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Improving sustainable supply chain performance through organisational culture: A competing values framework approach

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ABSTRACT

This research adopts the institutional and relational view theories to empirically test the impact of organisational culture (OC) on sustainable supply chain performance (SSCP) and further examines the impact of external integration on their relationship, drawing on a study in the food manufacturing industries in the UK and Greece. Using the mixed method approach, structural equation modelling (SEM) technique was first used to empirically analyse the data from a survey of 315 firms. In addition, insights from 11 interviews from top managers were qualitatively used as the basis to enrich and confirm the findings from the quantitative study. Our findings revealed that in the context of global supply chains only developmental, hierarchical, and group culture components of the competing values framework (CVF) as a model for assessing OC are conducive for achieving a higher SSCP. Although developmental, hierarchical and group cultures are instrumental for SSCP, a strong external integration is still required. Thus, external integration was found to mediate the relationship between the dimensions of OC and SSCP. The results further confirmed a positive relationship between all the dimensions of OC (developmental, group, hierarchical and rational culture) and external integration and a positive impact of external integration on SSCP. This research expands the institutional and relational view theories to examine the effect of OC (using CVF) on SSCP and further reveals the extent of external integration needed in the relationship to enhance SSCP in global supply chains. Supply chain managers are encouraged to adopt integrated competing values, namely, developmental, group, and hierarchical cultures to intensify the external integration in the supply chain to overcome several sustainability challenges and improve SSCP.

1. Introduction

Sustainability-related issues in the supply chains have increasingly gained traction in supply chain literature for decades (Dubey et al., 2017). Even though research on sustainability has increased exponentially and the anticipation is that this would translate into positive impact in business and industry, most firms are still struggling to improve their sustainable supply chain performance (SSCP) (Pagell and Wu, 2017). Among these firms are food manufacturing supply chains that have been heavily criticised due to their negative contribution to the environment and the society (Ghadge et al., 2020). This has increased the pressure on the food manufacturing firms to adopt sustainable supply chains (Kamble et al., 2020), yet most of these firms are failing to implement sustainability practices (Ghadge et al., 2020). The continuous negative impact of the food manufacturing supply chains highlights the need for sustainability performance of the firms to be addressed (Braziotis et al., 2013). Several theories and solutions have emerged to help in the implementation of practices that could help improve SSCP (Roy et al., 2020), especially in the food manufacturing industry. Sustainability authors including Miska et al. (2018) suggested that the first step in achieving an improved SSCP is to develop sustainability-oriented culture both at the firm and supply chain level. Sustainability-oriented culture can be defined as the philosophy and values that drive the sustainability-related decision-making process of the firm (Marshall et al., 2015). Nevertheless, literature has focused mostly on external factors, ignoring how contextual factors such as organisational culture (OC) and supply chain integration (SCI) could assist in the achievement of higher SSCP (Miska et al., 2018). The need

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to focus on contextual factors of the firm as well as the supply chain when addressing sustainability issues aligns with an important principle of strategic sustainability practice; the call for firms to incorporate a sustainability perspective within their culture and strategic planning process (Porter and Siggelkow, 2008; Garza, 2013) . This perspective advocates for sustainability principles to be integrated into the organisations core operations and culture and not just by engaging with it via ad-hoc add-ons. To address this gap, this study examines how OC and SCI (both strategic variables of firms (Arayesh et al., 2017; Ralston et al., 2015)) can be aligned in improving SSCP of manufacturing firms especially the food manufacturing supply chains.

This research focuses on the food manufacturing firms in the UK and Greece who mainly produce ready-made and cooked foods (rice, soups, pasta etc), chocolates, biscuits, processed fish, general canned foods, non-ready-made foods such as bags of rice, sugar, packaging raw fish etc and dairy manufacturers. Though these firms in the industry in the UK and Greece have been criticised for their negative social and environmental impacts (Ghadge et al., 2020), according to Formentini and Taticchi (2016), some food companies are strongly implementing sustainable practices through the streamlining of internal and supply processes and implemented governance mechanisms to be sustainable - and such companies have been considered as sustainability leaders in their industries. Although leading companies like Coffee and Pasta, have introduced sustainable practices in their sourcing process and production, ensured suppliers are certified and are strict on sustainability values (Formentini and Taticchi, 2016).

The concept of OC has gained prominence in sustainability literature as the basis for explaining how manufacturing firms and their supply chains could improve SSCP (Linnenluecke and Griffiths, 2010; Miska et al., 2018; Kucharska and Kowalczyk, 2019). Carter and Rogers (2008) considered sustainability supportive values and strategies as antecedents to maintaining sustainability in firms. Linnenluecke and Griffiths (2010) argued that, in developing a resilient supply chain to respond to environmental and social challenges, firms would need to undergo cultural transformation. Manufacturing firms, especially those with global supply chains, can be successful at sustainability implementation and performance when a supportive culture is adopted. Porter (2019) also asserted that new initiatives in organisations would require a thorough reorganisation of the OC. Since adopting sustainability requires both process and product changes, it is worthwhile for firms to embrace a sustainability-supportive culture, highlighting the significance of OC to SSCP. Vlachos (2015), for instance, stressed that implementing a supply chain strategy requires an appropriate culture, meaning, sustainability in food supply chains can be effective when a supportive culture is in place. This is because adopting a sustainability-oriented culture transforms organisational thinking and enables firms to easily implement sustainability into their supply chains (Vlachos, 2015). Regarding the influence of OC on SSCP, only Linnenluecke and Griffith (2010) have examined the possible impact of OC on sustainability performance, prompting the need for more studies to advance this field of study, particularly on how OC could influence the implementation and achievement of sustainability performance. Currently, Wijethilake et al. (2021) examined how OC can be used to shift organisational change towards sustainability adoption. These highlight how the current trend is shifting towards gaining insight into how OC could be used to improve SSCP. Nonetheless, literature is still yet to explore *how OC could be harnessed into improving SSCP especially in food supply chains*.

While internal integration has been reported to help firms enhance the implementation of sustainability -see for instance, Kang et al. (2018) and Tarigan et al. (2021)- external SCI can potentially play a role in influencing the relationship between culture-related internal integration factors and SSCP (Rizzi et al., 2022). Hence, one dimension of this study is to focus on external integration and examine the potential role it plays within the context of OC in helping to enhance sustainability performance in firms. Indeed, Pagell and Wu (2009) asserted the importance of closely collaborating with suppliers and customers (external integration) in the quest to improve sustainability performance. Formentini and Taticchi (2016) also highlighted that establishing governance mechanisms and integrating with supply chain partners could provide avenues for implementing sustainability practices to achieve high sustainability performance. Blome et al. (2014), Wiengarten and Longoni (2015) and Kang et al. (2018) have all indicated the importance of SCI in improving sustainability performance, efficiency, and organisational objectives of various supply chains. Relational view (RV) theory further strengthens this position by indicating that the sharing of trust, information, resources, and skills with external partners can improve competitive advantage of firms (Blome et al., 2014; Dyer et al., 2018; Gölgeci et al., 2019). Since the supply chain of food supply chains extend across borders and require close working relationship among firms and suppliers from different continents (Shee et al., 2018), the effectiveness of sustainability in the supply chains can be enhanced when there is a close collaboration among supply chain partners (Braziotis et al., 2013; Govindan, 2018). This suggests that regardless of the effectiveness of culture within a food manufacturing firm, coordination of ideas, skills, plans and joint sustainability assessment is needed between the supply chain partners for a successful implementation of sustainability practices and performance measurement (Touboulic and Walker, 2015). A wide variety of sustainability practices such as reducing packaging and waste, assessing environmental practices, production and delivery of eco-friendly products, carbon emissions assessment and reduction, etc can be implemented in the food manufacturing firms. However, joint working collaboration between the supply chain partners is what can accelerate the sustainability practice implementation and performance (Walker et al., 2008). Based on this, SCI in this study was operationalised with only supplier and customer integrations. Impliedly, after adopting a sustainability-supportive culture, food manufacturing firms can easily implement sustainability across the chain when there is a strong collaboration with suppliers and customers accounting for a possible mediation role of SCI in OC-SSCP relationship. Applying the RV theory, the consistent sharing of information, resources, skills, and knowledge among the supply chain partners is pertinent to increasing sustainability performance after adopting a sustainability-supportive cultural values. This reveals the mediation effect of external integration in the OC and SSCP relationship. Nonetheless, studies *exploring the mediation role of SCI on the OC and SSCP relationship are not forthcoming.*

In this study, we operationalised OC using competing values framework (CVF) which categorises OC into four main dimensions: developmental, group, rational and hierarchical cultures. The framework utilises the flexibility-control dichotomy to assess and reveal values which can directly influence supply chain strategies (Dubey et al., 2019). Using CVF, most supply chain authors (e.g., Yunus and Tadisina, 2016; Porter, 2019) have tried linking OC to supply chain strategies such as SCI and total quality management (TQM).

Institutional theory reveals the essence of adopting certain strategies for the purpose of gaining legitimacy or survival in an environment (Scott, 2008; Miska et al., 2018). Since sustainability has become a requirement for food manufacturing supply chains (Ghadge et al., 2020), the firms would strive to achieve a fit between culture and sustainability in the firm and across the supply chain. In this study, we argue that regardless of the cultural values upheld in the food manufacturing firms, institutional theory accounts for the adoption of sustainability practices into an OC, hence, the likelihood of OC creating a strong force for the firms to achieve higher SSCP. Regarding the relationship between OC and SSCP, Linnenlueke and Griffith (2010) theoretically predicted the possible impact of OC on SSCP while Wijethilake et al. (2021) also examined how firms could harness the dimensions of the CVF in shifting organisations towards sustainability change. Dora et al. (2020) and Vlachos (2015) asserted for more research into how OC can be used in accelerating sustainability performance. Due to paucity of research on the impact of OC on sustainability performance, *theoretically driven studies linking OC to SSCP using CVF*

especially in food manufacturing supply chains are still needed.

To address the gaps highlighted, this research empirically examines *how OC could be enhanced to improve the SSCP and investigates the mediation role of SCI.* Hence, the following research questions are addressed:

1. What is the role of played by OC in influencing SSCP?
2. Does external integration play a mediating influence on the relationship between OC and SSCP?

To answer these questions, we employ the multi-method approach utilising both quantitative and qualitative methods. We conduct the research in the food manufacturing industry in the UK and Greece due to the prevalence of sustainability issues and the availability of firms with global supply chains (Ghadge et al., 2020). This study makes significant contributions to both theory and practice by empirically determining how each of the dimensions of the CVF influence SSCP and assessing the extent of external integration needed to improve the SSCP. Since the study employs structural equation modelling (SEM) technique, the research further examines the relationship between OC and SCI and SCI and SSCP. The study subsequently used interviews as a qualitative approach to enrich and confirm the findings of the quantitative analyses.

To address the research questions outlined, the rest of the paper is structured as follows: the next section (Section 2) presents the theoretical and literature review, categorised into OC (CVF), SCI, SSCP and the relationship between each of the variables from which six research hypotheses are developed and the research framework presented. Section 3 outlines the research methodology while Section 4 presents the analysis and results of the study. In section 5, the discussion of the findings including the contributions are presented. Lastly, concluding remarks together with the limitations and suggestions for future research are outlined.

2. Review of related literature and development of the research hypothesis

2.1. Organisational culture and the competing values framework

OC has interestingly gained traction in academia and has received attention across several academic disciplines (Cao et al., 2015). Schein (1988, p.7) defined OC as "a pattern of basic assumptions; invented, discovered, or developed by a given group; as it learns to cope with its problems of external adaptation and internal integration; that has worked well enough to be considered valid and therefore, is to be taught to new members as the correct way to perceive, think and feel in relation to those problems". This definition reveals the role OC plays in the implementation of external strategies. Porter (2019) suggested that OC is relevant for successful introduction of supply chain strategies. Cadden et al. (2020) also highlighted that supply chain strategies with no definite or supportive culture are likely to fail. These reveal the usefulness of culture to the effectiveness of supply chain strategies.

Among the frameworks developed for assessing OC, the CVF has gained popularity in operations management literature as it contains dimensions that: (1) assess the (a) internal and external orientation, (b) human resource development, and (c) authority structure (d) allows easy comparison of values (Quinn and Rohrbaugh, 1983; Dubey et al., 2019) and (2) capable of revealing strategy-supportive values (see Fig. 1). The CVF categorises the OC of every organisation into four distinct types: (1) group (clan), (2) developmental (adhocracy), (3) rational (market) and (4) hierarchical culture (see Fig. 1). Developmental and group cultures are characterised by flexibility; however, developmental culture is externally oriented with much focus on growth and resource acquisition, whilst growth culture is internally oriented with much focus on building teamwork, cohesion, and morale (Cameron and Quinn, 2011). Rational and hierarchical cultures are both characterised by high levels of control. Whereas the former (externally-focused) uses incentives to generate competition among employees to pursue stated objectives (Cao et al., 2015), the latter is characterised by strict and formalised authority structure with the main focus on maintaining internal stability and control (Cameron and Quinn, 2011).

