Environmental orientation, external environmental information exchange and environmental performance: Examining mediation and moderation effects

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Abstract

Previous research presents mixed findings about the impact of environmental orientation (EO) on environmental performance (EP). Using the theoretical lens of resource orchestration theory (ROT) and contingency theory (CT), this study explores the relationships between EO, external environmental information exchange (EEIE) (with suppliers and customers), and EP. In particular, this study investigates the mediating role of EEIE between EO and EP, and the moderating effect of EO on the relationship between EEIE and EP. The proposed relationships were analysed through structural equation modelling and hierarchical linear regression analysis using survey data collected in Australia. The results reveal the partial mediating effect of EEIE on the EO-EP link, and the contingency effect of EO on the relationship between EEIE (with customers) and EP. Our study extends the boundaries of the current understanding by empirically testing both mediation and moderation within the same study, thereby presenting insights into how EO can positively influence EP, and under what circumstances. These findings provide managers with useful guidance on how EO can be complemented by external information sharing for environmental solutions.

Keywords: Environmental orientation; Environmental information exchange with suppliers and customers; Environmental performance

1. Introduction

Today's business environment is characterised by uncertainty, intense global competition, and evolving consumer expectations; therefore, firms must encourage innovative and proactive behaviour to survive and compete effectively (Arunachalam et al., 2018). It is increasingly recognised that such human behaviour can support and shape supply chain management (SCM) decision-making processes, practices, and performance (Gino & Pisano, 2008; Katsikopoulos & Gigerenzer, 2013). An orientation is a main driver and attribute of human behaviour that directs human action (Mariadoss et al., 2016). Environmental orientation (EO) has emerged as a central theme of corporate environmentalism, reflecting a proactive and innovative posture towards environmental issues (Banerjee et al., 2003; Chan, 2010). A proactive posture, however, requires operational integration capabilities to translate EO into sustainable solutions.

Sustainable supply chain management (SSCM) literature proposes supply chain collaboration as a main operational capability to transform EO into sustainable performance (Chan et al., 2012; Graham & Potter, 2015). Specifically, firms that possess operational collaboration mechanisms to absorb and better understand their customer and supplier information will be in a stronger position to transform market opportunities into solutions (Arunachalam et al., 2018). For instance, global public health policy responses to the COVID-19 pandemic has shown that both an innovative environmental posture and the acquisition and management of information from customers and suppliers can effectively address supply chain disruptions and sustainability issues (Sarkis, 2020). Inspired by these arguments and topical issues, this study argues that EO can generate positive environmental performance (EP) through the intervening steps of information exchanges with customers and suppliers.

Studies have shown interest in the relationship between EO and supply chain collaboration (Aboelmaged, 2018; Chan et al., 2012; Graham & Potter, 2015; Zhou et al.,

2020). When supply chain partners perceive environmental commitment, which reflects EO in firms, they show willingness to become part of environmental collaboration arrangements (Cao & Zhang, 2011; Hussain & Malik, 2020). Empirical studies have found tentative support for a positive association between EO and environmental collaboration (Aboelmaged, 2018; Zhou et al., 2020), but there are still contradictory results (Li et al., 2018). Different findings could be due to some studies not considering external environmental information exchange (EEIE)to be a dimension of environmental collaboration (Aboelmaged, 2018; Chan et al., 2012; Graham & Potter, 2015; Zhou et al., 2020). It has been suggested that environmental collaboration requires information exchange between supply chain partners and a clear understanding of their practices, objectives, and responsibilities (Vachon & Klassen, 2008; Yu et al., 2014). Exchanging environmental information (i.e., EEIE) with suppliers (ES) and customers (EC) refers to the exchange of information about objectives, responsibilities, practices, and performance (Wong et al., 2015; Yu et al., 2014). Thus, it is essential to investigate the information exchange dimensions (between buyer and suppliers) in SSCM literature, including to address the inconsistent results of existing empirical work investigating the impact of ES and EC on EP (Wong, 2013; Lai et al., 2015).

The above discussion regarding the effects of EO on ES and EC, and the effects of ES and EC on EP, suggest that EO and EC may act implicitly as mediating variables. While it has been suggested that EO is essential for reducing environmental burden and thus improving EP (Aboelmaged, 2018), EO may not be enough if not materialised into specific environmental capabilities (Fraj-Andrés et al., 2009). Collaboration practices have been explored in the SSCM literature, such as operational capability mechanisms, which can largely determine EO success; however, the specific role of information exchange (with customers and suppliers) has not been researched (Aboelmaged, 2018; Chan et al., 2012; Graham & Potter, 2015; Li et al., 2018; Zhou et al., 2020). Furthermore, it has been suggested that a main reason behind the poor

performance of SSCM is the lack of information sharing and visibility in the supply chain (Khan et al., 2020). This study thus seeks to contribute to the SSCM literature by considering a mediation effect. The theoretical basis for this approach lies in resource orchestration theory (ROT), which implies that competitive advantage can result from *how* resources are orchestrated (Ketchen et al., 2014). Specifically, EO could provide organizations with the drive to create superior EP (Lai & Wong, 2012); however, a group of intangible human resources are unlikely to be sufficient to achieve EP; EO necessitates operational implementation-focused capabilities. Specifically, consistent with the ROT, integrating and coordinating information mechanisms such as ES and EC can help leveraging orientation resources, which could eventually result in improved EP and environmental benefits (Wong et al., 2015, 2018).

Contingency theory (CT) provides an alternative theoretical framework to understand inconsistent findings in prior work, where the relationship between environmental collaboration practices (i.e., information exchange) and performance is still under debate (Lai et al., 2015; Wong, 2013). CT indicates that organizations are open systems, in that they are exposed to conditions that impact their practices and performance (Wong et al., 2011). However, the contingency role of organizational and cultural conditions has remained unexplored in the SSCM literature (Lai et al., 2015; Lo et al., 2013). We specifically propose that the relationship between EC, ES, and EP is contingent upon EO. Together, the ROT and the CT allow us to answer the following four research questions:

1) To what extent does EO affect ES and EC?

2) To what extent do ES and EC affect EP?

3) To what extent is the relationship between EO and EP mediated by ES and EC?

4) To what extent is the relationship between ES and EC on EP moderated by EO?

By answering these four research questions, we make multiple contributions to the literature. First. we inform the literature by delineating the precise nature of relationship between EO, EC, ES, and EP. Second, the information exchange perspective employed in our study contributes to the collaboration SSCM literature, clarifying some hitherto inconclusive empirical results. Third, our study provides an integrated framework by incorporating EO both as an antecedent to ES and EC, and as a moderator of the relationship between EEIE (i.e., ES and EC) and EP. The study is based on survey data collected in Australia, and the proposed relationships are tested using structural equation modelling and hierarchical linear regression. Specifically, the testing of mediation and moderation effects simultaneously provides a better representation of the complex collaboration-performance relationship, thereby explaining the inconclusive findings in previous literature (Ataseven & Nair, 2017; Calantone et al., 2017; Chang et al., 2016; Zhu et al., 2018). In addition to these contributions to theory, our results are also relevant for managers to understand how environmental drive can be complemented by external information sharing for environmental solutions.

The remainder of the paper is organized as follows: Section 2 provides further details of the theoretical underpinning employed in this study, and Section 3 develops the research hypotheses. Section 4 describes the methodology and reports the results. Section 5 explains the theoretical and practice implications of our empirical findings, and we conclude our study in Section 6 by identifying the limitations and direction for future research.

