the one hand, the firm's ability to generate a sustained competitive advantage largely depends on suppliers, who are by now recognized as a fundamental source of value creation and not merely a way to cut costs out of the supply chain (Hartmann *et al.*, 2012). With purchasing to turnover ratios being over 60% in many industries (CAPS, 2021), suppliers are key providers of goods and services within the focal firm's extended supply chain. Both research and practice offer plenty of evidence that buyer-supplier collaboration can create a competitive advantage by combining buyer's and supplier's expertise. Examples range from P&G's open innovation strategy to Toyota supply base management and Intel-Dell collaborative innovation initiatives (Saenz *et al.*, 2014). Consequently, the simultaneous achievement of operational and sustainability performance is fundamentally bounded by the capacity to integrate and deploy buying firms' and suppliers' skills in new ways that overcome the classic trade-offs reported by previous studies (Gimenez *et al.*, 2012). Several studies investigated the link between buyer-supplier collaborative practices and triple bottom line (TBL) outcomes, exploring the role of buyer-supplier interactions in overcoming potential sustainability trade-offs (e.g. Longoni *et al.*, 2019; Nunes *et al.*, 2020). Results provide mixed evidence, defining a research gap to further explore (e.g. Golicic and Smith, 2013; Miemczyk and Luzzini, 2019).

On the other hand, we intend to address the gap regarding internal organizational capabilities. In order to exploit the synergies between their own and suppliers' expertise, companies should be able to identify and use external knowledge in combination with their operations. This ability has been referred to as absorptive capacity (AC) (Cohen and Levinthal, 1990). It has been studied widely as a promoter of innovation (Kostopoulos *et al.*, 2011; Saenz *et al.*, 2014), but to a lesser extent in connection to sustainability (Riikkinen *et al.*, 2017). A company's AC depends on the individuals at the interface between organizational units or the external environment. As a consequence, previous research has clearly identified the purchasing department as a key actor in fostering the firm's AC (Kauppi *et al.*, 2013; Saenz *et al.*, 2014; Riikkinen *et al.*, 2017). Purchasing is, by definition, a boundary-spanning department that coordinates and connects multiple units across the purchasing process and constitutes the virtual interface between the firm and its supply base (Patrucco *et al.*, 2017). As such, it represents a context where AC can develop naturally. For this reason, we aim to investigate the purchasing department's ability to transform and exploit knowledge to promote environmental and social sustainability practices without compromising operational performance.

In other words, this study intends to address the following research question:

RQ1. How do buyer-supplier information sharing and purchasing absorptive capacity affect the triple bottom line performance of the purchasing department?

We advance that buyer-supplier information sharing is key to meeting the challenges related to sustainability and trade-off management. Integrating complementary knowledge from

strategic suppliers and working with them effectively are necessary conditions for performance improvement. Furthermore, we propose the purchasing realized absorptive capacity (PRAC) as an important mediator of the information sharing-performance relationship: only by translating into practice the value created through the collaboration can the buying firm ensure compelling results from suppliers.

Overall, our study will offer valuable insights for firms operating in those dynamic environments where the set-up of effective and sustainable supply chains requires the tight integration of buyers and suppliers. By doing this, we contribute to different streams of literature. First, we contribute to the sustainable supply chain management literature by shedding light on the concurrent role of buyer-supplier information sharing and PRAC. Second, only a handful of studies explored AC in the operations and supply chain management context, particularly in the purchasing context: we contribute to the measurement validation and advance the theoretical debate. Third, we introduce buyer-supplier information sharing as an important antecedent of PRAC, which, in turn, mediates the information sharing-performance relation.

To develop our argument, we first provide in Section 2 the relevant literature about trade-offs in sustainable supply chain management and purchasing absorptive capacity. We then develop the hypotheses about the expected relationships between key constructs of information sharing, PRAC and performance. In Section 4, we introduce the research design, along with the survey instrument, measures, data collection and preparation. In Section 5, we describe the outcomes of hypothesis testing, and in Section 6, we discuss the theoretical and managerial implications. Finally, Section 7 draws our conclusions and presents the research limitations and directions for further studies.

2. Literature review

2.1 Sustainability trade-offs in the upstream supply chain

The sustainability outcomes of firms' own operations and supply chain have been the subject of a broad body of literature, encompassing environmental, social and economic performance dimensions (Nunes *et al.*, 2020). Due to the preferable moral imperative associated with sustainability (Zhu and Lai, 2019) and its positive connections with overall firm financial performance (Whelan *et al.*, 2021), firms are integrating environmental and social criteria into day-to-day practices and decision-making (Marshall *et al.*, 2019). Over the past two decades, sustainable supply chain management emerged as an approach integrating environmental, social and economic goals across a focal firm's supply chain processes (Carter and Rogers, 2008).

Sustainability outcomes encompass the adoption of environmentally and socially responsible practices as well as the achievement of environmental, social or economic performance (Koberg and Longoni, 2019). Practices usually refer to investments in control and prevention and the adoption of management systems and certifications (van Donk *et al.*, 2010). Performance is generally defined in terms of the TBL: environmental performance considers efficiency in resource utilization, recycling and reduction of pollution, waste and emissions (Rao and Holt, 2005); social performance considers human rights, labor practices and impact on local communities (Yawar and Seuring, 2017); economic performance can be operationalized in terms of market, operational or accounting-based metrics (Golicic and Smith, 2013). This multiplicity of objectives further complicates when considering the reduced managerial visibility into the supply network (Villena and Gioia, 2018), the focal firm's diluted power across multiple supply chain tiers (Hoejmose *et al.*, 2013) and the divergent sustainability expectations across geographies (Wu and Pullman, 2015). As a result, preventing negative environmental and social outcomes and improving sustainability performance in modern supply chains remain a challenge (Koberg and Longoni, 2019).

This study focuses on the upstream portion of the supply chain, that is, the management of the relationship between a focal company and its suppliers. Current studies show how much firms struggle to integrate environmental and social principles into their supply chains and to overcome potential trade-offs (Sodhi and Tang, 2018; Longoni *et al.*, 2019; Nunes *et al.*, 2020). Monitoring and managing supplier relationships is key to implementing sustainability practices and hedging against potential risks (Kim *et al.*, 2021). Well-known cases from the past, such as Nike, BP, Nestlé and Apple, are examples of supplier-related sustainability issues that buyers could not anticipate (Lee and Vachon, 2016). However, companies are still surprised today by the misconduct in their supply chains, as it appears in both research and practice (Villena and Gioia, 2018; The Guardian, 2021). Sustainable supply chain management literature clearly acknowledges that the integration of the supply chain through mechanisms such as monitoring, information sharing and collaboration can lead to TBL performance improvement (Miemczyk and Luzzini, 2019; Marshall *et al.*, 2019; Kumar *et al.*, 2021; Negri *et al.*, 2021).

Yet, empirical research investigating the relationship between buyer-supplier interactions and TBL outcomes still provides mixed evidence. It is outside the scope of this study to conduct a systematic literature review, but empirical evidence is available about the link between a wide array of procurement practices and the TBL. These practices include information sharing, monitoring and collaboration (e.g. Luzzini *et al.*, 2015; Marshall *et al.*, 2019; Kumar *et al.*, 2021); power (e.g. Marshall *et al.*, 2019); incentives (e.g. Pakdeechoho and Sukhotu, 2018); top management commitment (e.g. Kumar and Rahman, 2016); supplier development (e.g. Yawar and Seuring, 2018); and risk management (e.g. Miemczyck and Luzzini, 2019). Recent literature reviews offer an interesting summary of the upstream management of supply chains and sustainability (e.g. Johnsen *et al.*, 2017; Koberg and Longoni, 2019; Negri *et al.*, 2021). For example, some studies show that buyer-supplier collaboration might simultaneously improve sustainability and cost performance (e.g. Miemczyk and Luzzini, 2019) but do not consider the operational performance. Other studies report potentially conflicting results between performance dimensions (e.g. Golicic and Smith, 2013). Yusuf *et al.* (2020) report a positive and significant relationship between sustainable supply chain management practices (which incorporate information sharing and collaboration with suppliers) on both operational and sustainability performance, although they do not isolate the contribution of sustainable procurement nor the effects on different performance dimensions. Thanks to an encompassing meta-analysis, Geng *et al.* (2017) show that supplier integration can positively affect operational and environmental performance, with no significant link with social performance (possibly due to lack of empirical studies in the field).