OC constitutes the bedrock of every organisation and strategy, therefore, a strategy without the support of well-defined values is bound to fail. Pagell and Wu (2009) indicated that a supportive OC creates room for firms to maximise environmental, social, and economic performance. Carter and Rogers (2008) also indicated the role of organisational strategy and supportive values in implementing sustainability practices and achieving good sustainability performance. Thus, the effectiveness of sustainability practices depends on the type of culture developed and maintained in the firms. This means food supply chains can be effective in the reduction of negative environmental and social effects when there are sustainability-supportive cultural values in place. The importance of food supply chains to economies have been stressed in extant literature. However, many concerns have been raised on the

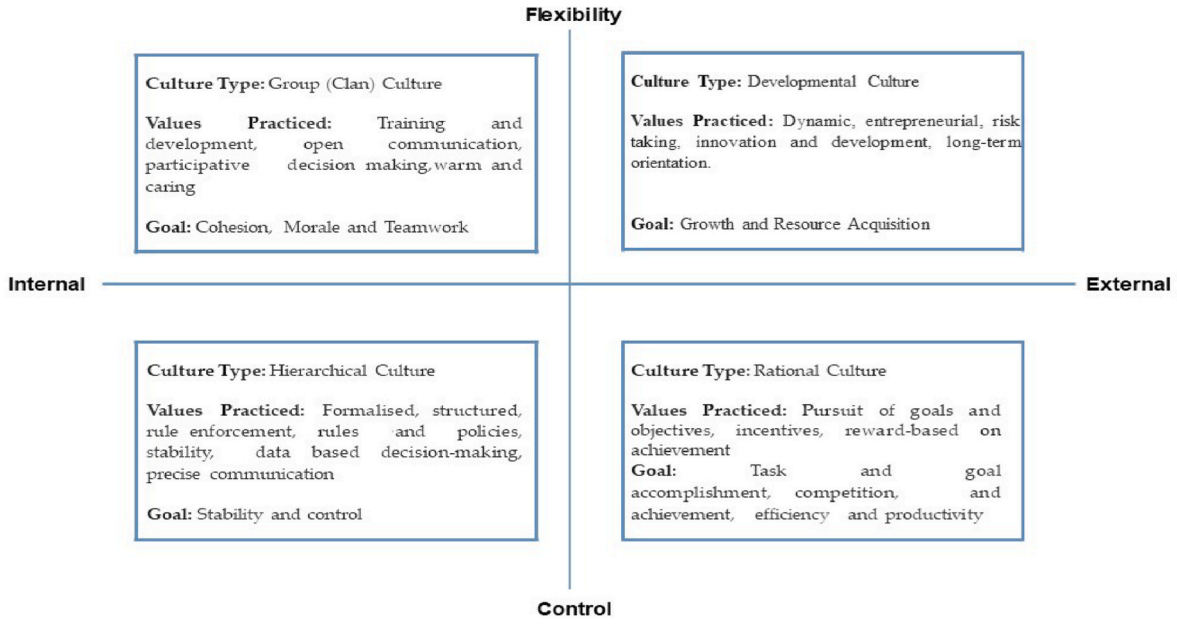

Fig. 1. Competing values framework (Cameron and Quinn, 2011).

increasing contribution of food supply chains to climate change (Ghadge et al., 2020). For example, dairy food supply chains are associated with high levels of carbon emissions and energy consumption due to the significant use of refrigeration in the supply chain (Glover et al., 2014; Ghadge et al., 2017). This raises serious sustainability concerns for the supply chain. Even though, several factors have been suggested, contextual factors such as OC and SCI have been found as very relevant to sustainability (Linnenluecke and Griffiths, 2010; Miska et al., 2018; Wijethilake et al., 2021), hence much empirical research is still needed to explore the area.

Also, from the perspective of the CVF, literature is lacking on research conducted on the role of OC in enhancing SSCP besides the conceptual study by Linnenluecke and Griffiths (2010) which developed a theoretical conceptualisation into the relationship between OC and SSCP. Wijethilake et al. (2021) also researched on how the dimensions of the CVF could help in the adoption of the sustainability practices. These suggest the need for more research examining the impact of OC on sustainability performance. Additionally, due to the need for sustainability adoption by the food supply chains, more studies are needed to investigate sustainability-supportive cultures in the industry. This research empirically builds on Linnenluecke and Griffiths (2010) work by examining the influence of OC (using the CVF) on SSCP.

2.2. Sustainable supply chain performance

The World Commission on Environment and Development (WCED) commissioned the Brundtland Report (WCED, 1987) which defined sustainable development as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p.43). Applied to the context of supply chain, sustainable supply chain (SSC) seeks to address the influence and relationships between supply chain management and the natural environment and society (Sauer and Seuring, 2018). The integration of sustainability thinking in supply chains involves mitigating negative environmental consequences on the natural environment (in terms of the usage of resources and the impacts caused by operational processes) as well as negative societal impacts while at the same time ensuring economic profitability of the firm and the supply chain (Schaltegger and Burritt, 2014; Jiang et al., 2019).

Since SSC seeks to attain continuous improvement in the balance of the triple bottom line (TBL) dimensions, improvements in SSCP can be considered as improvements in environmental, social, and economic performance. Environmental performance comprises practices adopted to reduce negative environmental impacts. A socially sustainable supply chain aims at maintaining and improving social factors while at the same time taking necessary steps to protect the wider society and various stakeholders of the supply chain (Das, 2017; Adesanya et al., 2020). Das (2017) categorised social performance practices into employee-centred social performance (ESP) and community-centred social performance (CSP) practices. The ESP focuses on activities that improve working conditions of employees in a particular firm. Pursuing both ESP and CSP at the firm and supply chain level can stimulate a better SSCP and simultaneously enhance the Drivers of Business Case for Sustainability (Schaltegger et al., 2012) which provides a more holistic and encompassing measure of business performance. These drivers consist of (1) Reputation and Brand Value, (2) Risk & Risk Reduction, (3) Employer Attractiveness, (4) Cost and Cost Reduction and (5) Innovative Capabilities. Ghadge et al. (2020) highlighted the sustainability issues around climate change, high energy consumption, resource scarcity, and high carbon emissions are caused by the complex nature of food supply chains. This prompts the need for sustainability performance of the food supply chains to be taken into serious consideration.

According to Ghadge et al. (2020), food supply chains are under continuous pressure to ensure food safety and adherence to sustainable standards. Despite the effort to institute sustainability practices, the food supply chains in the UK and Greece are still struggling with the implementation and improvement of their SSCP. This has consequently led to the continuous demand of research in the area (Tsolakis et al., 2018; Anastasiadis et al., 2020). Formentini and Taticchi (2016) indicated that food supply chains could improve sustainability performance through the adoption of the sustainability initiatives such as formalisation, instituting of governance mechanisms, changing supply chain processes and integration as practiced by the leading food supply chains. Pagell and Wu (2017) also added that transition from the traditional manufacturing practice to the contemporaneous sustainability-oriented manufacturing has become a burden to many manufacturing firms warranting the need for more research into factors enhancing sustainability performance especially in food supply chains (Dora et al., 2020).

Currently, a combination of both external and internal factors has been identified as having a huge impact on SSCP of firms. While some studies found training, formalisation and corporate governance (Formentini and Taticchi, 2016), reward systems and top management support as critical to sustainability implementation and enhancement, others such as Hassini et al. (2012), Marshall et al. (2015), Formentini and Taticchi (2016) and Miska et al. (2018) identified OC and SCI as the most crucial factors likely to exert maximum impact on SSCP; as yet, there is paucity of research on the extent to which these factors could impact SSCP. Miska et al. (2018) for instance indicated that whereas studies on formal factors are increasing, research on contextual factors such as OC are not forthcoming. This is because of the level of control firms could have on internal factors (Formentini and Taticchi, 2016). Meaning, on the verge of implementing sustainability practices, firms could begin with their internal factors such as culture. Many studies, for instance Fawcett et al. (2011) and Paulraj (2011) have also sought to establish the impact on SSCP of the following factors: technology, supply and demand uncertainties, internal resources and capabilities, and stakeholder pressure. These suggest that while studies on other factors are increasing, research on the relationship between SSCP, SCI and OC are still underdeveloped although as highlighted, it is very important.

2.3. Supply chain integration

In this study, SCI is considered as a multidimensional construct comprising only customer and supplier integration. This is due to the critical role provided by major customers and suppliers to the sustainability performance of focal food manufacturing firms (Blome et al., 2014; Formentini and Taticchi, 2016). Though internal integration and initiatives such as governance mechanisms contribute to the implementation of sustainability practices (Formentini and Taticchi, 2016), supply chain partners, mainly suppliers and customers, provide innovative sustainability ideas, assist in tracking carbon emissions information, help in assessing the environmental impact, develop environmentally friendly packages and foods, and engage in certification programs to enhance the sustainability performance of the overall supply chain. Consequently, examining the role of external integration within the context of an important internal component of firms -that is, culture-to help enhance the sustainability of firms has become important (Rizzi et al., 2022). Currently, SCI has been considered as very critical for the implementation of sustainability. According to Shou et al. (2018), SCI provides an avenue for suppliers, customers and manufacturing firms to share relevant information. Wiengarten and Longoni (2015) indicated the relevance of customer and supplier integration to the sustainability performance of Indian firms. Additionally, Jiang et al. (2019) and Adesanya et al. (2020) highlighted the key role that suppliers play in the implementation of sustainable management practices. Gualandris and Kalschsmidt (2014) highlighted that customer pressure and innovativeness are instrumental to the sustainability practices of several supply chains. This is because customers and suppliers provide valuable information on green packaging, sustainable product design and production and sustainability measurement. Formentini and Taticchi (2016) also indicated the need for firms to form a strong integration with their supply chain partners to increase

sustainability performance.

In the food supply chains, where customers prioritise safety, and demand for sustainable products and responsiveness, increasing visibility and integrating information-sharing are critical to achieving higher sustainability performance (Kumar et al., 2017). Furthermore, since the food supply chains extend across borders, exchange of information and data for sustainability measurement and improvement between the focal food manufacturing firms, customers, and suppliers are key for achieving higher SSCP. Sustainability is currently measured across the supply chain (Kang et al., 2018), which implies that, global supply chain partners of the food manufacturing firms must work closely to obtain the necessary sustainability performance. These portray the strength and criticality of SCI to the implementation of various sustainability practices and achievement of higher SSCP in the food supply chains. Kumar et al. (2017) further elaborated that SCI is relevant for sustainable material sourcing, value creation, efficiency and alleviating costs associated with maintaining sustainable supply chains. This makes SCI the current bedrock for a successful sustainability practice implementation in various supply chains. However, most of these studies do not provide the extent to which firms should integrate with supply chain partners as high levels of integration could inhibit the profitability motive of firms.

Blome et al. (2014) and Wiengarten and Longoni (2015) highlighted the consistent sharing of complementary resources, capabilities, and knowledge in a sustainable supply chain collaboration as highly significant to the implementation and improvement of sustainable products and for building sustainable supply chains. Regardless of the importance of SCI highlighted in extant literature, not much has been done in establishing the direct link between the dimensions of SCI and sustainability performance especially in food manufacturing supply chains.

3. Development of the hypotheses

In this study, we draw upon two theories: institutional and relational view theories which are briefly discussed below.

3.1. Institutional theory

Institutional theory argues that social structures inside or outside an organisation can facilitate the adoption of strategies or capable of restraining performance (Scott, 2008; Iarossi et al., 2011). The pressures instituted by these social structures or institutions instigate a reaction in the organisation through adoption or dropping of certain activities. The theory further states that firms are likely to respond to any pressure in the environment for the purpose of gaining legitimacy and survival (Scott, 2008; Iarossi et al., 2011). According to Kauppi (2013) and Glover et al. (2014), external pressures emanating from social, political, and economic influence firms' strategies and decisions to adopt legitimate practices and measures. Adopting legitimate practices enable firms to gain acceptance from the various stakeholders (Glover et al., 2014). Three forms of drivers namely, coercive, normative, and mimetic pressures have been considered as drivers for the adoption of sustainability in the food industry (Glover et al., 2014).

Within the context of sustainability of food manufacturing industry, coercive pressures emanate from people in powerful positions in the food manufacturing industry who enforce the adoption of environmental management practices (Kilbourne et al., 2002; Glover et al., 2014). Normative pressures are exerted by pressure groups and stakeholders to ensure food manufacturing firms are environmentally conscious, adopt other ethical practices and become socially responsible (Sarkis et al., 2011; Glover et al., 2014). Mimetic pressures occur from the food manufacturers imitating the sustainable practices of successful organisations which is very common with dairy manufacturers (Sarkis et al., 2011; Glover et al., 2014)

Using these pressures and the theory, supply chain researchers have examined the reasons for adoption of certain supply chain practices in the food manufacturing firms. Due to the current pressure on food supply chains to adopt sustainability, it is likely for the firms to adopt sustainability practices for the purpose of gaining legitimacy, profitability, and survival. Regardless of the cultural values present, the focal food manufacturing firms are likely to strive to achieve a fit between the culture practiced and sustainability, purposely to attain a higher SSCP to gain legitimacy. This, therefore, projects into the likelihood of a positive relationship between OC and sustainability adoption and performance in the food supply chains. Based on this theory, we argue that OC will likely exert a positive influence on SSCP.