2. Theoretical Framework and Literature Review

2.1. Theoretical framework

CT is based on the premise that there is no universal blueprint to understand all business context (Wong et al., 2011). Many existing frameworks in the contingency research tradition focus on how the internal and external environmental factors strengthen or weaken the relationship between the dependent and outcome variables (Sousa & Voss, 2008). While CT

provides an explanation of the circumstances under which a relationship between variables is strengthened, it does not explain *how* certain relationships exist (Schoonhoven, 1981). As an extension of the resource-based view (RBV), ROT emphasizes *how* rather than *what* type of resources can build competitive advantage (Ketchen et al., 2014). The RBV tries to explain competitive advantage from complex bundles of resources (*what*); however, the possession of resources may not suffice to obtain competitive advantage (Ketchen et al., 2014). Rather, competitive advantage stems from *how* resources are organised and orchestrated.

Orchestrating resources refers to three distinct dimensions: (1) creating a portfolio of resources, (2) resource bundling to create capabilities and competitive advantage, and (3) leveraging and synchronizing those capabilities, which is essential in generating competitive advantage (Chirico et al., 2011; Sirmon et al., 2011). Thus, consistent with the ROT perspective, we argue that EO, as a bundle of cultural and human resources, presents the necessary outlook and driving force to characterize and collate resources in the form of EEIE (with customers and suppliers). EEIE (with customers and suppliers) may also act as an enhancing and coordinating mechanism for executing environmental innovative thinking, attitudes, and resources characterized by EO, which generates EP superiority. Thus, while EO provides the vision that could generate EP, it may not be enough in itself, and can be complemented by EEIE mechanisms. Finally, consistent with the CT, we also suggest that EO can strengthen the relationship between EEIE (with customers and suppliers) and EP. Figure 1 presents our theoretical framework.

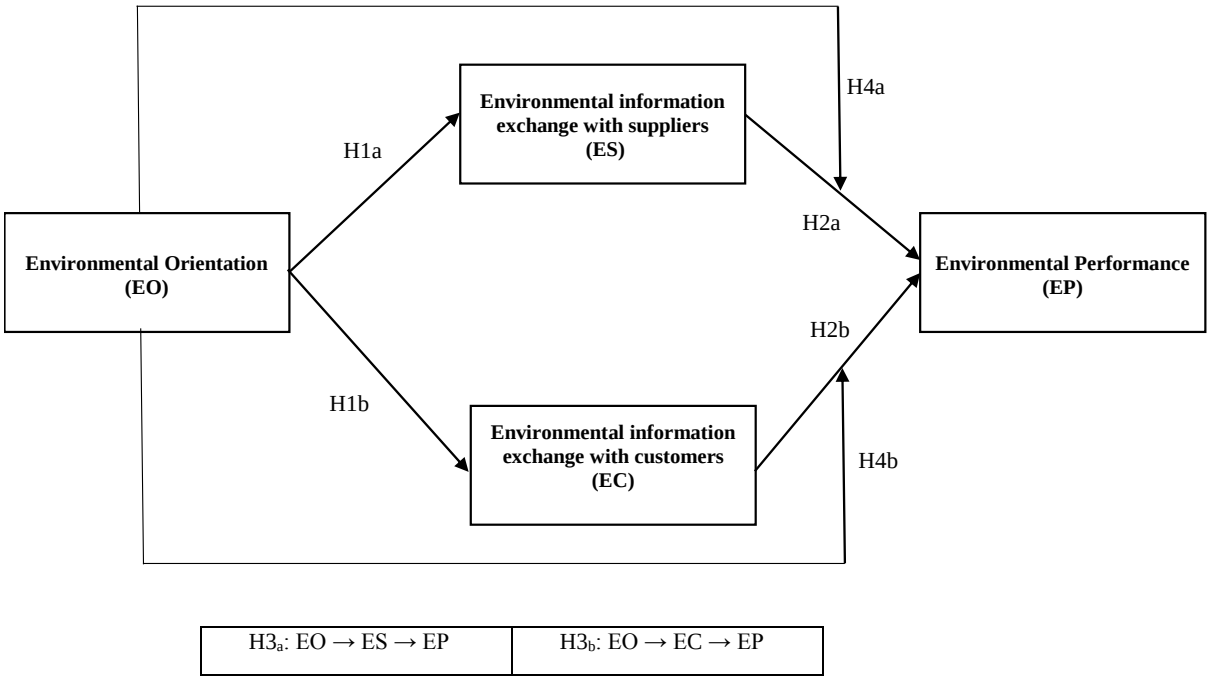


Figure 1: Proposed Research Model

2.2. Environmental orientation (EO)

Environmental development relates to attempts to mitigate negative environmental impacts, based on the axiomatic assumption that traditional economic growth is based on resource consumption, with implicitly negative environmental effects related to the consumption of resources and production of pollutants (Hall et al., 2010). At a corporate level, EO manifests acknowledgement that environmental problems may arise from a firm's operations, including the development, sourcing, manufacturing, and distribution of products and/or services (Banerjee, 2002). Environmental awareness manifests the concept of corporate environmentalism, which is often incorporated as part of corporate social responsibility or even branding initiatives in large organizations. EO entails the recognition of environmental issues by firms, and that related environmental concerns can be proactively integrated into strategy and processes (Banerjee, 2001). As a central theme of corporate environmentalism, EO

recognises the impacts of organizational activities on the natural environment, and the necessity to reduce such impacts (Banerjee, 2002).

EO is a proactive and innovative posture towards environmental issues that includes an internal focus (e.g., on firms' environmental values, missions, and commitments), and an external focus (e.g., on firms' awareness of and responsibility toward external stakeholders) (Banerjee et al., 2003; Chan, 2010; Gonzalez-Benito, 2008; Yu & Huo, 2019). EO is thus characterized as the proactive strategic posture and commitment towards the incorporation of environmental issues and practices into organizational strategy and operations (Benito-Gonzales, 2008; Mariadoss et al., 2016).

2.3. External environmental information exchange (EEIE) with suppliers and customers

SSCM refers to the management of a firm's internal as well as external practices to make the supply chain more sustainable (Feng et al., 2018; Khan et al., 2020; Paulraj et al., 2017; Yu et al., 2014). SSCM includes a wide variety of environmental practices (Pourjavad & Shahin, 2020; Vachon & Klassen, 2006; Wong et al., 2015), and collaboration and coordination practices are considered essential for the integration and effectiveness of the whole supply chain process (Vachon & Klassen, 2008; Hussain & Malik, 2020; Zhu et al., 2011). In particular, the SCM literature highlights the importance of EEIE as a key requirement for supply chain collaboration. It has been suggested that collaboration activities in the supply chain always contain EEIE (Wiengarten & Humphreys, 2010).

The nature of the information and when, how, and with whom it is exchanged determines the success of the collaboration effort (Chavez et al., 2015). For example, it has been established that information sharing, quality of the information shared, and open communication with suppliers and customers were essential to effectively recover from supply chain disruptions (Obayi et al., 2017; Wong et al., 2011). At the environmental level, the

exchange of environmental information with suppliers and customers has been identified as a critical practice and an integration competency (Lai et al., 2015; Wong et al., 2015). EEIE is presented in the sustainability literature as internal and external EEIE, and both types of information are instrumental in the overall integration process, conformance to regulations and certifications, and the reduction of environmental damage across the supply chain (Lai et al., 2015; Yu et al., 2014). The current work concentrates on the external perspective of EEIE (EC and ES) in the supply chain.