All in all, although we have evidence showing that certain interorganizational purchasing practices can have positive TBL outcomes, we still do not fully understand why. In other words, the mechanisms through which buyer-supplier relationship management can overcome the classic sustainability trade-offs are not fully explored. For these reasons, in the next section, we introduce a central construct in our study (i.e. purchasing realized absorptive capacity–PRAC) as a key intervening mechanism in the practices-performance relationship oriented toward TBL results.

2.2 Purchasing absorptive capacity

Studies have shown why and how sharing information and collaboration with suppliers can improve performance across all three bottom lines (Gimenez *et al.*, 2012). Furthermore, given the value creation potential of suppliers, previous studies highlight how buyer-supplier collaborations targeting environmental and/or social outcomes can be an effective strategy toward the TBL (Luzzini *et al.*, 2015). However, due to the increasing complexity and

fragmentation of supply chains, knowledge is dispersed across different actors, complicating the identification of viable solutions from a holistic sustainability perspective. Therefore, acquiring and exploiting new knowledge is extremely important to generate continuous learning and respond to emergent market conditions (Eisenhardt and Martin, 2000) that consider sustainability a central construct.

AC is defined as the "ability of a firm to recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990, p. 128). Thus, AC goes far beyond the research and development (R&D) intensity and investment (Zhang *et al.*, 2018). It refers to how firms acquire, develop and assimilate new knowledge to reach a competitive advantage (Revilla *et al.*, 2013).

Different operationalizations of AC have been proposed in the literature. Among the most common and tested, authors have distinguished *acquisition* (i.e. recognize and acquire new external knowledge), *assimilation* (i.e. analyze and interpret the external knowledge), *transformation* (i.e. internalize and convert the external knowledge, combining it with the existing one) and *exploitation* (i.e. use this knowledge to improve outputs) (Zahra and George, 2002). The first two components, *acquisition* and *assimilation*, are commonly grouped into *potential* AC, reflecting the firm's ability to incorporate new external knowledge. Instead, *transformation* and *exploitation* constitute *realized* AC, which refers to the firm's ability to leverage existing and acquired knowledge to improve its output (Zahra and George, 2002; Jansen *et al.*, 2005; Todorova and Durisin, 2007). Alternative formulations of AC, such as the one proposed by Tu *et al.* (2006), focus on four knowledge components of AC: *workers'* and *managers' knowledge*, *communication network*, *communication climate* and *knowledge scanning*.

In general, extant research consistently identified AC as a relevant factor in enhancing supply chain performance (Azadegan, 2011; Flatten *et al.*, 2011; Zacharia *et al.*, 2011; Saenz *et al.*, 2014). Authors have shown how AC can improve efficiency (Dyer and Hatch, 2006); increase product quality, profitability and productivity (Chen *et al.*, 2009); lower labor and production costs while increasing financial resource efficiency (Revilla *et al.*, 2013); and expand manufacturing capabilities (Zhang *et al.*, 2018). Nevertheless, only a few studies provide evidence on the positive effect of AC on sustainability performance (e.g. Riikkinen *et al.*, 2017).

While AC has been mainly studied in the organizational theory context, previous works have proposed adaptations to the operations and supply chain management context (Tu *et al.*, 2006; Patel *et al.*, 2012; Setia and Patel, 2013; Rojo *et al.*, 2018). In line with the definition above, Rojo *et al.* (2018, p. 638) adopt the definition of *operational* absorptive capacity as "the acquisition, assimilation, transformation, and exploitation of operations and supply chain knowledge." In line with this approach, we follow a more recent stream of literature and focus our attention on the purchasing department. The purchasing department represents the linkage between a firm and the external environment (Ehrgott *et al.*, 2011), and it is a crucial gatekeeper of knowledge and capabilities (Kauppi *et al.*, 2013). Consequently, some scholars have studied AC in relation to the firm's purchasing department (Schiele, 2007; Kauppi *et al.*, 2013; Saenz *et al.*, 2014; Riikkinen *et al.*, 2017).

On the one hand, the purchasing department coordinates the processes of scouting and selecting suppliers and later acts as the relational broker between suppliers and other organizational units. On the other hand, purchasing employees work internally by mixing and coordinating the skills and expertise from different departments that are necessary for the relationship with suppliers. As such, purchasing becomes a key enabler of AC.

Another important insight deriving from AC literature is the need to consider different dimensions of AC as separate concepts and constructs. Indeed, authors have shown that *potential* and *realized* AC might have different effects, as they represent fundamentally different abilities (e.g. Riikkinen *et al.*, 2017). Knoppen *et al.* (2022) introduce a cumulative

process model of AC, showing that one component can lead to another. However, extant literature reveals a limited understanding of the antecedents and consequences of the individual components of AC. Most of the research studies conducted so far consider AC as an aggregate construct, without differentiating between the creation (potential AC) and the utilization of knowledge (realized AC) (Setia and Patel, 2013; Riikkinen *et al.*, 2017; Khan *et al.*, 2019). Given our intention to study TBL performance, we focus our attention on the realized component of AC since it reflects the transformation and exploitation of knowledge and is expected to enhance a firm's performance and develop a competitive advantage (Setia and Patel, 2013; Flatten *et al.*, 2015; Kahn *et al.*, 2019). Therefore, in the remainder of the manuscript, we will refer to PRAC as our target concept.

The next section elaborates on specific hypotheses about the expected result of buyer-supplier information sharing on operational and sustainability performance. We then introduce PRAC as a critical mediator in the information sharing-performance relationship.

3. Research model and hypotheses

As illustrated in the previous sections, the combination of existent literature streams supports the connection between information sharing, absorptive capacity and purchasing performance. The present work aims to explore these connections more in detail through hypotheses elaborated in the following.

3.1 Information sharing in buyer-supplier relationships and operational performance

Due to the increasing complexity and knowledge fragmentation of supply chains, collaborative initiatives between supply chain actors often take place (Pagell, 2004; Caridi *et al.*, 2014). Among the forms of cooperation and collaboration, information sharing represents one of the most recurrent (Prajogo and Olhager, 2012) as it reflects the efforts to improve supply chain visibility and real-time information exchange (Kembro *et al.*, 2017). Information sharing refers to the exchange of important information between parties (Heide and Miner, 1992), and it has been receiving significant consideration in the buyer-supplier literature (e.g. Lee *et al.*, 2000; Lee and Kim, 2009; Ding *et al.*, 2011; Wacker *et al.*, 2016; Lee and Ha, 2018; Newell *et al.*, 2019). Examples of information shared between buyers and suppliers include inventory, demand forecast, production schedules, processes and capacity (Ding *et al.*, 2011). Parties share information with each other, expecting in return an improvement in their overall competitiveness (Wu, 2008; Singh and Power, 2009; Newell *et al.*, 2019). The underlying idea is that, by sharing information, the overall supply chain visibility increases, and firms have access to knowledge that may not be available within the firm (Kulangara *et al.*, 2016), which supports them in making accurate decisions and implementing corrective actions. Also, the availability of real-time and up-to-date information makes the supply chain more reactive and responsive to the demand: the exchange of information facilitates the understanding and the fulfillment of the agreed requirements between suppliers and buyers (in terms, for example, of delivery time and quality) and smoothens the production and transportation processes as well as the related costs (He *et al.*, 2017). Moreover, information sharing can also foster a more rapid identification and solution to problems (He *et al.*, 2017). Literature on operations and supply chain management has recognized information sharing as a key element for achieving efficiency, reducing costs, improving ordering processes, increasing operational and financial performance and thus enhancing competitive advantage (Lee *et al.*, 2000; Barratt, 2004; Paulraj *et al.*, 2008; Lee and Kim, 2009; Ding *et al.*, 2011; Ha *et al.*, 2011; Wacker *et al.*, 2016; Lee and Ha, 2018).

In this study, we focus on key operational performance in addition to cost. Indeed, while most of the current literature on buyer-supplier relationships measured operational

performance utilizing cost indicators (e.g. Carter and Rogers, 2008; Cao and Zhang, 2011; Liu *et al.*, 2020), we detect a dearth of studies relying on service-level dimensions (Zacharia *et al.*, 2011; Benton *et al.*, 2020). Greater information sharing improves alignment and synergies between buyer and supplier (He *et al.*, 2017) and implies a clearer understanding of the product or service specifications. In addition, it enables interactive performance measurement and management, which goes beyond the transactional command-and-control management of supply chain relationships (Koufteros *et al.*, 2014). Therefore, we expect that information sharing positively affects cost performance as well as other dimensions, such as quality and delivery (Singh and Power, 2009; Ding *et al.*, 2011; He *et al.*, 2017), in line with recent literature (e.g. Dey *et al.*, 2015; Maestrini *et al.*, 2018; Patrucco *et al.*, 2020).