3.2. Relational view theory

Dyer et al. (2018) proposed that a firm could enhance performance levels in an environment where there is consistent sharing of information, trust, resources, knowledge, skills, and investment with other external partners. The theory advocates for firms to achieve competitive advantage through a network or dyads of processes, firms and partners working together. The RV theory is essential in explaining why firms must enhance their SCI levels. This provides a strong foundation for examining how SSCP can be increased from SCI perspective. Based on this, it could be projected that firms with global supply chains such as the food manufacturing firms can achieve high levels of SSCP when there is consistent sharing of information, skills, trust, processes, and resources between partners across the supply chain.

Additionally, the theory could also be employed in examining the mediation role of SCI in improving SSCP after adopting a sustainability-supportive culture. This implies that, the culture of the focal food manufacturing firms is likely to strengthen the integration practices through the coordination of resources, skills, tacit knowledge, data, and information needed to intensify SSCP across the supply chain. Hence, culture is likely to improve SCI among the global food supply chain partners and through this, intensify the collaboration of resources, skills, knowledge, and information needed to achieve higher SSCP. Based on this theory, we argue that even with a sustainability supportive culture in place, food supply chains still need to strengthen their integration practices to achieve higher levels of sustainability performance.

3.3. Developmental culture, sustainable supply chain performance and supply chain integration

Developmental culture is characterised by flexibility and change while maintaining high levels of external control (Hartnell et al., 2011). This type of culture is focused on maintaining high levels of growth, resource acquisition, innovation, creativity, adaptation, change and responsiveness (see Fig. 1). In such a culture, employees are encouraged to solve problems, take risks, develop visions, take initiatives, and become idealistic (see Fig. 1). Due to the labour-intensive nature of the food supply chains, instilling such culture is likely to promote equal opportunity, staff development, societal well-being, employee commitment and equity, which lead to an increase in social performance. Since developmental culture is characterised by flexibility and long-term focus, it is relatively easier for the supply chains to introduce sustainability practices. Additionally, as the food supply chains extend across borders and impact on the environment of different nations, as a reciprocate gesture, the firms and their supply chains are plausible in implementing environmentally friendly practices due to resource maximisation objective of the culture. Linnenluecke and Griffiths (2010) contends that, the inclusion of sustainability in the supply chain would divert the profit maximisation objective, thereby, leading to low economic performance; akin to the traditional view as against the revisionist view of business model for sustainability (Marzuki et al., 2017). We argue here that stimulation of employee satisfaction and the continuous training and development of employees increase productivity, enabling the manufacturing firms and their supply chains to be creative in the adoption of environmental and social performance

practices while at the same time maximising profit.

It has been argued that a culture dominated by developmental cultural values may enable the formation of strong collaborations with customers and suppliers since members across the supply chain are poised on increasing resources from the environment (Braunscheidel et al., 2010; Cao et al., 2015; Porter, 2019). Such culture ensures that supply chain members work collaboratively through the coordination of resources, thereby, improving external integration. As this culture encourages resource maximisation, firms and their supply chains are likely to include sustainability into the culture for the purpose of gaining legitimacy and profitability, averting negative environmental impacts and attempting to achieve a good fit between developmental culture and SSCP. From a RV theory perspective, achieving this requires consistent sharing of information, resources, ideas, relational knowledge, and skills among the supply chain partners (Wiengarten and Longoni, 2015; Kang et al., 2018).

Even though developmental culture has a positive relationship with SSCP, external integration may account for such direct relationship. In this research, we assert that, though developmental culture could have a direct and positive impact on SSCP, the relationship is mediated by external integration (See Fig. 2). Therefore, in the food manufacturing supply chains:

H1a. Developmental culture is expected to have a positive relationship with SSCP.

H1b. Developmental culture positively influences external integration with customers and suppliers.

H1c. External integration mediate the relationship between developmental culture and SSCP.

3.4. Rational culture, sustainable supply chain performance and supply chain integration

Cao et al. (2015) defined rational culture as shared beliefs of using incentives to motivate employees to fulfil the firms' objectives. It also involves the use of adequate remuneration and reward system, resources, goal setting and efficient planning systems (see Fig. 1) (Cameron and Quinn, 2011). Introducing sustainability is a gradual process which requires sensitizing employees and supply chain members to attain the desired environmental, social, and economic performance. Effective and efficient reward systems could encourage employees to attain profitability and environmental goals of the firm and the supply chain. Chen and Chen (2019) suggested that since sustainability in the supply chain requires enormous organisational commitment, firms can be successful at fully implementing sustainability in the supply chain when employees are adequately rewarded and trained. Following the institutional theory, even though incentives can easily encourage employees to achieve the stipulated sustainability practices, it is argued that supply chains are likely to introduce sustainability practices due to external pressures and the quest to improve profitability. We argue that after adopting rational culture, the food manufacturing firms, and their supply chains are likely to take reasonable steps to introduce sustainability practices and achieve fit which may account for a positive relationship between rational culture and SSCP.

As rational culture focuses on stimulating employees' performance through incentives, it is expected to influence the internal not external integration of firms (Zu et al., 2010). However, with the global nature of the food supply chains, sustainability management has become a collaborative effort from partners across the chain, therefore, rational culture is likely to intensify the external integration practices of the firms which in turn encourages the sharing of resources, skills, knowledge, and ideas for a higher SSCP. In this study, we argue that, even though, rational culture may directly influence SSCP, external integration may account for the positive relationship between the two (see Fig. 2). Therefore, we postulate that within the context of sustainability and in the food manufacturing supply chains:

H2a. Rational culture is expected to positively influence SSCP.

H2b. Rational culture is expected to have a positive relationship with external integration.

H2c. External integration mediates the relationship between rational culture and SSCP.

3.5. Hierarchical culture, sustainable supply chain performance and supply chain integration

Hierarchical culture dwells on establishing and maintaining internal focus and control. This type of culture aims at mainly attaining internal stability and control. Cameron and Quinn (2011) indicated that management and leaders in such cultural environment encourage centralised decision-making, precise communication, and formalised decision -making systems (Zu et al., 2010). The presence of centralisation systems limits the motivation of employees and constrains employees' choices and actions. Cameron and Quinn (2011) argued that high conformity to rules and regulations leads to a stabilised and controlled environment which results in maximisation of profit. This means, achieving high levels of profit can be possible even in an organisational environment with high levels of control. Linnenluecke and Griffiths (2010) asserted that hierarchical culture stimulates economic performance. However, the pursuance of economic performance solely does not make firms and their supply chains sustainable. Drawing on institutional theory, food manufacturing firms with a strict hierarchical culture are likely to adopt sustainability, for the purpose of gaining legitimacy, and acceptance by customers and the society to maintain high profitability. Hence, food manufacturing firms adopting such culture are capable of maximising profitability (economic performance) whilst implementing sustainability practices across the supply chain.

However, the strict nature of hierarchical culture is likely to restrain innovation and creativity among employees and supply chain managers. As a result, the introduction of sustainability would create conflict and problems for the firms and supply chains. However, Berger et al. (2007) argued that firms are likely to pursue sustainability if it leads to profit maximisation and competitive advantage. The significance of customers and suppliers to sustainability performance has been stressed in extant literature (Kang et al., 2018), therefore, it is expected that firms with strict cultural values would pursue external integration practices with their supply chain partners which could increase SSCP. The complexity and lack of flexibility associated with hierarchical culture are likely to stifle customer and supplier integration. Nonetheless, as indicated, the quest to implement and improve SSCP would drive firms to form a strong integration with their external partners through the RV theory. We therefore argue that, though hierarchical culture is characterised by strictness and could influence SSCP, external integration is likely to account for the positive relationship (see Fig. 2). Therefore, in the food manufacturing supply chains:

H3a. Hierarchical culture is expected to positively influence SSCP.

H3b. Hierarchical culture is expected to have a positive effect on external integration.

H3c. External integration mediates the relationship between hierarchical culture and SSCP.

3.6. Group culture, sustainable supply chain performance and supply chain integration

The core values in such organisations are often belongingness, trust and participation, and such organisations use attachment, cohesiveness, membership, open communication, and participatory decision making (see Fig. 1) as motivational tools (Denison and Spreitzer, 1991). Group cultural values encourage: (1) teamwork, (2) exchange of opinions and

ideas among employees and team members, (3) problem solving in teams and (4) empower teams to attain stated objectives (Naor et al., 2008; Cao et al., 2015). Like developmental culture, group culture is also characterised by flexibility, making it easier for such culture to adopt sustainability practices (Linnenluecke and Griffiths, 2010; Porter, 2019). The high level of flexibility in such environments serves as an enabler for food manufacturing firms to collaborate easily with customers and suppliers. This implies that, with group culture, it is relatively easier to introduce sustainability into the supply chain for the achievement of a higher SSCP.

Group culture can be ideal for every supply chain as it encourages integration practices and enables swift implementation of supply chain strategies including sustainability. Touboulic and Walker (2015) confirmed the need for high level of coordination and team formation among supply chain partners for sustainability performance. This means implementing sustainability practices and improving sustainability performance require supply chain partners to work in teams for the purpose of accumulating innovative skills, ideas, and capabilities. Group culture is conducive for establishing high levels of supply chain coordination as it enables the formation of a sustainability team to share relational and tacit knowledge, coordination of resources and ideas for the purpose of achieving higher SSCP. This confirms the assertion of the RV theory. The collaborative nature of this culture improves the skill and develop employees, leading to a better social performance. The flexible nature of this culture makes it easier to introduce environmentally enhancing measures. We argue that the values inherent in a group culture could enable firms to establish strong teamwork between the supply chain partners to enhance SSCP confirming the mediating influence of external integration on the relationship between group culture and SSCP. This validates the assertion put forward by RV theory. In this paper, we argue that, with group culture, food manufacturing firms and their supply chains are better at implementing and achieving higher SSCP, however, SSCP can be further enhanced when there is teamwork and consistent sharing of relevant resources and information among supply chain partners. Based on this assertion, we hypothesise that in the food manufacturing supply chains:

H4a. Group culture is expected to have a positive impact on SSCP.

H4b. Group culture is expected to have a positive relationship with external integration.

H4c. External integration is expected to mediate the relationship between Group culture and SSCP.

3.7. Supply chain integration and sustainable supply chain performance

Carter and Rogers (2008) and Formentini and Taticchi (2016) have both indicated the need to integrate across the supply chain for the implementation of sustainability practices and the subsequent enhancement of sustainability performance. Due to the critical role of customers in the supply chain, food supply chains can succeed with the implementation and improvement of sustainability performance when a strong collaboration is formed with the customers. Based on this, food manufacturing firms are better able to implement and manage sustainability across the global supply chains when customers are strongly involved. Extending such collaboration to suppliers and engaging them in sustainability decision making is conducive for achieving and improving the sustainability performance (Wiengarten and Longoni, 2015) of the supply chains.

Additionally, global food supply chains are better able to manage and measure sustainability when information, resources, knowledge, and ideas are obtained from the global partners (RV theory). Based on this, we argue that, to improve SSCP, food manufacturing firms need an extensive collaboration of resources with their supply chain partners. In the food manufacturing industry, most of the customers who are the mainstream retailing firms exert a great deal of sustainability pressure on the supply chain. This implies that, across the supply chain, the focal manufacturing firms are likely to form an integration with customers before extending such gesture to the suppliers. Thus, within the context of sustainability, a strong linkage between a supply chain's macro processes is highly necessary. In this research, we argue that, in the food manufacturing industry, customer integration is likely to trigger supplier integration (See Fig. 2). In light of this, we hypothesise that in the food manufacturing supply chains:

H5. Collaboration with suppliers and customers exerts a positive influence on SSCP.

H6. Customer integration has a positive relationship with supplier integration.

3.8. Conceptual framework

Fig. 2 demonstrates the conceptual framework which summarises the linkages between the dimensions of OC (CVF), external integration and SSCP. The framework further highlights the various hypotheses of the study. The relationship between the various dimensions of the OC and SSCP are represented with H1a, H2a, H3a and H4a. Hypotheses H1b, H2b, H3b and H4b show the relationship between the dimensions of OC (CVF) and both customer and supplier integration. The mediating influence of external integration on the OC and SSCP relationship are represented with H1c, H2c, H3c and H4c. H5 represents the relationship between external integration and SSCP. Finally, H6 shows the link between customer and supplier integration.

4. Research methodology

Given the underdeveloped nature of research on the relationship between OC and SSCP from CVF perspective, we employed a mixed method approach that combines the qualitative (interview) and quantitative (survey) approaches as this approach ensures a more holistic overview of the issues being examined in this research (Shaw et al., 2020). Though, the mixed method approach was adopted, our study adopts the quantitative priority or quantity dominant type of research (Tashakkori and Teddlie, 1998). The qualitative method through interviews was conducted to essentially: (1) obtain the direct opinions, views, and perceptions of managers (Silverman, 2006; Miles et al., 2014), (2) support the statistical findings, (3) reveal additional constructs for measuring SSCP, and (4) enrich the results and analysis of the study. The quantitative study was also performed to statistically test the relationship between OC, SCI and SSCP and the results from both methods were used in discussing the findings of the study. Next, a questionnaire with information and constructs obtained from the interview and extant literature was designed (see Appendix I for the list of constructs). In Appendix I, the constructs with asterisk* were acquired from the interviews, the rest were obtained from existing literature.