The exchange of environmental information with suppliers includes exchanging knowledge on objectives, standards, and requirements with the objective of improving environment performance (Lai et al., 2015). This is a two-way EEIE with suppliers to collaborate on the design of products, sourcing of materials, and the production, distribution, and return of goods (Wong et al., 2015). For instance, early supplier involvement in the new product development process, distribution and recovery options (i.e., eco-design) is essential to gain environmental advantage across the supply chain (Lai et al., 2015). EEIE with suppliers (ES) is thus defined as the EEIE about objectives, obligations, strategies, benefits, practices, and performance related to environmental issues with suppliers (Wong et al., 2015).

The exchange of environmental information with customers includes providing information to them on environmental practices, as well as inviting their opinions to be internalised for product and processes development (Lai et al., 2015; Yu et al., 2014). Firms also advise customers how to reduce their impact on the environment and increase the visibility of environmental issues (Darnall et al., 2008; Wong, 2013), which contributes to greening the supply chain (Gonzalez-Benito, 2008). Furthermore, disclosing strategic environmental information (environmental goals, achievements, and efforts) to customers helps gain credibility, and improve firms' overall environmental profile, which contributes to customer loyalty and participation (Lai et al., 2015; Yu et al., 2014). Thus, EEIE with customers (EC) is

defined as the EEIE about objectives, responsibilities, strategies, benefits, practices, and performance related to environmental issues with customers (Wong et al., 2015).

3. Research Hypotheses

3.1. The effect of EO on EEIE with suppliers (ES) and customers (EC)

Behavioural operations have emerged as a critical research topic, revealing implicit links between operations management and human behaviour (Fahimnia et al., 2019). It is increasingly recognised that human behaviour can shape process design, process management, and performance improvement (Gino & Pisano, 2008). At a supply chain level, human behaviour can support and provide an understanding of the decision-making process to implement, operationalise, and improve supply chains (Hussain & Malik, 2020; Katsikopoulos & Gigerenzer, 2013). Recent work has encouraged the exploration of human behaviour as an antecedent of supply chain collaboration practices (Danese et al., 2020). As a main driver and attribute of human behaviour, an orientation is a latent attitude that directs human action (Arunachalam et al., 2018; Mariadoss et al., 2016). At a firm level, an orientation has been described as a bundle of human resources that provide the necessary vision to identify and implement resources (Chavez et al., 2020). Thus, a firm orientation can predict firm strategies and behaviours, thereby guiding strategic practices (Hakala, 2011). More specifically, the concept of firm orientation can be understood in terms of managerial beliefs, perceptions, cultures, predispositions, tendencies, motivations, proclivities, and desires that guide strategic planning, operationalization, and performance (Chan, 2010; Mariadoss et al., 2016).

One firm orientation is EO, which has been developed in sustainability literature as a critical capability that drives environmental supply chain practices (Mariadoss et al., 2016). The literature suggests that main traits related to a firm's sustainability culture, such as EO, are strong drivers of its sustainability attitude, thus naturally leading to sustainable practices with suppliers and customers (Mariadoss et al., 2016). When customers and suppliers perceive

mutual environmental commitments, such as in risk sharing, access to valuable information and resources, potential gains, and overall environmental proactiveness and innovativeness, they show more willingness to become part of the collaboration arrangement (Aboelmaged, 2018; Cao & Zhang, 2011). Environmental collaboration implies EEIE between the parties, and a clear understanding of their practices, objectives, and responsibilities (Vachon & Klassen, 2008).

Environmentally proactive firms try to ensure that components and materials procured from suppliers meet certain environmental certifications and requirements (Graham & Potter, 2015). EEIE with suppliers is key to monitor how suppliers comply with those requirements and meet common goals (Vachon & Klassen, 2006). Regarding customers, firms that are committed to recycling and material recovery options (eco-design) share relevant information on product and supply chain design with customers (Bloome et al., 2014). In sum, collaboration practices such as EEIE with suppliers and customers are relevant to reduce negative environmental impacts; however, EEIE requires a proactive posture, which is a prominent feature of EO (Graham & Potter, 2015; Zhou et al., 2020). Drawing on the ROT, we conceptualize EO as a group of intangible resources that encourages the creation of bundles of resources and capabilities, namely ES and EC (Chirico et al., 2011; Sirmon et al., 2011). This ROT grounding enables the conceptualization of EO as a major antecedent of ES and EC.

Some studies have investigated and found a positive link between EO and environmental collaboration practices in the supply chain (Aboelmaged, 2018; Chan et al., 2012; Graham & Potter, 2015; Yu & Huo, 2019; Zhou et al., 2020), while others offered contradictory results (Li et al., 2018). Although the above studies have contributed to the advancement of knowledge on the relationship between EO and environmental supply chain collaboration practices, they did not include EEIE as a key dimension of sustainable collaboration practices. It has been suggested that collaboration practices in the supply chain

always contain EEIE (Chavez et al., 2015; Wiengarten & Humphreys 2010), but a more targeted analysis of EEIE is required in the collaboration literature. The present study attempts to complement prior work with an EEIE perceptive to test the effect EO on both ES and EC, consistent with ROT. We posit the following hypothesis:

H1: EO is positively associated with (a) ES and (b) EC.

3.2. The impacts of ES and EC on environmental performance (EP)

Green supply chain collaboration practices are essential for EP gains (Feng et al., 2018; Lai et al., 2015; Pourjavad & Shahin, 2020), which implies a two-way exchange of environmental information on mutual responsibilities, resources, benefits, and goals (Wong et al., 2015; Zhou et al., 2020). Regarding customers, sharing voluntary information about environmental strategies and practices can increase downstream visibility in the supply chain, and thus improve greening efforts and performance (Gonzalez-Benito, 2008; Wong et al., 2015). Sharing information with customers allows them to improve their operational efficiencies and reduce their environmental impacts (Darnall et al., 2008; Lau, 2011). Regarding suppliers, customers in coordination with suppliers can better exchange information on products and component design that consider different recovery options (eco-design, reuse, remanufacturing, recycling and disposal) (Carter & Ellram, 1998; Lai et al., 2015), thereby mitigating damage to the environment.

The role of EEIE in environmental supply chains remains underexplored (Lai et al., 2015), and studies show inconsistent results. For instance, Khan et al. (2018) found support for the association between information sharing with partners and sustainable performance. Differentiating between buyer and supplier flows of information, Wong (2013) found customer information integration to be positively associated with environmental innovativeness and adaptability. Conversely, Lai et al. (2015) only found that sharing environmental information with suppliers have a significant relationship with EP. While the above empirical literature

demands further investigation, we anticipate a positive effect of ES and EC on EP, which is aligned with the second unique element of the ROT (Chirico et al., 2011; Sirmon et al., 2007): A bundle of resources and capabilities (information sharing with external partners) can offer differentiation and competitive advantage (EP). Thus, we posit the following hypothesis:

H2: (a) ES and (b) EC are positively associated with EP.