Thus, the first hypothesis we formulate is the following:

H1. Higher information sharing in buyer-supplier relationships positively impacts purchasing operational performance (cost, quality and delivery).

3.2 Information sharing in buyer-supplier relationships and sustainability performance

A more recent stream of research has addressed the role of information sharing in buyer-supplier relationships specifically related to sustainability (Woo *et al.*, 2016; Riikkinen *et al.*, 2017; Pakdeechoho and Sukhotu, 2018). In the last two decades, increasing attention has been posed to the environmental and social dimensions, in addition to the economic one, in line with the TBL view of sustainability (Esfahbodi *et al.*, 2016; Katiyar *et al.*, 2018). Nonetheless, the literature on buyer-supplier interactions and TBL outcomes still provides mixed evidence (Vachon and Klassen, 2006; Margolis *et al.*, 2011; Hollos *et al.*, 2012; Gimenez *et al.*, 2012; Feng *et al.*, 2020; Geng *et al.*, 2017), and the mechanisms through which buyer-supplier relationship management can overcome potential trade-offs between operational and sustainability performance are not fully explored (Jacobs *et al.*, 2010; MacCarthy *et al.*, 2013; Lam *et al.*, 2016). Furthermore, extant sustainable supply chain management literature mainly focused on environmental performance (Woo *et al.*, 2016; Geng *et al.*, 2017; Bian and Zhao, 2020; Feng *et al.*, 2020), while social performance continues receiving limited attention (Mani *et al.*, 2020). Few studies have recently started to address the social dimension specifically (e.g. Chin and Tat, 2015; Paulraj *et al.*, 2017; Yawar and Seuring, 2018; Kumar *et al.*, 2021). Recent social scandals in major companies and the increasing customer consciousness revealed how poor social performance is directly translated into a tainted brand image and poor economic performance (Hajmohammad and Vachon, 2016). As a result, there is a call for increased attention to social performance (Marshall *et al.*, 2015; Mani *et al.*, 2018; Zhu and Lai, 2019; Geyi *et al.*, 2020).

Further investigation is needed to clarify whether supply chain sustainability initiatives can be beneficial or harmful to operational performance (Geng *et al.*, 2017). Commitment to sustainability promotes the need for firms to collaborate with supply chain partners, particularly with suppliers (Luzzini *et al.*, 2015; Esfahbodi *et al.*, 2016). In order to comply with sustainability responsibilities, firms need to involve upstream partners in the form of information sharing, alignment and integration (Kumar and Rahan, 2016; Bian and Zhao, 2020; Kumar *et al.*, 2021). It is extremely problematic to achieve supply chain sustainability without supplier involvement and support (Kumar and Rahan, 2016; Kumar *et al.*, 2021), and information has been defined as one of the drivers for achieving sustainable supply chain performance (Hassini *et al.*, 2012; Woo *et al.*, 2016). The exchange of information facilitates sustainability goal achievements by fostering synergies among parties, reducing the overall effort and exploiting the common knowledge to develop comprehensive solutions (Daily and Huang, 2001). Through information sharing, firms can achieve knowledge integration, higher willingness to change, reduced uncertainty and distribution of risks related to sustainability

investments (Klassen and Vachon, 2003; Pagell and Wu, 2009), which, in turn, support the development of sustainability initiatives and lead to increased sustainability performance (Rao and Holt, 2005; Kumar and Rahan, 2016; Woo *et al.*, 2016; Kumar *et al.*, 2021). For these reasons, we expect that information sharing positively affects sustainability performance (environmental and social), in line with the latest studies (e.g. Giannakis *et al.*, 2020; Adesanya *et al.*, 2020).

We thus formulate our second hypothesis:

H2. Higher information sharing in buyer-supplier relationships positively impacts purchasing sustainability performance (environmental and social).

3.3 The mediating effect of purchasing realized absorptive capacity

As discussed above, the relationship between information sharing and performance has been widely explored, but a limited number of works investigated the intervening mechanisms. In this study, we examine one specific mechanism, namely purchasing absorptive capacity, and analyze its role in explaining *how* information sharing in buyer-supplier relationships can improve performance. Successful buyer-supplier cooperation and the achievement of superior performance are strictly related to how firms acquire and process knowledge (Meinlschmidt *et al.*, 2016), a concept reflected in the notion of absorptive capacity.

In particular, we argue that information sharing can drive PRAC, enabling synergetic performance outcomes. Several studies suggest that AC-related abilities mediate between selected antecedents and supplier performance (Carter, 2005; Modi and Mabert, 2007), including operational performance (Kahn *et al.*, 2006). Braunschneidel and Suresh (2009) show how internal and external integration should be followed up by market-based learning to improve flexibility and agility. Similarly, Saenz *et al.* (2014) show that AC allows companies to capitalize on the potential available from compatible partners, enhancing efficiency and innovation in a buyer-supplier context. We hypothesize that PRAC (the ability to transform and exploit knowledge) is stimulated by information sharing between buyer and supplier. Information sharing can lead to knowledge development (Kotabe *et al.*, 2011; Kulangara *et al.*, 2016), foster interorganizational learning and greater understanding (Paulraj *et al.*, 2008) and, therefore, represents one of the most important drivers of supply chain performance (Kulangara *et al.*, 2016). Nonetheless, information sharing alone may not be enough. It is essential that supply chain parties own the ability to use such information to create value and enhance supply chain performance (Newell *et al.*, 2019; Hsu *et al.*, 2021).

To translate the potential benefits of knowledge exchange that are typical of buyer-supplier relationships into realized benefits, firms need to match complementary skills and create actionable knowledge. Exploratory learning must be complemented by transformation and exploitation before enhancing performance (Cohen and Levinthal, 1990; Volberda *et al.*, 2010). Therefore, it would be short-sighted to suggest that buyers simply exchange information with suppliers and expect them to deliver superior performance. Instead, we expect that information sharing affects operational performance through PRAC.

Based on these arguments, we believe that PRAC enables firms to leverage information sharing between buyer and supplier and enhance the operational performance that suppliers deliver to the buying firm. Accordingly, we formulate our third hypothesis:

H3. PRAC positively mediates the relationship between information sharing and purchasing operational performance.

To incorporate a TBL perspective, we complement our hypothesis concerning operational performance with environmental and social performance. Very few studies assess the impact of purchasing AC on environmental and social capabilities (Riikkinen *et al.*, 2017). However, other studies suggest that organizational AC does relate to sustainability performance

(Dzhengiz and Niesten, 2020; Lu *et al.*, 2021). For example, companies with higher AC have been found more proactive to environmental innovations (Xie *et al.*, 2019), also in connection with stakeholder management (Dentoni *et al.*, 2016). Borland *et al.* (2016) argue that managers with an eco-centric mindset scan the environment for sustainability knowledge and are more likely to develop environmental competencies, put their knowledge to use and, in turn, drive environmental performance. Furthermore, the development of environmental capabilities requires an adaptation of routines and practices to adapt to sustainable development goals (Inigo *et al.*, 2017). In the form of knowledge transformation and exploitation, AC has been explicitly associated with environmental capabilities, given the need to integrate complex, external and cross-disciplinary environmental knowledge (Delmas *et al.*, 2011; Abareshi and Molla, 2013). Riikkinen *et al.* (2017) argue that sustainability is strongly context-dependent because environmental characteristics and impacts differ across geographical locations. Therefore, environmental concerns can only be addressed by transforming and exploiting salient environmental knowledge. Because purchasing professionals are subject to multiple messages from various stakeholders (such as suppliers, internal and external customers and industry associations, e.g. Zhu and Sarkis, 2007), they are likely developing a more holistic understanding of complex performance objectives and potential sustainability trade-offs.

Context dependence, the need to translate stakeholder pressures into actionable knowledge and the TBL mindset can also explain why PAC can drive social sustainability. However, social sustainability is also less tangible and relies on less codifiable know-how (Pinkse *et al.*, 2010), which is a possible explanation for the scarcity of empirical evidence around it. Furthermore, because social sustainability does not relate to products and manufacturing processes per se, knowledge transformation and exploitation capabilities (i.e. PRAC) are considered even more important in terms of incorporating labor protection and ethical conduct into operational practices within the firm and across the supply chain (Riikkinen *et al.*, 2017). This is ensured, for example, by enforcing the code of conduct at the supplier's site, recognizing higher than market prices, engaging with the local community in supply markets and using mediated forms of power (Marshall *et al.*, 2019).

