

## RESEARCH ARTICLE

# Demystifying the roles of organisational smart technology, artificial intelligence, robotics and algorithms capability: A strategy for green human resource management and environmental sustainability

Samuel Ogbeibu<sup>1</sup>  | Jude Emelifeonwu<sup>2</sup> | Vijay Pereira<sup>3</sup> | Raphael Oseghale<sup>4</sup> | James Gaskin<sup>5</sup> | Uthayasankar Sivarajah<sup>1</sup> | Angappa Gunasekaran<sup>6</sup>

<sup>1</sup>University of Bradford, Bradford, West Yorkshire, UK

<sup>2</sup>Melchizedek Order International, Scotland, Scotland, United Kingdom

<sup>3</sup>Neoma Business School, Reims, France

<sup>4</sup>University of Hertfordshire, Hatfield, UK

<sup>5</sup>Brigham Young University, Provo, Utah, USA

<sup>6</sup>The Pennsylvania State University, Philadelphia, Pennsylvania, USA

## Correspondence

Samuel Ogbeibu, University of Bradford, Bradford, West Yorkshire, UK.  
Email: [s.ogbeibu@bradford.ac.uk](mailto:s.ogbeibu@bradford.ac.uk), [ogbeibu.s@hotmail.com](mailto:ogbeibu.s@hotmail.com)

## Funding information

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Abstract

With growing climate change concerns, and constant advancements in smart technology, artificial intelligence, robotics, and algorithms (STARA), organisations in emerging economies are becoming more compelled to go green, develop and deploy their STARA capability to boost profits more effectively, and their environmental sustainability (ES). Likewise, with governments increasingly calling for ES, organisations' human resource management (HRM) is further pressured to ensure their programmes aid realisation of environmental objectives without compromising profit maximisation. However, it remains unclear how complementary Green HRM (GHRM) programmes can be supported by organisational STARA capability (OSC) to bolster ES. Accordingly, we investigate how OSC and GHRM programmes *predict* ES through a time lagged survey design with data from 461 managers of 177 manufacturing organisations in Nigeria. Results indicate that OSC positively predicts all GHRM programmes and ES but dampens the positive relationship between green training, involvement and development (GTID), and ES. Apart from green performance and compensation (GPC), which is a negative predictor, other GHRM programmes positively predict ES. While green recruitment and selection (GRS) and GTID are complementary mediators, GPC plays a competitive mediating role. Policy implications are subsequently discussed.

## KEYWORDS

artificial intelligence, environmental sustainability, green human, organisation STARA capability, robotics and algorithm, smart technology

**Abbreviations:** ES, environmental sustainability; GPC, green performance and compensation; GRS, green recruitment and selection; GTID, green training, involvement and development; OSC, organisational STARA capability; STARA, smart technology, artificial intelligence, robotics and algorithms.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2023 The Authors. Business Strategy and The Environment published by ERP Environment and John Wiley & Sons Ltd.

## 1 | INTRODUCTION

The constant innovative developments in *smart technology*, *artificial intelligence (AI)*, *robotics* and *algorithms* (STARA) amid global warming concerns have provoked global calls for manufacturing organisations to explore more cutting-edge work practices for inventing and managing eco-friendly products fundamental to environmental sustainability (ES) improvement (Sahoo et al., 2022; Taylor et al., 2012). Recent research argues that organisations can still maximise profits while ameliorating today's global warming concerns via an effective development and deployment of their STARA capability (Brougham & Haar, 2018; Chen et al., 2018). Organisational STARA capability (OSC) is described as the dynamic resources and innovation-driven knowledge of an organisation deployed to adopt and demonstrate proficiency in STARA in acceptable and adequate ways fundamental to achieving organisational objectives (Brougham & Haar, 2018; Ogbeibu et al., 2021). The drive to adopt and deploy OSC is also motivated by manufacturing organisations' drive to sustain a competitive edge in a hypercompetitive business environment (Chavez et al., 2015; Li et al., 2019). Similarly, while taking into consideration the need to maximise profits for shareholders, organisational leaders are also under pressure to address stakeholder concerns of increased ES (Abdulaziz et al., 2017; Dumont, Sheng, & Deng, 2017; Merriman & Sen, 2012). Consequently, organisational leaders across emerging and developed economies are beginning to initiate future focused work strategies for deploying radical technologies that fosters ES (Berrone et al., 2013; Chan et al., 2016). Chan et al. (2016) and Jassem et al. (2022) argued that ES can be defined as an eco-friendly activity that deals with how human actions are geared towards maintaining natural resources, safeguarding global biomes and supporting the earth's wellbeing both now and in the future.

Prior research indicates that, because of increasing global warming concerns and rapid advancements in the fourth industrial revolution, organisations have been motivated to engage more fully in ES (Mukhuty et al., 2022). Consequently, recent debates suggest that the future of work will be more rooted in work practices driven by OSC (Brougham & Haar, 2018; Oosthuizen, 2019). To simultaneously promote ES, meet organisational objectives and meet stakeholder expectations amid constant technological disruptions in a hypercompetitive business environment, studies advocate the need for development and deployment of organisational capabilities grounded in STARA (Chen et al., 2018; Ogbeibu et al., 2021). While the debate rages on around whether STARA is a "portent" or a "silver spoon", the discourse tends to overlook how it may be exploited as a valuable resource by organisations (Brougham & Haar, 2018; Parker & Grote, 2019). Prior studies contend that OSC can aid to further promote green initiatives to support the global sustainable development goals (SDGs), foster more effective compliance to the UNGC sustainability tenets and satisfy diverse stakeholders' demands (Ivancic et al., 2019; Vishwanath et al., 2019). Tussyadiah and Miller (2018), Vishwanath et al. (2019) and Brougham and Haar (2018) suggest that equipping organisations with dynamic capabilities such as assets or resources that leverage STARA could prove promising for fostering

organisation-wide competitive advantage. Parker and Grote (2019) and Li et al. (2019) argue that organisations equipped with STARA capability are more likely to be able to further catalyse momentum, meet deadlines and implement and achieve objectives fundamental to overall organisational success. Prior debates advocate that OSC can positively influence work processes and control as organisations become more equipped to combat and manage technical risks associated with executing green initiatives (Tussyadiah & Miller, 2018). Despite the potential benefits of OSC in driving green human resource management (HRM) implementation of ES, no empirical evidence directly supports this relationship (Albert, 2019). To date, it remains unclear how OSC acts to predict ES, and how OSC influences ES via key intervention or conditional green HRM (GHRM) programmes.

Moreover, Ali et al. (2021) and Arulrajah et al. (2015) suggest that, without HRM's support for green initiatives, organisations cannot simultaneously pursue ES while maximising profits. Ongoing contentions on HRM programmes such as green training, involvement and development (GTID), green recruitment and selection (GRS) and green performance and compensation (GPC) have been suggested by prior literature to be able to influence ES (Albert, 2019; Cuerva et al., 2014). The GTID is a "process that mirrors the inclusion, engagement, upskilling and improvement of teams' skills, attitudes, and knowledge to pre-empt deterioration of green-oriented capabilities and to further advance environmentally sustainable knowledge which benefits an organisation and its stakeholders" (Ogbeibu et al., 2020, p3). GRS deals with the identification, evaluation and recruitment of employees who possess required green centred expertise, and motivation to produce green innovative results critical to advancing the achievement of SDGs (Ahmad, 2015; Jabbour et al., 2013). Equally, GPC is defined as the conventional control, assessment and measurement policies and processes that encourage employees to develop their professional competencies, exert green behaviours, and get rewarded for compliance to green task expectations structured for fostering ES (Bohnsack et al., 2021; Renwick et al., 2016). Accordingly, organisations' HRM are motivated to go green – hence GHRM (Renwick et al., 2013; Yong et al., 2019). According to Ogbeibu et al. (2020, pg. 3), GHRM "is a set of guidelines and initiatives that inspire environmentally focused behaviours among employees so that they use their creativity to achieve green innovation outcomes, thus aiding the global cause to engender environmental sustainability." Traditional HRM practices may reflect functions that enable organisations to improve their overall business outcome while neglecting accommodation of ES (Ahmad, 2015; Dubois & Dubois, 2012). Organisational expectations are usually established on profit growth while green values are of less importance (Jabbour, 2013; Pinheiro et al., 2021). Hence, traditional HRM is not designed to maximise ES (Mukhuty et al., 2022; Peng et al., 2020).

To help close this gap, Teece et al. (1997) and Kawai et al. (2018) advocate the need for organisations to embrace the dynamic capability theory (DCT) and stakeholder theory (ST). DCT focuses on an organisation's ability to sense and develop, seize, and integrate, and reconfigure and transform key internal competencies fundamental to

addressing changes in a defined business environment (Ghosh et al., 2021; Teece, 2007). DCT posits that organisations can effectively respond to radical changes in the business environment if they deploy strong dynamic capabilities (Teece, 2014, 2018). Congruent with DCT, organisations can satisfy shareholders' needs and sustain competitive advantages while leveraging STARA capabilities (Ogbeibu et al., 2021; Teece et al., 1997).

However, DCT overlooks considerations of corporate social responsibility (Freeman, 1984; Freeman et al., 2018). Therefore, we turn to stakeholder theory as a complement to help bridge the gap between profitability and ES (Barney & Harrison, 2020). The stakeholder theory contends that organisations should go beyond mere focus on profit maximisation towards an adoption of corporate social responsibilities that align their objectives with sustainability (Clarkson, 1995; Peng et al., 2020). To help foster ES, studies suggest that the stakeholder theoretical tenets is a foundation for GHRM programmes to execute the implementation of ES strategies (Aguilera et al., 2021; Ogbeibu et al., 2020). GHRM programmes can advance ES objectives that are fundamental to bolstering ES (Ahmad, 2015).

Though several works from developed and emerging economies (Singh et al., 2020; Sobaih et al., 2020; Song et al., 2020) have recently begun to examine the concept of GHRM and ES, it remains largely unclear how GHRM programmes predict ES from the context of emerging economies (Nwosu & Ward, 2016; Ogbeibu et al., 2022). Congruent with the advocacy of the UNGC principles on ES, recent debates continue to echo the need for further research to be initiated across developing economies, like Nigeria, whose research on global warming is yet in its embryonic phase. Ogbeibu et al. (2021) specifically note that there is a paucity of literature that informs on how the STARA concept aids ES within the Nigerian manufacturing industry context. Studies suggest that activities of manufacturing firms in Nigeria are leading to natural resource depletion and air, water and land pollution (Sanni, 2018). Together, these activities and global warming are adversely impacting the society and the quality of life of many Nigerians. Recent efforts by the Nigerian government through the Security and Exchange Commission (SEC) to address this problem and enhance the quality of life of many Nigerians through ES, has led to the development of a code of conduct of corporate governance to encourage sustainable workplace practices (Adubor et al., 2022). As a result, guidelines and standards for successful mitigation of pollution in the manufacturing industry in Nigeria have been put in place to enhance the life quality of members of the society (Sanni, 2018). Thus, organisations in the Nigerian manufacturing industry are expected to develop ES strategies to effectively respond to these regulations as well as create and sustain competitive advantage. Congruent with recent debates, Nigeria is one of Africa's strongest emerging economies and its manufacturing industry reflects a stimulating case for obtaining deeper understandings into how OSC and GHRM influence ES (Ogbeibu et al., 2021; Sanni, 2018). Nevertheless, how manufacturing organisations in countries like Nigeria may deploy their STARA capabilities to effectively support GHRM programmes to foster ES remains unexplored (Nwosu & Ward, 2016; Ogbeibu et al., 2022).