4.1. Sampling and data collection (survey and interviews)

We tested our research in the food manufacturing industry in both the UK and Greece. The initial focus was on the food manufacturing industry in the UK, the food manufacturing industry in Greece was later added due to the difficulty in accessing data in the UK food industry. The industries from both countries were ideal for the research due to; (1) similarities and global nature of the supply chains (2) the sustainability issues engulfing the industries (Henningsson et al., 2004; Anastasiadis et al., 2020; Ghadge et al., 2020).

The industries in both countries constitute one of the largest contributors to their economy, however, implementing sustainability into their supply chains has been challenging, requiring the need for more research into their sustainability performance (Ghadge et al., 2020). For instance, Anastasiadis et al. (2020) and Ghadge et al. (2020) found that the capital intensive, energy consuming, and high carbon emissions

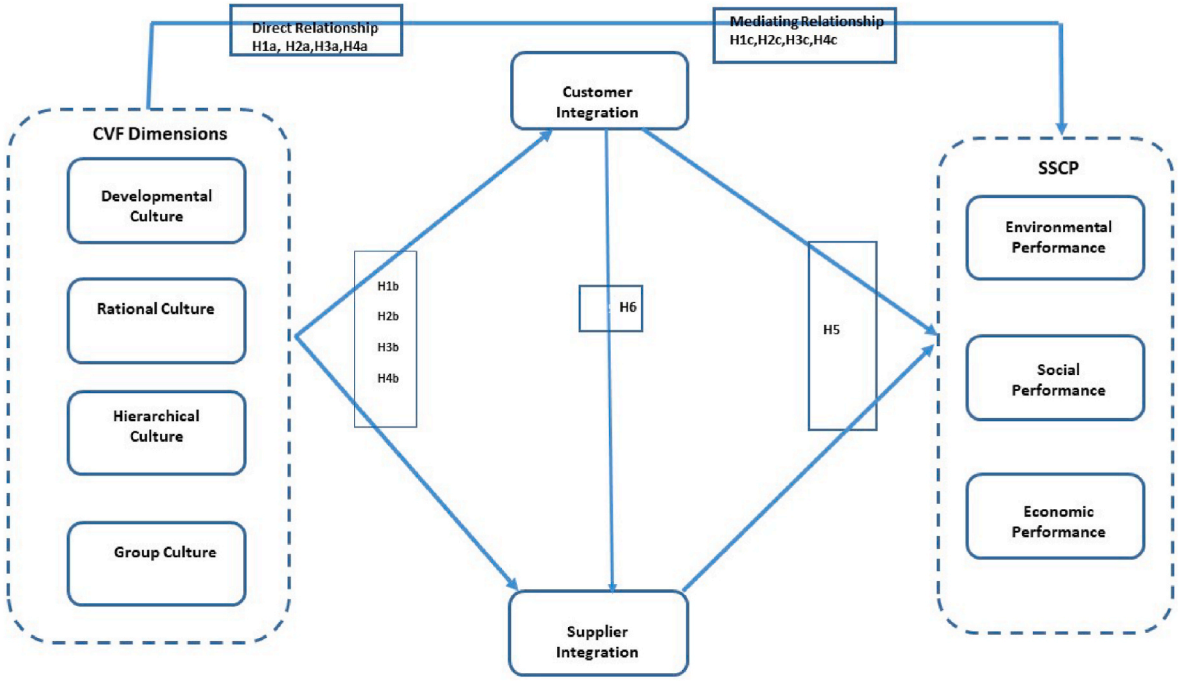

Fig. 2. Conceptual framework.

associated with the supply chains contributes enormously to climate change. Therefore, this research is expected to provide suggestions and guide food manufacturing firms and their supply chains on how to implement and achieve higher SSCP. The data were collected at firm-level where the individual food manufacturing firms in both industries were asked to provide information in relation to their supply chains.

A list of over 30,000 food manufacturing firms in the UK was obtained from the FAME (Financial Analysis Made Easy) database which contains a comprehensive list of manufacturing firms. However, we used personal contacts to obtain the list of firms from Greece. Using stratified sampling, we selected the firms based on their size (number of employees), profitability, location, products, and the availability of personal e-mails of a potential correspondent (see Table 1) in the firms. Our sample size amounted to 1, 535 firms comprising 935 (UK) and 600 (Greece). To improve generalisability, we selected the major industry players since we assumed their supply chain practices are benchmarked by other firms in the industry. Gualandris and Kalchschmidt (2016) asserted that large scale and profitable firms are capable of ingraining sustainability practices and SCI into their supply chains. Also, firms with products available in almost all the supermarkets were considered to have a wider distribution network, therefore, obtaining how their SSCP is measured would contribute enormously to practice and theory. From the list, 35 managers from top firms constituting both large and small-scale firms were selected for the interview. We randomly contacted the firms to obtain the direct contact of a potential respondent for an interview. Only 11 top managers comprising 2 CEOs, 2 Chief Operating Managers, 2 Operations Directors, 1 Accounts Manager, 2 Managing Directors, 1 Production support manager and 1 Director agreed to be interviewed. In all, 11 interviews were conducted, and the interviewed firms were made up of four (4) large scale and 7 small scale firms and for anonymity, their identities are not disclosed. The interviewed firms comprised manufacturers of varieties of cooked/ready-made foods, fresh meat and sea food processors, dairy manufacturers, and chocolate processors. Using firms with different products improves the external validity.

We designed two web-based surveys each for the respondents in the UK and Greece with the University's account on Qualtrics to ensure legitimacy, credibility, and alleviation of fears of the data falling into wrong hands (Dillman, 2011). The participants were contacted by e-mail before the surveys were distributed. After a total of four (4) follow-up and reminder e-mails, 325 of the e-mail addresses were found to be invalid, 48 were duplicated, 63 bounced and were undelivered while 115 declined to respond and 25 requested to be removed from the list. Reasons included potential respondents being out of office, and pressure at the workplace as the survey was conducted during the period of the Covid-19 pandemic. The total sample size, therefore, reduced to 959, out of which, 375 responses were received and only 315 responses were useable. The 60 unusable surveys had either missing or incomplete data. Due to this, the overall response rate for this study is 32.8%. Low response rate triggers non-response bias (Lorentz et al., 2013).

To test for non-response bias, we performed a chi-square (χ^2) test to determine any significant differences between the early and late responders on two demographic variables (Armstrong and Overton, 1977) for the responders from each of the countries. The full samples were split into two, based on the dates they were received. With the responses from the UK, the early group totalled 180 while the late group consisted of 79, and regarding the responders from Greece, the early and late group totalled 36 and 20 respectively. The χ^2 tests yielded no significant statistical differences at 95% significance level for the two categories of responses (UK and Greece). We also performed an extrapolation as recommended by Armstrong and Overton (1977) by testing the variables with one-way ANOVA to ensure the answers of respondents did not change in time and no statistical differences were found between the responses received after each round of reminders (Lorentz et al., 2013). Based on the results, we concluded that there does not appear to be a non-response bias in the demographic and the main variables of the study for the two categories of responses. A further *t*-test revealed no statistical differences between the means of two groups in terms of the cultural practices, SCI and SSCP for each of the responses from Greece and the UK. After these preliminary tests on the two sets of responses, they were subsequently merged, and a further *t*-test revealed no significant statistical differences between the means of two groups in terms of the variables of the study.

Only generic firm-level constructs were used in measuring OC, SCI, and SSCP to avoid potential respondent bias. Thus, the survey

Table 1
Profile of the respondents (n=315).

	Frequency	Percentage (%)
Respondents' Characteristics		
Position		
CEO	78	24.8
Supply chain Manager	53	16.8
Marketing/sales Manager	25	7.9
Finance Manager/Accountant	23	7.3
Line Manager/Supervisor	34	10.8
General Manager	57	18.1
Others/Directors	45	14.2
Education		
High School/Equivalent	7	2.2
College/Equivalent	21	6.7
Bachelor's Degree	123	39.0
Postgraduate	162	51.4
Others	2	.6
Firms' Characteristics		
Firm's Age (Years)		
5–10	4	1.3
10–15	29	9.2
15–20	105	33.3
20+	177	56.2
Number of Employees		
0–9	2	.6
10–49	26	8.3
50–249	130	41.3
250 or more	157	49.8
Turnover Level (€ Millions)		
Less than 2	2	.6
Between 2 and 10	23	7.3
Between 10 and 15	70	22.3
20 and Above	220	69.8
Ownership Type		
Private	299	94.9
Public	16	5.1
Working Years with Customers		
<5	7	2.2
5–10	33	10.5
10–15	87	27.6
>15	188	59.7
Working Years with Suppliers		
<5	14	4.4
5–10	28	8.9
10–15	89	28.3
>15	184	58.4

instrument contained questions centred on common practices found in almost every firm.

4.2. Instrument development

In designing the questionnaire, the results from the interview, specifically the firms' operationalisation of OC, SCI and SSCP (key performance indicators of these variables) together with the already established constructs in extant literature, were used (see Appendix I for the new constructs added from the interview). Most of the constructs, except some of the items for measuring SSCP, were adopted from extant literature as they have been well-developed and their validity and consistency well-tested. Most of the constructs for measuring the various dimensions of OC and SCI generated from the interview were similar to those used in extant literature. Multi-item scales were used in measuring the variables to improve internal consistency (Ketokivi and Schroeder, 2004; Yunus and Tadisina, 2016).

We asked the respondents to identify the measures being used in assessing their SSCP. Fig. 3 presents the items generated from the interview used by the firms for assessing the SSCP in the study. The new constructs obtained from the interviews and not often used in extant literature are indicated with asterisk* (see Appendix I). Two different set of surveys, English and Greek, were designed since most of the Greek respondents were not very proficient in English.

The questionnaire was originally designed in English and the back-translation method as recommended by Tyupa (2011) was used to develop the questionnaire for the responders in Greece. First, an operations management professor translated the English version into Greek, and then another operations management expert in Greece translated the Greek version back to English. The back-translated version was then compared with the original and no statement of discrepancies were found. The questionnaire was pre-tested with 10 academic experts of operations management and then 5 managers in the industry. We asked them to fill out the questionnaire, and then a face-to-face interaction was made for further clarifications. The questionnaire was refined based on the comments and constructive feedback received from the experts. Pilot test with the refined questionnaire was conducted with 15 managers and the reliability and internal consistency using Cronbach Alpha and exploratory factor analysis were tested before the survey was launched.

All the scales were developed and measured on a 7-point Likert-type scale and the respondents were asked to indicate the extent to which they agree with the items from (1 = "strongly disagree"; 7 = "Strongly agree"). The first section of the questionnaire contained scales for measuring environmental, social and economic performance (see Fig. 3). The second section of the questionnaire contained items measuring customer and supplier integration. The last section contained constructs for measuring each of the cultural dimensions. Appendix 1 contains the various scales and the related literature from which they were extracted.

In the last section, respondents were asked to respond to basic demographic information about their respective firms (see Table 1). Turnover and firm size were used as control variables in this study to test if profitability and firm size are relevant to SSCP.

5. Analysis and results

5.1. Interview analysis

The steps suggested by Miles et al. (2014) which includes (1) transcription; (2) in-depth exploration of the interviews and other notes or written memos; (3) manual coding with different colours; (4) developing themes; (5) connecting and interrelating themes; (6) analysing the relationships were employed in analysing the interview.

We used an interview guide with questions on SSCP, OC and SCI and each interview was recorded with voice recording devices. Consent forms and information about the research were sent to each of the respondent via email prior to the interview. Additionally, the consent of each of the respondent was sought before the interviews were recorded and assurance of anonymity, confidentiality, and ability to withdraw from the interview at any time were also provided. The interviews were partly conducted by face-to-face, over telephone and on skype. Due to time, logistical constraints, cost, and outbreak of the pandemic (COVID-19), all but two of the interviews were conducted over the telephone. The recorded interviews were transcribed using Microsoft Word, and the transcription was based on the structure of the questions on the interview guide, purposely for easy coding and categorisation. Manual coding was employed due to the small number of interviews and the quest to comprehensively understand SSCP, OC and SCI of the firms (Basit, 2003). Simultaneous coding namely, process, in-vivo, descriptive and causation coding were employed (Miles, Huberman and Saldana, 2014). The different kinds of coding were adopted to suit the aims and objectives of the research. The coding was done with the Microsoft word package and exported to Microsoft Excel for more clarity and to ascertain whether the coding was both comprehensive and exhaustive.

