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Examining the influence of employee engagement in supporting the implementation of green supply chain management practices: A green human resource management perspective

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Abstract

How implementation of environmental practices is supported by employee engagement remains underexplored in the literature. Based on the natural resource-based view (NRBV), this study examines the role of employee engagement in supporting successful implementation of green supply chain management (GSCM) practices. Specifically, we theorise and test the mediating role of employee engagement on the relationship between GSCM practices and environmental performance. Survey data from 394 manufacturing firms were used to test the model and hypotheses. Our findings show that employee engagement plays an important role in supporting the implementation of most GSCM practices. Non-significant results in relation to eco-design practices suggest that employee engagement is not as important for supporting product design-based GSCM practices. Our study provides insights for managers and scholars seeking to address important questions around 'how' GSCM practices can be implemented effectively.

KEYWORDS
employee engagement, environmental performance, green human resource management, GSCM practices, NRBV

1 | INTRODUCTION

The business case for investment in environmental management systems, technologies, practices and policies has been a prominent theme of research within the operations and supply chain management literature throughout the past two decades (Liu, 2020; Vachon & Klassen, 2008). While a strong case for a link between environmental efforts and improved environmental performance has been established, levels of environmental improvement can vary, with some practices being more strongly linked to environmental improvement than others (De Burgos-Jiminez et al., 2014; Graham & Potter, 2015; Yang et al., 2010). Empirical support for a direct relationship between environmental practices and other dimensions of organisational performance, such as cost, quality and operational performance, has been more mixed, leading to recognition that this relationship may be more complex than initially thought and that a range of other factors may influence the extent to which positive performance outcomes can be achieved (Adebanjo et al., 2016; Bianchi et al., 2021; Graham & McAdam, 2016; Longoni & Cagliano, 2015; Pederneiras et al., 2021). As the environmental agenda continues to gain momentum, creating

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mounting pressure on businesses across a range of industries to adapt, the question of 'how' they can do so in a way that enhances their competitive advantage takes precedence over 'whether' they can achieve a competitive advantage from environmental efforts. Accordingly, research attention is shifting away from seeking to establish a direct relationship between environmental efforts and performance towards seeking to understand more about the different factors that might exert an influence on the extent to which positive outcomes can be achieved (Bianchi et al., 2021; Daily et al., 2012; De Burgos-Jiminez et al., 2014; Delmas et al., 2011; Graham & McAdam, 2016; Pederneiras et al., 2021).

Environmental practices can only lead to improved organisational performance if they are implemented effectively (Huang et al., 2017; Pederneiras et al., 2021; Zhu et al., 2012). If new practices are introduced without the necessary supporting structures and processes in place to facilitate their implementation, the potential to generate sources of competitive advantage will be hindered (Renwick et al., 2012). The natural resource-based view (NRBV) highlights the importance of engagement with relevant stakeholders throughout the implementation of environmental strategies (Hart, 1995; Hart & Dowell, 2011). In order for environmental efforts to achieve their full potential in terms of competitive advantage, it is essential that the key stakeholders involved in their implementation are equipped to manage this effectively. As the actors carrying out the day-to-day activities within companies, employees are key stakeholders in the practical implementation of environmental strategies (Daily et al., 2012; Ronnenberg et al., 2011). A number of studies highlight the importance of human resource management practices in supporting employees to manage the changes associated with environmental strategies more generally (Jabbour et al., 2013; Longoni & Cagliano, 2015; Ren et al., 2022; Renwick et al., 2012; Yu et al., 2020). Earlier studies, however, tend to focus on green human resource management (GHRM) links with internal environmental practices (Adebanjo et al., 2016; Delmas et al., 2011; Jabbour et al., 2013; Pereira-Moliner et al., 2012), with more recent studies calling for consideration of practices at the broader supply chain level, often referred to as green supply chain management (GSCM) practices (Jabbour & Jabbour, 2016; Nejati et al., 2017; Yu et al., 2020).

In response to these calls and others to develop an understanding of 'how' companies can generate a competitive advantage through environmental efforts in the supply chain (De Burgos-Jiminez et al., 2014; Graham & McAdam, 2016; Zhu et al., 2012), this study considers the potential for engagement with internal stakeholders, namely, employees, through GHRM practices to support effective implementation of GSCM practices as reflected through environmental performance outcomes.

While some studies consider the role of GHRM practices as antecedents to GSCM practices (Nejati et al., 2017; Yu et al., 2020), or their direct influence on environmental performance (Daily et al., 2012; Jabbour et al., 2013), we are not aware of any studies that consider their mediating role in supporting the successful implementation of GSCM practices. From a theoretical standpoint, investigating the mediating role of GHRM practices and the pathways between GSCM practices and environmental performance is important from a capability development perspective (Agyabeng-Mensah et al., 2020; Singh et al., 2020). It may be the case that GSCM practices, when channelled through workforce engagement initiatives, may facilitate the creation of socially complex environmental SC capabilities, which in turn enhance environmental performance (Aragón-Correa & Sharma, 2003; Barney, 1991; Shi et al., 2012). The mediation effects of GHRM practices could also help extend NRBV theory and shed light on how the environmental practices outlined in the NRBV can be operationalised and implemented in SC settings (Alt et al., 2015; Hart & Dowell, 2011). Lastly, the research is also important from a practical standpoint and can help management identify the specific GHRM practices, that is, employee involvement, integration and top management support, which intertwine with specific GSCM practices, to enhance environmental performance. For instance, this paper also explores whether both process- and product-based GSCM practices are channelled through GHRM practices. We respond to these important gaps by seeking to answer the following research question grounded in the NRBV:

Does engagement with key stakeholders, namely, employees, through the mechanism of GHRM practices, support successful implementation of GSCM practices as reflected through environmental performance outcomes?

In seeking to address this question, we conducted an empirical study using a survey of 394 manufacturing companies operating in the UK. Our study makes a number of important contributions to the literature on GSCM. First, it examines the role of engagement with key stakeholders, namely, employees, in supporting the implementation of environmental practices as outlined in the NRBV. As far as we are aware, our study is one of the first to consider the mediating influence of employee engagement in supporting successful implementation of GSCM. Second, it contributes to the emergent literature seeking to understand more about the processes and mechanisms through which companies can embed environmental practices into their organisations in a sustainable and cost-effective manner.

2 | THEORETICAL BACKGROUND

The NRBV proposes that companies can generate a competitive advantage through proactive engagement with the natural environment (Hart, 1995; Hart & Dowell, 2011). Based on this premise, many studies have investigated the relationship between environmental management and organisational performance. Empirical support for a direct link between some environmental practices and improved environmental performance has been strong (Graham & Potter, 2015; Pullman et al., 2009; Yang et al., 2010), while results for direct links with other dimensions of organisational performance have been less conclusive (Christmann, 2000; Green et al., 2012). At the heart of the resource-based view (RBV), which the NRBV stems from, is the argument that companies possess unique bundles of resources and capabilities that enhance their ability to generate sources of competitive advantage (Barney, 1991). Thus, in the context of environmental

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practices, it is not surprising that some companies implement these more successfully than others due to the unique resources and capabilities they possess that support the implementation of these practices. For example, companies who have pre-existing experience of implementing new processes or practices may possess capabilities that can also support the implementation of new environmental practices (Christmann, 2000; Graham, 2018; Hart & Dowell, 2011).

According to Hart (1995), the NRBV is composed of three sustainability-oriented resources/practices aimed at sustainable advancement within organisations and the wider business eco-system (McDougall et al., 2019). These compose of pollution prevention, product stewardship and sustainable development (Hart, 1995; Hart & Dowell, 2011). Pollution prevention can be practically implemented through internal environmental practices, focused on reducing the physical waste and emissions created throughout the production process and can be captured through the practice of waste reduction (continuous improvement) (Graham & McAdam, 2016; Hart & Dowell, 2011; Michalisin & Stinchfield, 2010; Schoenherr, 2012). Product stewardship goes a step further to consider the environmental impact of products throughout their life cycle as well as the environmental impacts created throughout supply chain processes (Graham, 2018; Hart & Dowell, 2011). Lastly, sustainable development promotes the idea of a long-term shared vision (Alt et al., 2015; Hart, 1995). It can pertain to the implementation of new clean technology in support of environmental advancement and the sourcing of energy from entirely renewable sources, such as wind and solar power (De Stefano et al., 2016; Hart & Dowell, 2011).