3.3. The mediating effects of ES and EC on the environmental orientation–environmental performance (EO-EP) link

The ROT offers a theoretical perspective to comprehend the relationship between EO, EEIE, and EP. While it has been suggested that environmental posture is essential for reducing environmental burden (Aboelmaged, 2018; Lai & Wong, 2012), it is not enough in itself if it is not first materialised into a specific environmental strategy (Fraj-Andrés et al., 2009). For example, to address supply chain disruption while achieving sustainable benefits during the COVID-19 pandemic, an environmental and innovative posture was required, but also the effective acquisition and management of information from customers and suppliers (Sarkis, 2020). This example is evident in external collaboration practices, where EP can be undermined by an environmentally oriented organization if its external supply partners poorly manage their environmental practices (Li et al., 2018). Specifically, consistent with the ROT, integrating and coordinating mechanisms such as EEIE support coordinating and orchestrating resources, which could lead to environmental advantage (Wong et al., 2015, 2018). Information sharing, and open communication with external partners are essential mechanisms for supply chain integration (Obayi et al., 2017; Wong et al., 2011). This exposition is aligned with the third element of ROT: leveraging capabilities for competitive advantage (Chirico et al., 2011; Sirmon et al., 2007). In other words, customer and supplier EEIE could function as an intervening mechanism between EO and EP.

On the empirical front, some studies have demonstrated support for the positive and direct association between EO and EP (Niemann et al., 2019; Zhou et al., 2020); however, others could not find a significant relationship (Fraj-Andrés et al., 2009). This suggests the presence of an explanatory mechanism through which EO affects performance. The present research considers EEIE (i.e., ES and EC) as an integration capability, and thus as a possible mediating variable to better explain the EO-EP link. Thus, ES and EC can be key to turn environmental drive into EP; however, ES and EC may equally necessitate EO qualities for its realization.

The exploration of mechanisms to understand the effect of EO on performance has not been adequately researched in the literature; in particular, there have been calls for more exploration of how the adoption of EO can enhance competitiveness (Chan et al., 2012). In response to such calls, a few studies have implicitly explored the mediating role of external collaboration practices in green supply chains (Chan et al., 2012; Graham & Potter, 2015; Li et al., 2018). Others formally tested the mediation effect of external environmental collaboration practices. For instance, Aboelmaged (2018) tested and found support for the mediating effect of environmental supplier collaboration in the link between EO and business performance. Furthermore, Zhou et al. (2020) found that green supply chain integration partially mediates the link between external EO and EP. However, neither of the above studies explicitly considered EEIE (with customers and suppliers) as part of their collaboration (mediation) constructs, nor as individual dimensions. It has been suggested that a primary reason behind the poor performance of SSCM is the lack of information sharing and visibility in the supply chain (Khan et al., 2020). Thus, complementing the above literature with an EEIE perspective, consistent with ROT, we investigate the potential mediation effect of EEIE (i.e., ES and EC) in the EO and EP link. Thus, we hypothesise the following:

H3: (a) ES and (b) EC mediate the relationship between EO and EP.

3.4. The moderating effect of EO

The contingency view in the sustainability supply chain literature is still developing (Niemann et al., 2019; Zhao et al., 2018). CT provides a theoretical framework to understand inconsistent findings in prior work, and the relationship between environmental collaboration practices and performance is still under debate (Lai et al., 2015; Wong, 2013). Related empirical studies have generally considered contingency factors that range from business environment variables (competitive intensity and technology) to coordination and collaboration conditions (trust); however, the role of organizational and cultural conditions remains comparatively unexplored (Lai et al., 2015; Lo et al., 2013). One of these cultural conditions is EO, which naturally provides a contingency structure for environmental practices in the supply chain (Chan et al., 2012; Niemann et al., 2019).

A few empirical studies have investigated the contingency role of EO in the green supply chain collaboration literature. For example, Mariadoss et al. (2016) investigated and found support for the moderating effect of EO on the relationship between cultural orientation and sustainable purchasing practices. Niemann et al. (2019) investigated and found support for the moderating role of EO on the organizational preparedness for corporate entrepreneurship and EP link. Kang and He (2018) showed that EO encourages employees to learn, process, and share relevant environmental information, internally and externally, to improve EP. However, other empirical studies have found complications in the relationship between EO and organizational experiences. For example, EO often requires a strong commitment of resources, such as environmental standards certification and process changes that are not always valued by external partners, and which in some cases act to the detriment of financial and even environmental performance (Doran & Ryan, 2016). These arguments and somewhat ambiguous findings point to the need for further empirical research that investigates the moderating role of EO on environmental collaboration supply chain management. We

specifically propose the contingency role of EO on the exchange of environmental information with suppliers and customers and performance. Hence, reflecting on the above argument, based on the CT, we argue that:

H4: EO moderates the relationships between (a) ES and (b) EC and EP.

4. Methods and Results

4.1. Questionnaire design and measures

To test the research hypothesis, a survey research design was selected. All the theoretical constructs identified in the literature review were operationalized using established scales. EO was measured using a six-item scale by Mariadoss et al. (2016). The scales for ES and EC were adopted from Wong et al. (2015, 2020). EP was based on the scale used by Paulraj et al. (2017). The use of established scales to measure theoretical constructs increases the content validity of survey questions (Hulland et al., 2018). In addition, the survey questionnaire was pretested by a panel of three academics and two senior industry managers. Minor adjustments were made to the survey questions in response to the panel's feedback. The finalized survey questions are presented in Table 2.

The literature also suggests that firm size has a potential confounding effect, because larger firms are generally more resource munificent, which can facilitate the integration of supply chain processes (Yu et al., 2020a). Therefore, we controlled for the firm size by taking into account the total number of employees for the surveyed firms. To adjust for the skewness of data, we took a natural log of the total number of employees for each surveyed firm.

4.2. Sample and data collection

To test the proposed theoretical effects, managers with SSCM experience were identified as the target informants, because they were more likely to objectively assess the organizational practices representing the theoretical constructs (Krause et al., 2018). We approached the Ethical Trade Alliance (ETA) to reach out to its email contact list of senior

operations and supply chain manager as the sampling frame of our research. ETA is a collaborative forum to support implementation of sustainable practices across different industrial sectors in Australia. Consequently, we believe that a sample drawn from ETA's contact list is likely to give informed assessments of firms' sustainable practices and performance (Hulland et al., 2018). ETA sent the survey invitation email on our behalf, which was received by 1,124 industry managers listed on its contact list. To improve the survey response rate, industry contacts occupying senior operations and supply chain managerial positions were also followed up and directed to the ETA's survey invitation. This motivated 113 responses, of which 13 had to be discarded due to high rates of missing data. This gave us the final sample of 100 responses, and a final response rate of 8.9% to conduct our SEM analyses (Table 1). The literature suggests that lower response rates are more common for survey email invitations, and a response rate of 4% or more for survey emails is generally considered acceptable (Jadhav et al., 2019).

We focussed on Australia for data collection for two reasons. First, Australia is globally known for its involvement in sustainability initiatives, such as its pioneering implementation of carbon pricing in 2012 (Fahimnia et al., 2013). Recent studies suggest that Australian companies are particularly likely to participate in sustainable supply chain initiatives such as reducing pollution and sustainable product development (Varsei et al., 2014; Varsei & Polyakovskiy, 2017). Second, Australia has a fragile ecosystem and is facing egregious environmental challenges associated with long-distance transportation and climate change, such as catastrophic bushfires in recent years (Jadhav et al., 2019). For these reasons, we believe Australia presents as an interesting case study from a SSCM perspective.