Different colours were used in coding the issues relating to each of the concepts. The colour 'blue' was used in highlighting all the codes relating to SSCP, SCI's codes were highlighted in 'red' while OC and codes establishing the relationships between the concepts were highlighted in 'green' and 'grey' respectively. The 'codings' were categorised

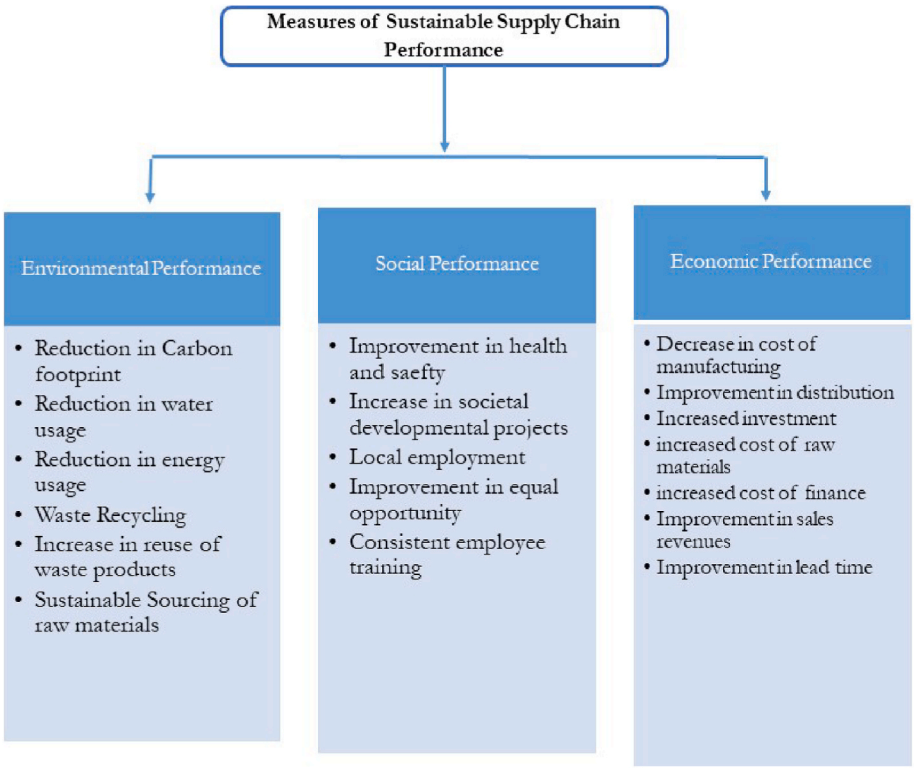

Fig. 3. Measures of sustainable supply chain performance.

into broader themes, that is, OC, SSCP and SCI and the themes were subsequently classified under each of the concepts of the study. For example, all issues relating to sustainability including influencing factors and the sustainability measures were grouped under *factors influencing SSCP*, while issues relating to SCI and OC were grouped under each of the concepts respectively. In this study, however, our focus was on the measures of SSCP (see Fig. 3) since the constructs for OC and SCI have been well-developed and tested in extant literature. Due to the smaller size of the interviews, only two authors performed the coding and comparisons of the coding were made from time to time. Any emerging issues related with the codings were sorted between the authors. This improved the intercoder reliability rate. Saturation was reached on the 10th interview. We triangulated the interviews with the other secondary sources such as reports of the firms. Results on the relationship between the variables are used in discussing the general findings of the study.

5.2. Measurement model

Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) were performed to assess the reliability, validity and unidimensionality of the multi-item scales of each of the latent variables. The CFA was performed with Partial Least Squares-SEM (PLS version 3.2.9) due to the normality issues in the data as the normal distribution was first checked using the Shapiro-Wilk distribution test (Shapiro and Wilk, 1965). Both the dependent and independent variables of the study were subjected to the test at a two-tailed significance level $p < 0.05$. Whereas normality test with significance level of more than 0.05 ($p > 0.05$) is considered as normal (Shapiro and Wilk, 1965), the normality test in this study (see Appendix III) revealed results to the contrary signifying normality issues in the data. PLS-SEM assumes non-normality among data distributions (Sosik et al., 2009) and possesses the ability to run complex bootstrapping routines (Henseler and Sarstedt, 2013).

As indicated in Table 2, the measurement items had a very high convergent validity. The factor loadings ranged between 0.506 and 0.923 while the AVE ranged between 0.538 and 0.732 which were above the threshold of 0.500 (Fornell and Larcker, 1981) except for the AVE of environmental performance which had a score of 0.488. All but EV1 and EV2 had high T-values. The high values indicate that most of the variances in the constructs were explained by their respective variables or indicators.

Furthermore, we assessed the reliability of each of the construct using both Cronbach Alpha and composite reliability scores. As presented in Table 2, the values were above the threshold of 0.70 indicating good reliability of the constructs. Fornell and Larcker (1981) argued that the square root of the AVE should be larger than the correlations among the latent variables to assess discriminant validity, therefore, as presented in Table 3, the square root of the AVE were larger than the correlations among the variables indicating no issues with discriminant validity.

We also tested for the problem of multi-collinearity by assessing the Variation Inflation Factors (VIFs) which should not be more than 3.0 (Hair et al., 2020). All the measuring items, except 6 had VIF values ranging between 1.511 and 2.966, hence, it was concluded that multi-collinearity does not appear to be an issue. Since the data were obtained from a common source with the same set of questions, we conducted Harman's one-factor test (Podsakoff et al., 2003) to rectify any issues of common method variance (CMV). The results revealed Ten (10) factors with eigenvalues above 1.0, explaining 67.145 per cent of the total variance. The first factor explains 40.690 per cent of the total variance, explaining most of the variance. Additionally, the Full Collinearity VIF (FCVIF) showed values of less than 3.3 for most of the variables (Kock, 2015). The results, therefore, indicate that common method variance is not an issue in the data.

For the two different set of responses, we tested for the issue of measurement invariance with measurement invariance of composite models (MICOM) (Henseler et al., 2016). Based on the results, the original correlations between the variables were greater than 5% quantile at $p > 0.05$. Permutation-based confidence levels were also performed to assess any differences between the composite mean and

Table 2
Confirmatory factor analysis.

Variables	Items	Factor Loadings	T-values	Cronbach Alpha	Composite Reliability	AVE
Environmental Performance (ENVP)	*EV1*	.530	9.089	.819	.867	.488
	EV2	.692	14.829			
	EV3	.787	17.028			
	EV4	.809	16.459			
	EV5	.775	17.524			
	EV6	.726	16.143			
	EV7	.506	7.460			
Economic Performance (EP)	*EP1*	.781	18.964	.855	.890	.538
	EP2	.827	22.067			
	EP3	.724	16.245			
	EP4	.594	10.313			
	EP5	.740	14.758			
	EP6	.755	18.352			
	EP7	.690	14.119			
Social Performance (SP)	*SP1*	.707	15.961	.826	.874	.537
	SP2	.725	11.352			
	SP3	.790	13.957			
	SP4	.780	17.528			
	SP5	.757	15.525			
	SP6	.624	18.501			
			13.895			
Supplier Integration (SUPI)	*SI1*	.652	22.049	.871	.899	.530
	SI2	.785	22.587			
	SI3	.783	19.124			
	SI4	.734	25.453			
	SI5	.802	11.782			
	SI6	.550	20.947			
	SI7	.731	22.384			
	SI8	.756	21.231			
Customer Integration (CUSI)	*CI1*	.719	16.576	.845	.883	.519
	CI2	.782	19.066			
	CI3	.668	14.830			
	CI4	.770	17.599			
	CI5	.611	11.692			
	CI6	.761	18.959			
	CI7	.718	17.146			
Developmental Culture (DC)	*DC1*	.788	23.373	.878	.912	.674
	DC2	.874	25.563			
	DC3	.842	24.174			
	DC4	.855	24.045			
	DC5	.738	20.683			
Group Culture (GC)	*GC1*	.793	22.000	.843	.889	.616
	GC2	.678	14.014			
	GC3	.845	22.230			
	GC4	.828	21.021			
	GC5	.771	18.070			
Rational Culture (RC)	*RC1*	.887	21.700	.936	.952	.798
	RC2	.904	22.516			
	RC3	.918	26.256			
	RC4	.923	23.987			
	RC5	.831	17.297			
Hierarchical Culture (HC)	*HC1*	.661	10.033	.872	.915	.732
	HC2	.903	29.496			
	HC3	.918	28.412			
	HC4	.913	19.491			

Table 3
Discriminant validity analysis.

Var.	CUSI	DC	ECP	ENVP	GC	HC	RC	SUPI	SP
CI	***0.721***								
DC	0.314*	***0.821***							
ECP	0.447*	−0.075	***0.733***						
ENVP	0.220*	0.303*	0.373*	***0.699***					
GC	0.237**	0.779*	0.457*	0.313**	***0.785***				
HC	0.150**	0.522*	0.208*	0.151**	0.570	***0.856***			
RC	0.201*	0.515*	0.043	0.089	0.544**	0.474*	***0.893***		
SI	0.472*	0.193*	0.341*	0.222**	0.183*	0.101**	0.093**	***0.728***	
SP	0.204*	0.296*	0.756	0.429**	0.301**	0.139	0.132*	0.094	***0.733***
Mean	6.082	5.996	6.092	6.083	6.110	4.138	5.625	6.081	6.135
St.Dev	0.700	0.763	0.693	0.638	0.690	1.260	1.128	0.683	0.677

Notes: $n = 315$, the square root of the average variance extracted is indicated on the diagonal in bold and italics, CUSI-customer integration; SUPI-supplier integration DC-developmental culture; ECP-economic performance; ENVP-environmental performance; GC-group culture; HC, hierarchical culture, *$p < 0.05$, **$p < 0.01$.

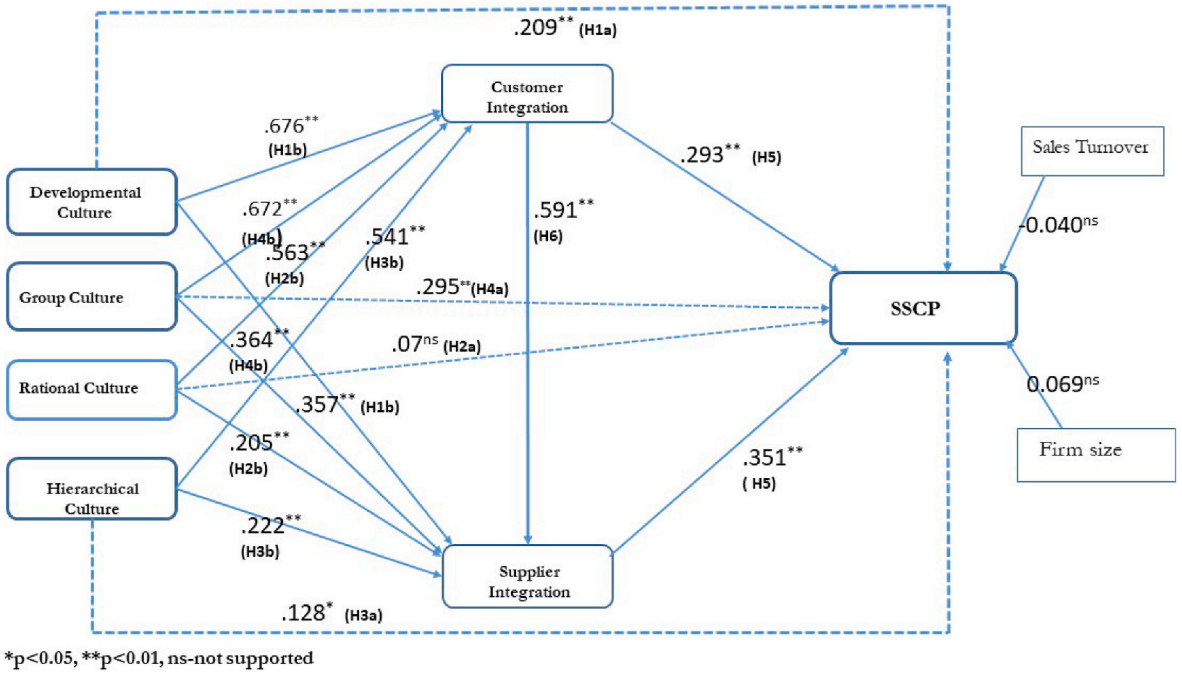

Fig. 4. Structural model with results.

the variance across the groups (Henseler et al., 2016). All the tests proved non-existence of measurement invariance issues in the data.

5.3. Structural model

To simplify analysis of the structural model, environmental, social, and economic variables were treated as a single second order construct (i.e., SSCP). Our focus was not on OC and SCI and SCI and SSCP as they have been extensively researched into, however, the path analyses revealed their relationship which are examined together with the main objectives of the study. In Fig. 4, developmental culture had a positive and significant correlation with customer and supplier integration with coefficients ($\beta = .676$, $p < 0.01$, $R^2 = 0.457$) and ($\beta = 0.357$, $p < 0.01$, $R^2 = 0.763$) respectively, thereby supporting Hypothesis 1b. Additionally, the results revealed a positive and significant relationship between developmental culture and SSCP ($\beta = 0.209$, $p < 0.01$, $R^2 = 0.710$), Supporting hypothesis 1a. We also tested the mediation role of customer integration and supplier integration on the relationship between developmental culture and SSCP at a bias-corrected confidence interval level of 95%, with an indirect effect value of 0.164 and significance level $p < 0.05$, Hypothesis 1c was supported indicating the mediation role of external integration on the relationship between developmental culture and SSCP (Table 4).