In sum, the purchasing department is one of the firm's key areas facing high pressure to promote sustainability (Riikkinen *et al.*, 2017). Given the emphasis on a supply chain perspective as a condition for true sustainability, purchasing departments are on the front line to promote and transfer ethical guidelines to upstream supply chain tiers (Luzzini *et al.*, 2015; Villena and Gioia, 2018). Therefore, while purchasing is subject to the traditional pressures toward efficiency and service, it has also become a key sustainability catalyzer (Johnsen *et al.*, 2018). Thus, we hypothesize the following:

H4. PRAC positively mediates the relationship between information sharing and purchasing sustainability performance.

Overall, we expect that, thanks to the mediating role of PRAC, information sharing between buyer and supplier can simultaneously improve multiple performance dimensions, such as operational and sustainability, conciliating the three dimensions of the TBL (Jacobs *et al.*, 2010; MacCarthy *et al.*, 2013; Lam *et al.*, 2016). Figure 1 shows the conceptual model reflecting the hypotheses discussed above.

4. Methodology

4.1 Survey development and sample

To test the relationships in the research model, we used the data collected from a broad international project focused on investigating purchasing strategies, practices, organizations and performance of companies in different industries. Data were collected in four different countries (Finland, Germany, Ireland and Italy) during 2014 and 2015. The questionnaire

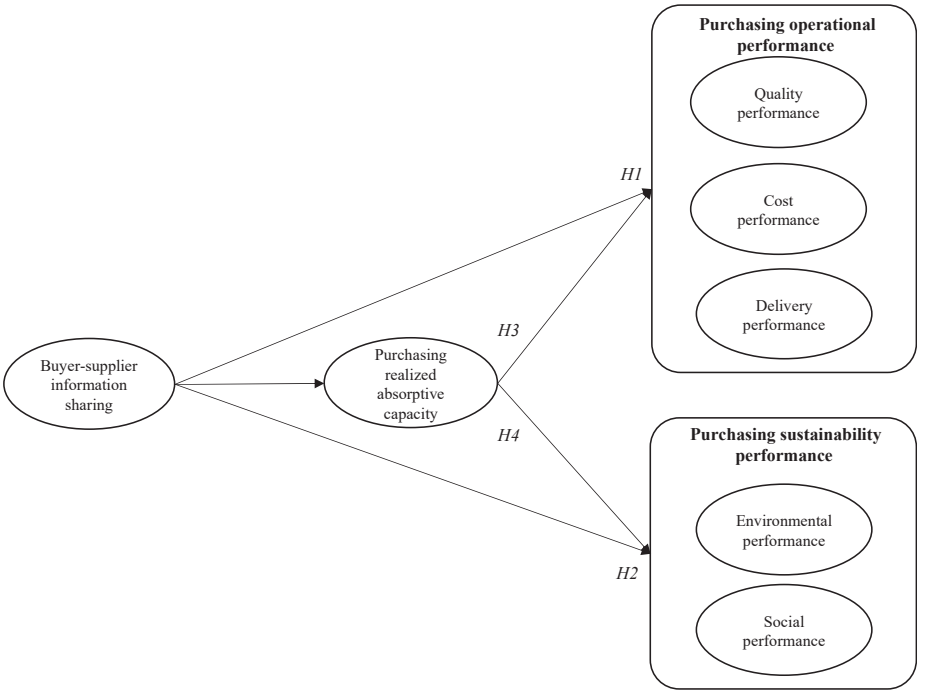

Figure 1.
Research model

collects data about four areas. The first two collect general information about the company and the main characteristics of the purchasing department. The remaining two sections asked to focus on a purchasing category directly managed by the respondent and captured information related to the nature of supplier relationships and main practices adopted, and obtained performance at the category level. The survey was originally developed in English, as were the institutional item scales. It was then translated to local languages following the translation, review, adjudication, pretesting and documentation procedure (TRAPD; Harkness *et al.*, 2004). Finally, pilot tests were conducted in each country to refine the questions and items included.

The researchers' team decided to include both manufacturing and service industries, and a random sample of companies in these industries was drawn from each country-level database (Fonecta in Finland, Dun and Bradstreet in Germany, the Bill Moss Partnership in Ireland and AIDA in Italy). Only companies with at least 50 employees were included in the sample. All countries followed the same data collection procedures to ensure consistency. After the random sampling, a suitable respondent was identified in each organization through the company website, LinkedIn or direct company contact. Each respondent was approached via phone first, and the electronic survey was sent to only those who agreed to participate. The databases across the four countries included 20,515 companies that fit our sampling criteria. Of these, 3,068 were selected through random sampling; 3,059 were directly contacted (some companies did not match the criteria after sampling, for example, had moved abroad or were not part of the specified industry anymore); and 1,105 were reached via phone (for those not reached, either a suitable respondent was never located in the company or the appropriate respondent never answered our calls despite a minimum of three attempts made). A total of 656 companies agreed to participate, and out of these, 305 useable responses were received,

thus yielding a 10% response rate of the total sample and a 46% response rate of those who agreed to respond. Table 1 reports the main data characteristics. Due to the broadness of the questionnaire, earlier publications have used the same data. However, the constructs and the relationships included in the model are unique to the study and original compared to the existing literature, and the use of these data does not suffer from any "data reuse" practice (van Raaj, 2018).

4.2 Measures

We used the extant literature to measure latent variables included in the research framework, and we operationalized a set of seven constructs and four control variables. Appendix 1 presents, for each construct, its description and corresponding main references.

Buyer-supplier information sharing captures those practices aimed at increasing integration with suppliers through higher supply chain visibility (e.g. Narasimhan and Kim, 2002). For this purpose, we adapted previously proposed measures of information sharing as part of supplier integration efforts (e.g. Flynn *et al.*, 2010; Wong *et al.*, 2011). Respondents were asked to rate how much their company shares cost information with major suppliers, shares production schedule information with major suppliers in real time, requires major suppliers to share cost information and requires major suppliers to contribute to the company's cost and quality improvements. Respondents were asked to answer each question using a Likert scale ranging from 1 ("totally disagree") to 7 ("totally agree").

Purchasing realized absorptive capacity measures the ability of the purchasing department to transform external knowledge and exploit it to create a competitive advantage (Todorova and Durisin, 2007). In line with previous literature (e.g. Kotabe *et al.*, 2011; Setia and Patel, 2013), PRAC is conceptualized as a second-order construct that includes the transformation and exploration capabilities of the purchasing department. Particularly, for *transformation capabilities*, respondents were asked to rate if their purchasing department and employees (1) consider the consequences of changing external market demands in terms of new products and services, (2) record and store newly acquired knowledge for future reference, (3) quickly recognize the value of new external ideas to existing knowledge, (4) hardly shared practical experiences and (5) are slow to grasp opportunities from new external knowledge.

Descriptive	Freq	%	Descriptive	Freq	%
Country			*Industry Sector*		
Italy	99	*32.5*	Manufacturing	234	*76.7*
Germany	70	*23*	Information technology	23	*7.6*
Finland	84	*27.5*	Finance and insurance	19	*6.2*
Ireland	52	*17*	Professional services	29	*9.5*
Purchasing categories			*Respondent position*		
Raw materials	125	*41*	Purchasing director	53	*17.4*
Components and supplies	90	*29.5*	Purchasing manager	153	*50.2*
IT services	28	*9.2*	Senior, project buyer	34	*11.1*
Logistics services	16	*5.2*	Buyer, purchasing agent	28	*9.2*
Office equipment and supplies	19	*6.2*	Other	32	*10.5*
Maintenance and cleaning	27	*8.9*	Missing	5	*1.6*
Employees					
Medium (50–249)	150	*49.1*			
Large (250–1,000)	78	*25.6*			
Very large (>1,000)	75	*24.6*			
Missing	2	*0.7*			
Total	*305*	*100*		*305*	*100*

Table 1. Sample descriptive

For *exploitation capabilities*, respondents were asked to rate if their purchasing department and employees (1) have a clear division of roles and responsibilities, (2) constantly consider how to exploit knowledge better, (3) have difficulty contributing to new products and services implemented by the company and (4) have a common language regarding our company's products and services.

The approach to measuring *purchasing operational performance* is adapted from the production competence framework proposed by the operations management literature (e.g. Gonzalez-Benito, 2007; Vachon and Klassen, 2008) and includes items related to purchasing cost and quality and level of service. To measure quality aspects, we asked the respondents to rate to what extent category performance met management's expectations for what concerns the (1) features and functionality, (2) durability, (3) reliability and (4) fit of the specifications of the purchased products or services. To measure quality aspects, we asked the respondents to rate to what extent category performance met management's expectations for what concerns the (1) productivity of purchasing resources, (2) inventory levels and (3) cost of the purchased products or services. To measure service aspects, we asked the respondents to rate to what extent category performance met management's expectations for what concerns the (1) fulfillment of agreed schedules by suppliers, (2) fulfillment of agreed delivery terms by suppliers and (3) supplier flexibility to adapt capacity for the purchased products or services.