Yong et al. (2019) and Rupa and Saif (2022) argue that GHRM programmes should be guided by green centred values, as this could foster ES. Prior research suggests that by driving green values within the workforce, GHRM programmes are more likely to positively influence ES, and thus reinforce work practices fundamental to ES (Ahmad, 2015). Jackson et al. (2011) emphasises that GHRM programmes are pertinent for fostering organisational objectives to become more closely aligned with the United Nations Global Compact (UNGC) ES principles. However, by overlooking GHRM programmes, implementation of set objectives for achieving ES could be impeded (Jabbour, 2013; Muisyo & Qin, 2021). Studies consequently conjecture a negative or insignificant association between GHRM programmes and ES (Arulrajah et al., 2015). Moreover, GHRM programmes have been argued to influence ES positively and negatively (Pham et al., 2019; Renwick et al., 2016) and have been found to have no significant association with the ES tenets (Yong et al., 2019). Given the conflicting findings of extant research, it remains unclear how GHRM programmes predict ES. Additionally, given recent global warming concerns and the volatility of technological disruptions typified via STARA advancements and impacts STARA has on the business environment (Chams & García-Bland, 2019; Naz et al., 2022), our study attempts to contribute through assessing how distinct GHRM programmes respectively predict ES, and act as intervention actors influencing the association between OSC and ES. We thus, expound and connect the debates on the concept of ES, the need for organisational capability development and implementation of GHRM functions to drive green behaviours towards achieving ES, as their nexus have mainly been loosely or implicitly examined in prior literature (Bohnsack et al., 2021; Merriman & Sen, 2012).

To achieve this, we first seek to contribute by empirically examining how OSC predicts all GHRM programmes respectively, as this important gap is yet unaddressed in the literature. Second, we examine how OSC and GHRM simultaneously act to predict ES. Third, we aim to investigate the plausible mediating mechanisms by which each GHRM programmes act as intervention actors that influence the associations between OSC and ES. This has also been overlooked by extant research and less considered in practice. Fourth, we seek to examine the linear moderated mediation role of OSC on the relationship between GTID and ES.

We organise the rest of the papers into four sections. We first review the literature on GHRM, OSC and ES to support the development of our hypotheses. Next, we outline the methodology. Finally, we present and then discuss our findings and their implications for theory and practice before drawing conclusions.

## 2 | LITERATURE REVIEW

### 2.1 | Theoretical and contextual underpinning and hypothesis development

The Nigerian manufacturing sector plays a very important role in the Nigerian economy by helping to alleviate poverty through job

creation. Regardless, the negative effects of activities of firms in the industry in Nigeria (and globally) such as natural resource depletion and air, water and land pollution cannot be undermined (Aftab et al., 2022). Recently, a Global Environmental Outlook (GEO 4) report noted that activities in the manufacturing industry increased global temperature by 0.74% globally because of the production of greenhouse emission (Afum et al., 2020). As a result, many manufacturing organisations around the world are responding to calls for sustainable manufacturing by designing and implementing green practices including GHRM in response to government regulations to fulfil the ES needs of stakeholders (Reyes-Santiago et al., 2019; Yong et al., 2019) while creating sustained competitive advantage. Despite the level of progress made in the manufacturing sector in many developed countries, the situation in many developing sub-Saharan African countries including Nigeria is different.

According to Sanni (2018), ES in the manufacturing sector is driven by technology-push dynamics such as organisational technological and management capabilities. Extant literature suggests that there is a lack of adequate STARA, management and green capabilities in the Nigeria manufacturing sector (Olaiya et al., 2022; Sanni, 2018). Given this context, the ability of manufacturing firms to engage in ES activities in Nigeria through advanced manufacturing technology, OSC and GHRM principles is limited (Akintayo et al., 2020; Sanni, 2018). The few studies available on GHRM and OSC have shown that such efforts can simultaneously bolster the relevant human resource capability and behaviour relevant for ES and profit maximisation in the manufacturing industry in Nigeria (Ogbeibu et al., 2021; Sanni, 2018). However, the literature suggests that these manufacturing organisations are not doing enough towards ensuring that employees acquire the green practices and OSC required for ES (Ogbeibu et al., 2021; Olaiya et al., 2022) despite increasing regulation in the manufacturing industry to enhance ES (Sanni, 2018). Two recent regulations in Nigeria to enhance ES in the industry include government guidelines and standards for the successful mitigation and control of pollution and environmental impact (Sanni, 2018) and the SEC established code of conduct for corporate governance to encourage the implementation of green and sustainable workplace practices in the industry (Adubor et al., 2022).

However, like the general literature on GHRM, studies on GHRM specifically in the manufacturing industry in Nigeria have produced inconsistent results (Aftab et al., 2022; Ogbeibu et al., 2021; Renwick et al., 2016). Some studies conjecture a non-association between GHRM and ES (Arulrajah et al., 2015; Bolanle et al., 2022) while others suggest a positive relationship between both variables (Olaiya et al., 2022). Adubor et al. (2022) and Kuo et al. (2022) therefore call on future studies to draw on mediating variables to provide a more precise and nuanced explanation to enhance theory and practice in the field. Thus, Nigeria and its manufacturing industry provides a useful context for understudying the gap in knowledge (Ogbeibu et al., 2021).

Freeman et al. (2018) and Ogbeibu et al. (2021) note that organisations should adopt the Stakeholder theory in understanding the gap on how to bolster ES through GHRM and OSC. Stakeholder theory

describes the relationship between organisations and their environment (Ogbeibu et al., 2021). Stakeholder theory accentuates the need for organisations to focus on positively impacting the environment for the benefit of all stakeholders while maximising profit, rather than focus on profitability alone for the good of shareholders (Ogbeibu et al., 2021). Stakeholder theory scholars note that GHRM is among the most important sustainable approaches for driving ES (Kuo et al., 2022) while maximising shareholders' interests. As an ES approach, GHRM encourages workers to acquire and deploy relevant competencies required to perform their jobs in an environmentally friendly way (Kuo et al., 2022). However, it is difficult to build our current study on Stakeholder theory alone. We note that Stakeholder theory omits prior internal resources that support the development of STARA capabilities.

Reyes-Santiago et al. (2019) contends that proactive environmental strategy such as GHRM is a form of dynamic capability. Consistent with the dynamic and complex nature of a holistic approach to ES, dynamic capability is considered appropriate to study its embeddedness in GHRM and OSC (Bianchi et al., 2022). However, current dynamic capability literature overlooks ES considerations. This study therefore draws on well-established stakeholder theory and integrates it with DCT to explain how OSC and GHRM independently predict ES as well as shed light on the mechanism by which GHRM programmes intervene in the OSC and ES nexus.

Bianchi et al. (2022) note that dynamic capability enables organisations to change and embed ES in their operations. Scholars have affirmed that the design and successful adoption of advanced technology such as STARA is a firm's capability that promotes its ability to continuously implement ES practices (Hofmann et al., 2012). This is achieved through conscious effort by the firm to sense, seize and integrate internal and external resources such as STARA capabilities in response to environmental challenges to meet stakeholders' expectations (Liang et al., 2022; Teece, 2007; Teece et al., 1997) while creating and sustaining competitive advantage in a highly competitive business environment. We note that by sensing the environment for opportunities and knowledge, seizing identified opportunities and knowledge and reconfiguration of such knowledge into OSC, organisations can successfully develop green knowledge and OSC for ES (Bianchi et al., 2022).

Drawing on the stakeholder theory perspective, manufacturing firms can respond to government regulations by deploying GHRM practices to encourage their employees to develop and deploy the green skills needed to drive ES outcomes and profit simultaneously (Ogbeibu et al., 2021). Equally, extant debates on the conceptualisation and implications for the dynamic capability theory suggests a probable nexus between the tenets of the OSC and ES phenomenon (Bianchi et al., 2022; Hofmann et al., 2012; Reyes-Santiago et al., 2019). Congruently, the dynamic capability theoretical assumptions provide support for the OSC and ES relationship such that, by deploying unique capabilities, organisations can leverage the benefits of advanced digital and physical technologies to directly combat constant environmental changes and further support green oriented operations in their activities that foster ES (Ogbeibu et al., 2021;

Teece, 2007). We thus argue that firms can develop and use OSC in ways that positively impact the environment as a strategy to achieving ES outcomes in manufacturing organisations while maximising profit (Sanni, 2018). Moreover, debates of extant literature relate that GHRM practices enable employees to develop and deploy their green skills and behaviour and using OSC in bolstering ES as well as maximising profit for shareholders of the company. Thus, the following hypotheses are developed.

### 2.1.1 | OSC and ES

The rise of STARA is expected to transform the future of work, improve operations and reduce the complexity of cumbersome projects (Brougham & Haar, 2018; Rusch et al., 2022). However, when it comes to exploiting OSC as an efficient tool that could further drive green related initiatives towards increased ES (Makridakis, 2017), empirical investigations are lacking. Although, prior debate suggests that OSC is positively associated with ES (Cuerva et al., 2014; Vishwanath et al., 2019), extant research contends that OSC could also lead to job losses (Brougham & Haar, 2018). Oosthuizen (2019) and Parker and Grote (2019) argue that OSC could also lead to increased job strain, health issues and work-life balance conflicts, as employees are obliged to adopt, adapt and demonstrate expertise associated with newer technological advancements. Studies argue that efforts applied to implement OSC to foster green initiatives that could promote ES are usually resisted by employees faced with work-life balance complexities and increased goal expectation pressures (Berrone et al., 2013; Merriman & Sen, 2012). While the works of Ogbeibu et al. (2021), Parker and Grote (2019) and Vishwanath et al. (2019) contend that STARA ought to be given closer attention to avoid its negative consequences, what the literature has not yet empirically established is how OSC predicts ES.

With volatile changes in technology, organisations are constantly exploring ways to facilitate the development of capabilities required to drive ES. One key area of dynamic capability development is OSC. With OSC, organisations move from performing error-prone and repetitive routines in their business processes towards more value-adding and knowledge intensive tasks (Ivancic et al., 2019). Prior theoretical and empirical research suggests that OSC can help organisations shift the need for human labour toward a focus on quality and value-creation using STARA (Ivancic et al., 2019). Without doubt, organisations use advanced technology and specialised human knowledge (Tariq et al., 2019) to explore and exploit green thinking pathways by which green products are developed (Frey & Osborne, 2017; Ogbeibu et al., 2021). Drawing on DCT, by exploiting existing OSC, organisations' advantage of improving efficiency or interpreting and systematising knowledge is more likely to expand in scope from internal to more external sources such as competitors, customers and suppliers (Santoro et al., 2021). As a result, organisations can integrate resources to achieve organisation goals such as ES. Notably, by deploying STARA components such as 3D Printing and AI, organisations in the manufacturing industry become more flexible and swifter

to innovate while reducing environmental degradation and material wastage (Shuaib et al., 2021; Xie & Zhu, 2020). We therefore argue that OSC may drive ES in organisations.