Table 1: The Demographics of Informants and their Organizations

Informants' Positions		**Industry**	
C-Suite/Managing Director	14.00%	Food, Beverage & Alcohol	14.00%
Directors	11.00%	Rubber, Plastic & Chemicals	8.00%
Managers	37.00%	Textile and Apparel	3.00%
Others	38.00%	Automotive	5.00%
Number of Employees		Transportation & Warehousing	31.00%
<50	38.00%	Electrical & Electronics	5.00%
50-200	12.00%	Telecommunication & Technology	8.00%
201-500	11.00%	Wholesale & Retail Trade	5.00%
>500	39.00%	Others	16.00%
Annual Revenue (AU$ Millions) *			
<10	23.00%		
10-100	33.00%		
101-800	28.00%		
>800	15.00%		
*The annual revenue information for one informant's company was missing			

The sample size requirements for our study were determined both at the research design phase and after the data collection was completed. During the research design phase, an *a priori* sample size was calculated using the Soper (2016) calculator, which implements the theoretical work put forward by Westland (2010) on sample size determination. Our model was based on four latent constructs with 25 indicator variables. In addition, we drew on the recommendations of Westland (2010) and Malik and Abdallah (2020) (for the 'desired statistical power' $(1 - \beta) = 0.8$, 'medium anticipated size' $(d) = 0.35$, and the 'probability of type-1 error' $(\alpha) = 0.05$) to obtain our minimum target sample size of 94 (from the Soper calculator). After the data collection phase was completed, we referred back to the literature and found support that a sample size of 100 is acceptable for models employing five or less latent constructs that have more than three indicator variables, particularly if there are high communalities between the indicator variables and the latent constructs (Hair et al., 2014, p. 574). Our final sample size meets these three requirements.

All four theoretical constructs used in this study have four or more indicator variables (Table 2). Furthermore, strong communalities are shown by high average variation extracted (AVE > 0.60) values during the confirmatory factor analysis (CFA (Table 3). In addition, we used the maximum likelihood estimation method for our SEM analyses, which has been tested to provide valid and stable results for sample sizes in the range of 100 - 400 (Hair et al., 2014, p. 573). These multiple justifications from the literature gave us the confidence that our final sample size of 100 was adequate to proceed with the statistical analyses.

4.3. Adequacy of data collection method

To detect and minimize the common method bias (CMB), both procedural and statistical approaches were employed. Procedural approaches such as the complete anonymity of the survey responses and voluntary participation was emphasized during the data collection process to reduce the possibility of acquiescence and social desirability bias (Hulland et al., 2018). In addition, the survey design in Qualtrics employed a proximal separation between independent, mediating, and dependent variables. The literature suggests that the proximal separation restricts the ability of respondents to answer the subsequent questions based on the previous responses, thereby minimizing the CMB (Krause et al., 2018). The data collection process was followed by two statistical tests to detect the extent of CMB for the collected data.

First, CFA was performed in AMOS 27 by constraining all indicator variables to a single factor, which gave a poor model fit (χ^2/degree of freedoms ratio (CMIN/DF) = 4.883, Comparative Fit Index (CFI) = 0.567, Incremental Fit Index (IFI) = 0.572, Tucker–Lewis Fit Index (TLI) = 0.528, and Root Mean Square Error of Approximation (RMSEA) = 0.198). This model fit was significantly poorer than the measurement model with four theoretical constructs (Table 2). This shows that a single factor is unable to account for the major variance in our data, therefore CMB is not a significant issue (Hulland et al., 2018; Yu et al., 2020a). In the second CMB test, a common latent factor was added to the four theoretical constructs, and a

CFA measurement model was run. The CFA model fit with and without the common latent factor was marginally different (ΔCFI and ΔTLI = 0.019, ΔIFI = 0.020). Previous studies suggest that a minimal difference between model fits with and without a common latent factor evidences negligible data collection method variance (Hulland et al., 2018; Yu et al., 2020a).

In order to determine non-response bias, we followed Malik and Abdallah's (2020) suggestion that late respondents can be assumed to be more similar to non-respondents. Therefore, we compared the early and late respondents by performing a Mann-Whitney U test for statistical differences between the five theoretical constructs. No statistically significant differences were observed for the first quarter (nearly = 25) and the last quarter (nearly = 25), indicating no response bias for our data (Malik and Abdallah, 2020).

4.4. Measurement model and construct validity testing

The measurement model and construct validity testing followed the methods delineated by Hair et al. (2014) and Jadhav (2019). A measurement model for the four theoretical constructs was constructed in AMOS 27. The measurement model fit indices reported in Table 2 were within the recommended threshold values of CMIN/DF < 3, TLI > 0.90, CFI > 0.90, IFI > 0.90 and RMSEA < 0.08. The standard coefficients of the indicator variables for the four theoretical constructs and their t-values are also reported in Table 2. The reliability and discriminant and convergent validity of the theoretical constructs were also established using this measurement model. The composite reliability scores for all theoretical constructs met the minimum threshold of 0.7. Similarly, all AVE scores were more than 0.50, which confirms the convergent validity of the four theoretical constructs. For discriminant validity, we compared the square root of AVEs with the inter-construct correlations, and the results affirmed that the five constructs were not sufficiently correlated. Table 3 provides details on the constructs' descriptive power and their validity tests.

Table 2: The Measurement Model Results

	Theoretical Constructs and Indicator Variables	Std. Coeff.	t-Values
Environmental Orientation (EO)			
1	Allocating sufficient funds for environmental improvement in an annual budget is important to our firm.	0.817	7.878
2	Top management believes in having systems for measuring and assessing environmental performance.	0.883	8.500
3	Our firm believes in training and education of environmental related issues among employees.	0.912	8.766
4	Implementing environment protection criteria in contractor selection process is important to our firm.	0.818	7.885
5	Our top management team has conviction on taking environmental actions.	0.826	11.043
6	Our firm supports research and development of environmental technologies	0.710	_a
Exchange environmental information with suppliers (ES)			
7	We exchange information about our environmental goals with our suppliers	0.931	_a
8	We exchange information about our environmental responsibilities with our suppliers	0.891	14.805
9	We exchange information about our environmental strategies with our suppliers	0.893	14.894
10	We exchange information about our environmental benefits with our suppliers	0.860	13.381
11	We exchange information about our environmental best practices with our suppliers	0.857	13.285
12	We exchange information about our performance standards related to environmental issues with our suppliers using an integrated environmental information system	0.549	6.165
13	We exchange information with our suppliers about environmental issues using an integrated environmental information system	0.557	6.289
Exchange environmental information with customers (EC)			
14	We exchange information about our environmental goals with our customers	0.851	5.822
15	We exchange information about our environmental responsibilities with our customers	0.916	6.027
16	We exchange information about our environmental strategies with our customers	0.911	6.013
17	We exchange information about our environmental benefits with our customers	0.875	5.898
18	We exchange information about our environmental best practices with our customers	0.886	5.934
19	We exchange information about our performance standards related to environmental issues with our customers using an integrated environmental information system	0.543	11.980
20	We exchange information with our customers about environmental issues using an integrated environmental information system	0.543	_a
Environmental Performance (EP)			
21	Reduction in air pollution	0.761	_a
20	Reduction in waste (water and/or solid)	0.843	8.758
23	Decrease in consumption of hazardous/harmful/toxic materials	0.801	8.266
24	Increase in energy saved due to conservation and efficiency improvements	0.843	8.767
25	Decrease in use of natural resources	0.820	8.488

_a indicates a parameter that was fixed at 1.0, n=100, All t-value were significant to $p < 0.005$

Model fit indices: CMIN/DF =1.483, TLI=0.941, CFI=0.949, IFI=0.949, RMSEA=0.070
All indicator variables were measured using a 7 point Likert scale.