There have been a number of recent calls for studies to recognise the complexity of the relationship between the aforementioned environmental practices and firm performance and to look beyond direct links in order to develop an understanding of other factors that might play an important, indirect role in supporting this relationship (Bianchi et al., 2021; Daily et al., 2012; Delmas et al., 2011; Graham & McAdam, 2016; Hart & Dowell, 2011; Pederneiras et al., 2021). Hart and Dowell (2011) highlighted stakeholder integration as an important area of focus for future studies seeking to develop the NRBV. According to the NRBV, stakeholder integration is a key resource for companies seeking to implement advanced environmental practices at the supply chain level as they will need to work with external stakeholder groups such as customers and suppliers to support these efforts (Graham, 2018; Hart, 1995). On reflection of the NRBV and its development over the 15 years since its introduction, Hart and Dowell (2011) highlighted the importance of understanding the role of key stakeholders in supporting the implementation of environmental practices both internally and at the supply chain level. Further, they call for more studies to seek to understand the mechanisms through which companies engage key stakeholders in environmental efforts and how this engagement can influence the potential for successful implementation (Hart & Dowell, 2011).

As the actors directly involved in the implementation of environmental strategies and practices, the importance of engaging employees cannot be understated (Renwick et al., 2012; Texeira et al., 2012). Failure to effectively engage this key stakeholder group could hinder the potential for performance improvements as human resources are critical to the success of operations and supply chain management practices (Jabbour & Jabbour, 2016; Nejati et al., 2017; Ren et al., 2022). The role of GHRM practices as mechanisms for engaging with employees to support the implementation of environmental practices has emerged as an important, yet relatively nascent area of research (Daily et al., 2012; Ren et al., 2022; Yu et al., 2020). Studies looking at the implementation of other operations management practices, such as total quality management or lean management, provide empirical support for the importance of engaging employees through human resource management practices to support successful implementation (Cadden et al., 2020; Pereira-Moliner et al., 2012). Longoni and Cagliano (2015) noted the importance of employee engagement in supporting the progression from lean practices towards environmental practices. The importance of engaging with this key stakeholder group is evident, yet few empirical studies assess the potential for this to influence the success of environmental practices as reflected through improved performance.

In this study, employee engagement (key stakeholder integration) comprises three collective GHRM elements. These include employee involvement, employee integration and top management support. Employee involvement relates to the idea that employees have the information and requisite knowledge needed (through training) to make decisions and utilise their skills effectively while being rewarded for doing so (Lawler, 1996). Employee involvement is particularly important for pollution prevention practices linked to waste reduction (Shi et al., 2012), whereby employees are challenged to reduce waste through continuous improvement (see Hart & Dowell, 2011; Shi et al., 2012; Agyabeng-Mensah et al., 2020). Employee integration, on the other hand, relates to the idea that employees are fully embedded within an organisation-wide strategy (Chen & Paulraj, 2004). Employee integration is thus important for product stewardship strategies in the supply chain, which consider the entire lifecycle of the product, from design to customer take-back. In this sense, employees need to be fully aligned with boundary spanning environmental strategies through team meetings and cross-functional collaboration (De Stefano et al., 2016). Lastly, top management support is necessary for aligning strategy (shared vision), motivating employees and cultivating environmental capabilities (Hart & Dowell, 2011; Singh et al., 2020). Top management support is principally important for the adoption of new clean technologies (Hart & Dowell, 2011), which may require disruptive changes in supply chain processes and organisational culture (De Stefano et al., 2016; Roscoe et al., 2019).

Table 1 provides the theoretical framework presented in this study. The table operationalises the linkages between environmental resources outlined in the NRBV and how these translate to GSCM practices (Hart & Dowell, 2011). Moreover, the role of stakeholder integration (employee engagement) is outlined across all three dimensions. For example, in terms of product stewardship and managing lifecycle costs, the GSCM practice of eco-design is logically linked to this NRBV resource in the literature (De Stefano et al., 2016;

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TABLE 1 Theoretical framework linking the natural resource-based view, green supply chain practices and employee engagement (stakeholder integration).

NRBV resource	GSCM practice	Stakeholder mechanism	Performance
Pollution prevention: Minimize emissions, effluent and waste (Hart, 1995: Hart & Dowell, 2011)	Waste management (continuous improvement) (Graham & McAdam, 2016; Treacy et al., 2019)	Employee involvement, integration and alignment in continuous improvement efforts (Shi et al., 2012: Agyabeng-Mensah et al., 2020)	Improved waste management Treacy et al. (2019)
Product stewardship: Minimise lifecycle costs (Hart, 1995; McDougall et al., 2019)	Eco-design and environmental logistics (Velazquez et al., 2015: De Stefano et al., 2016)	Employee involvement, integration and alignment in eco-design efforts (Alt et al., 2015; Andriopoulos & Lewis, 2010)	Reduced use of harmful materials Graham and McAdam (2016)
Sustainable development: Minimize the environmental burden of firm growth (clean technology and shared vision) (Hart, 1995; Hart & Dowell, 2011)	Energy reduction through clean technology (De Stefano et al., 2016)	Top management support and employee involvement in terms of implementing and aligning a clean technology strategy (shared vision) (De Stefano et al., 2016; Montalvo, 2007)	Energy reduction, reduced carbon emissions (De Stefano et al., 2016)

Abbreviations: GSCM, green supply chain management; NRBV, natural resource-based view.

Shi et al., 2012). Leading on from this, the framework argues that eco-design is facilitated by employee engagement, that is, employees that are integrated, involved and aligned with an eco-design strategy are more likely to seek out new innovative design ideas to support such a strategy (Andriopoulos & Lewis, 2010; Singh et al., 2020). The idea is that employee engagement (GHRM practices) will play a mediating role in the relationship between GSCM practices and environmental performance. This logic forms the basis for the theoretical framework.

The development of our framework is also motivated by relevant literature, which suggests that there is a gap for a study that determines how firms can successfully implement GSCM practices. For example, Ronnenberg et al. (2011) and Daily et al. (2012) provided preliminary empirical support for a link between GHRM and environmental performance, suggesting that practices such as training, empowerment and change management can support the implementation of environmental management systems. Yu et al. (2020) called for more studies to extend this focus to include consideration of the relationship between GHRM and environmental practices at the supply chain level. Studies that adopt a supply chain level focus highlight the importance of having GHRM practices in place to support the implementation of GSCM practices but assess the direct link between GSCM practices and environmental performance rather than assessing the impact of the GHRM practices in supporting improvements in this dimension (e.g., Jabbour et al., 2013). There is substantial empirical support for a direct link between GSCM practices and environmental performance in the extant literature (Graham & Potter, 2015; Rao & Holt, 2005; Schoenherr, 2012; Vachon & Klassen, 2008), yet we are not aware of any studies that consider the combined influence of GSCM and GHRM in driving improvements in environmental performance. This is an important consideration as it could shed light on the importance of employee engagement in supporting the successful implementation of GSCM practices.

3 | HYPOTHESIS DEVELOPMENT

This section presents a series of hypotheses grounded in the NRBV to assess the links between GSCM, GHRM and environmental performance. The key theoretical argument underpinning the hypotheses is that companies who want to improve their environmental performance through GSCM practices need to effectively engage the key stakeholders involved in implementing these practices, namely, their employees in order to support successful implementation (Hart, 1995; Hart & Dowell, 2011). The following sections present the variables and the hypothesised relationships between them as outlined in Figure 1.