#### H1. OSC positively predicts ES.

### 2.1.2 | OSC and GRS

Recent studies suggest that organisational efforts to use OSC to foster green innovation can be impeded by employees with adverse views of STARA (Vishwanath et al., 2019). As such, organisations with an eye for sustainable objectives are more likely to identify, recruit and select employees with green expertise and motivation to deploy their green expertise to accomplish green innovative results (Muisyo & Qin, 2021). Considering these innovations are often driven by STARA, organisations seek to hire employees with STARA competencies, and the motivation required to deploy STARA. Ogbeibu et al. (2021) and Salvi et al. (2021) contend that green initiatives are enabled through digital platforms. Because of existing OSC, organisations are more likely to deploy hiring processes that depend on STARA to identify and select employees with green knowledge and expertise to further their green environmental objectives. According to Garg et al. (2018), organisations can use AI to promote effective GHRM. For example, through AI, organisations deploy machine learning software that can scan curriculum vitae (CV) in CV repositories to enhance the identification and selection of applicants with green expertise and motivation (Albert, 2019; Garg et al., 2018). Additionally, by using smart technologies and AI in recruitment activities, these organisations reduce the number of employees travelling to interview on site (Garg et al., 2018), further aiding environmental performance by reducing emission and waste that would have emanated from their traditional hiring processes (Ojo & Fauzi, 2020).

#### H2. OSC positively predicts GRS

### 2.1.3 | OSC and GTID

An organisation's ability to innovate depends on its capacity to generate and sustain relevant knowledge (Park et al., 2019). Consistent with this perspective, Nonaka (1994) contended that successful organisations consistently seek to identify new ways to sustain or reconfigure existing capabilities. Therefore, appropriate HRM practices (such as GTID) translate organisational capability such as OSC into successful outcomes (Özbag, 2013). Managing HR to achieve better capabilities requires the development of employees' knowledge base and expertise (Özbag, 2013). Thus, organisations with existing OSC may seek to sustain or renew their current OSC to fulfil current and future environmental goals to facilitate ES. GTID is one critical component of HRM relevant for the development and renewal of green knowledge (including STARA skills) useful for driving environmental objectives (Muisyo & Qin, 2021; Özbag, 2013). With OSC, organisations seeking

to innovate are therefore more likely to deploy GTID programmes to help employees further develop relevant expertise and motivation for STARA to drive relevant environmental outcomes (Xie & Zhu, 2020) in the form of ES (Muisyo & Qin, 2021). These organisations are also more likely to rely on existing OSC in the process, using STARA components to provide relevant green training and development programmes to develop green knowledge and expertise to drive the motivation and behaviour required to facilitate the use of green knowledge (Muisyo & Qin, 2021; Sung & Choi, 2018).

In line with recent works of Ogbeibu et al. (2021) and Salvi et al. (2021), green initiatives are fostered when set tasks, including human resource functions, are executed via digital platforms. Studies relate how digital technology is used to enhance workplace learning and capability development (Giacumo & Breman, 2016; Itzchakov et al., 2022). In a smart things-based training environment, Charmonman et al. (2015) contend that machine learning is useful for training employees to enhance performance. Using STARA components to facilitate the development of green knowledge and expertise does not only support the renewal or development of OSC but also supports environmental objectives.

**H3.** OSC positively predicts GTID.

#### 2.1.4 | OSC and GPC

Extant research suggests that OSC is important for promoting environmentally sustainable goals, including GHRM (Ogbeibu et al., 2021). One key aspect of GHRM is GPC, which involves how to measure environmental outcomes consistent with set standards across organisation units, and the use of such standards to effectively compensate employees practicing green behaviours (Renwick et al., 2013). Organisations seeking to pursue ES through OSC are more likely to measure performance around green (and STARA) knowledge development and application as well as compensate such behaviour (Renwick et al., 2013; Teeter & Sandberg, 2016). These organisations may deploy green audits to gain useful data on employee environmental behaviour and performance consistent with corporate wide environmental performance standards (Renwick et al., 2013).

Organisations with existing OSC are more likely to rely on STARA capability to enhance their environmental goals informing GPC (Ogbeibu et al., 2021). Recent studies show that by using STARA components in the appraisal process, organisations can further pursue environmentally sustainable goals (Jyoti, 2019). Using STARA components such as AI for performance measurement, organisations can better exploit data to measure green performance to effectively ascertain and reward green compliance across organisation units in pursuit of environmental objectives (Bohnsack et al., 2021). Jyoti (2019) contends that by deploying STARA components, organisations can quantify ecological executions and create green data frameworks for reviews. Chamorro-Premuzic and Taylor (2017) argued, noting that organisations are more able to assess performance through AI by converting records into a psychological profile that can be used to

determine future performance and counterproductive behaviours. Also, automating the appraisal process reduces paperwork associated with traditional appraisals, which furthers environmental objectives (Jyoti, 2019).

**H4.** OSC positively predicts GPC

#### 2.1.5 | GPC and ES

As a GHRM programme, GPC helps guide and measure the environmental performance of employees and their respective and collective contributions towards green initiatives such as ES (Masri & Jaaron, 2017). GPC ensures stability of green processes, preventing deterioration of tasks that foster ES (Ogbeibu et al., 2020). Studies advocate a positive link between GPC and ES (Ahmad, 2015; Ogbeibu et al., 2020). Consistent with DCT and stakeholder theory, GPC reflects an organisation's dynamic capability by which organisations can control green processes and opportunities via established green centred metrics that help them maximise profits and sustain competitive advantage by implementing ES (Kawai et al., 2018; Teece et al., 1997). Such metrics assess and control acquisition, utilisation, maintenance and waste of resources (Masri & Jaaron, 2017). As a DC, organisations can use GPC to execute corporate-wide environmental management information systems for monitoring resource flows and eco-friendly practices, and to further ensure achievement of ES goals (Berrone et al., 2013). Organisations should implement reward systems for green behaviours (Ahmad, 2015; Davis et al., 2019; Jackson et al., 2011).

By connecting green compensations with green behaviour, organisations can inspire employees to contribute towards ES (Arulrajah et al., 2015). Ramus (2001) found that recognition-based rewards exerted a strong influence in provoking commitment towards green initiatives. Integrating compensation schemes with green criteria is a viable approach that GHRM could deploy to facilitate ES (Renwick et al., 2016). While such GHRM practices may positively motivate employees to commit towards achieving SDGs, there is limited empirical research around such influence (Mansoor et al., 2021). Integration of environmental criteria into compensation and performance appraisals could motivate employees to address green issues that may drive environmental performance (Chiarini, 2021; Renwick et al., 2013).

**H5.** GPC positively predicts ES.

#### 2.1.6 | GTID and ES

GTID is echoed to be the most important driver for development of employees in any given green initiative (Jabbour, 2013). Seminal works on the GTID concept have suggested a positive link between the practices endemic in the GTID operations, EI and ES (Cuerva et al., 2014; Dangelico et al., 2016; Jackson et al., 2011; Renwick

et al., 2013). Undergirded by the DCT, the GTID relates an organisation's dynamic capability that can be deployed to provide intellectual development opportunities for employees to obtain green-centred skills and knowledge necessary for fostering ES (Dangelico et al., 2016; Renwick et al., 2016). Congruent with the transformation tenets of the DCT, the GTID can aid organisations to transform and continuously develop their resources, and assets, and further ensure that their human capital are constantly engaged in green practices to foster ES implementation (Ogbeibu et al., 2022; Teece, 2018). The GTID is important as it can be leveraged to initiate, drive and readily respond to volatile changes impacting how ES opportunities are reconfigured and transformed in the business environment (Ahmad, 2015; Ghosh et al., 2021). Song et al. (2020) argue that implementation policies of GTID allow for the creation and exchange of green creative initiatives' opportunities which are fundamental to strengthening the positive association between GTID and ES. Studies opine that GTID can aid employees to better ascertain environmental concerns, develop their competencies, and design effective mechanisms that better align organisational green goals to the SDG expectations (Arulrajah et al., 2015; Ogbeibu et al., 2020). Moreover, by exploring and conducting a corporate-wide training needs analysis centred on uncovering what green competencies are lacking in employees, organisations may be in a better position to sense green opportunities, seize and develop intellectual capital resources, and transform key green practices for advancing ES implementations (Ghosh et al., 2021; Sobaih et al., 2020). To advance ES implementations, debates of prior research suggest a constant education of employees on how to drive green initiatives, exert green behaviours, design and implement workshops, analyse work environments, waste management, and development of energy efficiency strategies (Masri & Jaaron, 2017; Ogbeibu et al., 2020).

Additionally, extant investigations suggest that organisations' GTID policies can be orchestrated to empower employees and create an inclusive work climate that supports them in their participation in green initiatives (Renwick et al., 2016). Deploying green inclusion strategies consequently allows for employees' voice on environmental related concerns to be easily heard, effectively assessed, and efficiently addressed (Emelifeonwu & Valk, 2019; Masri & Jaaron, 2017). By embracing the tenets of GTID, studies contend that organisations can be able to mould a workforce of members who are pro-environmentally oriented and motivated to commit towards promoting ES implementations (Berrone et al., 2013; Chams & García-Bland, 2019). Moreover, to further transform green resources and processes fundamental to fostering ES, Teixeira et al. (2012) suggest that the giving of constructive feedback to employees should not be overlooked, as it is a way of aligning green initiatives to ES objectives. Also, Jabbour et al. (2013) advocated that GHRM's efforts deployed via training and development of employees is positively associated with ES. Yusliza et al. (2017) and Pham et al. (2019) argue that GTID can help engage and educate employees on the importance of cleaner production of goods, waste reduction, stifling environmental pollution diffusion and energy conservation. This is supported by Pham et al. (2019) who emphasised on the need for employees to undergo green education and training in order to be equipped and to

demonstrate capabilities fundamental to ES. We thus, theorise the following.

**H6.** GTID positively predicts ES.

### 2.1.7 | GRS and ES

Prior literature suggests a positive link between GRS and ES (Masri & Jaaron, 2017; Ogbeibu et al., 2020). To promote ES, GRS processes would need to consider recruiting employees who are interested in, supportive of, and possess green competencies, and are willing to advance ES initiatives (Abdulaziz et al., 2017; Renwick et al., 2016). As the bedrock of the GHRM programmes, recent research suggests that organisations may be able to advance ES if recruiting processes are green centred (Jackson et al., 2011). Likewise, organisations' websites and job advertisements could signal a focus on competent candidates who are passionate about green initiatives (Chams & García-Bland, 2019). Song et al. (2020) and Masri and Jaaron (2017) suggest that designing job descriptions, candidate specifications, and task responsibilities that incorporate green statements, directives and concerns will attract the right human capital assets needed to foster ES implementations.

Consistent with DCT, GRS is a key dynamic capability by which organisations can attract resources such as green talent, who's environmentally grounded competencies can be leveraged to drive ES (Jackson et al., 2011). Further supported by stakeholder theory, GRS criteria can be designed to showcase an organisation as a pro-environmental change agent (Yong et al., 2019). By establishing green centred recruitment processes, green grounded values are more easily instilled among new recruits (Jabbour & Santos, 2008; Yu et al., 2020). Singh et al. (2020) and Chen and Chang (2013) advocate that such approaches are important for greening the workforce and promoting ES. Green values enshrined in recruiting may be the key by which GRS may satisfy stakeholders' expectations for ES (Ahmad, 2015). GRS is an effective means for ensuring that green centred job specifications are aligned with employees whose values support green objectives (Jia et al., 2018; Yong et al., 2019). Leal-Rodríguez et al. (2018) stress that this allows for increased awareness and more efficient delivery of green initiatives such as ES.