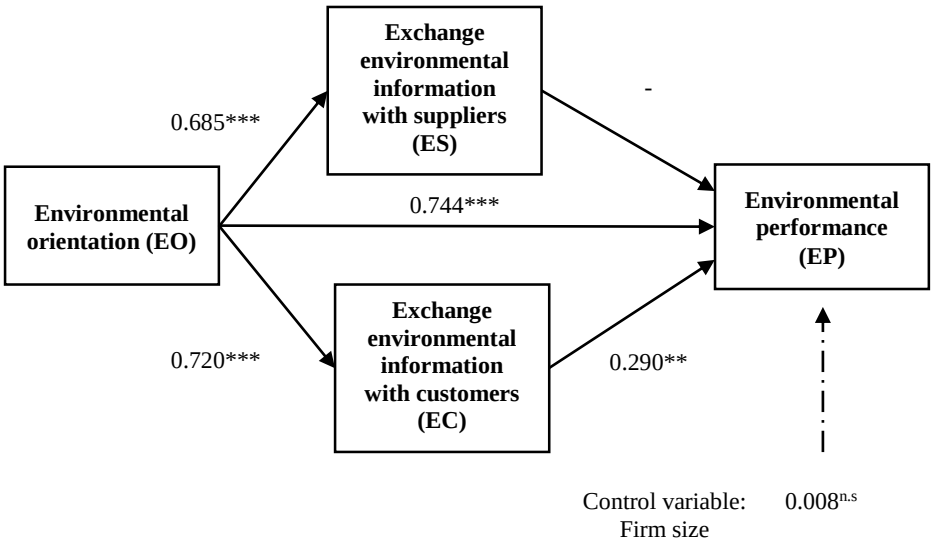
Table 3: Constructs Descriptive, Validity Test Results and Inter-Constructs Correlations

Construct	Mean	Std Dev	CR	AVE	EO	ES	EC	EP
Environmental Orientation (EO)	4.545	1.051	0.930	0.689	**0.830**			
Exchange environmental information with suppliers (ES)	4.804	1.302	0.926	0.650	0.652	**0.806**		
Exchange environmental information with customers (EC)	3.173	0.783	0.925	0.647	0.694	0.796	**0.804**	
Environmental performance (EP)	4.178	0.708	0.908	0.663	0.663	0.278	0.493	**0.814**

CR = Composite Reliability, AVE = Average Variance Extracted, Square root of AVE is shown as bold in diagonal.

4.5. Structural equation modelling direct effects and mediation analysis

To analyse the direct effects and mediation, we constructed a Structural Equation Model (SEM) in AMOS 27. The SEM fit values reported in Figure 2 also satisfied the thresholds described in the previous subsection. The SEM analysis indicates that all direct and mediating effect hypotheses other than H2a were supported (Figure 2, Table 4). We implemented the AMOS Boot Strapping two-tailed significance test through Gaskin et al.'s (2020) AMOS plugin to determine the statistical significance of the specific indirect relationships.



N=100, CMIN/Df =1.582, CFI=0.933, TLI=0.924, IFI=0.934, RMSEA=0.077
****denotes a p-value < 0.005, ** denotes a p-value < 0.05 and n.s shows non-significant relationships Statistically significant relationships are represented by solid lines. Standardized regression coefficients are reported for only the statistically valid relationships.*

Figure 2: The SEM Model, Direct Effects and Mediation Analyses

Table 4: The Direct and Mediation Relationship Hypothesis Results

Relationships		Direct Effect	Indirect Effect	Findings	Hypothesis Test
Direct Relationship (X→Y)					
H1a	EO→ES	0.685***	-	Positive relationship	*Accept*
H1b	EO→EC	0.720***	-	Positive relationship	*Accept*
H2a	ES→EP	- 0.464***	-	Negative relationship	*Reject*
H2b	EC→EP	0.290**	-	Positive relationship	*Accept*
Mediation (X→Mediator→Y)		**(X→Y)**	**(a.b)**		
H3a	EO→ES→EP	0.744***	- 0.318***	Partial mediation	*Accept*
H3b	EO→EC→EP	0.744***	0.209**	Partial mediation	*Accept*

*** < 0.005, **< 0.05

EO = Environmental Orientation, ES=Exchange environmental information with suppliers, EC=Exchange environmental information with customers, EP=Environmental performance

CMIN/DF=1.582, CFI=0.933, TLI=0.924, IFI=0.934, RMSEA=0.077

4.6. *Moderation Analyses*

To test the moderation hypothesis, hierarchical linear regression (HLR) analysis was performed in SPSS 27. First, the reflective latent constructs comprising multiple items were converted into observed measures, by taking an average or by calculating the factor scores of the standardized coefficients reported in Table 2 (Calantone et al., 2017). The factor scores' calculation incorporates differential indicator loadings (i.e., higher indicator loadings convey a higher impact on how a theoretical construct has been perceived by the survey informants). Previous studies suggest that factor score calculation is the preferred approach to construct observed measures from latent reflective constructs measured using multiple items (Calantone et al., 2017).

We used AMOS 27's impute function to calculate the factor scores for our latent constructs. We further transformed our data by standardizing the factor scores of the observed measures. The standardized factor scores serve two important purposes: avoiding multicollinearity, and facilitating the visualization of moderation effects. High

multicollinearity among the independent variables inflates the standard errors of the estimated regression parameters, thereby affecting the moderation results (Calantone et al., 2017). The moderation effect of EO was hypothesized to affect the relationships between ES → EP (H4a) and EC → EP (H4b). Therefore, a sub-model represented by equation (1) was constructed.

$$EP = \alpha_0 + \alpha_1 EO + \alpha_2 ES + \alpha_3 EC + \alpha_4 (EO \text{ x } ES) + \alpha_5 (EO \text{ x } EC) + Error \quad (1)$$

The HLR analyses involved a sequential examination of how the control variables, main effects, and moderation effects affect the dependent variable. Based on equation 1, the HLR analyses was performed in SPSS 27 using three steps. In step 1, a regression model was run to examine the effects of firm size as a control variable on EP. In step 2, the two independent variables (ES and EC) and the moderating variable (EO) were added to examine their main effects on EP. In step 3, the two interaction terms representing the hypothesized moderation effects of EO on ES and on EC were also added to the regression model. The results of the HLR analyses are presented in Table 5. All variance inflation factors (VIFs) were either below or within the acceptable thresholds of 3-5 (Hair et al., 2014, p. 200), indicating that multi-collinearity was not an issue.