Finally, *purchasing sustainability performance* incorporates the environmental and social performance constructs adapted from previous literature (e.g. Montabon *et al.*, 2007; Hollos *et al.*, 2012). Specifically, to measure environmental performance, we asked the respondents to rate to what extent category performance met management's expectations for what concerns the (1) supplier ability to meet agreed environmental performance goals, (2) ensuring that purchased products/services contain green attributes and (3) that they do not contain environmentally undesirable substance. To measure social performance, we asked the respondents to rate to what extent category performance met management's expectations for what concerns the (1) enforcement of a code of conduct for suppliers, (2) the implementation of independent audits of ethical performance of suppliers and (3) the use of more stringent ethical and social mandates than required in host countries. Respondents were asked to answer all the questions using a Likert scale ranging from 1 to 7.

In addition to the main constructs in the model, we included several control variables over supplier operational and sustainability performance: the type of industry (i.e. manufacturing vs. service), the company size (small vs. big according to the EU classification), the country (i.e. Italy vs. Germany vs. Ireland vs. Finland) and the nature of the category purchased (i.e. direct materials vs. office supplies vs. services) were operationalized through dummy variables.

4.3 Bias control

Potential biases were considered in the survey and protocol design and the data analysis. Several approaches (direct contact by phone, multiple mailings and the assurance to share results) were used to ensure a high response rate and avoid nonresponse bias (Frohlich, 2002). Nonresponse bias was checked through independent sample *t*-tests between early, late and nonrespondents on control variables such as the number of employees and revenues. We observed no significant differences between the groups on these key firm characteristics, suggesting that nonresponse bias is not a significant concern for the study. We also ran nonparametric tests in each survey country to compare the valid respondent group to the sample in the country. These tests confirmed that no significant differences existed in the distribution of company size (number of employees) and the distribution of industries (ISIC code).

Further, we reduced social desirability bias by assuring confidentiality (Handley and Benton, 2012) and by formulating questions related to the company processes and behaviors rather than focusing on the direct personal behavior of the respondent.

The study was conducted to minimize common method bias, following the recommendations of Podsakoff *et al.* (2003). This was ensured in several ways. First of all, the questionnaire was labeled as a comprehensive research project to understand purchasing strategies, practices and performance on an international basis. Therefore, no reference to the model in Figure 1 was provided, and respondents' attention was not drawn to the relationships being targeted in this study. Second, questions were organized in different sections, preventing respondents from developing their theories about possible cause-effect relationships. Third, some items were reverse coded (i.e. TANSF4, TRANSF5, EXPL3, EXPL4 in Appendix 1) to balance positively and negatively worded items. Finally, the common latent factor technique was applied, using the performance constructs and the related items. Through this analysis, we found that the common latent variable had a linear estimate of 0.656 (and it was significant for all the observed variables). This value indicates a variance of 43%, which is below the threshold of 50%. Based on how the survey procedure was designed and these additional tests, we can conclude that common method bias does not represent a concern for our study.

4.4 Data analysis approach

The presented hypotheses were tested using covariance-based structural equation modeling (CB-SEM). Since the objective of our research is theory-testing and confirmation, we decided to adopt CB-SEM as it is more suitable when the research objective is prediction and theory development (Astrachan *et al.*, 2014). The model was tested using the maximum likelihood (ML) estimation method (White, 1982), as ML is able to provide more realistic indexes of overall fit and less biased parameter values for paths that overlap with the actual model, as compared to other methods such as partial least squares and weighted least squares (Lowry and Gasking, 2014). Furthermore, the ML estimation assumes that the variables in the model are (conditionally) multivariate normal, which is valid for our data set according to the Doornik–Hansen ($p > \chi^2 = 0.106$) and Henze–Zirkler tests ($p > \chi^2 = 0.137$).

In order to evaluate the model's viability, we used several fit indexes (Hu and Bentler, 1999). We checked that the ratio between the chi-square goodness-of-fit statistic and the degrees of freedom in the model was below the cut-off value of 3 (Hooper *et al.*, 2008). We also verified two of the indexes recommended by Hu and Bentler (1999): the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). CFI values closer to 1 indicate a good fit (with a value > 0.9 considered a satisfactory threshold), while, for RMSEA, a value lower than 0.08 can be considered acceptable.

Finally, to verify the mediation effect of the *purchasing RAC,* we assessed the reliability of our results by testing the significance of the indirect effect through bootstrapping analysis with 97.5% bias-corrected confidence intervals (Hayes, 2009).

5. Results

5.1 Constructs validity and reliability

In Table 2, we provide the results for the confirmatory factor analysis (CFA). To increase the model's statistical power without decreasing the construct's theoretical validity, the variables IS1, TRANSF1, TRANSF5, EXPL1, EXPL4, OP1 and OP6 were dropped as a result of the CFA. The measurement model fit indicators were found to be satisfactory ($\chi^2 = 477.73$; χ^2/d.f. = 2.42; RMSEA = 0.068; CFI = 0.927; TLI = 0.914). We assessed convergent validity through significant loadings from all scale items on the hypothesized constructs as well as

	Loading	*t*-value	CR	CA	MO	AVE
Buyer-supplier information sharing						
IS2	*0.767*	*15.8*	0.839	0.743	0.775	0.640
IS3	*0.943*	*22.9*				
IS4	*0.665*	*11.2*				
IS1	*Dropped*					
Purchasing transformation capabilities						
TRANSF1	*0.660*	*17.9*	0.769	0.751	0.758	0.528
TRANSF2	*0.734*	*22.6*				
TRANSF3	*0.780*	*26.1*				
TRANSF4	*Dropped*					
TRANSF5	*Dropped*					
Purchasing exploitation capabilities						
EXPL2	*0.710*	*10.9*	0.801	0.788	0.818	0.672
EXPL3	*0.916*	*19.6*				
EXPL1	*Dropped*					
EXPL4	*Dropped*					
Purchasing realized absorptive capacity (second-order construct)						
TRANSF	*0.896*	*21.3*	0.869	0.796	0.808	0.768
EXPL	*0.857*	*15.3*				
Purchasing operational performance						
OP2	*0.8521*	*43.2*	0.976	0.902	0.911	0.567
OP3	*0.8495*	*42.5*				
OP4	*0.8125*	*38.8*				
OP5	*0.7308*	*25.3*				
OP7	*0.6872*	*21.1*				
OP8	*0.6295*	*17.9*				
OP9	*0.6392*	*13.3*				
OP10	*0.7150*	*24.8*				
OP1	*Dropped*					
OP6	*Dropped*					
Purchasing environmental performance						
ENV1	*0.902*	*61.4*	0.878	0.861	0.868	0.709
ENV2	*0.919*	*64.3*				
ENV3	*0.684*	*33.2*				
Purchasing social performance						
SOC1	*0.859*	*51.3*	0.922	0.889	0.893	0.797
SOC2	*0.906*	*69.3*				
SOC3	*0.912*	*71.9*				

Table 2.
Constructs' validity

through the average variance extracted (AVE), composite reliability (CR), Cronbach's alpha (CA), and McDonald's omega (MO) (Anderson and Gerbing, 1988). All the loadings are significant according to the t-values. CA, CR and MO values range between 0.743 and 0.976, with the suggested threshold being >0.7; AVE ranges between 52.8 and 79.7%, with the suggested threshold being 50%. This, overall, confirms the robustness of the construct measurement approach.

As an additional test for discriminant validity (Table 3), we compared the squared correlation between two latent constructs to their AVE estimates (Fornell and Larcker, 1981). Following this test, the AVE for each construct should be higher than the squared correlation between each pair of constructs. This condition is valid for all the constructs.

5.2 Path analysis

As a first step of our analysis, we tested the direct effect of *buyer-supply information sharing* on performance, which is reported in Figure A1 in Appendix 2. Without the mediator, buyer-supplier information sharing has a positive impact on purchasing *operational performance* ($\beta = 0.376$, $p < 0.001$), as well as on sustainability performance ($\beta = 0.231$, $p < 0.01$ for *environmental performance*, $\beta = 0.210$, $p < 0.01$ for *social performance*). Therefore, we find support for our hypotheses H1 and H2.