3.1 | GSCM

The concept of GSCM is captured in different ways across different studies. Broadly speaking, it includes a range of internal and supply chain level practices targeted towards addressing product and process-based environmental challenges. A wide range of environmental practices are considered in the GSCM literature reflecting the heterogeneity of practical responses being implemented by different companies. In capturing the concept of GSCM, we sought to identify practices that reflect the practical implementation of the proactive environmental strategies outlined in the NRBV, namely, pollution prevention, product stewardship and sustainable development (Hart, 1995; Hart & Dowell, 2011). It is these strategies that are proposed to generate competitive advantage, so it was important to identify practices that reflect their implementation. As highlighted in the theoretical framework in Table 1. The NRBV practice of pollution prevention advocates a proactive approach to environmental management as opposed to a reactive pollution control strategy (Hart & Dowell, 2011). GSCM practices, such as waste reduction, become a key vehicle for improving environmental

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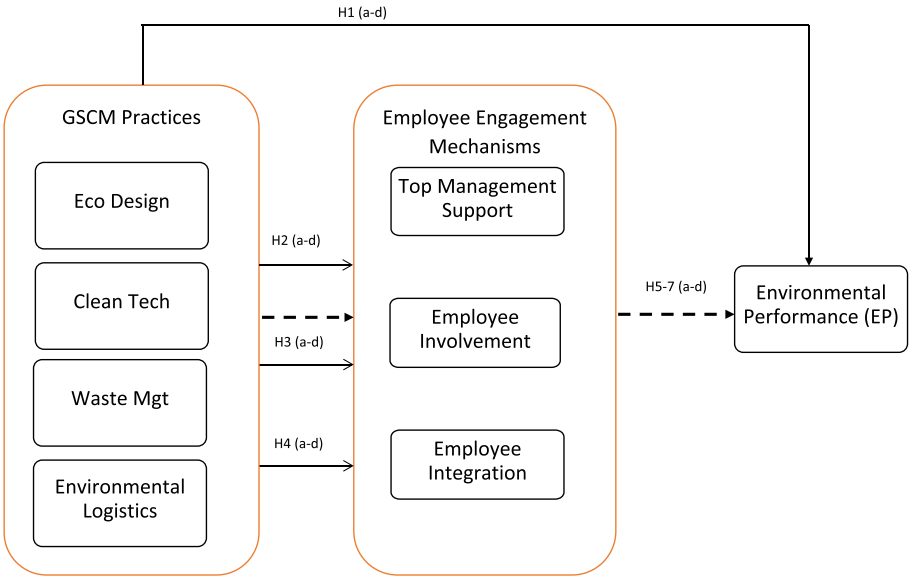
FIGURE 1 Conceptual framework.



performance through continuous improvement and reduction of waste at source (pollution prevention), for example, the elimination of excess packaging (Graham & McAdam, 2016; Hart & Dowell, 2011). Product stewardship goes a step beyond pollution prevention to consider the environmental impact of products throughout their life cycle as well as environmental impacts created throughout supply chain processes (Graham, 2018; Hart & Dowell, 2011). For example, eco-design is focused on addressing environmental impacts created by a product throughout its life cycle and is conducted at the pre-production stage of the process (Sarkis et al., 2010; Zhu & Sarkis, 2007). We also include the practice of environmental logistics that captures efforts to reduce environmental impacts and carbon emissions generated through transportation and logistics activities, that is, logistics pooling (Velazquez et al., 2015). Lastly, sustainable development relates to a long-term shared vision, which includes the implementation of radical innovations such as the adoption of new clean technology to reduce energy usage (Alt et al., 2015; De Stefano et al., 2016; Hart & Dowell, 2011). Logically, the introduction of cleaner technology in supply chains should have a positive effect on environmental performance by replacing obsolete pollution control technology, reducing energy usage (Radonjiča & Tominc, 2007) and, in some cases, giving the firm a competitive advantage through novel proprietary technology (De Stefano et al., 2016; Hart & Dowell, 2011).

A key objective for collectively implementing the aforementioned GSCM practices is to improve the environmental performance of operations and supply chain-level activities. Improvements in environmental performance include, but are not limited to, reduction of waste, reduced fuel consumption and emissions from logistics activities, increased reusability and recyclability of components, and energy reduction through clean technology adoption (Gondivan & Hasanagic, 2018; Pazirandeh & Jafari, 2013; Pullman et al., 2009). The relationship between GSCM practices and environmental performance is already supported empirically by a number of studies (Graham, 2018; Green et al., 2012; Rao & Holt, 2005; Vachon & Klassen, 2008); thus, we hypothesise

> **Hypothesis 1.** There is a positive association between the GSCM practices (*H1a*) eco-design, (*H1b*) clean technology adoption, (*H1c*) waste reduction, (*H1d*) environmental logistics and environmental performance.

3.2 | GHRM

GHRM practices are mechanisms through which companies can engage with, equip and support their employees to adapt to changes associated with implementing environmental strategies. The implementation of new practices or any form of change requires effective communication and engagement with the employees who will be responsible for managing the day-to-day practical aspects of change (Cadden et al., 2020; Daily & Huang, 2001; Delmas et al., 2011). GHRM practices can help create an environment that is more conducive to implementing new practices by shaping organisational culture and bringing employees on board with efforts (Cadden et al., 2020; Ren et al., 2022; Ronnenberg et al., 2011). Top management support, employee involvement and employee integration are recognised as key GHRM practices essential for supporting the changes required for the implementation of environmental practices (Longoni & Cagliano, 2015; Renwick et al., 2012; Ronnenberg et al., 2011). While studies highlight other GHRM practices such as environmental training, environmental rewards and environmental recruitment as important (Nejati et al., 2017; Renwick et al., 2012; Sarkis et al., 2010), these practices tend to be more focused on supporting specific training, development and motivation needs on an ongoing basis. It is beyond the scope of this study to consider all of the GHRM practices identified in the literature; thus, we focus on the broader practices of top management support, employee involvement and employee

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integration as mechanisms for engaging with employees and bringing them on board with environmental efforts.

3.3 | The relationship between GSCM and GHRM

A strong case is developing in the literature to suggest that employee engagement, through the mechanism of GHRM practices, represents an important piece of the puzzle in understanding more about 'how' companies successfully implement GSCM practices (Daily et al., 2012; Nejati et al., 2017). Insights can also be taken from the literature on lean implementation, where similar arguments have been developed and supported empirically. For example, Cadden et al. (2020) found that lean implementation led to positive operational outcomes when mediated with an employee-oriented culture. Bortolotti et al. (2015) also reported the importance of an employee-centric orientation in achieving high-performance outcomes from lean implementation. Thus, for companies seeking to implement GSCM practices, ensuring there are mechanisms through which they can effectively engage their employees will be an essential step in the implementation journey.

Employee engagement to support GSCM implementation should be an ongoing process, using mechanisms that facilitate continuous, two-way engagement (Longoni & Cagliano, 2015). Training and development mechanisms alone will not be sufficient to deliver the deeper, cultural changes needed to support the successful, ongoing implementation of new practices (Cadden et al., 2020). The importance of top management support as a mechanism for implementing change, empowering employees and instituting systems to promote desired behaviour is widely recognised in the environmental management literature (Daily et al., 2012; Ronnenberg et al., 2011; Yu et al., 2020). If the importance of environmental efforts is not communicated clearly by the top management, the level of engagement with employees to support these efforts will be hindered (Daily et al., 2012; Ren et al., 2022). Top management support is also particularly important for implementing change, and thus, it is important in terms of adopting new clean technologies (Hart & Dowell, 2011), which often results in managing disruptive and complex change and engaging employees to accept such change (Singh et al., 2020). Top management support therefore relates to the idea of shared-vision in the NRBV (De Stefano et al., 2016; Hart & Dowell, 2011). It is also important for employees to feel involved and empowered in the process of implementing environmental practices (Cadden et al., 2020; Daily et al., 2012; Longoni & Cagliano, 2015). Employee involvement comprises efforts to promote awareness and motivation among employees, provide appropriate training and development opportunities and develop mechanisms to support two-way communication to support the implementation of environmental practices (Graham & McAdam, 2016; Ronnenberg et al., 2011). Employee integration captures the mechanisms used to support communication of the environmental agenda on an ongoing basis, including development of environmental teams, meetings and other environmental knowledge sharing activities. These activities are important for function spanning activities such as eco-design and product stewardship in the context of the NRBV (Chen & Paulraj, 2004; De Stefano et al., 2016; Graham & McAdam, 2016). Considered together, these GHRM practices are mechanisms for engaging employees and bringing them on board to support the implementation of GSCM practices (Daily et al., 2012; Ronnenberg et al., 2011; Yu et al., 2020). Thus, we argue that companies implementing GSCM practices will also implement GHRM practices to engage their employees to support these efforts as captured in the following hypotheses:

> **Hypothesis 2.** There is a positive association between the GSCM practices (*H2a*) eco-design, (*H2b*) clean technology adoption, (*H2c*) waste reduction, (*H2d*) environmental logistics and top management support.