Moreover, our results also showed a strong relationship between rational culture and customer integration ($\beta = .563$, $p < 0.01$, $R^2 = 0.316$) and supplier integration ($\beta = 0.205$, $p < 0.01$, $R^2 = 0.719$), thereby, providing support for Hypothesis 2b. On the other hand, rational culture had a positive but a weaker and unsupported relationship with SSCP ($\beta = 0.07$, $p = 0.111$, $R^2 = 0.694$), providing no support for Hypothesis 2a. Nonetheless, customer and supplier integration were found to fully mediate the relationship between rational culture and SSCP (indirect effect = .204, $p < 0.05$), thereby supporting hypothesis 2c. Hierarchical culture also had a strong positive relationship with customer integration ($\beta = 0.541$, $p < 0.01$, $R^2 = 0.293$) and supplier integration ($\beta = 0.222$, $p < 0.01$, $R^2 = 0.729$) also supporting hypothesis 3b. The relationship between hierarchical culture and SSCP was also found to be positive ($\beta = 0.208$, $p < 0.05$, $R^2 = 0.705$), the relationship was significant at $p < 0.05$ level, also supporting hypothesis 3a. External integration was also found to mediate the relationship between hierarchical culture and SSCP (indirect effect = 0.185, $p < 0.05$), also supporting hypothesis 3c.

Our results further indicated a strong positive and significant relationship between group culture and customer and supplier integration, ($\beta = .672$, $p < 0.01$, $R^2 = 0.452$) and ($\beta = 0.364$, $p < 0.01$, $R^2 = 0.767$) respectively, thereby, supporting Hypothesis 4b. The results provided evidence for a strong relationship between group culture and SSCP ($\beta = 0.295$, $p < 0.01$, $R^2 = 0.730$), indicating support for Hypothesis 4a. With an indirect effect of 0.139 and significance level of $p < 0.05$, external integration was found to mediate the relationship between group culture and SSCP (Table 4), thereby supporting Hypothesis 4c.

The path analysis also revealed a positive and strong relationship between customer integration and supplier integration ($\beta = .591$, $p < 0.01$, $R^2 = 0.729$), the significance of the relationship supports Hypothesis H6 while both customer integration and supplier integration

Table 4
The indirect effect of external integration on culture and SSCP.

Path Direction	Indirect Effect	Bias-corrected 95% confidence interval			Hypothesis Testing (p-values)
		Bias	Lower Bound	Upper Bound	
H1c: DC -> CUSI -> SUPI -> SSCP	0.164	0.001	0.090	0.252	Supported (<.05)
H2c: GC -> CUSI -> SUPI -> SSCP	0.139	0.001	0.037	0.233	Supported (<.05)
H3c: RC -> CUSI -> SUPI -> SSCP	0.203	0.002	0.121	0.325	Supported (<.05)
H4c: HC -> CUSI -> SUPI -> SSCP	0.185	−0.002	0.126	0.254	Supported (<.05)

Note: DC- developmental culture; GC- group culture; RC-rational culture; HC-Hierarchical culture; CUSI-customer integration; SUPI- supplier integration; SSCP-sustainable supply chain performance.

with coefficients of ($\beta = .293$, $p < 0.01$, $R^2 = 0.293$) and ($\beta = 0.351$, $p < 0.01$, $R^2 = 0.729$) respectively were found to exert positive influence on SSCP, thereby supporting, Hypothesis H5. Firm size and sales turnover both had no effect on SSCP. Table 6 provides summary for each of the hypotheses tested in the study. Appendix II provides detailed information on the testing of each of the hypothesis and the relationship between each of the individual variables in the study. The *f size* effects and confidence interval associated with each of the relationship tested in the study are presented in Appendix II.

5.4. Assessment of the structural model fit

We assessed the rigor of the model fit and structural model using the predictive capability (R^2), predictive relevance (Q^2) and unobserved heterogeneity to determine the potential replication of the observed values and further examined the extent of heterogeneity in data (Akter et al., 2017).

The findings revealed good Q^2 values > 0, adequate standardised root mean square residual (SRMR) (<0.08) and good Goodness of fit (GoF) > 0.36 (Hu and Bentler, 1999; Henseler et al., 2016). Hu and Bentler (1999), Henseler et al. (2016) and Hair et al. (2020) indicated that Q^2 below 0, GoF closer to 1 and SRMR less than 0.08 should be considered as acceptable values for assessing model fit. Therefore, the values of the model fit indices in Table 5 indicate a good fit of the proposed model. Additionally, the NFI is closer to 1, exact fit criteria measures (d_ULS and D_G) were all non-significant indicating no significant difference between proposed and the implied model (Hu and Bentler, 1999; Henseler et al., 2016). The RMS_theta with values of 0.12 or below, and NFI values of closer 1 indicate a good fit (Hu and Bentler, 1999; Henseler et al., 2016). Therefore, in this study, the RMS_Theta value of 0.125 and NFI of 0.66 met the minimum threshold indicating a good model fit.

Table 5
Model fit analysis.

Model Fit Parameters	Values
SRMR	0.07
NFI	.66
D_ULS	16.516
D_G	3.521
RMS_Theta	0.125

Table 6
Summary of the results.

Hypotheses	Path Coefficients (t-values) p-values	Conclusion
H1a: DC->SSCP	.209 (1.241) **	**Supported**
H1b: DC->CUSI	.676 (4.114) **	**Supported**
DC–>SUPI	.357 (4.140) **	**Supported**
H1C: DC -> CUSI -> SUPI -> SSCP	.164 (2.464) **	**Supported**
H2a: RC -> SSCP	.07 (0.429)^{ns}	**Not**
H2b: RC->CUSI	.563(3.701)**	**Supported**
RC–>SUPI	.205 (2.194)**	**Supported**
H2C: RC -> CUSI -> SUPI -> SSCP	.203 (2.392)**	**Supported** **Supported**
H3a: HC -> SSCP	.128 (1.858)*	**Supported**
H3b: HC->CUSIH	.541 (2.631)**	**Supported**
HC–>SUPI	.222 (2.597)**	**Supported**
H3C: HC -> CUSI -> SUPI -> SSCP	.185 (2.272)**	**Supported**
H4a: GC -> SSCP	.295 (3.960)**	**Supported**
H4b: GC->CUSI	.672 (2.674)**	**Supported**
GC–>SUPI	.364 (2.903)**	**Supported**
H4C: GC -> CUSI -> SUPI -> SSCP	.139 (1.688)**	**Supported**
H5: CUSI-> SSCP	.293 (3.791)**	**Supported**
SUPI->SSCP	.351 (3.418)**	**Supported**
H6: CUSI -> SUPI	.591 (7.019)**	**Supported**
Sales Turnover - > SSCP	−.040 (0.339)^{ns}	**Not**
Firm size - > SSCP	.048 (1.182)^{ns}	**Supported** **Not** **Supported**

DC- developmental culture; GC- group culture; RC-rational culture; HC-Hierarchical culture; CUSI-customer integration; SUPI- supplier integration; SSCP-sustainable supply chain performance. *p < 0.05, **p < 0.01.

5.5. Robustness checks

We performed additional regression analyses to determine if correlation among the first order constructs corresponds to results in the structural model and also determined how OC and external integration individually impacts the environmental, social and economic performance of the firms (see Table 7).

The results also confirmed a negative relationship between rational culture and environmental performance and also an unsupported relationship with social and economic performance across all the models. The rest of the cultural dimensions had a positive relationship with environmental, social, and economic performance especially in models 2, 4 and 6. The results support the findings of this research and affirm the positive influence of all cultural values except rational culture on SSCP. External integration had a positive and stronger connection with SSCP also in models, 2, 4 and 6. Sales turnover had no influence on the achievement of the environmental performance of the firms while firm size had a role to play in the environmental, social and economic performance (see Table 7). The results confirm the assertion of Gualandris and Kalchschmidt (2016) who stated that firms with large number of resources and employees can easily implement sustainability practices. Appendix II also provides other significant testing results including the confidence interval results and *f size* effects associated with each of the paths are analysed.

6. Discussion

In discussing the findings, the results from both interviews and statistical analyses were used. Our interviews confirmed the relevance of customer pressure in the adoption of sustainability practices in the food manufacturing industry. This is true as social and environmental practices including workplace safety, working conditions, carbon emission reduction play a crucial role in the purchase decision making process of current customers (Gualandris and Kalchschmidt, 2014). Similarly, customers of the food manufacturers who are mainly the mainstream retailers, have developed a keen interest in the sustainability practices of the supply chains, thereby enforcing the adoption of certain environmental and social practices. These sustainability demands by the customers have triggered the adoption of certain sustainability capabilities and responsible management practices (Klassen and Vachon, 2003; Gualandris and Kalchschmidt, 2014) to avoid the risk of boycott by the customers. Meaning, the firms react to the sustainability demands of customers by first instilling sustainability-supportive cultural values which could enable easy implementation of sustainability practices, thereby accounting for a positive impact culture on sustainability performance of firms. As highlighted by Carter and Rogers (2008) and Formentini and Taticchi (2016), firms need to introduce new values and adopt new governance systems when adopting sustainability practices and measures. The findings of the study revealed a positive relationship between developmental culture and external integration conforming to the empirical findings of (Braunscheidel et al., 2010; Cao et al., 2015; Porter, 2019). As firms are transitioning to ingrain sustainability into their supply chains, developmental culture provides an avenue for the firms to accumulate creative and innovative ideas, implement sustainability into the long-term strategies, and design sustainability programs for each department in the organisation. The values inherent in this culture also enable collaboration of innovative skills and ideas from the supply chain partners to implement sustainability practices

Table 7
Hierarchical regression analysis.

	Environmental Performance		Social Performance		Economic Performance	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	4.998	1.827	5.261	1.260	5.971	.883
Sales Turnover	.082^{ns}	.034^{ns}	.069^{ns}	−.040^{ns}	.101^{ns}	−.006^{ns}
Firm Size	.186*	.195*	.179**	.033**	.183*	.027^{ns}
DC	.268**	.052**	.137**	.154**	.003^{ns}	.003*
GC	.248**	.061**	.174**	.177**	.290**	.289**
RC	−.054^{ns}	−.027^{ns}	.025^{ns}	.042^{ns}	.020^{ns}	.033^{ns}
HC	.023^{ns}	.019**	.026^{ns}	.019*	.037**	.085**
CUSI	–	.058**	–	.229**	–	.310***
SUPI	–	.072**	–	.232**	–	.205**
R^2	.081	.617	.048	.600	.061	.646
Adjusted R^2	.077	.535	.042	.589	.055	.637
F	13.119**	14.352**	7.883**	10.050**	10.058**	14.201**

DC- developmental culture; GC- group culture; RC-rational culture; HC-Hierarchical culture.
CUSI-customer integration; SUPI- supplier integration; SSCP-sustainable supply chain performance, *p < 0.05, **p < 0.01.

(Espino-Rodríguez and Taha, 2022) explaining the positive impact of this culture and external integration. The positive relationship between developmental culture and SSCP implies that, food manufacturing firms encouraging a culture of growth through new ideas, risk taking, innovation and development and continuous acquisition of all forms of resources can easily implement sustainability practices to improve the SSCP.

Linnenluecke and Griffiths (2010) highlighted that firms with a dominant developmental culture place a lot of emphasis on developing the innovative skills of employees and expanding the learning capacity, thereby, improving the social performance. Gualandris and Kalchschmidt (2014) highlighted the importance of innovative thinking to overcoming sustainability challenges. Acquiring innovative skills enables firms to obtain a lot of solutions from the employees and supply chain partners to implement sustainability practices for the purpose of overcoming existing environmental and social challenges and consequently improving the sustainability performance. This proves that maintaining high levels of innovation in firms leads to the development of employees and coalition of several skills and ideas to improve environmental and social performance (Tachizawa and Wong, 2015; Neessen et al., 2021). Applying the institutional theory, the adoption of developmental culture can fast-track the introduction and achievement of higher SSCP in order to respond to the sustainability pressures of stakeholders. Regarding the effect of developmental culture, one of the managers argued:

> In my firm, we emphasise on continuous improvement, quality, safety, career development and excellence. These highly impact every activity of the firm including sustainability, it has helped maintain a good relationship with our partners and our sustainability performance we have achieved so far.

The study also revealed the crucial role of external integration in mediating the relationship between developmental culture and SSCP. Currently, achieving sustainability performance in the supply chains require joint effort from the supply chain partners (Kang et al., 2018). This means that forming a strong integration enables the firms to obtain the necessary ideas for producing green packaging and sustainable products, reducing carbon emissions, and assessing sustainability impact of the supply chain (Yu et al., 2014; Adesanya et al., 2020). The results suggest that with a developmental culture, the food manufacturing firms still need a close working relationship with customers and suppliers across the supply chain to improve the SSCP. The flexibility associated with developmental culture makes it easier for firms to form a stronger working relationship with customers and suppliers for the purpose of sharing resources, data, innovative skills, information, and facilities to implement sustainability practices and achieve an improved SSCP. This makes developmental culture very significant and effective for SCI and SSCP especially for firms with global supply chains.