**H7.** GRS positively predicts ES.

### 2.1.8 | The moderated-mediation role of OSC

OSC has a positive influence on organisations' efforts to contribute towards SDGs as organisations consistently engage in eco-friendly innovations (Parker & Grote, 2019). Moreover, under periods of varying technological advancements and consequent disruptions, the constant adoption, adaptation and implementation of OSC in the workplace could foster the advancement of GTID initiatives (Garg et al., 2018; Salvi et al., 2021). Complex GTID processes could be implemented via AI or virtual reality technologies (Ransbotham et al., 2017). Complicated

task processes and training modules that could have otherwise been hazardous could be replicated in a virtual simulation environment and studied safely by employees (Ransbotham et al., 2017). Deploying STARA can save distinct costs such as warehouse and training centre rentals, machinery and equipment costs and others, as these tangible resources are translated to virtual environments equipped with user-friendly smart technologies (Berrone et al., 2013; Oosthuizen, 2019). OSC can also enable GTID to compartmentalise operations associated with green workshop initiatives that could be further conducted in real time across disparate geographical locations, and consequently save organisations costs associated with travel expenses (Ogbeibu et al., 2021; Vishwanath et al., 2019). Organisations equipped with STARA competencies are better prepared to face a hypercompetitive business environment (Wu et al., 2017). While, OSC could yield promising results for organisations, it does have a way of negatively influencing how GTID impacts ES (Ogbeibu et al., 2021; Renwick et al., 2013). Though OSC can promote GTID, subsequent task demands placed on employees may become overwhelming as they try to meet new expectations (Perron et al., 2006; Renwick et al., 2013). Compliance with organisational sanctions and deploying STARA grounded resources to achieve expected value could lead to increased pressure for employees – despite their trainings on the application of STARA resource (Renwick et al., 2013). Studies advocate that this could lead to work-life balance and health concerns for employees as they struggle to implement newer technologies into their task routines (Ogbeibu et al., 2021). Extant research suggests the need for organisations to apply some degree of task flexibility for employees (Perron et al., 2006) when implementing STARA into existing routines. Ogbeibu et al. (2021) and Ogbeibu et al. (2022) further emphasise that, by not giving closer attention to the probable negative consequences of STARA implementation when driving training initiatives, organisations may inadvertently impair the positive relationship GTID may have had on ES.

**H8.** OSC positively influences GTID but dampens the positive association between GTID and ES.

### 2.1.9 | The mediating roles of GHRM programmes on the relationship between OSC and ES

While OSC has direct influence on ES, how GHRM mediates their relationship is yet underdeveloped in the literature (Rehman et al., 2021; Singh et al., 2020). The relationship between OSC and ES is driven by effective knowledge and capabilities management (Muisyo & Qin, 2021). The ES process begins with novel green ideas; therefore, organisation knowledge/capability management such as the management of OSC is crucial for the development of competencies, behaviours and motivation for driving the relationship between OSC and ES (Özbag, 2013). Through GRS, employees with green and STARA expertise can deploy STARA components, such as 3D printing, in driving ideas to enhance ES (Muisyo & Qin, 2021). As such, organisations with OSC are more likely to exploit GRS to hire employees with green (including STARA) expertise who are willing to deploy STARA capabilities needed for ES (Ogbeibu et al., 2021; Salvi et al.,

2021). With green expertise and STARA capabilities, new hires can deploy existing OSC to drive ES and other stakeholders' green goals (Salvi et al., 2021).

Simply hiring and retaining skilled employees is usually not sufficient to drive innovation (Debrah et al., 2018) and fulfil stakeholders' green objectives. From this standpoint, knowledge required to foster ES drawing on OSC is usually organisation specific (Debrah et al., 2018). Therefore, organisations seeking to drive ES through OSC are more likely to deploy GTID programmes to build firm specific green (including STARA) knowledge bases through training and development of employees (Wang et al., 2020). From this standpoint, GTID influences the organisation's direction of learning to further acquire STARA and green skills as well as promote employee enthusiasm and ability (Wang et al., 2020) to draw on existing OSC for ES (Ogbeibu et al., 2021). By focusing on nurturing employee green creativity skills (including STARA knowledge) through GTID, organisations benefit from developing a pool of employees adept at thinking divergently (Gube & Lajoie, 2020; Ogbeibu et al., 2021). From a dynamic capability perspective, we argue that ES will emerge as organisations seize new green ideas spotted by employees with green knowledge and expertise using STARA components based on existing OSC. However, building on extant research by Renwick et al. (2013), organisations can maintain high levels of flexibility when appraising the outcome of GTID to facilitate ES. In contrast, excessive demands on employees with green knowledge may inadvertently lead to increased pressure and impair an organisation's progress towards green goals (Perron et al., 2006).

We argue that the periodic evaluation of and compensation of employees' green performance using STARA components might not facilitate the link between OSC and ES because of added pressure to perform (Ahmad, 2015; Merriman & Sen, 2012). Studies have noted that organisations have used negative reinforcement (such as supervisors warning and criticism) to drive employee compliance with their environmental management objectives via OSC (Chan & Hawkins, 2010; Renwick et al., 2013). Given several opportunities, such as rapid profit maximisation, that OSC implementation can provide organisations, organisations are likely to be more forceful in promoting compliance with environmental objectives through GPC (Chan & Hawkins, 2010; Muisyo & Qin, 2021). Prior studies argue that the use of such GPC related strategy may create work-life balance complexities and increased goal expectation pressures for employees (Renwick et al., 2013). Consistent with this view, GPC might not enhance the link between OSC and ES as employees may avoid innovation for fear of failing and self-protective behaviours following the use of negative GPC mechanisms (Renwick et al., 2013). We further show this study's overall hypotheses as captured in Figure 1.

**H9.** GRS mediates the positive relationship between OSC and ES.

**H10.** GTID mediates the positive relationship between OSC and ES.

**H11.** GPC mediates the positive relationship between OSC and ES.

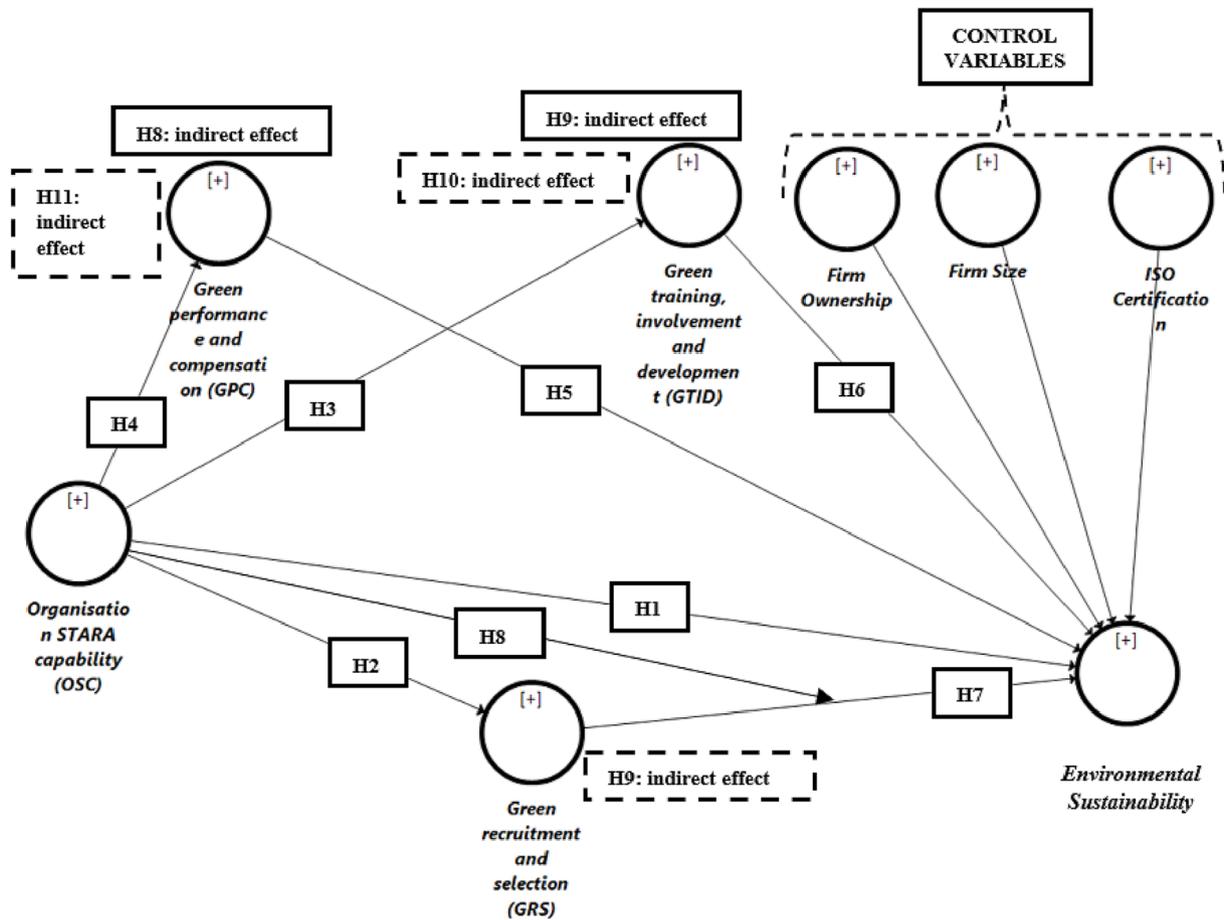


FIGURE 1 Theoretical model.

### 3 | RESEARCH METHODS

Consistent with prior research (Hughes et al., 2020; Ogbuibe et al., 2021), respondents from the R&D, HRM, Information Technology, Operations, and Production departments of 177 manufacturing organisations in Nigeria, formed our study's target population. The respondents had titles of chief operating officer (COO), senior manager, director and general manager. These respondents (between two and five per firm) were appropriate informants who had sufficient knowledge on questions pertaining to OSC, GHRM programmes, and ES. Respondents' contacts were obtained via different avenues such as establishing initial contacts via the LinkedIn and Twitter platforms, through company website inquiries sections, networking relationships built during attended seminars/workshops, direct referrals by friends of respondents, personal appointments and visits scheduled with respondents and others. The manufacturing organisations were medium-size firms with employees ranging from 75 to 200 and headquartered in seven different states that represent key manufacturing hubs in Nigeria (Ogbuibe et al., 2018; Usman & Amran, 2015). The sampling frame for our study is a total of 400 manufacturing organisations and this is based on the updated manufacturing association of Nigeria CEO's confidence index report (Manufacturers Association of Nigeria, 2020). Moreover, using the recommendations of Kock and

Hadaya (2018) on the use of the inverse square root method for sample size estimation was applied to obtain a stratified proportionate sampling of participants. The stratified proportionate sampling technique is relevant in our study to allow for clear partitioning of the population into groups that are congruent with the overall representative sample size. This approach is consistent with the debates of extant literature (Ogbuibe et al., 2018; Teddlie & Yu, 2007). Given that our study's lowest path co-efficient falls within the range of 0.21–0.3 at a 95% confidence level, the required minimum sample size is therefore 69 (Kock & Hadaya, 2018), and this is far below our present study's sample size of 177 manufacturing organisations. To detect unengaged respondents, we included an attention check: "This question is to ensure you are carefully reading and answering all questions accordingly. Therefore, respond to this question by selecting only numbers 2 and 5, and proceed with other questions." A total of 558 questionnaires were distributed and 470 were returned. After careful scrutiny of all the responses, nine copies of incomplete questionnaires (including those that wrongly responded to the attention check) were discarded, and 461 completed questionnaires were found useful for further analysis. This 82.6% response rate is consistent with extant literature (Ogbuibe et al., 2021).