> **Hypothesis 3.** There is a positive association between the GSCM practices (*H3a*) eco-design, (*H3b*) clean technology adoption, (*H3c*) waste reduction, (*H3d*) environmental logistics and employee involvement.

> **Hypothesis 4.** There is a positive association between the GSCM practices (*H4a*) eco-design, (*H4b*) clean technology adoption, (*H4c*) waste reduction, (*H4d*) environmental logistics and employee integration.

3.4 | The mediating influence of GHRM on the relationship between GSCM and performance

The implementation of new GSCM practices initiates a range of practical changes to processes and organisational routines (Silva et al., 2019). From an NRBV standpoint (see Table 1), the integration of key stakeholders is a key aspect of the NRBV and represents an important vehicle for supporting the integration of GSCM practices (Hart & Dowell, 2011; McDougall et al., 2019). By integrating employees in pollution prevention (waste reduction practices), product stewardship (eco-design initiatives) and sustainable development (clean technology adoption), firms can create socially complex practices, which allow firms to transform individual environmental practices into collective supply chain capabilities (Barney, 1991; Hart, 1995; McDougall et al., 2019; Shi et al., 2012). It is these capabilities that allow firms to enhance environmental performance (Graham & McAdam, 2016; Hart & Dowell, 2011). As highlighted in Hart and Dowell (2011, p. 1473), 'Proactive environmental strategies are dependent upon specific and identifiable processes, which are socially complex and specific to organisations'. This is also supported by recent research by Singh et al. (2020) who find that socially oriented GHRM practices mediate the relationship between green innovation and environmental performance. Conversely, a lack of appropriate employee engagement mechanisms could hinder the potential for environmental performance improvements to be achieved from GSCM practices. If employees are not fully aware of the changes required from them to implement new practices, the implementation is unlikely to obtain the desired results (Daily

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et al., 2012; Delmas et al., 2011; Ren et al., 2022). Further, poor communication about the reasons for change could lead to employee resistance that would also have a negative impact on the implementation process and hinder the potential for improvements to be achieved, for example, resistance to the adoption of new clean technology (De Stefano et al., 2016; Nejati et al., 2017). In light of the perceived importance of employee engagement reflected in the GSCM literature (Daily et al., 2012; Ronnenberg et al., 2011; Yu et al., 2020), we consider it to be a critical success factor in the implementation of GSCM practices as reflected in the following hypotheses:

Hypothesis 5. Top management support mediates the relationship between (*H5a*) eco-design, (*H5b*) clean technology, (*H5c*) waste reduction, (*H5d*) environmental logistics and environmental performance.

Hypothesis 6. Employee involvement mediates the relationship between (*H6a*) eco-design, (*H6b*) clean technology, (*H6c*) waste reduction, (*H6d*) environmental logistics and environmental performance.

Hypothesis 7. Employee integration mediates the relationship between (*H7a*) eco-design, (*H7b*) clean technology, (*H7c*) waste reduction, (*H7d*) environmental logistics and environmental performance.

4 | RESEARCH METHODOLOGY

The UK manufacturing sector provides the context for this research. Pressures on UK businesses are at an all-time high. With the impacts of Brexit and COVID-19 permeating businesses across sectors, unprecedented challenges have hit businesses like a tsunami. The UK manufacturing sector represents an output of £396.6Bn, which contributes 11% to UK GVA. Unemployment in the sector rose by over 50,000 during the year 2019–2020 (ONS, 2020), with 52% of firms having to make redundancies and over 80% of manufacturers reporting a fall in sales and orders (Make UK, 2021). Coupled with societal and government attention on climate change, UK manufacturing is under the microscope like never before. This unprecedented set of challenges and environmental pressures results in the UK manufacturing sector providing an extremely topical and valuable context to investigate.

4.1 | Data collection

A sample of 1500 UK manufacturing companies was obtained using a national database of key industry sectors. Standard Industry Classification (SIC) codes were used to develop a population of manufacturing companies across a range of industries. A population of 5135 companies was identified at this first stage. Following this, random sampling was applied leading to the development of a final sample of 1500 companies to be surveyed. This sample included small, medium and large companies as environmental challenges and pressures can affect all companies regardless of size. In order to target those most knowledgeable about the environmental practices within their organisation, we sought responses from operations, production, environmental managers or equivalent as key informants. In accordance with Dillman's (2007) total design method, we included a personalised cover note outlining the purpose of the study along with a reassurance of anonymity, an instruction guide and an offer of a composite summary of the research results in the initial mailing of the survey. A reminder to complete the survey was sent out to all respondents a week after the initial mailing, followed by full reissuing of the survey packs to non-respondents 3 and 7 weeks later after initial contact.

TABLE 2 Sample characteristics.

Characteristics	Number (%)
Industry	
Automotive and aerospace	61 (16)
Chemical and pharmaceutical	53 (13)
Electrical/electronic	22 (6)
Food and beverage	42 (11)
Mechanical	47 (12)
Utility	71 (18)
Textile good	83 (21)
Others	14 (4)
Position	
CEO/president/owner/managing director	76 (19)
Operations/production/factory manager	154 (39)
General manager	67 (17)
Environmental manager or equivalent	87 (22)
Other	10 (3)
Organization size (no of employees)	
Less than 50	71 (18)
50–100	83 (21)
101–249	105 (27)
250–499	29 (7)
500–999	85 (22)
1000+	21 (5)
Industry experience	
6–10 years	339 (89)
11–15 years	35 (9)
16 years or more	20 (2)
Sales turnover	
Under £1 M	123 (31)
£1M–£10M	76 (19)
£11M–£50M	54 (14)
£51M–£100M	46 (12)
Over £100M	95 (24)

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We received 411 responses, of which 17 were deemed unusable following a two-step screening process for missing data (Hair et al., 2010). Responses with missing data exceeding 10% were removed in the first step. Responses with missing data exceeding 5% on a single variable were examined in the second step to assess if the data were missing completely at random (MCAR), using Little's MCAR test (Hair et al., 2010). Post screening, 394 usable surveys remained generating an effective response rate of 26.2%. Further, the data followed the assumption of normality as the skewness and kurtosis indices were within the acceptable ±2 range (George & Mallery, 2010). Also, scores of variance inflation factor (VIF) less than 5 indicated the absence of multicollinearity issues in the dataset (Kalnins, 2018). Table 2 outlines the characteristics of the companies who responded to the survey, including industry sector, position of respondent and the number of employees. Respondents represented a range of key manufacturing sectors, including automotive and aerospace, chemical and pharmaceutical, food and beverage and textile. The respondents all held senior positions in the firm, such as CEO/MD, operations manager, general manager and environmental manager. Further, 89% of respondents had over 5 years' experience with 76% having over 10 years' experience. Therefore, respondents were deemed to have sufficient experience and knowledge to respond to the survey. Respondents were also asked to complete the survey in relation to their own organization and were asked to confirm their level of knowledge on the themes investigated in the survey using a 7-point Likert scale to ensure that they were in a position to provide a credible response. A mean score of 6.1/7 (87.1%) was received in response to this, providing additional reassurance that respondents completing the questionnaire were knowledgeable of their firms' environmental practices and policies.