Group culture was also found to have a positive relationship with both customer and supplier integration which is consistent with the findings of (Braunscheidel et al., 2010; Cao et al., 2015; Porter, 2019). However, the results contradict the negative relationship between group culture and supplier integration found by Braunscheidel et al. (2010) highlighting the importance of this results to extant literature. The contradictory results could emanate from the use of multiple industry in their study unlike this study which focuses on the food manufacturing firms. The results mean that, in the food manufacturing industry, manufacturers with a dominant group cultural values practise high level of flexibility, employee engagement and most essentially teamwork. In the food manufacturing industry, strong coordination across borders, countries and even continents is required to deliver food systems and achieve sustainability performance (Braziotis et al., 2013). The flexibility and the strong teamwork associated with the culture help to coordinate employees inside the firms and such effort is extended to customers and suppliers across the chain, hence, the positive relationship between group culture and external integration confirmed in this study. Sustainable supply chain management require the collaborative effort of supply chain partners; therefore, group culture is suitable as it encourages integration and teamwork among supply chain partners to obtain high SSCP. One of the managers uttered that:

> Honestly, humility and teamwork greatly influence the firm's ability to communicate and integrate effectively with our customers and suppliers.

The results further revealed the positive effect of group culture on SSCP. Food manufacturing firms with much emphasis on group culture, focus on developing their human resource, acquiring resources through teamwork, and achieving most organisational objectives including productivity through teamwork. Such food manufacturing firms can harness the skills, expertise, resources, and knowledge of the team members to improve the SSCP (Wiengarten and Longoni, 2015). Food manufacturing firms with a dominant group culture engage in the renewal and upgrading of employees' knowledge and skill through education and training. This promotes equal opportunities (Linnenluecke and Griffiths, 2010), consequently improving the social performance. In such an environment, sustainability team comprising the supply chain partners could be formed to develop solutions for any sustainability-related challenges and assist in the implementation of sustainability practices. The exchange of innovative ideas, information, and skills in team meetings could enable the supply chain to devise strategies to implement sustainability practices for the improvement of the SSCP (Gualandris and Kalchschmidt, 2014; Liu et al., 2018). Moreover, the continuous prevalence and usage of teamwork within the food

manufacturing firms enable employees to quickly grasp the sustainability policies and goals, thereby, improving the SSCP which validates the institutional theory. Furthermore, the sustainability team (comprising the supply chain partners) through joint decisions and efforts enable quicker response to customer's demands and build various structures to respond to the negative impact of the supply chain in the environment and society. Two respondents said:

> Sustainability is already part of the culture in the firm, so the teamwork and the strict sustainable polices that are discussed and passed down to workers definitely helps in attaining our sustainability performance.

> Making quality products and achieving sustainability performance, teamwork is important in my firm.

The study further confirmed the mediation role of customer and supplier integration on the relationship between group culture and SSCP. The strong teamwork in the firm enhances the internal collaboration, thereby, preparing members of the firm to form a strong collaboration with customers and suppliers (Cao et al., 2015). The consistent sharing of data, information, resources, facilities, and knowledge enable the continuous improvement of SSCP, confirming the crucial role of customer and supplier integration to SSCP even after implementing group culture. Hence, external integration is partly responsible for the positive relationship between group culture and SSCP also confirming the RV Theory. Supporting this, one respondent voiced that:

> Teamwork, transparency and relationships with customers and suppliers. We work together as a team. The customers and suppliers are core to the business, and we work together to achieve to increase sustainability and profitability of the business.

Rational culture characterised by the usage of incentives had a positive relationship with both customer and supplier integration (external integration). The result contradicts the findings of Cao et al. (2015) and Porter (2019) but consistent with the empirical findings of (Braunscheidel et al., 2010). Braunscheidel et al. (2010) highlighted that firms with rational culture encourages employees to pursue a strong external integration with customers and suppliers in the supply chain to stimulate competitiveness and performance. Regardless of the type of culture, firms will still integrate with customer and suppliers across the chain to withstand uncertainties (Flynn et al., 2016) and improve profitability. Rational culture was further found to exert no influence on SSCP mainly due to the over-reliance of incentives. Another reason is the determination to reduce the overall supply chain cost to improve economic performance. There is continuous pressure on food supply chains to implement sustainability (Ghadge et al., 2020; Kamble et al., 2020), therefore, sustainability practices would still be implemented irrespective of the incentive system in the organisation, accounting for the negative influence of rational culture on SSCP. The results indicate that the integration of sustainability policies into the firm and supply chains-and directing organisational members to follow the policies does not require the institution of rigorous incentive schemes. Regarding this, one respondent said:

> We don't rely on incentives for the employees.

Another respondent also reiterated that since most employees are outsourced, not much relevance is placed on incentives.

> Incentives do not actively play a major role because most of our employees are not employed directly as they are through the agencies.

Surprisingly, customer and supplier integration (external integration) were found to mediate the relationship between rational culture and SSCP. This result is quite surprising, considering the negative relationship that was found between rational culture and SSCP. However, the mediating influence of external integration reflects the strong impact and importance forming integration with customers and suppliers to sustainability performance. It means in the food manufacturing supply chains; external integration is critical to improving SSCP. This is mainly due to the close working relationship that must exist between the supply chain partners to design sustainable products, measure sustainability, and introduce the sustainability practices into the supply chain. Though, rational culture does not directly improve sustainability performance, a rational culture intensive firms can still improve SSCP but only when an external integration with supply chain partners is intensified. Through rational culture, the focal manufacturing firms can establish a good working relationship with the customers and suppliers across the supply chain to obtain the required information and assistance needed to implement sustainability practices and achieve higher SSCP. This represents the full mediation role of external integration in the rational culture and SSCP relationship.

Hierarchical culture has been confirmed by empirical research (e.g., Braunscheidel et al., 2010; Cao et al., 2015) to have an inverse relationship with external integration. This study, however, found results to the contrary by revealing a positive relationship between hierarchical culture and external integration. Hierarchical culture is characterised by high levels of control, fixed authority structure and high levels of restrictions (Cameron and Quinn, 2011). The positive relationship could be attributed to the need to collaborate with customers and suppliers across the supply chain to outrun competitors and quickly respond to customers' changing sustainability demands (Porter, 2019) to improve sustainability performance. As indicated, food supply chains need to implement sustainability practices to stay in business and enjoy profitability. Therefore, the firms would strive to integrate sustainability practices across the supply chain and enact strict measures to regulate and ensure the required sustainability practices are implemented successfully (Wijethilake et al., 2021). We also found hierarchical culture to positively influence SSCP. The results mean that food manufacturing firms maintaining a fully controlled and structured environment with centralised decision-making and minimal flexibility can implement sustainability practices in the firm and across the supply chain. The lack of flexibility, high control structure and restrictions associated with this culture could limit employees' motivation and constrain their progress and happiness, resulting in a weaker social performance.

Linnenluecke and Griffith (2010) and Cameron and Quinn (2011) further indicated that the strict authority structure maximises production leading to high economic performance. Hierarchical culture is relevant to ensuring employees' focus on the profitability objectives (Cadden et al., 2020) and environmentally and socially enhancing policies of the firm. Due to this, food manufacturing firms and their supply chains are likely to pursue sustainability if it increases competitive advantage and profitability -and ensure strict adherence to the sustainability practices demonstrating the practicality of the institutional theory. Maintaining strict adherence to set rules and regulations on sustainability enables employees to pursue the environmental and social objectives (Wijethilake et al., 2021) and conform to established sustainability standards.

External integration was also found to mediate the relationship between hierarchical culture and SSCP. Currently, with sustainability gaining prominence, the focal manufacturing firms with strict authority structure would still pursue activities such as customer and supplier integration across the chain if it leads to higher SSCP. This is due to the relevance of integration of global supply chain partners to the implementation of sustainability practices across the chain. Establishment of strict adherence to external integration rules ensure strong collaboration with customers and suppliers to achieve the required levels of SSCP. Confirming the RV theory, the collaboration of skills, knowledge, information and resources results in the achievement of higher SSCP after adopting hierarchical culture.

In the food manufacturing supply chains, external integration was found to exert a positive influence on SSCP confirming the results of

empirical studies (e.g., Blome et al., 2014; Wiengarten and Longoni, 2015; Kang et al., 2018). Shou et al. (2018) confirmed that the interplay between customer and supplier integration is crucial for overcoming several challenges in the supply chain and increasing firm performance. The coordination between suppliers and customers is very crucial for undertaking environmental research and developing necessary skills and capabilities for achieving higher SSCP (De Stefano and Montes-Sancho, 2018). The critical role played by the customers in the industry, makes it significant for the firms and suppliers to form a working relationship to respond to the sustainability challenges and achieve the sustainability objectives. With the current sustainability demands, firms are required to operate and maintain responsible supply chains, by protecting the environment and society regardless of the size and income level of the firm.

Lastly, following the findings of Shou et al. (2018) and Lacoste and Johnsen (2015), our study also confirmed a positive link between customer and supplier integration. This is mainly due to the strength of customers in the supply chains of the food manufacturing firms. The sustainability demands of the customers can only be met when the suppliers are also involved in setting sustainability performance targets and making sustainability decision. Regarding this, one manager said:

> We have a sustainability team comprising the customers, suppliers, and us. We can only meet the sustainability standards and objectives when the suppliers fully understand what we are up to as the supply chain begins with them.

6.1. Implications for supply chain theory

Food supply chains have been heavily criticised because of their negative impact on climate and society (Ghadge et al., 2020). The low sustainability adoption associated with the supply chains has warranted the demand for more research into the factors which could enable the implementation of sustainability practices to improve sustainability performance. Wijethilake et al. (2021) and Linnenluecke and Griffiths (2010) highlighted that the first step in implementing sustainability practices is to adopt a sustainability- oriented culture. Carter and Rogers (2008) and Formentini and Taticchi (2016) have also highlighted the need for firms to adopt sustainability -supportive values and integrate across the supply chain to implement sustainability practices. However, studies revealing the relevance of culture to SSCP are still under-developed. The findings of this study, therefore, contribute enormously to the literature OC, SCI and SSCP of food supply chains in three different ways.

First, using the CVF, we found that all the dimensions of OC except rational culture had a positive relationship with environmental, social, and economic performance (SSCP) of the food manufacturing supply chains. The findings of this research make unique contributions to the literature revealing that only the values inherent in three cultures (developmental, hierarchical and group culture) are critical for SSCP. These results contradict the predictions of Linnenluecke and Griffith (2010) which envisaged a positive relationship between all the dimensions of the CVF and sustainability performance. Wijethilake et al. (2021) also confirmed the relevance of all the dimensions of culture on sustainability performance. This study takes a nuanced view by confirming the relevance of only three cultural values to sustainability performance. Additionally, our results confirmed that both flexible culture, thus, developmental and group cultures characterised by flexibility have the strongest relationship with SSCP. Though, few researchers (e.g., Porter, 2019) view hierarchical culture as inconvenient for supply chain strategy implementation, our results found that hierarchical culture characterised by strictness and centrality of decision-making helps to maintain and enables the organisation and their supply chains to focus on established sustainability practices. Hierarchical culture can be used to channel the behaviour of members both in the firms and across the supply chain to adopt the established sustainability practices and standards.

Second, our study confirms that after adopting a sustainability-supportive culture, a strong integration with customer and suppliers across the supply chain is instrumental in improving SSCP. Formentini and Tachiti (2016) also provided insights on the significance of SCI to sustainability practices implementation and subsequent attainment of high SSCP. This confirms the mediation role of external integration on OC and SSCP relationship. Research (e.g., Braunscheidel et al., 2010; Seo et al., 2014; Cheng et al., 2016) revealed the mediating link of SCI in the implementation of several supply chain strategies. Though the effectiveness of SCI has been confirmed in the literature, no studies have examined the mediating link of SCI in the implementation of sustainability practices. Our findings are therefore unique as they reveal the mediation role of external supply chain integration between OC and SSCP relationship. The findings suggest that after adopting a sustainability-supportive culture, a strong integration with customers and suppliers across the supply chain is still needed to improve the SSCP.

Last, our research confirmed a positive relationship between the dimensions of OC and SCI in the supply chains of food manufacturing firms. As the relevance of culture to SSCP has been established, it is also crucial to reveal the types of cultures which could enable firms to form a strong integration with supply chain partners for the implementation of sustainability practices. The results of our study contradict research (e.g., Zu et al., 2010; Braunscheidel et al., 2020; Cao et al., 2015; Porter, 2019), highlighting its uniqueness. For example, whereas Zu et al. (2010) revealed no significant relationship between developmental culture and external integration, our study confirmed a positive relationship between the two. Similarly, our findings on the positive relationship between group culture and external integration contradict that of Braunscheidel et al. (2010) who found no direct relationship. With regards to rational culture, whereas Cao et al. (2015) found no relationship with external integration, our results confirmed positive relationship between the two variables. Our findings further confirmed a positive effect of hierarchical culture on external integration contradicting the results of studies (e.g., Braunscheidel et al., 2010; Zu et al., 2010; Cao et al., 2015; Porter, 2019) which found a negative relationship. The results imply that, due to the responsive nature of the food supply chains, there is the need for high levels of integration with customers and suppliers (Kumar et al., 2017). This may account for the positive relationship between OC and SCI in our study as the food manufacturing firms need a strong SCI to maintain responsive supply chains.