Next, we introduced PRAC as mediator in the model. Table 4 shows the structural model results, including standardized path coefficients, with the significance based on two-tailed *t*-tests for our hypotheses. Also in this case, the measurement model fit indicators were found to be satisfactory ($\chi^2 = 498.6$; χ^2/d.f. = 2.49; RMSEA = 0.07; CFI = 0.922; TLI = 0.910).

As we can see, higher *buyer-supplier information sharing* leads to better purchasing operational performance ($\beta = 0.382$, $p < 0.001$), while the direct effect is no more statistically significant in the case of sustainability performance for both *environmental* ($\beta = 0.118$, $p > 0.05$) and *social* ($\beta = 0.156$, $p > 0.05$) dimensions.

For what concerns the mediating role of PRAC, we can see that *buyer-supplier information sharing* positively affects *PRAC* ($\beta = 0.348$, $p < 0.001$) which, in turn, significantly affects purchasing *operational* ($\beta = 0.487$, $p < 0.001$), *environmental* ($\beta = 0.566$, $p < 0.001$) and *social* ($\beta = 0.511$, $p < 0.001$) performance. To verify the statistical significance of this mediation effect, we followed some of the most recent recommendations (e.g. Rungtusanatham *et al.*, 2014), and we tested the indirect effects in the model through bootstrapping analyses by considering bias-corrected and accelerated confidence intervals (97.5%). According to this approach, a mediation occurs if the derived confidence interval does not contain zero. The results are reported in Table 5.

	1	2	3	4	5
1. Buyer-supplier information sharing	*0.800*				
2. Purchasing realized absorptive capacity	0.498***	*0.876*			
3. Purchasing operational performance	0.344***	0.501***	*0.753*		
4. Purchasing environmental performance	0.144*	0.467***	0.474***	*0.842*	
5. Purchasing social performance	0.126*	0.415***	0.311***	0.552***	*0.893*

Note(s): (square root of the AVE for the latent variable shown in italics on the diagonal; *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05)

Table 3.
Correlation matrix

	Purchasing realized absorptive capacity	Purchasing operational performance	Purchasing environmental performance	Purchasing social performance
Independent variables				
Buyer-supplier information sharing	0.348***(4.11)	0.382***(3.85)	0.118^{NS}(1.05)	0.156^{NS}(1.49)
Purchasing realized absorptive capacity	–	0.487***(4.71)	0.566***(6.62)	0.511***(4.47)
R^2	*0.471*	*0.504*	*0.331*	*0.314*

Note(s): (*** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05; ^{NS} p-value > 0.05; values of t-statistics shown in brackets)

Table 4.
SEM path analysis

Table 5.
Tests for mediation

	Direct effects	Indirect effects	Total effects	Bootstrapping confidence intervals for indirect effects	
Purchasing realized absorptive capacity					
→ Buyer-supplier information sharing	0.348*** (4.09)	–	0.348*** (4.09)		
Purchasing operational performance					
→ Buyer-supplier information sharing	0.382*** (3.84)	0.169*** (3.52)	0.551*** (5.13)	0.124	0.209
→ Purchasing realized absorptive capacity	0.487*** (4.70)	–	0.487*** (4.70)		
Purchasing environmental performance					
→ Buyer-supplier information sharing	0.118^{NS} (1.06)	0.197*** (4.68)	0.315*** (3.78)	0.119	0.249
→ Purchasing realized absorptive capacity	0.567*** (6.61)	–	0.567*** (6.61)		
Purchasing social performance					
→ Buyer-supplier information sharing	0.156^{NS} (1.48)	0.178*** (3.37)	0.334*** (3.64)	0.116	0.214
→ Purchasing realized absorptive capacity	0.511*** (4.48)		0.511*** (4.48)		

Note(s): (*** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05; ^{NS} p-value > 0.05; values of t-statistics shown in brackets)

As the indirect effects are statistically significant for operational, environmental and social performance and their confidence intervals do not contain the zero, we can accept our hypotheses H3 and H4 about the mediation role of *PRAC*. As for the dummy control variables, no one resulted as significant.

5.3 Robustness checks: endogeneity and relationship between purchasing performance

Additional robustness tests were performed to refine the results further. First, we wanted to ensure that the tested model was not affected by endogeneity problems. To check this aspect, we tested an alternative model where *PRAC* is used as an antecedent of *buyer-supplier information sharing*. The path estimates of the resulting model are included in Figure A2 (Appendix 2). As the fit indixes of this model are worse (χ^2 = 592.23; χ^2/d.f. = 2.96; RMSEA = 0.08; CFI = 0.898; TLI = 0.882), we can conclude that the research model in Figure 1 has better explanatory power.

Second, the model presents multiple performance outcomes that are correlated with each other (see Table 3). Particularly, we can notice a correlation between purchasing operational performance and environmental performance (0.474, $p < 0.001$), between operational performance and social performance (0.331, $p < 0.001$) and between environmental performance and social performance (0.552, $p < 0.001$). To verify that the model was not affected by multicollinearity, we then looked at the covariance matrix of the residuals of the performance items (reported in Table A2 in Appendix 3). As no significant correlations between residuals are present in the matrix, we can conclude that multicollinearity does not affect the model.

Last, due to the ample literature that relates sustainability performance to operational performance (e.g. Yu *et al.*, 2014), we also tested a model including such relationships between the purchasing performance constructs. As we can see from the path estimates (reported in Figure A3 in Appendix 2), we have a positive relationship between purchasing environmental and operational performance ($\beta = 0.356$, $p < 0.001$), but not between social and operational performance ($\beta = 0.084$, $p > 0.05$). However, the goodness of fit indicators for this model are once again worse compared to the main research model (χ^2 = 599.34; χ^2/d.f. = 2.97; RMSEA = 0.077; CFI = 0.896; TLI = 0.881).

6. Discussion and main contributions

We can now discuss and interpret the results obtained through the model testing. By accepting H1, our analysis reveals that buyer-supplier information sharing positively affects operational performance in terms of cost, quality, and delivery, which is in line with previous literature about outcomes of supplier collaboration initiatives to increase supply chain information visibility (e.g. Lee *et al.*, 2000; Barratt, 2004; Paulraj *et al.*, 2008; Lee and Kim, 2009; Ding *et al.*, 2011; Ha *et al.*, 2011; Wacker *et al.*, 2016; Lee and Ha, 2018). Although sharing valuable know-how can be risky and increase the necessary relational investments, relying on higher information sharing improves coordination and the level of trust in buyer-supplier relationships, which is likely to generate significant improvements in purchasing performance on several operational dimensions (i.e. cost, quality and level of service). This positive impact holds in both models (without and with PRAC as the mediator), which means that companies can benefit from higher performance outcomes independently from the transformation and exploitation capabilities of the purchasing department.

Regarding H2, we find that information sharing is positively related to sustainability performance without considering PRAC in the model. When adding the mediator, the direct effect of information sharing loses significance. This result suggests that the increase in information exchange between suppliers and buyers indirectly contributes to increase sustainability performance. This positive impact is explained by the purchasing department

capability to transform and exploit this information (PRAC; Riikkinen *et al.*, 2017), to create value and to enhance sustainability performance (Newell *et al.*, 2019; Hsu *et al.*, 2021).

Finally, by accepting H3 and H4, our analyses formally recognize the PRAC as a key gateway to obtain higher purchasing performance on multiple dimensions (i.e. operational and sustainability). While investments to increase visibility and integration with suppliers are certainly necessary, they may not be sufficient to improve performance. In this regard, our results show that, when the objective is to increase operational performance, a higher PRAC is a "nice to have" capability, as companies can exploit the higher availability of information directly to improve purchasing costs, quality and level of service, but also indirectly, thanks to the purchasing department's ability to use this information to create new opportunities for operational performance improvements. Instead, when the objective is to increase sustainability performance, a higher PRAC is a "must have" capability, as the improvement of social and environmental performance in purchasing is mostly explained by the PRAC. The purchasing department can transform the information and knowledge exchanged with the suppliers into opportunities to improve environmental (e.g. selecting suppliers with higher ability to meet environmental goals; buying from suppliers able to offer products or services that contain green attributes, etc.) and social (e.g. enforcing supplier code of conducts; implementing audits on suppliers' ethical behaviors) performance. This result nicely complements existing conceptualizations that relate PAC to purchasing maturity (e.g. Schiele, 2007), as we show that the purchasing department characteristics embedded into PRAC (such as its organizational set-up, knowledge sharing mechanisms and relational links) are key factors to explain simultaneous improvements on multiple performance dimensions following increased information exchange.