Participants' ages ranged from 33 to 60 years and 56.3% were male respondents. Regarding education, 58.2% of participants had

masters' degrees, 10.2% had a PhD and 31.6% had undergraduate degrees. With the help of five experts (two professors and three industry practitioners), our questionnaire items were evaluated to enhance face validity prior to distribution. Experts consulted in our study are individuals with the ability and required level of qualifications, experience or knowledge to review, access and critique the subject matter of our study and our corresponding questionnaire assessment items, consistent with the conventions of prior research (Yusoff, 2019). We recruited nine research assistants (RAs) for purposes of data collection. Apart from the OSC, measures of other constructs examined in our study are already published and established scales that mainly needed to be adapted/adopted accordingly to this study's context. Congruent with the debates of extant research (Cook & Beckman, 2006; Polit et al., 2007) performing content validity for all the constructs in our study was helpful to ascertain their degree of relevance in our study's context. Following the guidance of Yusoff (2019), content analysis and validity assessment was performed to strengthen the validity of the measurement items used in our study. For the measurement scale of the OSC construct, a total of six items were originally developed based on prior seminal empirical work on the STARA concept (Ogbeibu et al., 2021). Out of all 24 items used to measure all constructs in our study, all five experts were not in support of two items in the OSC measures, while the other four items were deemed relevant. After carrying out the item and scale-level content validity index (I-CVI & S-CVI) that is based on the recommendations of Yusoff (2019), results show that the average of the I-CVI scores for all items on the scale ( $S-CVI/Ave = 0.91$ ) and the proportion of items on the scale that achieved a relevance scale of 3 or 4 by the five experts ( $S-CVI/UA = 0.92$ ) and the scale level CVI ( $S-CVI/UA = 0.91$ ), therefore indicates that satisfactory levels have been met and that our questionnaire has achieved satisfactory level of content validity.

Consistent with prior research, a pilot study with fifty participants was initiated (Artino et al., 2014). Although conducting a pilot study in our case may not have been necessary after all. We acknowledge that conducting a pilot study is relevant for refining measurement items, removing vagueness, bias and for further ensuring the potential respondents have sufficient clarity of the subject matter under investigation (Malmqvist et al., 2019). Given the use of experts to support a thorough process of the content validity of our respective constructs, the advocated norms of executing a pre-test exercise were upheld (Lackey & Wingate, 1998). Moreover, considering the quality of feedback from the experts and the pre-test process analysis initiated in congruence with Yusoff's (2019) study, we had no further need to conduct a separate pilot study for this research investigation. Debates of prior literature relate that there's no need for already established measurement scales/items to go through a pilot study phase if the same specific established measures were previously tested on the same or similar population sample (Lackey & Wingate, 1998; Malmqvist et al., 2019). Equally, the role of a pilot study becomes even less significant if the prior established measures have previously been used to test a defined population in a specific cultural context in which another closely similar investigation or replication-based study

is to be initiated (Brink & Wood, 1998). Lackey and Wingate (1998) advocate that for investigations where procedural difficulties or flaws are not experienced during data collection or subsequent final written report, such research can be considered successful. Similarly, we have used already established measurement scales to test the constructs in our study and these measures have previously been used to test a similar population sample and in the same target cultural context (Ogbeibu et al., 2020; Ogbeibu et al., 2021). The measurement items were also subjected to a thorough pre-test screening process to sufficiently account for measurement items refinement, removal of vagueness, partiality and for further ensuring our potential respondents have sufficient clarity of the subject matter under investigation (Junyong, 2017). Participants were contacted by RAs via several initial and follow-up phone calls and emails to book face-to-face appointments to foster onsite questionnaire distribution and collection. Questionnaires were also sent via email and traditional mail that included a paid return postage envelope – especially to respondents in organisations located far away from the RAs.

Moreover, as recommended by Podsakoff et al. (2012), we applied a temporal separation between the predictors and target construct during data collection, and the data was obtained from key informants from distinct departments of each organisation to support multisource information and increased data reliability. These steps aid to dampen the effects of common method bias (CMB). In agreement with prior studies (Ogbeibu et al., 2021), questionnaires for ES were distributed nine weeks after the distribution of the GHRM programmes and OSC questionnaires. Additionally, anonymity of participants was guaranteed and an item in the OSC construct was reverse coded to help control for CMB (Podsakoff et al., 2012). Similarly, we compared early (initial 10%) and late respondents (last 10%) to help detect a possible existence of non-response bias and found no significant difference between the constructs. Furthermore, consistent with the collinearity evaluation recommendation by Kock (2015), the variance inflation factor (VIF) results which ranges from 1.000 to 2.368 confirms that CMB has no major influence in our study.

### 3.1 | Measures

The questionnaire used 7-point Likert scales (see the Appendix for measurement details). Consistent with the works of Nejati et al. (2017) and Zaid et al. (2018), the GRS and GTID constructs were respectively measured by four and five items that were adopted from Ogbeibu et al. (2020). GPC was measured by four items adapted from Ogbeibu et al. (2020). These measures were thus operationalised in ways that best capture our study's context, scope and level of analysis. The scale reliabilities for GPC (0.986), GRS (0.903) and GTID (0.864) indicate reliable measurement. Given that the OSC construct is in its embryonic phase in the literature, we adapted four items from Ogbeibu et al. (2021), as their work offers the only empirically established measure for the STARA concept in ways that best capture our context with a scale reliability of 0.856. To measure ES, five items were adapted (0.800 scale reliability) from Akhtar et al. (2018). To

adjust for endogeneity concerns, and consistent with Zailani et al. (2015), and Ogbeibu et al. (2020), firm ownership, ISO certification status and firm size were controlled for because of their known influences on innovation.

### 3.2 | Analysis

Consistent with the causal-predictive nature of this study, the variant-based structural equation modelling (VB-SEM) technique was employed via SmartPLS 3. This is also considering VB-SEM's soft distributional assumptions, model specification, complexity and interpretation ease, and as a recommended approach for prediction-oriented studies such as in our case (Hair et al., 2019).

### 3.3 | Results

Results from descriptive statistics shows that values of standard deviation (1.3–1.9), mean (5.3–5.6), Kurtosis (–1.9 to 1.9) and skewness (–1.9 to 1.1) suggest no major deviations from normal distributions of data (Hair et al., 2010). Figure 2 suggests that all measurement items contribute significantly to their designated factor (Hair et al., 2010; Ogbeibu et al., 2020). In Table 1, rhoA and composite reliability values confirm internal reliability and validity for all constructs, and AVE values confirm convergent validity (Ringle et al., 2018). Likewise, values of Heterotrait–Monotrait Ratio (HTMT) in Table 2 confirm the discriminant validity of all factors (Ringle et al., 2018). For model fit considerations, Hair et al. (2019) and Ringle et al. (2018) strongly emphasise against the use of model fit indices especially for prediction-oriented studies and that researchers should rely instead

on models' predictive power, relevance and accuracy (Ringle et al., 2018).

The structural model was estimated using the basic partial least squares (PLS) bootstrapping algorithm with 5,000 subsamples. Per Chin (1998), as shown in Figure 2, the  $R^2$  values of 0.416 ( $t = 8.066$ ,  $p \leq .000$ ), 0.281 ( $t = 6.025$ ,  $p \leq .000$ ) and 0.191 ( $t = 4.982$ ,  $p \leq .000$ ) suggest moderate, small and small degrees of variance explained in GPC, and GTID, and GRS by the OSC construct, respectively. The  $R^2$  value of 0.528 ( $t = 11.878$ ,  $p \leq .000$ ) suggests a moderate degree of variance explained in ES by GPC, GTID, GRS and the OSC constructs respectively, consistent with extant research (Ogbeibu et al., 2018; Ogbeibu et al., 2021).

Consistent with the effect size measures recommended by Ringle et al. (2018), results from Figure 3 indicate that OSC is a positive predictor that exerts a large ( $f^2 = 0.713$ ) positive influence on GPC ( $\beta = 0.645$ ,  $p \leq 0.001$ ), a medium ( $f^2 = 0.104$ ) positive influence on ES ( $\beta = 0.342$ ,  $p \leq 0.001$ ), a medium ( $f^2 = 0.236$ ) positive influence on GRS ( $\beta = 0.437$ ,  $p \leq 0.001$ ), and a large ( $f^2 = 0.390$ ) positive influence on GTID ( $\beta = 0.530$ ,  $p \leq 0.001$ ). Figure 3 shows that while GPC ( $\beta = -0.222$ ,  $p \leq 0.001$ ) exerts a small ( $f^2 = 0.059$ ) negative influence on ES, GRS ( $\beta = 0.152$ ,  $p \leq 0.001$ ), and GTID ( $\beta = 0.468$ ,  $p \leq 0.001$ ) are positive predictors with small ( $f^2 = 0.033$ ) and medium ( $f^2 = 0.274$ ) effect sizes on ES. Taken together, all these results provide support for H1 to H7.

Our moderated-mediation findings show that OSC exerts a medium ( $f^2 = 0.102$ ) negative influence which dampens ( $\beta = -0.200$ ,  $t = 4.001$ ,  $p \leq 0.001$ ) the positive relationship between GTID and ES. This supports H8. Moreover, to estimate the mediation hypotheses and effect sizes of our complex model, we followed the recommendations of seminal works in the field (Hayes, 2015; Nitzl et al., 2016; Ogbeibu et al., 2021). The results suggest that GRS ( $\beta =$

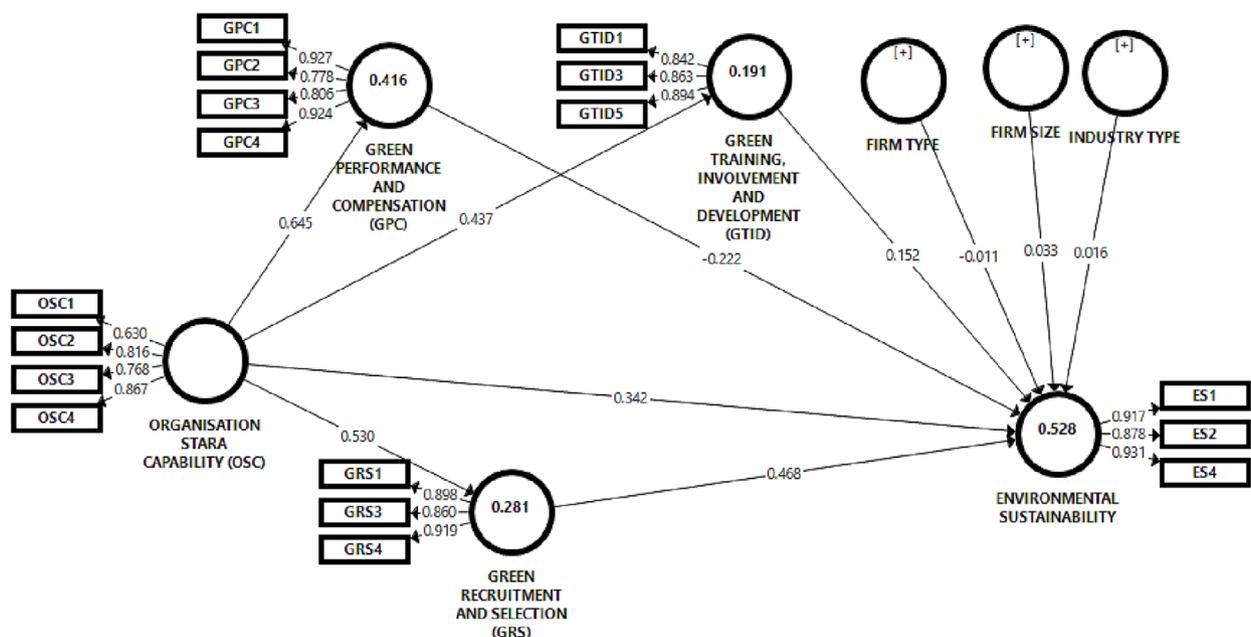


FIGURE 2 Measurement of outer model.