6.2. Implications for supply chain managers

The empirical findings of this research generally provide relevant insight and ideas to the managers in the food manufacturing industry and also supply chain managers in other industries. First, our results imply that top management, in developing the overall corporate strategies, need to embrace and adopt developmental, group and hierarchical cultures to instil sustainability into the firms. This is confirmed by research (e.g., Marshall et al., 2015; Montabon et al., 2016; Wijethilake et al., 2021) which considered supportive culture as crucial to integrate sustainability into the supply chains. The values identified in each of these cultures provide managers with a clue to manage and shift employees' behaviour towards implementing the sustainability practices. This means instilling both flexible (group and developmental) and control (hierarchical) cultural values is important to enhance the environmental, social, and economic performance of firms. Managers should focus on the values including teamwork, creativity, innovation, risk-taking, education and training, long-term orientation inherent in a flexible culture to gradually implement the various sustainability practices and achieve high SSCP.

Instilling flexible cultural values can enable managers to; (1) easily train and develop employees in sustainability, (2) establish sustainability teams, (3) encourage sustainability learning in the supply chain

(4) channel the behaviour of supply chain members towards the long-term sustainability objectives of both the firm and supply chain, (5) encourage accumulation of innovative ideas and (6) develop sustainable ways of employing resources for the purpose of reducing sustainability problems associated with supply chains. Encouraging creativity and innovation in organisations enable access to ideas and knowledge that could assist in improving environmental, social, and economic performance. To achieve this, managers should organise regular training and workshops on creativity and innovativeness for their employees. These trainings could focus on encouraging employees to think and act sustainably and empower them with the necessary knowledge and skills to contribute towards improving the sustainability performance of both the firm and supply chain. As part of sustainability training, managers should encourage employees to work in groups/teams. This would instil the culture of teamwork, encourage collegiality, and enable the organisation to possess wide range of sustainability ideas. Wijethilake et al. (2021) also highlighted that group-oriented culture encourages sustainability-related innovations and fosters strong sense of community development and participation.

Second, hierarchical culture is characterised by strict levels of control, it stifles innovation and creative thinking among employees (Linnenluecke and Griffiths, 2010). Nonetheless, the positive impact of such culture on SSCP implies that managers should maintain strict rules about sustainability in the workplace. This can enable managers to channel employees' effort to work towards meeting the sustainability targets of the supply chain. Instilling sustainability and culture into a supply chain is a gradual process, therefore, managers should build the developmental and group cultural values into the strategy of the firm and supply chain and establish stringent measures with the hierarchical culture to guide both the organisational members and partners across the supply chain towards adopting the various environmental, social, and economic practices in the firm. Supply chain managers should ensure sustainability policies are built into the long-term strategic plans, the plans should be broken down into strict sustainability rules and regulations, and ensure each department is given sustainability targets and milestones in the organisation. These would drive the organisations and their supply chain to improve their sustainability performance.

Last, the results provided in this study reveal the relevance of suppliers and customers in implementing sustainability practices and measuring sustainability performance. Top managers should enact the overall supply chain strategy to include effective integration with customers and suppliers. This should include conscientising employees and the whole organisation to prioritise collaborations with external supply chain partners. A good and effective SCI is necessary to maintain responsiveness and management of sustainability in the supply chain. Through SCI managers can collate all information necessary to perform relevant environmental assessments such as Life Cycle Assessment and other sustainability enhancing activities to increase SSCP. With a strong external integration in place, managers can implement and achieve higher SSCP, after adopting a well-balanced and integrated competing values (developmental, group and hierarchical culture). Although the results are currently limited to the food manufacturing industry; they could be applicable to other industries. For instance, the values inherent in the developmental and group culture can be adopted by firms in several other industries to incite the adoption of sustainability practices.

7. Conclusion, limitations and suggestions for future research

This study drew on the institutional and RV theories and the CVF to empirically examine the effect of OC on SSCP in the food manufacturing industries of the UK and Greece. Furthermore, with the relevance of external integration to current global supply chains, this research sought to determine whether customer and supplier integration are needed to ascertain a better SSCP after implementing a suitable culture. We argued that within the context of sustainability, all the dimensions of OC would have positive implication for SSCP. Our findings from the quantitative analysis, which were confirmed through interviews with top managers in the food industry, suggested that all cultural dimensions except rational culture had a positive impact on SSCP. Customer and supplier integration were also found to mediate the relationship between all the dimensions of OC and SSCP. Consequently, in this study, we consider sustainability-oriented culture as comprising integrated competing values, namely, group, developmental and hierarchical culture. Supply chain mangers are therefore required to encourage employees, to think and act sustainably, share innovative ideas in teams, and forge a closer alliance with supply chain partners. These values facilitate the coordination of ideas, skills, knowledge, and measures and ensure there is improvement in sustainability performance. Additionally, managers are encouraged to maintain stringent rules and regulations on sustainability both within the organisation and across the supply chain to enhance SSCP. These values can be applied in other industries expecting a higher achievement in their sustainability performance. Moreover, food manufacturing firms facing challenges with sustainability performance could benchmark the sustainable practices implemented by leading firms such as Pasta and Coffee. These firms have successfully initiated sustainability supportive values, streamlined their supply chain processes, instituted new governance mechanisms and are keen on sustainability certifications of suppliers (Formentini and Taticchi, 2016).

Despite the contributions of the findings to both theory and practice, scope for further research, which builds on this study exist. The findings of this research are industry-specific (food manufacturing firms in the UK and Greece), thereby, limiting the generalisation of the study. Future research can test the framework of this study in other industrial settings or use multiple industries. The impact of rational culture on SSCP needs to be investigated further and the relationship re-examined. Future research can also determine the mediation role of the complete dimensions of SCI (internal, customer and supplier integration) in the relationship. Moreover, the relationship between SCI and SSCP is an emerging area, therefore, more research is needed to strengthen the results of extant studies.

The SSCP in this study was only measured at the focal firm level, however, in assessing the sustainability performance of a supply chain, a holistic measurement of the sustainability performance of all partners in the supply chain is needed. Studies holistically assessing the sustainability performance of the supply chain are not forthcoming, which could open a potential window for future research. Our study was conducted in only two European countries limiting the generalisability of the research to other countries. Future research can replicate the study using multiple countries and further assess the impact of national culture on the implementation of sustainability practices of firms; also, results from emerging economies would be of much interest. Though literature has revealed the relevance of internal integration to sustainability performance, only external integration was considered in this study. Future studies could include internal integration into the model and measure the role of internal integration in the development of sustainability-supportive cultural values.

Authors statement

All authors have participated fully in (a) conception and design, or collection, analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

Data availability

The data that has been used is confidential.

Appendix I

Variables, Measuring items and their Related Literature

Indicate your response on 7-point Likert Scale from (1-Strongly Disagree, 7-Strongly Agree)

Sustainable Supply Chain Performance

Variables	Constructs	Literature
Environmental Performance	EV1: Supply chain's implementation of environmentally friendly projects*	Sarkis (2006); Vachon and Klassen (2008); Hassini et al. (2012); Kang et al. (2018);
	EV2: Sustainable extraction of raw materials*	
	EV3: Water consumption	
	EV4: Energy consumption	
	EV5: Carbon reduction	
	EV6: Frequency of waste recycling*	
	EV7: Compliance to environmental standards*	
Social Performance	SP1: Sustainable societal developmental projects*	
	SP2: Health and safety of employees	
	SP3: Employee training and development	
	SP4: Equal opportunity for advancement*	
	SP5: Motivation of employees*	
	SP6: Local resident employment*	
Economic Performance	EP1: Manufacturing cost*	
	EP2: Distribution cost	
	EP3: Lead time	
	EP4: Delivery performance	
	EP5: Investment*	
	EP6: Operational Cost	
	EP7: Sales Revenue*	

Supply Chain Integration

Variables	Constructs	Literature
Customer Integration	CI1: Sharing of production plans with customers	
	CI2: Sharing of data via computerisation systems	
	CI3: Sharing of Point of Sales information	
	CI4: Product and process design decisions	
	CI5: Survey of customers' needs	
	CI6: System coupling with customers	
	CI7: Involvement in sustainability decision*	
Supplier Integration	SI1: Decision about quality	
	SI2: Involvement in sustainability decision*	
	SI3: Product design process involvement	
	SI4: Procurement practices	
	SI5: Benchmarking and results sharing	
	SI6: Sharing of demand forecasts	
	SI7: Quick ordering systems	
	SI8: Sharing of information through information technology	

Organisational Culture

Variables	Constructs	Literature
Group Culture	**GC1:** Development of human resource and employee commitment	Naor et al. (2008); Liu et al. (2010); Cameron and Quinn (2011); Cao et al. (2015); Yunus et al. (2016); Porter (2019); Organisational Culture Assessment Instrument
	GC2: Acquiring resources through teamwork	
	GC3: Task and goal accomplishment through teamwork	
	GC4: Empowering employees to use teamwork for objective achievement	
	GC5: Productivity and efficiency through teamwork	
Development Culture	**DC1: Importance of** development of new ideas and product.	
	DC2: Initiation of change in employees	
	DC3: Commitment to innovation and development	
	DC4: Encouragement of creativity in employees	
	DC5: Production orientation	

(*continued on next page*)

(*continued*)

Variables	Constructs	Literature
Rational Culture	**RC1:** Pursuance of firms' objectives through incentive systems RC2: Incentives reward hardworking employees RC3: Incentives enables full internal control RC4: Incentive system encourages competition RC5: Incentives encourages quality pursuance RC6:	
Hierarchical Culture	**HC1:** Structured and controlled environment HC2: Referral of issues to top management HC3: CEO's approval of every decision HC4: Little action until a manager approves a decision.	

II. Significant Testing Results

Further test results.

Path	Path Coefficient	95% BCa Confidence Interval	Significant?	f^2 effect size
H1a-H1d	0.120	(-0.087, 0.281)	Yes	0.021
H1a: DC→SSCP	0.063	(-0.068, 0.195)	No	0.010
H1b: RC→SSCP	0.233	(0.105, 0.357)	Yes	0.095
H1c: GC→SSCP	0.115	(-0.031, 0.236)	Yes	0.040
H1d: HC→SSCP				
H2a-2d	0.715	(0.594, 0.821)	Yes	1.047
H2a: DC→II	0.284	(0.111, 0.479)	Yes	0.098
DC→CI	0.258	(0.084, 0.394)	Yes	0.139
DC→SI	0.526	(0.403, 0.650)	Yes	0.383
H2b: RC→II	0.229	(0.037, 0.352)	Yes	0.097
RC→CI	0.150	(0.021, 0.284)	Yes	0.065
RC→SI	0.689	(0.575, 0.791)	Yes	0.904
H2c: GC→II	0.291	(0.106, 0.531)	Yes	0.117
GC→CI	0.275	(0.079, 0.448)	Yes	0.170
GC→SI	0.522	(0.398, 0.614)	Yes	0.575
H2d: HC→II	0.202	(0.038, 0.335)	Yes	0.072
HC→CI	0.165	(0.059, 0.268)	Yes	0.203
HC→SI				
H3a-3c	0.466	(0.274, 0.606)	Yes	0.214
H3a: II→SSCP	0.185	(-0.070, 0.425)	Yes	0.041
H3b: CI→SSCP	0.260	(0.180, 0.566)	Yes	0.059
H3c: SI→SSCP				
H4a-4d	0.068	(0.005, 0.135)	Yes	
H4a: DC->SCI->SSCP	0.051	(0.017, 0.108)	Yes	
H4b: GC->SCI->SSCP	0.064	(0.026, 0.116)	Yes	
H4c: RC->SCI->SSCP	0.043	(0.009, 0.111)	Yes	
H4d: HC->SCI->SSCP				

CI-customer integration; II-internal integration; SI-supplier integration; SSCP=Sustainable Supply Chain Performance; DC-developmental culture; GC-group culture; HC-hierarchical culture; RC-rational culture. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

III

Shapiro-Wilk Normality Test for the Samples

Variable	Statistic	Df	Significance
Environmental Performance (ENVP)	.938	315	.000
Economic Performance (ECP)	.926	315	.000
Social Performance (SP)	.934	315	.000
Customer Integration	.917	315	.000
Supplier Integration	.922	315	.000
Developmental Culture (DC)	.928	315	.000
Group Culture (GC)	.919	315	.000
Rational Culture (RC)	.915	315	.000
Hierarchical Culture (HC)	.870	315	.000
Years of working with customers	.726	315	.000
Years of working with suppliers	.735	315	.000
Turnover Level	.589	315	.000
Firm Size	.766	315	.000
Years of Existence	.730	315	.000
Educational Level	.735	315	.000

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