Ultimately, our results empirically support the argument that collaborative relationships can create value without necessarily leading to trade-offs (Longoni *et al.*, 2019; Nunes *et al.*, 2020). Thanks to transformation and exploitation capabilities of their purchasing departments, companies can invest in collaboration initiatives to increase supply chain visibility and obtain, in return, an improvement on both purchasing operational and sustainability performance, a key objective for supply chain to remain competitive in today's fast-changing and uncertain environment (Markman and Krause, 2016). Our robustness checks further confirm this conclusion, as they also highlight a positive relationship between purchasing environmental and operational performance (De Giovanni, 2012; Yoo *et al.*, 2019).

These results provide several contributions to theory and practice that are summarized in the following.

6.1 Main theoretical contributions

These results contribute to the existing SCM literature in four areas. In the context of collaborative supply chain relationships, we complement existing studies that focus the attention on information exchange as a form of buyer-supplier collaboration but only analyze their impact on relationship specific variables (Ha *et al.*, 2011) and/or operational performance (Li *et al.*, 2014; He *et al.*, 2017). Our study represents one of the first attempts to analyze the relationship between information sharing practices with suppliers and environmental and social performance.

In the context of knowledge management in supply chains, we contribute by providing a new perspective on the role of PAC in buyer-supplier relationships. Although the existing literature acknowledges the role of purchasing as a knowledge integrator at the boundary of the firm and its supply base (e.g. Luzzini *et al.*, 2015; Patrucco *et al.*, 2017), it rarely formalizes such role into formal abilities. We do so by focusing on PRAC. In line with recent AC literature, we show that information sharing can be considered an antecedent of PRAC, further building on the idea that AC is a cumulative ability that requires first the acquisition and then the exploitation of knowledge (Knoppen *et al.*, 2022). This work clearly identifies

PRAC – and transformation and exploitation capabilities – as the intervening mechanism that regulates the relation between buyer-supplier information sharing and performance (operational and environmental).

In the context of sustainable supply chains, we contribute to the previous literature focused on exploring the organizational mechanisms through which collaboration can improve environmental or social outcomes without compromising operational performance (e.g. Mani and Gunasekaran, 2018; Mani *et al.*, 2018). Several studies have investigated the effects of sustainable supply chain management practices on multiple performance dimensions (e.g. Koberg and Longoni, 2019). Still, very few have provided an explanation of the underlying mechanisms leading to this performance improvement, and this study does so by considering two elements (information sharing and AC) that rarely have been related to sustainability aspects. Furthermore, our findings explicitly respond to the call for increased attention to the social dimension of sustainability (Mani *et al.*, 2018; Geyi *et al.*, 2020).

Finally, in the context of performance management in supply chains, we contribute to the debate about how to reconcile conflicting performance dimensions, such as environmental practices/performance vs. operational performance (e.g. Riikkinen *et al.*, 2017; Yoo *et al.*, 2019; Hossan Chowdhury and Quaddus, 2021; Samad *et al.*, 2021). In this regard, while the purchasing department has been traditionally subject to pressures toward operational performance, our study presents it as a company area that can also act as a key sustainability catalyzer (Johnsen *et al.*, 2018) without necessarily compromising operational performance (Kleindorfer *et al.*, 2005; Besiou and Van Wassenhove, 2015).

6.2 Managerial implications

These results have several managerial implications. First, we deem our results relevant for managers engaged in collaborative efforts with their supply chain partners. For a firm's success, managers need to recognize the key role of their suppliers and support an active sharing of information with them. Purchasing and supply chain departments are increasingly expected to support corporate sustainability initiatives by aligning supply chain strategies and the ongoing management of suppliers. Our study shows that interorganizational capabilities are crucial to achieving TBL outcomes, emphasizing the importance of relational practices, enabling information sharing and co-value creation. However, it is also essential to understand the limitation of a collaborative buyer-supplier relation in the absence of effective elaboration and exploitation of external knowledge. The simple investment in higher exchange of information is not enough if not complemented with the capabilities of integrating, processing and building on such information. Therefore, managers should promote collaborative practices with supply chain partners, but also foster such capabilities within their organizations. In particular, by emphasizing the role of PRAC, we offer managers evidence that transformation and exploitation represent the key knowledge management capabilities that purchasing department must develop to drive significant performance improvement.

The results of our research also encourage managers to walk the path to supply chain sustainability, which should not be seen as a mere compromise to operational performance. Thanks to an adequate PRAC, companies can use external information and knowledge to create competitive advantage in the operational, environmental and social areas, moving away from a myopic, single-dimension optimization approach.

7. Conclusions, limitations and future developments

Using survey data from 305 procurement professionals, the present paper analyzes the relationships between buyer-supplier information sharing, supplier's operational

performance, sustainability performance and the role that the absorptive capacity of purchasing employees plays in favoring the collaboration-performance relationship. We found that information sharing indeed can simultaneously lead to an operational and sustainability performance increase. These outcomes are better explained through the lens of PRAC, which acts as a gateway to leverage the benefits deriving from interorganizational information exchange.

Despite the contributions listed above, we can reflect on some limitations that might open avenues for further research. First, the generally significant effects that we could test might be contingent on some context-dependent variables. Even though we controlled for the potential effects of sample heterogeneity regarding country, industry, size and type of category, further studies can benefit from a broader investigation of these and other contingencies. Future works might replicate our analysis to confirm its reliability and further enrich our knowledge of potentially moderating effects we did not investigate, possibly exploiting larger subsamples and multigroup analyses. For purchasing research, it might be particularly interesting to test our model across different groups of purchasing categories, in line with portfolio management literature (Luzzini *et al.*, 2012).

Second, our research is survey-based, consistent with the target research gap and hypotheses. Despite their validity over time, the relatively old age of the data set calls for a confirmation of the tested relationships with more recent data. In replicating the study, future research could consider if exogenous factors (e.g. market characteristics, technology evolution, COVID-19 emergency) have impacted the presented results.

Third, although we show the positive effect of information sharing and PRAC on performance, previous research and anecdotal evidence show how hard developing partnerships and knowledge management capabilities is. A qualitative approach (e.g. case study research) could provide a more in-depth understanding of how firms can develop PRAC, implement knowledge and information sharing mechanisms with suppliers, what the challenges are, when inertia may arise and how it could be mitigated.

Finally, our study does not investigate in-depth the correlation between multiple purchasing performance dimensions. In line with the stream of literature investigating how to overcome potential trade-offs between different performance dimensions (e.g. De Giovanni, 2012; Nunes *et al.*, 2020), future studies could explore the longitudinal, reciprocal relationship between performance.

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Appendix 1
Items included in the questionnaire

Table A1.
Construct measures

First-order construct	Adapted from. . .	Label	Indicators (corresponding to the survey questions)	Mean	SD
Buyer-supplier information sharing	Flynn *et al.* (2010); Wong *et al.* (2011)	IS1	We share our cost information with our major suppliers of this category	3.05	1.35
		IS2	We require cost information sharing by our major suppliers in this category	3.78	1.46
		IS3	We require major suppliers in this category to contribute to (our company) cost/quality improvement	4.45	1.32
		IS4	We share real time production schedule information with major suppliers in this category	3.47	1.51
Purchasing transformation capabilities	Setia and Patel (2013)	TRANSF1	Our department considers the consequences of changing external market demands in terms of new products and services	4.30	1.05
		TRANSF2	Employees record and store newly acquired knowledge for future reference	3.91	1.12
		TRANSF3	Our department quickly recognizes the value of new external ideas to existing knowledge	4.12	1.06
		TRANSF4	Employees hardly share practical experiences (reverse coded)	3.56	1.21
		TRANSF5	We are slow to grasp the opportunities for our department from new external knowledge (reverse coded)	3.41	1.16
Purchasing exploitation capabilities		EXPL1	Our department has a clear division of roles and responsibilities	4.34	1.32
		EXPL2	We constantly consider how to better exploit knowledge	4.20	1.12
		EXPL3	Our department has difficulty contributing to new products and services implemented by the company (reverse coded)	3.31	1.28
		EXPL4	Employees have a common language regarding our company's products and services	4.36	1.10

(*continued*)

Table A1.