4.2 | Measurement scales

To capture the GSCM practices, four constructs were used, namely, eco-design (ED), clean technology (CT), waste management (WM) and environmental logistics (EL). GHRM was captured through three constructs: top management support (MS), employee involvement (EI) and employee integration (EMI). The dependent variable was captured through an environmental performance (EP) construct. Scales used to measure these constructs were adapted from pre-established scales present in the literature. A 7-point Likert scale anchored from either 'strongly agree' or 'a very great extent' (=7) to 'strongly disagree' or 'not at all' (=1) or 'not at all' to 'a very great extent' was used to assess the responses to each of the questions.

The scales used to measure each construct are outlined in Table 3. ED is comprised of four items adapted from Zhu and Sarkis (2007). ER and WR are both composed of six items, obtained from Graham and Potter (2015) and Graham and McAdam (2016), respectively. EL is composed of four items adapted from Gonzalez-Benito and Gonzalez-Benito (2006) and Pazirandeh and Jafari (2013). TM has three items and EI has four items, both adapted from measures used by Ronnenberg et al. (2011). EMI has four items and is an adaptation from Chen and Paulraj (2004), Tashman and Marano (2009), and Graham and McAdam (2016). EP has five items and is an established scale used by Pullman et al. (2009) and Graham and McAdam (2016). Minor modifications were made in the item wording to fit the research context.

A number of control variables were included in the study that may impact environmental practices and outcomes. Organization size, industry experience and sales turnover are common control variables in environmental studies within operations management and were therefore deemed appropriate for this study.

4.3 | Non-response bias

To assess for the presence of non-response bias, two tests were conducted. Firstly, an independent *t*-test was conducted to compare early ($n = 202$) and late ($n = 192$) respondents against all scales (Armstrong & Overton, 1977). The independent *t*-test result did not find any significant differences between the two groups. Additional *t*-tests were conducted on key variables and control variables, such as company size and age. No significant differences were revealed providing confidence that non-response bias does not appear to be an issue in this study.

4.4 | Common method bias (CMB)

As the response was collected from a single informant in each company, CMB could impose a threat to the validity of the study. Hence, techniques such as protecting anonymity of respondents and using well-concise and simple items were used to minimise the threats of CMB (Podsakoff et al., 2003). Further, Harman's single-factor test was performed in SPSS 26.0 using exploratory factor analysis (EFA), a one-factor model, to assess the CMB issue. Results indicated that the one-factor model accounted for 27.87% of 'average variance extracted' score, which was well below the 50% cut-off, indicating freedom from the pervasive threat of bias (Podsakoff et al., 2003).

5 | RESULTS

5.1 | Measurement model

The hypothesised measurement models of constructs were tested using first-order CFA models [first step of structural equation modelling (SEM)] in AMOS 26.0. Maximum likelihood (ML) estimation method based on the variance–covariance matrix was selected for analysis. The CFA measurement models were validated by examining goodness-of-fit indices. Items loading above 0.50 were retained for the scales (Hair et al., 2010). Holistic-fit

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TABLE 3 Constructs scales.

Construct	Items	Adapted from
GSCM environmental practices		
Eco-design (ED)[a]	**ED1**—the potential impact of our products on the environment has become an important consideration in their design and development **ED2**—seek to reduce consumption of energy and resources when designing our products **ED3**—design our products with consideration of reuse, recyclability and recovery of materials and component parts **ED4**—seek to avoid or reduce use of hazardous materials in the design of our products	Zhu and Sarkis (2007)
Clean technology (CT)[a]	**CT1**—have taken steps to reduce energy consumption throughout the business **CT2**—monitor our energy-use data to track improvements **CT3**—employees are trained to support energy reduction efforts within their roles **CT4**—have invested in technology to facilitate reduction of energy consumption (e.g., LED lighting, newer machinery and heat recovery) **CT5**—have/plan to invest in renewable energy sources (e.g., solar and wind) **CT6**—new technologies have supported our energy reduction efforts	Hart and Dowell (2011); Radonjiča and Tominc (2007); De Stefano et al. (2016)
Waste management (WM)[a]	**WM1**—monitor levels of waste within processes to identify areas for improvement **WM2**—strive to eliminate unnecessary waste from our processes **WM3**—employees are trained to support waste management efforts within their roles **WM4**—seek to reuse and recycle waste where possible **WM5**—have reduced the amount of waste we send to landfill through our waste management practices **WM6**—external organisations have supported our waste reduction efforts (e.g., waste management companies)	Graham and Potter (2015); Graham and McAdam (2016)
Environmental logistics (EL)[a]	**EL1**—consider the environmental impact of our transport and logistics activities **EL2**—plan and coordinate our transport and logistics activities in attempt to reduce negative environmental impact **EL3**—seek ways to further reduce the environmental impact of our logistics activities **EL4**—reducing the environmental impact of our transport and logistics activities is important to us	Gonzalez-Benito and Gonzalez-Benito (2006); Pazirandeh and Jafari (2013)
GHRM mechanisms		
Top management support (MS)[a]	**MS1**—there is a clear commitment from top management to tackle environmental concerns **MS2**—top management devotes adequate resources to the implementation of environmental practices **MS3**—top management encourages all employees to engage with environmental efforts	Ronnenberg et al. (2011)
Employee involvement (EI)[a]	**EI1**—employees are trained to participate in and support environmental efforts **EI2**—employee suggestions are encouraged and taken on board **EI3**—the importance of tackling environmental concerns is communicated to all employees **EI4**—areas of improvement/success in relation to environmental performance are communicated to all employees to encourage further engagement **EI5**—getting employees to 'buy in' to environmental efforts is important	Ronnenberg et al. (2011)
Employee integration (EMI)[a]	**EMI1**—we have cross-functional environmental teams to facilitate communication across departments **EMI2**—we hold regular meetings that include discussion of environmental initiatives **EMI3**—environmental objectives are continually reinforced throughout the company **EMI4**—we actively share knowledge across departments in order to minimise our environmental impact	Chen and Paulraj (2004); Tashman and Marano (2009); and Graham and McAdam (2016)
Environmental performance		
Environmental performance (EP)[b]	**EP1**—reduced energy usage **EP2**—improved waste management **EP3**—reduced carbon dioxide emissions **EP4**—reduced consumption of hazardous/harmful/toxic materials **EP5**—reduced overall environmental impact of production	Pullman et al. (2009); and Graham and McAdam (2016)

[a]Seven-point Likert scale with 1 = strongly disagree and 7 = strongly agree.
[b]Seven-point Likert scale with 1 = not at all and 7 = very great extent.

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examination showed an acceptable fit for all measurement models. The relative chi-square (χ^2/df) was 3.21 (below 5); comparative fit index (*CFI*) and Tucker–Lewis index (*TLI*) were 0.95 and 0.95, respectively (above 0.90 threshold); and root mean square error of approximation (*RMSEA*) was 0.05 (below 0.08 threshold). All of the scales show item loadings ranging between 0.61 and 0.81 (Hair et al., 2010). The CFA results are presented in Table 4.

TABLE 4 CFA measurement models results.