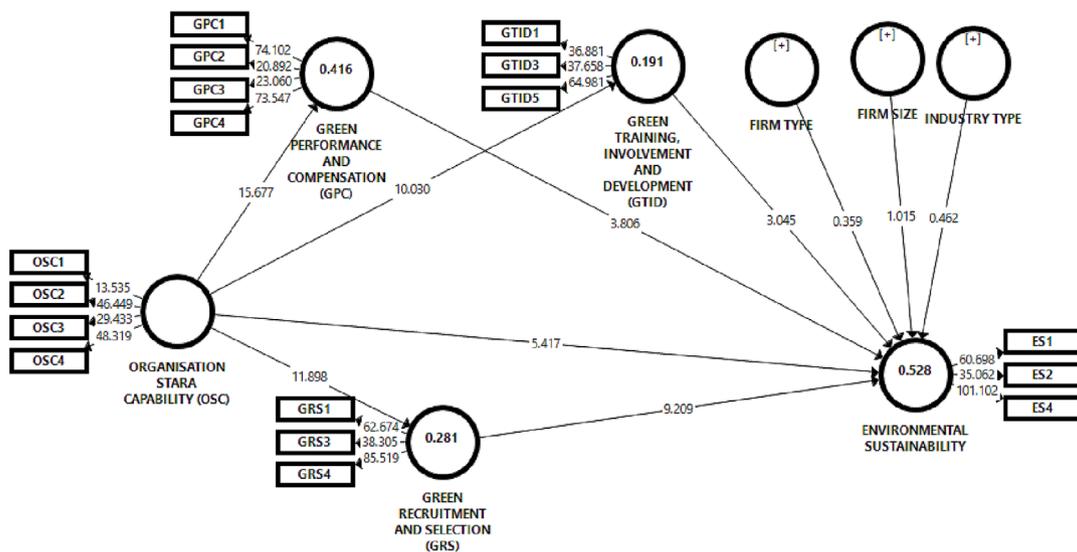
**TABLE 1** SmartPLS3 measurement model analysis, reliability, validity and prediction oriented assessments.

Construct	Composite reliability (CR)	VIF values	rho_A	AVE	PLS PREDICT RMSE	LM RMSE
Firm ownership	1.000	1.069	1.000	1.000		
Firm size	1.000	1.040	1.000	1.000		
Green performance and compensation (GPC)	0.920	1.764	0.886	0.742		
Environmental sustainability (EI)	0.934		0.896	0.826		
•ES1					0.942	0.838
•ES2					<b>0.906</b>	<b>0.913</b>
•ES4					0.891	0.83
Green recruitment and selection (GRS)	0.900	1.471	0.835	0.751		
Green training, involvement and development (GTID)	0.922	1.690	0.879	0.797		
ISO certification	1.000	1.033	1.000	1.000		
Organisation STARA capability (OSC)	0.856	2.368 (GPC = 1,000; GTID = 1,000; GRS = 1,000)	0.811	0.601		

Abbreviations: AVE, average variance extracted; VIF, variance inflation factor.

**TABLE 2** Heterotrait–monotrait ratio (HTMT) – discriminant validity check.

	FO	FS	GPC	ES	GRS	GTID	ISO	OSC
Firm ownership (FO)								
Firm size (FS)	0.144							
Green performance and compensation (GPC)	0.092	0.046						
Environmental sustainability (ES)	0.074	0.055	0.184					
Green recruitment and selection (GRS)	0.089	0.056	0.356	0.556				
Green training, involvement, and development (GTID)	0.059	0.034	0.289	0.759	0.613			
ISO certification	0.124	0.048	0.048	0.067	0.084	0.033		
Organisation STARA capability (OSC)	0.161	0.070	0.801	0.569	0.520	0.583	0.105	



**FIGURE 3** Measurement of structural (inner) model.

0.066,  $p \leq 0.01$ ), and GTID ( $\beta = 0.248$ ,  $p \leq 0.001$ ) are complimentary mediators of the relationship between OSC and ES. The indirect effect size ( $v$ ) results indicate that GTID exerts a relatively large ( $v = 0.061$ ) influence as a complimentary mediator, and GRS exerts less than a small ( $v = 0.004$ ) indirect effect while acting as a significant complimentary mediator. Likewise, GPC is found to be a competitive mediator ( $\beta = -0.143$ ,  $p \leq 0.01$ ) with a small effect ( $v = 0.02$ ). These results support H9 to H11.

The values in Figures 2 and 3 indicate that firm size, ISO certification and firm ownership exhibit no significant influence on ES. Consistent with prior research (Ringle et al., 2018), the  $Q^2$  result of 0.429 provides support for our model's predictive accuracy and suggests an acceptable level of predictive relevance. Similarly, results of PLS PREDICT MAE and LM MAE in Table 1, indicates a small and acceptable predictive power of our model (see Shmueli et al., 2019).

## 4 | DISCUSSION AND CONCLUSION

### 4.1 | Interpreting our findings in light of extant literature

Consistent with prior debates, our study demonstrates that, apart from GPC which is a negative predictor of ES all GHRM programmes, such as GRS and GTID, are positive predictors of ES (Ogbeibu et al., 2020; Yusliza et al., 2017). Our findings show that GTID exerts the strongest positive influence on ES compared with that of GRS. These findings are supported by the debates of prior research which suggest that HRM initiatives, such as recruitment, selection, training, and development, that are grounded in green centred values, can positively foster ES (Yong et al., 2019). Nevertheless, by demonstrating how GPC acts as a negative predictor of ES, our study stands in dissonance to prior debates that emphasise that GHRM programmes have no significant impact, or wholly maintain a positive influence on ES (Ahmad, 2015; Yong et al., 2019; Yusliza et al., 2017).

Consistent with prior work, our study shows that OSC positively influences all GHRM programmes. Moreover, in our study, OSC exerts the largest positive influence on GPC, and a large positive influence on GTID when compared with that of GRS and ES which are also positively influenced by OSC. These findings confirm prior research that contend that organisations should consider deploying STARA to enhance GHRM programmes and ES initiatives (Albert, 2019; Ogbeibu et al., 2022; Vrontis et al., 2021). These findings further challenge the debates of extant literature that advocate STARA as a portent with several negative implications to organisations green initiatives (Frey & Osborne, 2017; Horton, 2017; Li et al., 2019; Ogbeibu et al., 2021).

Additionally, our moderated-mediation analysis shows that OSC dampens the positive influence that GTID has on ES. This finding suggests that while organisations deploy their STARA capability to positively drive GTID initiatives, constant advancements in technology can push organisations to regularly develop and equip their human capital with practical knowledge of the latest technological advancements (Lu, 2019; Makridakis, 2017). In today's global hypercompetitive business environment, this also means that employees would

have to engage in a continuous loop of unlearning, re-learning, adapting and or adopting newer technological advancements to keep up (Chavez et al., 2015; Oosthuizen, 2019). Studies lament that this process could have adverse effects on the wellbeing of employees, lead to increased stress and pressure, and promote work-life balance concerns (Khallash & Kruse, 2012; Li et al., 2019).

We also find that GRS and GTID are complimentary mediators of the relationship between OSC and ES. This implies that GRS and GTID help to carry the positive influence of OSC on ES. These findings suggest that organisations' GRS practices and GTID initiatives can aid their implementation of STARA capabilities to drive their ES. These findings are consistent with extant debates that have suggested the need for organisations to not overlook the promising roles of GHRM programmes and how they can help promote the achievement of SDGs (Albert, 2019; Vrontis et al., 2021).

Contrary to contemporary assumptions and recent debates in the literature, we find that GPC plays a small but significant competitive role that impedes the positive influence of OSC on ES. This finding takes a contradictory position to the debates championed in existing research (Ahmad, 2015; Ogbeibu et al., 2020). Recent contentions suggest that GPC's competitive role could be the outcome of unsupportive or inadequate environmental guidelines and green reward policies (Arulrajah et al., 2015; Renwick et al., 2016; Vrontis et al., 2021). In an effort to ensure rapid profit maximisation and ES, studies contend that organisations have sometimes implemented strict GPC practices which employees may deem unfavourable (Abdulaziz et al., 2017; Davis et al., 2019). Thus, despite the positive support of OSC towards the workforce, rigid green metrics and sanctions employed by organisations could demotivate rather than provoke employees to commit towards green initiatives associated with ES (Berrone et al., 2013; Ogbeibu et al., 2021). ES implementations may consequently be impaired.

### 4.2 | Implications for theory on OSC, GHRM and ES

This study investigated emerging ES constructs that capture a novel interdisciplinary framework for advancing cleaner production, sustainable consumption, and green processes in manufacturing organisations. Although the literature has investigated the nexus between HRM and innovation, there is limited research into the association between GHRM programmes and ES. Likewise, how OSC acts to predict GHRM and ES, and the mediating roles of GHRM programmes in the OSC and ES relationship has been overlooked, and especially within an emerging economy context like Nigeria (Ogbeibu et al., 2021). Equally, while recent results remain inconclusive, our study contributes by leveraging DCT and stakeholder theory to advance insights into how OSC and distinct GHRM programmes act to predict ES, and how GHRM programmes act as intervention mechanisms in the OSC and ES nexus. We extend DCT and stakeholder theories by providing evidence of how organisations can deploy their STARA capability to foster GHRM programmes in their efforts to promote ES.

Our findings deepen empirically established insights into how OSC can help organisations sense and seize relevant resources in the business environment, then transform these resources to exploit opportunities through GHRM programmes to promote ES (Chavez et al., 2015; Oosthuizen, 2019; Vrontis et al., 2021). By showing that OSC has a large positive influence on GRS, we provide evidence that supports organisations' use of STARA capabilities to enhance the implementation of GRS practices. Our findings also provide additional empirical and theoretical support that OSC drives GTID initiatives. Moreover, our study demonstrates that, though OSC has positive associations with distinct GHRM programmes, its influence on GPC is larger when compared with GTID and GRS.