First-order construct	Adapted from…	Label	Indicators (corresponding to the survey questions)	Mean	SD
Purchasing operational performance	Gonzalez-Benito (2007); Vachon and Klassen (2008)	OP1	Features and functionality of purchased products or services	4.32	0.79
		OP2	Durability of purchased products or services	4.32	0.87
		OP3	Reliability of purchased products or services	4.31	0.91
		OP4	Fit between purchasing specifications and purchased products or services (e.g. high finish, uniformity, consistent delivery)	4.32	0.83
		OP5	Productivity of purchasing resources	4.35	0.93
		OP6	Low inventory levels	4.25	0.95
		OP7	Low cost of purchases (e.g. purchasing price, transportation)	4.19	1.12
		OP8	Fulfillment of agreed schedules by suppliers	4.15	0.91
		OP9	Fulfillment of agreed delivery terms by suppliers (e.g. quantity, quality, format)	3.93	1.05
		OP10	Supplier flexibility to adapt capacity to our needs	4.23	0.89
Purchasing environmental performance	Montabon *et al.* (2007); Hollos *et al.* (2012)	ENV1	Supplier ability to meet agreed environmental performance goals	3.85	1.01
		ENV2	Ensuring that purchased products/services contain green attributes (e.g. recycled or reusable items)	3.75	1.04
		ENV3	Ensuring that purchased products/services do not contain environmentally undesirable substance (e.g. hazardous or toxic materials)	4.09	1.19
Purchasing social performance		SOC1	Enforcement of a code of conduct for suppliers	3.84	1.17
		SOC2	Use of independent audits of ethical performance of suppliers	3.55	1.13
		SOC3	Use of more stringent ethical and social mandates than required in host countries	3.63	1.11

Appendix 2
Additional model testing

Alternative model 1: model without PRAC as the mediator.

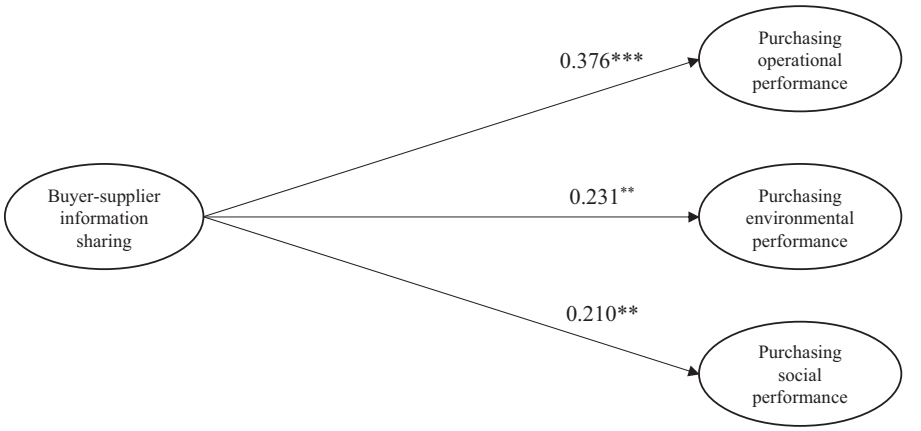


Figure A1.
Path estimates – model without PRAC as the mediator

Note(s): ***p-value < 0.001; **p-value < 0.01; *p-value < 0.05; ^{NS}p-value > 0.05; goodness of fit: $\chi^2 = 246.47$; χ^2/d.f. = 2.12; RMSEA = 0.056; CFI = 0.958; TLI = 0.951

Alternative model 2: model with PRAC as an antecedent of buyer-supplier information sharing.

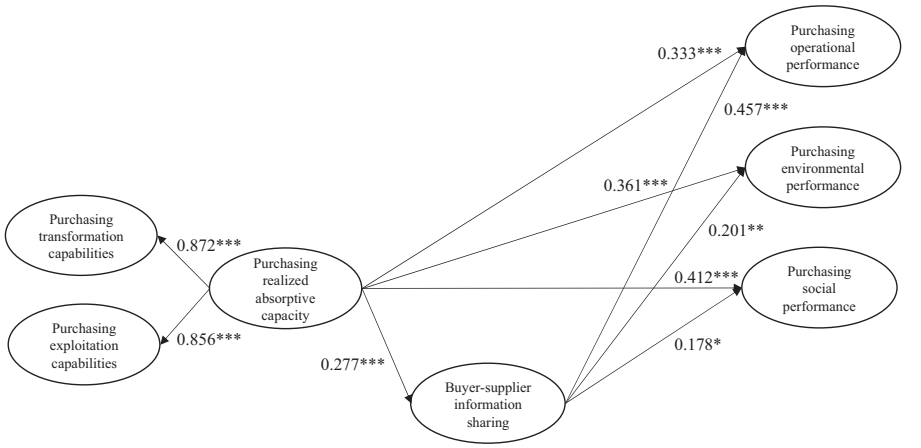
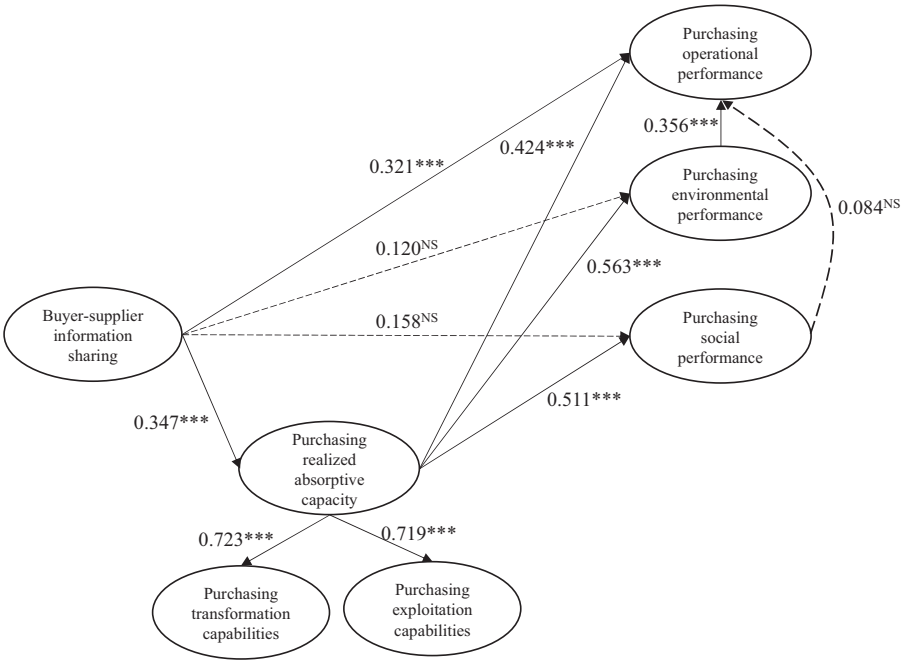


Figure A2.
Path estimates – model with PRAC as an antecedent

Note(s): ***p-value < 0.001; **p-value < 0.01; *p-value < 0.05; ^{NS}p-value > 0.05; goodness of fit: $\chi^2 = 592.23$; χ^2/d.f. = 2.96; RMSEA = 0.08; CFI = 0.898; TLI = 0.882

Alternative model 3: model with relationships between sustainability and operational performance.



Note(s): ***p-value < 0.001; **p-value < 0.01; *p-value < 0.05; NSp-value > 0.05; goodness of fit: $\chi^2 = 599.34$; χ^2/d.f. = 2.97; RMSEA = 0.077; CFI = 0.896; TLI = 0.881

Figure A3.
Path estimates – model with relationships between purchasing sustainability and operational performance

Appendix 3
Correlation matrix of residuals

	OP2	OP3	OP4	OP5	OP7	OP8	OP9	OP10	ENV1	ENV2	ENV3	SOC1	SOC2	SOC3
OP2	0													
OP3	0.106	0												
OP4	0.027	0.035	0											
OP5	−0.057	−0.063	−0.045	0										
OP7	−0.08	−0.09	−0.062	0.121	0									
OP8	−0.078	−0.05	−0.045	0.049	0.07	0								
OP9	−0.092	−0.06	−0.01	−0.015	0.024	0.119	0							
OP10	−0.035	−0.053	0.01	−0.009	0.01	0.112	0.103	0						
ENV1	−0.003	−0.042	0.01	−0.008	0.078	0.023	0.05	0.023	0					
ENV2	−0.054	−0.078	−0.007	−0.041	0.017	0.043	0.056	0.003	0.004	0				
ENV3	0.094	0.096	0.114	0.119	0.131	0.163	0.134	0.105	−0.017	−0.002	0			
SOC1	0.039	0.021	0.053	0.052	0.083	0.02	0.03	0.15	0.011	0.011	0.118	0		
SOC2	−0.009	−0.049	−0.042	−0.024	0.058	−0.099	−0.048	0.019	−0.006	−0.012	−0.032	−0.003	0	
SOC3	−0.046	−0.013	−0.039	0.038	0.094	−0.027	0.021	0.012	−0.016	0.012	−0.022	−0.007	0.006	0

Table A2. Correlation matrix of residuals – performance items