Constructs	Items	Loading
Eco-design (ED)	ED1	0.672
	ED2	0.712
	ED3	0.611
	ED4	0.646
Clean technology (CT)	GT1	0.771
	GT2	0.798
	GT3	0.762
	GT4	0.712
	GT5	0.616
	GT6	0.799
Waste management (WM)	WM1	0.81
	WM2	0.752
	WM3	0.734
	WM4	0.801
	WM5	0.812
	WM6	0.652
Environmental logistics (EL)	EL1	0.755
	EL2	0.801
	EL3	0.793
	EL4	0.751
Top management (TM)	MS1	0.816
	MS2	0.865
	MS3	0.798
Employee involvement (EI)	EI1	0.834
	EI2	0.711
	EI3	0.858
	EI4	0.819
	EI5	0.691
Environmental integration (EMI)	EM1	0.701
	EM2	0.682
	EM3	0.752
	EM4	0.803
Environmental performance (EP)	EP1	0.822
	EP2	0.765
	EP3	0.631
	EP4	0.757
	EP5	0.693

5.2 | Scale validation

We examined the construct validity by means of convergent validity and discriminant validity. Convergent validity was established through average variance extracted (AVE). AVE scores of dimensions of GSCM and GHRM constructs as well as environmental performance achieved a minimum score of 0.50, indicating adequate convergent validity (as given in Table 5) (Hair et al., 2010). The internal consistency was established by Cronbach's alpha and composite reliability. Scores above 0.70 threshold for Cronbach's alpha and composite reliability indicated reliable measures (as given in Table 5) (Hair et al., 2010). Further, the Fornell–Larcker criterion was utilised to assess discriminant validity that compares the square root of the AVE of each construct with the correlation between the construct and others (Fornell & Larcker, 1981). Results shown in Table 5 indicated that the square root of the AVE of each construct exceeds their respective paired correlation, confirming sufficient discriminant validity.

5.3 | Structural model

Before testing the hypotheses, bidirectional correlations among variables were determined to understand the tentative directions of their associations (Table 5). All the variables were positively and significantly correlated with each other. These bidirectional correlations cannot predict hypothetical relationships; hence, structural model (second step of SEM) in AMOS 26.0 was examined. Here, GSCM environmental practices, namely, 'eco-design', 'clean technology', 'waste management' and 'environmental logistics', were considered as the independent variables (IV). GHRM mechanisms, namely, 'top management support', 'employee involvement' and 'employee integration', were the mediators (M), and 'environmental performance' was considered as the dependent variable (DV).

SEM results showed that model fit was found to be within the requisite ranges of the key indices and therefore can be reported as acceptable. The χ^2/df was non-significant (2.75, $p = .31$); the $CFI = 0.98$; $TLI = 0.97$; and the $RMSEA = 0.04$ (Hair et al., 2010). Table 6 first shows the direct relationships between GSCM practices and environmental performance. All GSCM practices and environmental performance ('eco-design', 'clean technology', 'waste management' and 'environmental logistics') were positively and significantly related to 'environmental performance' ($\beta = .42$, $p < .05$; $\beta = .51$, $p < .05$; $\beta = .62$, $p < .01$; and $\beta = .61$, $p < .01$, respectively). Therefore, *H1a–H1d* were supported. Table 6 then illustrates the relationships between GSCM practices and GHRM mechanisms. 'Eco-design' had a non-significant relationship with 'top management' ($\beta = -.37$, $p > .05$), yet 'clean technology' ($\beta = .36$, $p < .05$), 'waste management' ($\beta = .41$, $p < .05$) and 'environmental logistics' ($\beta = .38$, $p < .01$) were positively and significantly linked to 'top management'. Hence, these results provided grounds for rejecting *H2a* but supporting *H2b–H2d*. All GSCM practices ('eco-design', 'clean technology', 'waste management' and 'environmental logistics') were positively and significantly related to 'employee involvement' ($\beta = .32$, $p < .01$; $\beta = .25$, $p < .01$;

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TABLE 5 Scale validation—Reliability and validity.

	ME	SD	α	CR	AVE	ED	ER	WM	EL	TM	EI	EMI	EP
ED	23.12	1.14	0.80	0.82	0.76	***0.87***							
CT	32.53	2.01	0.89	0.91	0.78	0.38**	***0.88***						
WM	33.83	1.16	0.90	0.92	0.81	0.42**	0.37**	***0.9***					
EL	21.15	2.9	0.95	0.96	0.87	0.41**	0.51**	0.39**	***0.93***				
TM	16.06	1.48	0.95	0.96	0.76	0.24**	0.32**	0.36**	0.26**	***0.87***			
EI	26.84	1.71	0.94	0.95	0.84	0.24**	0.32**	0.30**	0.26**	0.42**	***0.92***		
EMI	23.12	1.94	0.92	0.94	0.81	0.17*	0.24**	0.18*	0.31**	0.45**	0.36**	***0.90***	
EP	27.89	0.98	0.91	0.92	0.82	0.43**	0.18*	0.38**	0.47**	0.47**	0.29**	047**	***0.91***

Note: *Italic values* in the diagonal row are √AVE.

Abbreviations: AVE, average variance extracted; CR, composite reliability; CT, clean technology; ED, eco-design; EI, employee involvement; EL, environmental logistics; EMI, environmental integration; EP, environmental performance; ME, mean; SD, standard deviation; TM, top management; WM, waste management; α, Cronbach's alpha.

**Correlations are significant at the .01 level (two-tailed).

TABLE 6 Hypotheses testing.

Hypotheses	Causal path	*β*	*SE*	Decision
Relationship between GSCM practices and environmental performance				
H1a	ED→EP	.42*	0.10	Supported
H1b	CT→EP	.51*	0.13	Supported
H1c	WR→EP	.62**	0.11	Supported
H1d	EL→EP	.61**	0.13	Supported
Relationship between GSCM practices and GHRM mechanisms				
H2a	ED→TM	−.37	0.06	Rejected
H2b	CT→TM	.36*	0.04	Supported
H2c	WR→TM	.41*	0.03	Supported
H2d	EL→TM	.38**	0.05	Supported
H3a	ED→EI	.32*	0.07	Supported
H3b	CT→EI	.25**	0.07	Supported
H3c	WR→EI	.52**	0.05	Supported
H3d	EL→EI	.27*	0.04	Supported
H4a	ED→EMI	.17	0.06	Rejected
H4b	CT→EMI	.28**	0.09	Supported
H4c	WR→EMI	.33*	0.08	Supported
H4d	EL→EMI	.39*	0.05	Supported

Abbreviations: CT, clean technology; ED, eco-design; EI, employee involvement; EL, environmental logistics; EMI, environmental integration; EP, environmental performance; *SE*, standard error; TM, top management; WM, waste management; *β*, standard beta coefficient.

*$p < .01$.**$p < .01$.

***$p < .001$.

$\beta = .52$, $p < .01$; and $\beta = .27$, $p < .05$, respectively). Therefore, *H3a–H3d* were supported. GSCM practice 'eco-design' had a non-significant relation with 'employee integration' ($\beta = .17$, $p > .05$), yet 'clean technology' ($\beta = .28$, $p < .01$), 'waste management' ($\beta = .33$, $p < .05$) and 'environmental logistics' ($\beta = .39$, $p < .05$) were positively and significantly linked to 'employee integration'. Hence, these results provided grounds for rejecting *H4a* but supporting *H4b–H4d*. Associations between GHRM mechanisms and environmental performance were also examined to confirm they were significantly linked to the dependent variable in advance of the mediation analysis. Results indicated that 'top management support', 'employee involvement' and 'employee integration' were positively and significantly related to 'environmental performance' ($\beta = .32$, $p < .01$; $\beta = .35$, $p < .01$; $\beta = .26$, $p < .05$, respectively).

We examined the postulated mediation effects following two steps—(i) the paths from IV→M (*a*) and M→DV (*b*) are significant ($p < .05$) (joint significance of paths *a* and *b*) and (ii) non-inclusion of zero in the upper (*UL*) and lower limits (*LL*) of the 95% bootstrapping

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confidence interval (*CI*) (Falk & Biesanz, 2016). Bootstrapping is an approach widely recognised for accurately testing mediation in SEM (Adebanjo et al., 2016; Preacher & Hayes, 2004). Bootstrapping in SEM provides unbiased estimates of mediation and provides *CI* (Cheung & Lau, 2008). The bootstrapping approach is regarded as capable of controlling for type I errors and any low power issues when testing mediation through direct and indirect relationships (MacKinnon et al., 2007; Preacher & Hayes, 2004). The SEM bootstrapping method is recognised as more accurate and having less assumptions than other traditional mediation analysis techniques (MacKinnon et al., 2007). Due to the central nature of mediation in this study, the bootstrap approach ($n = 500$ replications) was adopted. Further, if the direct path and indirect effects are both significant, mediation is known as 'partial mediation', and if former is non-significant and latter is significant, it is the case of 'complete mediation' (Baron & Kenny, 1986).