Table 5: Hierarchical Linear Regression Results for Moderation Analyses

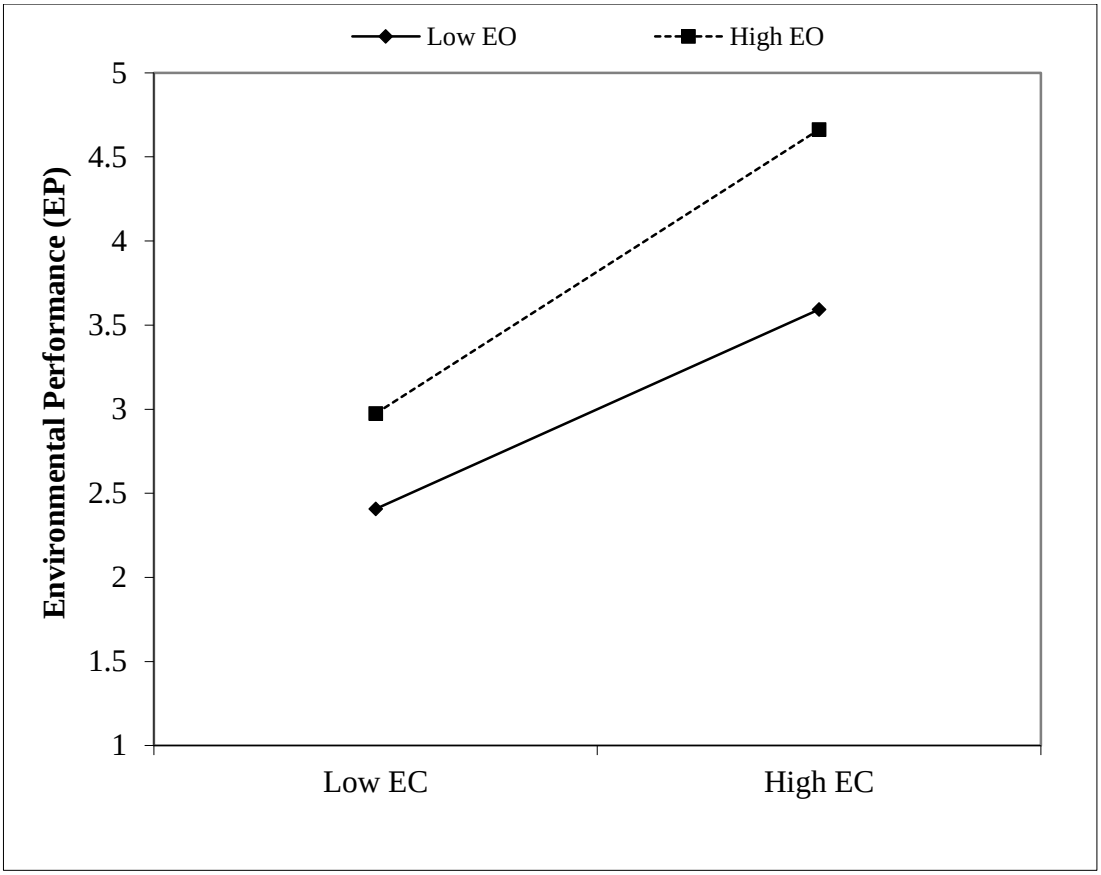
	Step 1 Std Coeff (SE)		**Step 2** Std Coeff (SE)		**Step 3** Std Coeff (SE)		**Hypothesis**
Constant	-0.291(0.185)		-0.014(0.122)		-0.068 (0.117)		
Control Variables							
Firm size	0.054 (0.029)	n.s	0.003 (0.019)	n.s	-0.008 (0.019)	n.s	
Independent Variables							
Exchange environmental information with suppliers (ES)			-0.657 (0.123)	***	-0.635 (0.118)	***	
Exchange environmental information with customers (EC)			0.487 (0.13)	***	0.592 (0.128)	***	
Moderator							

Environmental Orientation (EO)			0.806 (0.096)	***	0.819 (0.094)	***		
Interactions Effects								
ES x EO					-0.1 (0.009)	n.s	Not supported	(H4a)
EC x EO					0.252 (0.092)	***	Supported	(H4b)
Model Summary								
F-Value	3.469		37.811		29.681			
Adjusted R^2	0.024		0.598		0.635			
R^2 Change	0.034		0.58		0.043			
F Value Change	3.469	n.s	47.609	***	5.791	***		
Durbin-Watson	2.279		2.052		2.078			
VIF - Max	1		4.177		4.738			

Dependent variable: Environmental Performance (EP)

*** < 0.005, **< 0.05, n.s=not significant

The addition of ES, EC and EO in step 2 produced improvements in the R^2 and the F-value change was statically significant. The inclusion of the interactions in step 3 showed statistically significant F-value change, and the increase in R^2 indicated the improved ability of the step 3 model to explain the variance in EP. The interaction effect of the EO and ES on EP was found to be negative and non-significant. This shows no support for H5a, which was thus rejected. The interaction effect of *EC x EO* was positive and significant (0.252, p-value < 0.005), providing support for H5b. This moderation effect is also plotted in Figure 3 as a two-way interaction, which shows that the EO strengthens the positive relationship between EC and EP.



EO = Environmental Orientation, EC=Exchange environmental information with customers

Figure 3: EC and Environmental Performance in Low/High EO

5. Discussion

5.1. Theoretical implications

This study has highlighted the need for investigating how behavioural aspects precede and shape supply chain collaboration (Danese et al., 2020). Specifically, the findings support an integrated framework that incorporates EO as an antecedent and a moderator of EEIE (sharing environmental information with customers and suppliers) and EP. The conceptualization and empirical testing of the mediating and moderating effects of EO to clarify inconsistent findings in the environmental supply chain collaboration literature is a significant contribution to theory. Furthermore, our research framework is consistent with

ROT, in findings that sharing environmental information with customers (not suppliers) acts as a leveraging and complementing mechanism to translate EO into EP, which also complements CT by providing an explanation to *how* EO could better achieve EP. The main findings are discussed in the following paragraphs.

One finding underlined the essential role of EO as an enabling instrument of both EC and ES. A proactive posture towards the incorporation of environmental issues and practices (top management support on environmental actions, environment protection criteria in contractor selection process, and employee environmental training and education) is a strong driver and an essential human characteristic that leads to sustainable collaboration practices with suppliers and customers (Mariadoss et al., 2016). This corroborates the argument that when customers and suppliers perceive environmental drive and commitment (i.e., EO) in firms, they are more willing to become part of environmental collaboration efforts and share valuable information (i.e., a clear understanding of their practices, objectives, and responsibilities) and resources to reduce negative environmental impacts (Aboelmaged, 2018; Cao & Zhang, 2011). Most empirical studies investigating the link between EO and environmental collaboration practices did not consider EEIE as a key collaboration dimension (Aboelmaged, 2018; Chan et al., 2012; Li et al., 2018; Zhou et al., 2020); thus, our findings extend existing literature by introducing the EEIE perspective of collaboration in environmental supply chains.

Another important finding was that EC had a significant positive effect on EP. This contributes to understand inconsistent results in prior work (Lai et al., 2015; Wong, 2013) and the relatively unexplored role of EEIE in the SSCM literature (Lai et al., 2015). Specifically, our result supports the view that exchanging information with customers about environmental strategies and objectives can improve operational efficiencies, and reduce negative environmental impacts (Darnall et al., 2008; Gonzalez-Benito, 2008; Lau, 2011; Wong et al.,

2015). Conversely, our study shows a negative significant association between ES and EP. While counterintuitive, this result is consistent with Wong (2013), who found that supplier environmental information does not contribute to environmental innovative ideas and flexibility. Interviews revealed that even though suppliers are essential in providing information related to sustainable materials and components, they play a negligible role in new product and process development for environmental purposes, due to the type of information shared.