We contribute to literature and to practice by complimenting prior works that have advocated a positive relationship between GRS, GTID and ES (Ahmad, 2015; Yong et al., 2019; Yusliza et al., 2017). Policymakers and organisational leaders can endeavour to strengthen their GRS and GTID strategies to better support initiatives fundamental to ES. We provide evidence by which policymakers can leverage OSC to promote GHRM programmes to drive ES. Our findings further challenge extant GHRM juxtapositions and theoretically driven ES contentions of prior research by demonstrating that GPC is a negative predictor of ES. Contrary to prior expectations, we further contribute by providing evidence that predicts how GPC impairs OSC's positive association with ES. We show that although GPC mediates OSC and ES via a competitive mediating role, the magnitude of its significant negative influence is small. Given the inconclusive debate of prior research on the OSC and ES relationship, this finding consequently challenges extant theorising by demonstrating that the positive influence of GPC on ES may be exaggerated by prior research. Moreover, our findings show that GRS and GTID act as complementary mechanisms that amplify the positive influence of OSC on ES. We consequently contribute to theory and practice by bolstering existing insights that have championed the role of GHRM programmes on OSC and ES. We do this by providing evidence that supports the implementation of GRS activities and GTID initiatives in ways that align with the influence of OSC, and fosters compliance to SDGs via ES (Khallash & Kruse, 2012; Li et al., 2019).

We offer novel moderated-mediation evidence by demonstrating original insights that challenge seminal contemporary theories undergirding the GTID and ES nexus. We show that, while OSC positively promotes GTID, it also attenuates the positive influence that GTID has on ES. This finding is noteworthy and timely given the constant dynamic nature of technological advancements and the pressure that rapid change has on organisations to continuously enforce changes – which unfortunately, inadvertently has adverse effects on employees applying newer technologies to routine tasks.

### 4.3 | Implications for practice on OSC, GHRM and ES

OSC and GHRM programmes are integral parts of organisations that are concerned about producing eco-friendly product innovations

(Ahmad, 2015; Oosthuizen, 2019; Yong et al., 2019; Yusliza et al., 2017). Our study finds that while OSC positively drives GRS, GTID, and GPC, it exerts a larger positive influence on GPC compared with GRS and GTID. Therefore, practicing managers may want to consider initiating policies that will embrace the implementation of initiatives that foster green compensation and organisations' environmental-wide performance appraisal systems. Allocation of resource schemes may also include higher considerations as relevant resources would be needed to further bolster development of OSC implementation plans. Applying strong STARA support to GPC could help reinforce continuity and stability of green tasks and routine processes fundamental to promoting ES (Khallash & Kruse, 2012; Li et al., 2019). We offer empirical evidence that practitioners may adopt to guide green centred actions and policies around the deployment of STARA capabilities by organisations. This step is important to control for making wise decisions that support organisations' business models for providing GHRM programmes with the resources captured in STARA.

Our findings suggest that GHRM programmes play distinct fundamental roles in promoting ES. Practitioners should note that though GTID and GRS exert positive influences on ES, GTID is a larger positive predictor of ES. Therefore, practitioners and policymakers may want to reinforce and intensify their present strategies to enhance ES. Thus, organisations may want to pursue policies that ensure training initiatives are supported by the United Nations global compact on ES. Green centred education workshops can help organisations reinforce their green values needed to foster ES. Policymakers may also want to consider pursuing opportunities for inclusiveness that foster empowerment of programmes that promote ES. Equally, organisational leaders should consider instituting policies that guide the processes by which organisations engage in recruiting and retaining the right green talent needed for aiding the advancement of SDGs. It may be beneficial for organisations if their GRS policies are regularly reviewed to ensure they are consistent with stakeholder expectations on cleaner production and carbon footprint concerns. Nevertheless, caution should be taken when implementing GPC initiatives, as we show it has a negative influence on ES and a competitive mediating role between OSC and ES. Consequently, policymakers may want to consider gently enforcing GPC associated policies with optimum levels of flexibility to drive green initiatives and constantly deter cases of excessive focus on metrics and compliance.

We offer novel insights showing that OSC dampens the positive influence of GTID on ES. Given the nature of this finding, policymakers may want to revisit earlier established GTID related policies and overall organisational high expectations. Consequently, programmes should be institutionalised to ensure adequate monitoring of plausible negative impacts that organisational expectations may have on employees. Organisational work processes and routine tasks could be closely aligned to stakeholder theory's assumptions of considerations for the people, profits, and planet (Renwick et al., 2016). Employees' wellbeing and work-life balance should be carefully monitored to ensure progress without burnout as employees are expected to constantly unlearn, learn, adapt, and adopt newer technologies for

aiding organisations to bolster profits and ES (Khallash & Kruse, 2012; Li et al., 2019).

Policymakers can take comfort in our findings that suggest that GTID and GRS can act as forces to pull organisations closer towards promoting ES, such as cleaner productions, sustainable consumption, resources conservation, and recycling. This can be deduced via our study's finding that GRS and GTID act as complimentary mediating mechanisms that reinforce the relationships between OSC and ES. Consequently, policymakers ought to consider fostering the institution of GHRM policies and practices such as recruitment, selection, training, and development that identify, develop and retain talent with green centred values, who are also capable of driving OSC implementations. Equally, policymakers should consider setting up initiatives that can more closely drive and monitor how OSC implementations aid green practices in ways that ensure green values are not undermined. Moreover, policymakers may take comfort in the knowledge that the plausibly overwhelming threats advocated by the STARA age do not infer disaster for organisations but are another avenue that can be exploited to foster ES. Our study shows that this is a relevant and timely strategy that organisations may deploy to aid their efforts in achieving expectations of the United Nations' SDGs. Furthermore, policymakers should develop strategies to ensure that organisations that are driven by green centred values that are constantly concerned with promoting their ES not just for profiteering and boosting competitiveness, but for fostering cleaner production and ES.

#### 4.4 | Limitations and future research directions

We have attempted to offer organisation-level evidence in this study; thus, individual-level implications should not be inferred. Though, this does provide room for future research to replicate our study from an individual or team level perspective. Future research may include an investigation on respective employees' opinions of top management leaders' behaviours towards OSC implementation to drive ES, and employees' plausible experience of the use of STARA related components to drive ES initiatives. It will be interesting to obtain subordinates' views on how the distinct GHRM programs act to predict ES. Given the need to constantly develop people and interpersonal relationships, it will be useful to understand the role teams play in embracing the complexities associated with the STARA concept and how distinct teams may leverage OSC to further bolster ES. Equally, we have not investigated the much broader view of GHRM programmes such that we separate GPC, GTID and GRS functions, such as green compensation, performance, training, inclusion, empowerment, development, recruitment, and selection. This may have prevented deeper insights into how each GHRM's broad range of programmes act to directly predict ES and how they are further impacted by OSC. Equally, by separating and investigating the broader GHRM programs, chances of obtaining original findings that either expand, challenge or compliment on-going theoretical debates and conventional understandings can be deduced without compromising the reliability of the results in a replication-based study. From a

methodological standpoint, GHRM may also be fully modelled as a single construct or as a higher-order construct when dealing with very complex conceptual models that include the GHRM disparate programs. Though, our theorising of GHRM programmes resonates with extant research that has investigated GHRM programmes in similar ways. We, therefore, call on future research to examine the broader nature of the GHRM programmes and how they act to influence ES when predicted by OSC.

Additionally, although our study leverages DCT and stakeholder theory, we have not investigated the role of other stakeholders like customers, suppliers, and others. Moreover, doing this would have thrown us off course from the prime aims of our study focused on organisation-level evidence. We therefore call on future researcher to pursue theorising that captures other stakeholders. While our research may have produced significant findings, it may be limited as its insights are grounded in time-gap cross-sectional data that has focused on the Nigerian manufacturing industry experience. However, our findings are substantive, timely, and relevant to not only the Nigerian economy, but to other emerging economies that share similar issues. Therefore, in the future, it is important for a cross-national and or a longitudinal investigation to be carried out to further strengthen the generalisability of our research findings.

#### CONFLICT OF INTEREST STATEMENT

No potential conflict of interest was reported by the authors.

#### ORCID

Samuel Ogbeybu  <https://orcid.org/0000-0002-8844-3695>

#### REFERENCES

- Abdulaziz, N. A., Senik, R., Yau, F. S., San, O. T., & Attan, H. (2017). Influence of institutional pressures on the adoption of green initiatives. *International Journal of Economics and Management*, 11(S3), 939–967.
- Adubor, N. V., Adeniji, A. A., Salau, O. P., Olajugba, O. J., & Onibudo, G. O. (2022). Exploring green human resource adoption and corporate sustainability in Nigerian Manufacturing Industry. *Sustainability*, 14, 2–15.
- Aftab, J., Abid, N., Cucari, N., & Savastano, M. (2022). Green human resource management and environmental performance: The role of green innovation and environmental strategy in a developing country. *Business Strategy and Environment*. <https://doi.org/10.1002/bse.3219> (ahead-of-print)
- Afum, E., Osei-Ahenkan, V. Y., Agyabeng-Mensah, Y., Owusu, J. A., Kusi, L. Y., & Ankomah, J. (2020). Green manufacturing practices and sustainable performance among Ghanaian manufacturing SMEs: The explanatory link of green supply chain integration. *Management of Environmental Quality: An International Journal*, 31, 1457–1475.
- Aguilera, R. V., Aragón-Correa, J. A., Marano, V., & Tashman, P. A. (2021). The corporate governance of environmental sustainability: A review and proposal for more integrated research. *Journal of Management*, 47(6), 1468–1497. <https://doi.org/10.1177/0149206321991212>
- Ahmad, S. (2015). Green human resource management: Policies and practices. *Cogent Business & Management*, 2, 1030817. <https://doi.org/10.1080/23311975.2015.1030817>
- Akhtar, P., Khan, Z., Frynas, J. G., Tse, Y. K., & Rao-Nicholson, R. (2018). Essential micro-foundations for contemporary business operations: Top management tangible competencies, relationship-based business networks and environmental sustainability. *British Journal of Management*, 29, 43–62. <https://doi.org/10.1111/1467-8551.12233>