The mediating effects on the relationship between GSCM practices and environmental performance through GHRM mechanisms are shown in Table 7. Indirect effects are calculated as the product of the path coefficients between the IV (the four dimensions of GSCM practices: eco-design, clean technology, waste management and environmental logistics) and three Ms (three dimensions of GHRM mechanisms: top management, employee involvement and employee integration) and between these Ms and DV (environmental performance). Results indicate that 'top management support' could not mediate the path between 'eco-design' and 'environmental performance' as the path involved from 'eco-design' to 'top management support' was non-significant, respectively. Thus, *H5a* was rejected. Remaining mediation paths were positively significant. Paths from 'clean technology', waste management' and 'clean technology' to 'top management' as well as path from 'top management' to 'environmental performance' were positively significant. The 95% bootstrapping *CI* results confirmed the absence of zero within *UL* and *LL*. 'Top management' mediated the path between 'clean technology' (*UL CI* = 0.3231, *LL CI* = 0.0624), 'waste management' (*UL CI* = 0.4232, *LL CI* = 0.1101) and 'environmental logistics' (*UL CI* = 0.3127, *LL CI* = 0.0421) and 'environmental performance'. Therefore, *H5b–H5d* were supported. The indirect effect size of 'top management support' in mediating the relationship between GSCM practices (except 'eco-design') and 'environmental performance' was relatively moderate.

Further, paths from 'eco-design, 'clean technology', waste management' and 'environmental logistics' to 'employee involvement' as well as path from 'employee involvement' to 'environmental performance' were positively significant. The 95% bootstrapping CI results

TABLE 7 Mediation.

Hypotheses	Indirect path	Indirect effect size (*ab*)	95% Bootstrap *CI*		Decision
			LL	*UL*	
Mediating effect of GHRM mechanisms on relation between GSCM practices and environmental performance					
H5a	ED→TM→EP	Mediation not supported as *H2a* non-significant			
H5b	CT→TM→EP	0.115^{PM}	0.0624	0.3231	Supported
H5c	WR→TM→EP	0.131^{PM}	0.1101	0.4232	Supported
H5d	EL→TM→EP	0.121^{PM}	0.0421	0.3127	Supported
H6a	ED→EI→EP	0.112^{PM}	0.0421	0.3127	Supported
H6b	CT→EI→EP	0.088^{PM}	0.1446	0.5620	Supported
H6c	WR→EI→EP	0.178^{PM}	0.0037	0.2231	Supported
H6d	EL→EI→EP	0.095^{PM}	0.0131	0.1376	Supported
H7a	ED→EMI→EP	Mediation not supported as *H4a* non-significant			
H7b	CT→EMI→EP	0.073^{PM}	0.0265	0.1146	Supported
H7c	WR→EMI→EP	0.086^{PM}	0.0310	0.2323	Supported
H7d	EL→EMI→EP	0.101^{PM}	0.0068	0.3230	Supported
Direct effect		*β*	*SE*		
ED→EP		0.31^{*}	0.06		
CT→EP		0.24^{*}	0.04		
WR→EP		0.22^{**}	0.05		
EL→EP		0.29^{**}	0.07		

Abbreviations: *a*, path from independent variable to mediator; *b*, path from mediator to dependent variable; *CI*, confidence interval; CT, clean technology; ED, eco-design; EI, employee involvement; EL, environmental logistics; EMI, environmental integration; EP, environmental performance; *LL*, lower limit; *SE*, standard error; TM, top management; *UL*, upper limit; WM, waste management; *β*, standard beta coefficient; ^{PM}, both significant direct and indirect effects indicate 'partial mediation'.

$^{*}p < .01$. $^{**}p < .01$.

$^{***}p < .001$.

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indicated that 'employee involvement' significantly mediated the relationship between 'eco-design' (*UL CI* = 0.3127, *LL CI* = 0.0421), 'clean technology' (*UL CI* = 0.5620, *LL CI* = 0.1446), 'waste management (*UL CI*=0.2231, *LL CI*=0.0037) and 'environmental logistics' (*UL CI* = 0.1376, *LL CI* = 0.0131) and 'environmental performance'. Hence, providing grounds for supporting *H6a–H6d*. The indirect effect size of 'employee involvement' on mediating the relationship between two GSCM practices ('eco-design' and 'environmental logistics') and 'environmental performance' was moderate, and it was also moderate for the remaining links.

Path from 'eco-design' to 'employee integration' was not significant; thus, 'employee integration' failed to mediate the relationship between 'eco-design' and 'environmental performance', hence rejecting *H7a*. Remaining paths, 'clean technology', 'waste management' and 'environmental logistics' to 'employee involvement' as well as path from 'employee involvement' to 'environmental performance' were positively significant. The 95% bootstrapping CI results indicated that 'employee integration' mediated the path between 'clean technology' (*UL CI* = 0.1146, *LL CI* = 0.0265), 'waste management' (*UL CI* = 0.2323, *LL CI* = 0.0310) and 'environmental logistics' (*UL CI* = 0.3230, *LL CI* = 0.0068) and 'environmental performance'. Therefore, *H7b–H7d* were supported. The indirect effect size of 'employee integration' in mediating the relationship between GSCM practices (except 'eco-design') and 'environmental performance' was moderate while other indirect effects were relatively low. While the direct relationship between GHRM practices and environmental performance remained significant on the introduction of HSCM mechanisms, their significance was reduced but was still different from zero. According to Zhao et al. (2010), such type of mediation is known as 'complementary mediation'.

Therefore, the supported hypotheses noted above reflect partial (or complementary) rather than full mediation (see Agyabeng-Mensah et al., 2020). This suggests that GSCM practices are associated with environmental performance improvements directly but the inclusion of supporting GHRM mechanisms adds strength to the model as the direct effects are weakened when the mediating variables are included (Agyabeng-Mensah et al., 2020).

Regarding the control variables, organization size, industry experience and sales turnover were tested on environmental performance for significance. The results showed that no significant differences were found, with scores of .19, .15 and .21, respectively.

6 | DISCUSSION

Our study has examined the role of employee engagement, through the mechanism of GHRM practices, in supporting successful implementation of GSCM practices as reflected through improved environmental performance. Results from a survey of 394 UK manufacturing companies support most of the hypotheses, suggesting that GHRM practices play a crucial role in supporting the implementation of GSCM practices. This section provides an overview of the results and their implications for theory and practice.

6.1 | Implications for theory

Our study makes several important theoretical contributions. Firstly, examining our results holistically, our paper finds empirical support for the important role of employee engagement in supporting the successful implementation of GSCM to enhance environmental performance. This represents an important finding in itself; however, when we delve deeper into the aforementioned relationship, the theoretical implications of this finding really come to the fore. Secondly, as shown in Table 1, this study fully operationalises the NRBV and links environmental practices to the development of green supply chain capabilities. This paper therefore contributes to NRBV literature more generally, by strengthening the link between theory and practice in supply chain settings (Shi et al., 2012). This is important, as many studies fail to fully incorporate the NRBV framework within empirical research, instead they apply the framework in an abstract way, or focus on one specific element of the NRBV (McDougall et al., 2019; Shi et al., 2012). Moreover, it also helps breakdown complex theoretical constructs, such as product stewardship, into digestible SC practices for practitioners (see Table 1). Thirdly, this study deconstructs the GSCM–environmental performance relationship, thus having important implications for both theory and practice. The results of this study suggest that engagement with key stakeholders (employee engagement) is important for supporting the implementation of environmental strategies and progressing towards more advanced levels of implementation (Hart, 1995; Hart & Dowell, 2011). More specifically, when NRBV practices are combined with GHRM practices, such as top management support, employee involvement and employee integration, they create intangible and socially complex capabilities (Barney, 1991; Cadden et al., 2020; Hart, 1995), which in turn enhances environmental performance across the supply chain. The observation that these capabilities are socially constructed directs management to apply these practices to other areas of the supply chain. For example, top management support plays a key role in creating a shared vision (Hart, 1995), which in turn can be used to align employees and suppliers with the firm's sustainable SC strategies, for example, clean technology adoption.