Instead, organizations rely on themselves for their environmental management practices, to insure compatibility and cohesion across their operations, to avoid disruption and compromising other operational objectives (Wong, 2013). This interpretation is consistent with prior work in supply chain collaboration, which found that manufacturers' operations are still internally oriented, especially when it comes to gaining efficiencies and competitiveness (Huo et al., 2014; Yu et al., 2020b). Furthermore, developing supplier information capabilities requires that firms invest heavily in supply chain information infrastructure for process coordination, but sustainability efforts may be inadequate to achieve environmental benefits and financial returns on such investments. This finding may also be explained by the nature of our sample. Nearly one third of the respondents came from the transportation & warehousing where suppliers might have a lower relevance. Conversely, customer environmental information plays a key role in environmental management, as firms often focus on addressing market needs (Wong, 2013). Thus, it can be implied that environmental-related capabilities may have an external market-oriented perspective, and possibly an internal perspective, which is a function of the firm's internal knowledge, which is hence not associated with supplier collaboration efforts.

A novel contribution of this study is the finding of the partial mediation effect of EC and ES (giving partial support to H4a and H4b). The partial mediation effect of EC implies that

EO positively affects EP, but this can be complemented by external collaboration resources, namely environmental information coming from customers. This supports the view that, while essential for reducing environmental burden, environmental drive may not be enough if not complemented by specific environmental capabilities (Fraj-Andrés et al., 2009). Together, EO and EC can have a synergistic impact on EP. EO, which conveys important human and intangible resources, could support various aspects of EC synchronization and vice versa, to enhance EP. This finding also supports the recent empirical work of Zhou et al. (2020), who found that green supply chain integration partially mediates the relationship between EO and EP.

However, Zhou et al. (2020) and other related studies considered the mediation effect of environmental collaboration practices (Aboelmaged, 2018; Chan et al., 2012; Graham & Potter, 2015; Li et al., 2018), disregarding EEIE (with customers and suppliers) as part of their collaboration efforts. Thus, this finding extends prior work. Regarding the partial mediation effect of ES and its negative effect on EP, it can be inferred that EO alone is more effective in achieving EP. An interpretation of this finding lies in the excess of information coming from suppliers in the context of EO. It has been suggested that excessive information in information-rich environments can make decision-making complicated (Williams et al., 2013). Thus, information coming from suppliers could be excessive and less relevant, which could afflict managers in their environmental decision-making processes. In sum, our findings show that EO accompanied only by EC seems to be more effective to improve EP.

Another novel contribution of this study is identifying the moderating effect of EO on the EC-EP link. Our results show that EO positively moderates the relationship between EC and EP. Thus, the higher the orientation and proactive attitude towards environmental issues, the stronger the impact of EC on EP. This result highlights that firms that encourage a culture around EO can enable effective EC strategies for environmental improvement. For example,

in the face of the COVID-19 pandemic, an innovative environmental posture was a key factor that enhanced the acquisition and management of information from customers to develop sustainable solutions (Sarkis, 2020). Our findings offer a contingency perspective to the developing SSCM literature (Niemann et al., 2019; Zhao et al., 2018), and provide a theoretical framework to understand inconsistent findings in prior work (Lai et al., 2015; Wong, 2013). Furthermore, the contingency role of organizational and cultural conditions such as EO in the SSCM remains comparatively unexplored (Lai et al., 2015; Lo et al., 2013), thus our finding contributes to a better understanding of cultural phenomena in SSCM.

Overall, our findings support the logic expressed in the ROT. Taken individually, the direct relationships between EO and EP, and EC and EP, seem to support the RBV; however, as an integrated model our work extends the RBV through the lense of the ROT in that it provides an explanation to how resources are managed and orchestrated to improve EP. Finally, consistent with the CT, we offer an alternative but complementary perspective to the ROT.

5.2. Managerial implications

Our empirical findings provide important guidelines for managers. First, our findings suggest that EO serves as an enabler for environmental information sharing and collaboration with customers and suppliers. It is important for firms to promote EO by developing their environmental missions and integrating environmental concerns into their corporate strategies and operational processes, which helps building effective environmental collaboration. Managers seeking to develop the exchange of environmental information with external partners should be aware of the relevance and value of EO, and thus encourage a culture around it.

Second, our partial mediation results indicate that managers should recognise the leveraging role of external environmental information. Specifically, to meet the environmental demands of multiple stakeholders, firms should place emphasis on exchanging environmental information with customers. Firms respond faster to market trends such as sustainability when

they develop superior sensing abilities that allow them to absorb information more effectively from their customers. Building effective EEIE mechanisms with customers help firms reduce waste and decrease the consumption of resources, and production of hazardous, harmful, and toxic materials. Thus, EC could greatly complement an environmental posture, therefore it should accompany EO for EP improvement.

Third, our empirical evidence suggests that too much information or excessive and less relevant environmental information can make managers' decision-making processes even more complicated, which can negatively afflict their environmental decision-making processes. For instance, while suppliers can play a key role providing information related to materials and sustainable product design, the type and amount of information shared could have a detrimental effect on EP.

Fourth, our findings suggest that EO serves as a factor that encourages environmental collaboration with customers, and as a cultural aspect that should be stimulated to improve the effectiveness of environmental collaboration practices with customers. In other words, EO should be encouraged at all levels: to encourage external collaboration and, when collaboration is in place, to improve the chances of these collaboration efforts to become real sustainability solutions. Overall, our evidence indicates that managers should develop integrated environmental strategies that promote environmental awareness and proactiveness in their organisations, which will both support and enhance EEIE with customers, to achieve potential environmental superiority and competitive advantage, in addition to the intrinsic benefits of improved sustainability.

6. Conclusions and limitations

Using ROT and CT as theoretical lenses, this study advances the SSCM literature by providing empirical evidence to explain the relationships between EO, external environmental

information sharing (i.e., EC and ES), and EP. More specifically, this study contributes to the literature by providing empirical evidence on the mediating effect of ES and EC on the relationship between EO and EP, and the moderating effect of EO on the relationships between EC and EP. From a practical perspective, the moderation and mediation results provide managers with useful insights into how environmental drive can be greatly complemented by external information sharing efforts at a supply chain level for environmental improvement. Although this study makes significant contributions to both theory and practice, there are some limitations that might provide opportunities for future research.

First, the main limitation of this study is the focus on a small sample of organisations in Australia. With a larger sample size of the manufacturing industry, future research should confirm the empirical results obtained in our study and possibly test the relationships in different industries, regions, and countries.

Second, this study focuses on examining the environmental dimension of sustainability; however, previous research has suggested that the three performance dimensions of the Triple Bottom Line (TBL) approach (i.e., social, financial, and environmental) can be incorporated into a firm's evaluation and decision-making processes to successfully implement SSCM practices. Future research is encouraged to investigate the impacts of SSCM on all TBL performance dimensions, which would broaden our results.

Third, a negative significant association between ES and EP was found, which contradicts the general understanding that EEIE with suppliers is an essential collaborative practice. While other studies found similar results, we encourage future work to further explore this relationship and include contingency factors that may play a part.

Fourth, our study tested mediation between EO and EP; however, future studies could test moderation including contingency factors, such as business environment variables, coordination and collaboration mechanisms, and organizational and cultural conditions.

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