In the testing of the mediation hypotheses, this study builds upon the GSCM literature base, as few studies consider the practices that should be developed alongside GSCM practices to support implementation efforts (Singh et al., 2020). Building on preliminary empirical results from qualitative studies outlining the crucial role of GHRM practices in supporting implementation (Longoni & Cagliano, 2015; Texeira et al., 2012), we make an important contribution to this emergent theme of research seeking to understand more about 'how' companies can successfully implement environmental practices by providing empirical support for the role of GHRM practices as mechanisms for supporting successful implementation. In doing so, we also respond to the many calls for studies to develop an understanding of the factors that support successful implementation of GSCM practices (Bianchi et al., 2021; De Burgos-Jiminez et al., 2014; Graham & McAdam, 2016; Longoni & Cagliano, 2015). Our results provide support for the vast majority of the mediated pathways between GSCM

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and environmental performance through GHRM practices. It is important to note that the results supported partial, rather than full mediation. This finding supports Agyabeng-Mensah et al. (2020), who investigated the influence of internal GSCM practices and the mediating role of GHRM on supply chain cooperation and financial performance. More specifically, the relationships in the mediation analysis in Agyabeng-Mensah et al. (2020) demonstrated partial rather than full mediation for the hypotheses under study (see also Vázquez-Brust et al., 2022). The authors argued that GHRM has an important background role to play in the aforementioned relationships and underline the importance of partial mediation, in comparison with studies that fail to establish such as relationship. Therefore, in the context of this study, it is important for companies to have appropriate GHRM practices in place in order to implement GSCM practices effectively. If they do not engage their employees to support the implementation of GSCM practices, they may not be able to achieve the same level of improvement in environmental performance. This is consistent with the narrative in the GHRM/GSCM literature, which highlights the importance of employee engagement for GSCM implementation (Daily et al., 2012; Longoni & Cagliano, 2015; Nejati et al., 2017; Ren et al., 2022), yet we go a step further to empirically test the combined influence of GSCM/GHRM on environmental performance and conclude that employee engagement may be a key factor in supporting successful implementation.

The non-significant results for the direct association between eco-design, top management support and employee integration respectively (*H2a* and *H4a*) raise a number of interesting questions. It is worth noting that eco-design was the only product design-focused practice we included in our conceptualisation of GSCM. The results supported the positive direct associations between the process-focused (including clean process technology) GSCM practices and GHRM practices and their mediated pathways through GHRM to environmental performance. Thus, there seems to be a distinction in the level of importance of employee engagement in relation to product-/design-focused practices and process-focused practices. This does not necessarily contradict the importance of stakeholder engagement as outlined in the NRBV (Hart, 1995; Hart & Dowell, 2011). Rather, it suggests that engagement with other stakeholder groups, such as suppliers or customers, may be more beneficial for supporting product-focused GSCM practices like eco-design. This would be consistent with findings in the broader new product development (NPD) literature that highlight the importance of engagement with external stakeholders to support the success of NPD efforts (Knudsen, 2007; Potter & Paulraj, 2020). This provides an interesting avenue for future research to consider.

Our study also contributes to research considering the role of stakeholders in relation to GSCM implementation. The influence of stakeholders as antecedents to GSCM implementation is well documented in the extant literature (Liu et al., 2017; Sarkis et al., 2010; Tachizawa et al., 2015), yet their role in supporting GSCM implementation has not received as much research attention. Our data suggest that certain key stakeholder groups, such as the employees who are directly involved in the implementation of GSCM practices, may determine the extent to which these practices are successful. Thus, the role of stakeholders can be extended beyond being antecedents to GSCM, to playing a crucial role in supporting the successful implementation of GSCM. This is consistent with other studies that consider the role of engagement with other key stakeholder groups such as suppliers and customers in supporting improvements in environmental performance (Graham & Potter, 2015; Vachon & Klassen, 2008). It is also consistent with emergent research outlining the importance of engaging employees through GHRM practices when implementing GSCM practices (Longoni & Cagliano, 2015; Ren et al., 2022; Yu et al., 2020).

A further contribution of our study relates to the national context investigated. Studies have explored the link between GHRM and GSCM in contexts such as Malaysia, China, India (Adebanjo et al., 2016; Yu et al., 2020), Brazil (Jabbour et al., 2013; Texeira et al., 2012), Iran (Nejati et al., 2017), Mexico (Daily et al., 2012), Spain (Pereira-Moliner et al., 2012; Sarkis et al., 2010), Italy (Longoni & Cagliano, 2015) and Germany (Delmas et al., 2011), yet, as far as we are aware, no studies have considered these themes within the context of the UK. As noted earlier, the UK provides an interesting context facing a range of unique challenges related to Brexit. Our results suggest that, in spite of these unique challenges, the environmental agenda remains an important focus for UK manufacturing companies who are seeking to engage their employees to support this agenda.

6.2 | Implications for practice

Our study also generates a number of useful insights for managers and practitioners. Firstly, our findings suggest that engaging employees effectively to ensure they are on board with supporting the implementation of environmental practices is an essential step in ensuring that practices can achieve the desired outcome of improving environmental performance. Employees are the actors directly involved with the practices on a day-to-day basis, so having their buy-in is key to ensuring success. Our results also suggest that this applies more in the case of process-based practices (including clean processing technologies), which require input from a broader range of employees and that product-/design-based practices may benefit from engagement with other relevant stakeholders more. Secondly, we outline three key practices as effective mechanisms for employee engagement, namely, top management support, employee involvement and employee integration. This demonstrates how important it is for top management to actively encourage all employees to engage with environmental efforts, to involve them in the process and to ensure effective communication throughout the implementation process and beyond. The more involved employees feel in the environmental agenda, supported by their senior managers, the more motivated they will be to engage with and support these efforts (Longoni & Cagliano, 2015). On the other hand, failure to effectively engage employees in environmental efforts could hinder the potential for these efforts to be successful (Nejati et al., 2017). Finally, if companies want to develop sources of competitive advantage through

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environmental efforts, it is important that they manage the implementation process effectively. Our study has considered the impact of GSCM and GHRM on environmental performance, providing support to suggest that effectively managed implementation can indeed lead to improvements in environmental performance. The potential for improved environmental performance to lead to improvements in other areas of performance such as cost or operational performance is recognised in the literature (De Burgos-Jiminez et al., 2014; Graham & McAdam, 2016; Green et al., 2012). In light of this, managers can take away the point that improving environmental performance may also generate improvement in other areas of organisational performance.

7 | CONCLUSION

This study has addressed the question of whether engagement with key stakeholders, namely, employees, through the mechanism of GHRM practices, supports successful implementation of GSCM practices as reflected through environmental performance outcomes. Our results suggest that the answer to this question is yes, apart from in the case of product-/design-based practices, which may require engagement with other relevant stakeholders to support their implementation. Thus, for the implementation of process-based GSCM practices to be successful in terms of improving environmental performance, employee engagement through GHRM practices plays a key role in bringing employees on board to support these efforts.

7.1 | Limitations and future research directions

While our cross-sectional, survey design enabled the collection of a large amount of data for analysis, which could be considered a strength of the study, we recognise that it also imposes a number of limitations for our research. We were unable to capture the length of time GSCM and GHRM practices have been implemented, which may have an influence on their success. Future studies could examine longitudinal data to assess the extent to which the length of implementation might influence the potential success of these practices. In survey research, there are limitations on the quantity and depth of data that can be collected. Thus, we can only speculate about the non-significant results relating to eco-design, and future research should investigate this further to identify whether other stakeholders are more important to engage when implementing product-based GSCM practices. Future research should continue to consider the different factors that can support the successful implementation of GSCM practices. It might be useful to consider the role of some of the more focused GHRM practices in this regard, such as training and development, environmental recruitment and environmental performance and rewards management.

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