- Akintayo, T. C., Akinlabi, S. A., Okokpujie, I. P., Ishola, F., & Akinlabi, E. T. (2020). Advanced manufacturing technology in Nigeria: A review. *IOP Conference Series: Materials Science and Engineering*, 1107, 012115.
- Albert, E. T. (2019). AI in talent acquisition: A review of AI-applications used in recruitment and selection. *Strategic HR Review*, 18, 215–221. <https://doi.org/10.1108/SHR-04-2019-0024>
- Ali, Y., Younus, A., Khan, A. U., & Pervez, H. (2021). Impact of lean, six sigma and environmental sustainability on the performance of SMEs. *International Journal of Productivity and Performance Management*, 70(8), 2294–2318. <https://doi.org/10.1108/IJPPM-11-2019-0528>
- Artino, A. R., La Rochelle, J. S., Dezee, K. J., & Gehlbach, H. (2014). Developing questionnaires for educational research: AMEE Guide No. 87. *Medical Teacher*, 36, 463–474. <https://doi.org/10.3109/0142159X.2014.889814>
- Arulrajah, A. A., Opatha, H. H., & Nawaratne, N. N. (2015). Green human resource management practices: A review. *Sri Lankan Journal of Human Resource Management*, 5(1), 1–16.
- Barney, J. B., & Harrison, J. S. (2020). Stakeholder theory at the crossroads. *Business & Society*, 59(9), 203–212. <https://doi.org/10.1177/0007650318796792>
- Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity as the mother of 'green' inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, 34, 891–909. <https://doi.org/10.1002/smj.2041>
- Bianchi, G., Testa, F., Tessitore, S., & Iraldo, F. (2022). How to embed environmental sustainability: The role of dynamic capabilities and managerial approaches in a life cycle management perspective. *Business Strategy and the Environment*, 31, 312–325.
- Bohnsack, R., Bidmon, C., & Pinkse, J. (2021). Sustainability in the digital age: Intended and unintended consequences of digital technologies for sustainable development. *Business Strategy and the Environment*, 31(2), 599–602. <https://doi.org/10.1002/bse.2938>
- Bolanle, B. P., Ebeguki, I., Odunayo, S. P., Kelechi, C. C., & Efeomo, I. S. (2022). Crystallising green training and development practices on employee behavioural outcomes in the manufacturing sector. *Academy of Strategic Management Journal*, 21, 1–16.
- Brink, P. J., & Wood, M. J. (1998). *Advanced Design in Nursing Research* (2nd ed.). SAGE Publications, Inc.
- Brougham, D., & Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, 24(2), 239–257. <https://doi.org/10.1017/jmo.2016.55>
- Chamorro-Premuzic, T., & Taylor, B. (2017). Can AI ever be as curious as humans? Harvard Business Review. Retrieved from <https://hbr.org/2017/04/can-ai-ever-be-as-curious-as-humans>
- Chams, N., & García-Bland, J. (2019). On the importance of sustainable human resource management for the adoption of sustainable development goals. *Resources, Conservation and Recycling*, 141, 109–122. <https://doi.org/10.1016/j.resconrec.2018.10.00>
- Chan, E., & Hawkins, R. (2010). Attitudes towards EMSs in an international hotel: An exploratory case study. *International Journal of Hospitality Management*, 39, 641–651.
- Chan, K. H., Yee, R. W., Dai, J., & Lim, M. K. (2016). The moderating effect of environmental dynamism on green product innovation and performance. *International Journal of Production Economics*, 181, 384–391. <https://doi.org/10.1016/j.ijpe.2015.12.006>
- Charonman, S., Mongkhonvanit, P., Dieu, V. N., & Linden, N. (2015). Applications of internet of things in elearning. *International Journal of the Computer, the Internet and Management*, 23(3), 1–4.
- Chavez, R., Yu, W., Jacobs, M., Fynes, B., Wiengarten, F., & Lecuna, A. (2015). Internal lean practices and performance: The role of technological turbulence. *International Journal of Production Economics*, 160, 157–171. <https://doi.org/10.1016/j.ijpe.2014.10.005>
- Chen, T., Li, F., & Chen, X. O. (2018). Innovate or die: How should knowledge-worker teams respond to technological turbulence? *Organizational Behavior and Human Decision Processes*, 149, 1–16. <https://doi.org/10.1016/j.obhdp.2018.08.008>
- Chen, Y.-S., & Chang, C.-H. (2013). Utilize structural equation modeling (SEM) to explore the influence of corporate environmental ethics: The mediation effect of green human capital. *Quality & Quantity*, 47, 79–95.
- Chiarini, A. (2021). Industry 4.0 technologies in the manufacturing sector: Are we sure they are all relevant for environmental performance? *Business Strategy and the Environment*, 30(7), 3194–3207. <https://doi.org/10.1002/bse.2797>
- Chin, W. W. (1998). In G. A. Marcoulides (Ed.), *The partial least squares approach to structural equation modeling* (1st ed.). Lawrence Erlbaum Associates, Inc.
- Clarkson, M. B. E. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review*, 20, 92–117.
- Cook, D. A., & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: Theory and application. *The American Journal of Medicine*, 119(2), 166.e7–166.e16. <https://doi.org/10.1016/j.amjmed.2005.10.036>
- Cuerva, M. C., Triguero-Cano, A., & Corcoles, D. (2014). Drivers of green and non-green innovation: Empirical evidence in low-tech SMEs. *Journal of Cleaner Production*, 68, 104–113. <https://doi.org/10.1016/j.jclepro.2013.10.049>
- Dangelico, R. M., Pujari, D., & Pontrandolfo, P. (2016). Green product innovation in manufacturing firms: A sustainability-oriented dynamic capability perspective. *Business Strategy and the Environment*, 26, 490–506. <https://doi.org/10.1002/bse.1932>
- Davis, M. C., Unsworth, K. L., Russell, S. V., & Galvan, J. J. (2019). Can green behaviors really be increased for all employees? Trade-offs for "deep greens" in a goal-oriented green human resource management intervention. *Business Strategy and the Environment*, 1–12, 335–346. <https://doi.org/10.1002/bse.2367>
- Debrah, Y., Oseghale, O., & Adams, K. (2018). Human capital, innovation and international competitiveness in sub-Saharan Africa. In I. Adeleye & M. Esposito (Eds.), *Africa's competitiveness in the global economy* (pp. 219–248). Palgrave Macmillan.
- Dubois, C. L. Z., & Dubois, D. A. (2012). Strategic HRM as social design for environmental sustainability in organization. *Human Resource Management*, 51, 799–826.
- Dumont, J., Shen, J., & Deng, X. (2017). Effects of green HRM practices on employee workplace green behaviour: the role of psychological green climate and employee green values. *Human Resource Management*, 56, 613–627.
- Emelifeonwu, J. C., & Valk, R. (2019). Employee voice and silence in multinational corporations in the mobile telecommunications industry in Nigeria. *Employee Relations*, 41(1), 228–252. <https://doi.org/10.1108/ER-04-2017-0073>
- Freeman, E. R., Phillips, R., & Sisodia, R. (2018). Tensions in stakeholder theory. *Business & Society*, 59, 1–19. <https://doi.org/10.1177/0007650318773750>
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254–280. <https://doi.org/10.1016/j.techfore.2016.08.019>
- Garg, V., Srivastav, S., & Gupta, A. (2018). Application of artificial intelligence for sustaining green human resource management, International Conference on Automation and Computational Engineering (ICACE -2018), Amity University Greater Noida Campus, U. P., India, Oct 3-4, 2018.
- Ghosh, S., Hughes, M., Hodgkinson, I., & Hughes, P. (2021). Digital transformation of industrial businesses: A dynamic capability approach. *Technovation*, In press, 113, 102414. <https://doi.org/10.1016/j.technovation.2021.102414>

- Giacomo, L. A., & Breman, J. (2016). Emerging evidence on the use of big data and analytics in workplace learning: A systematic literature review. *Quarterly Review of Distance Education*, 17(4), 21–38.
- Gube, M., & Lajoie, S. (2020). Adaptive expertise and creative thinking: A synthetic review and implications for practice. *Thinking Skills and Creativity*, 35, 1–14.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hair, J. F., William, B. C., Barry, B. J., & Rolph, A. E. (2010). *Multivariate data analysis* (7th Edition (7th ed.) ed.). Pearson Prentice Hall.
- Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, 50(1), 1–22. <https://doi.org/10.1080/00273171.2014.962683>
- Hofmann, K. H., Theyel, G., & Wood, C. H. (2012). Identifying firm capabilities as drivers of environmental management and sustainability practices—evidence from small and medium-sized manufacturers. *Business Strategy & Environment*, 21, 530–545.
- Horton, J. J. (2017). The effects of algorithmic labour market recommendations: Evidence from a field experiment. *Journal of Labour Economics*, 35(2), 345–385. <https://doi.org/10.1086/689213>
- Hughes, M., Hughes, P., Morgan, R. E., Hodgkinson, I. R., & Lee, Y. (2020). Strategic entrepreneurship behaviour and the innovation ambidexterity of young technology-based firms in incubators. *International Small Business Journal: Researching Entrepreneurship*, 39, 202–227. <https://doi.org/10.1177/0266242620943776>
- Itzhakov, G., Weinstein, N., & Cheshin, A. (2022). Learning to listen: Downstream effects of listening training on employees' relatedness, burnout, and turnover intentions. *Human Resource Management Journal*, 1–16.
- Ivancic, L., Susa, V. D., & Bosilj, V. V. (2019). Robotic process automation: Systematic literature review. In C. E. Di Ciccio (Ed.), *Business process management: Blockchain and central and Eastern Europe forum* (pp. 280–295). Springer Nature. [https://doi.org/10.1007/978-3-030-30429-4\\_19](https://doi.org/10.1007/978-3-030-30429-4_19)
- Jabbour, C. J. (2013). Environmental training in organisations: From a literature review to a framework for future research. *Resources, Conservation and Recycling*, 74, 144–155. <https://doi.org/10.1016/j.resconrec.2012.12.017>
- Jabbour, C. J., Santos, F. C., Fonseca, S. A., & Nagano, M. S. (2013). Green teams: Understanding their roles in the environmental management of companies located in Brazil. *Journal of Cleaner Production*, 46, 58–66. <https://doi.org/10.1016/j.jclepro.2012.09.018>
- Jabbour, C. J. C., & Santos, F. C. A. (2008). The central role of human resource management in the search for sustainable organizations. *International Journal of Human Resource Management*, 19, 2133–2154.
- Jackson, S. E., Renwick, D. W., Jabbour, C. J., & Muller-Camen, M. (2011). State-of-the-art and future directions for green human resource management: Introduction to the special issue. *German Journal of Human Resource Management: Zeitschrift für Personalforschung*, 25(2), 99–116.
- Jassem, S., Zakaria, Z., & Che Azmi, A. (2022). Sustainability balanced scorecard architecture and environmental performance outcomes: A systematic review. *International Journal of Productivity and Performance Management*, 71(5), 1728–1760. <https://doi.org/10.1108/IJPPM-12-2019-0582>
- Jia, J., Liu, H., Chin, T., & Hu, D. (2018). The continuous mediating effects of GHRM on employees' green passion via transformational leadership and green creativity. *Sustainability*, 10(9), 3237. <https://doi.org/10.3390/su10093237>
- Junyong, I. (2017). Introduction of a pilot study. *Korean Journal of Anesthesiology*, 70(6), 601–605. <https://doi.org/10.4097/kjae.2017.70.6.601>
- Jyoti, K. (2019). Green HRM—People Management Commitment to Environmental Sustainability. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3323800>
- Kawai, N., Strange, R., & Zucchella, A. (2018). Stakeholder pressures, EMS implementation, and green innovation in MNC overseas subsidiaries. *International Business Review*, 27, 933–946. <https://doi.org/10.1016/j.ibusrev.2018.02.004>
- Khallash, S., & Kruse, M. (2012). The future of work and work-life balance 2025. *Futures*, 44, 678–686. <https://doi.org/10.1016/j.futures.2012.04.007>
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>
- Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, 28(1), 227–261. <https://doi.org/10.1111/isj.12131>
- Kuo, Y., Khan, T. I., Islam, S. U., Abdullah, F. Z., Pradana, M., & Kaewsaengon, R. (2022). Impact of green HRM practices on environmental performance: The mediating role of green innovation. *Frontiers in Psychology*, 13, 916723. <https://doi.org/10.3389/fpsyg.2022.916723>
- Lackey, N. R., & Wingate, A. L. (1998). The pilot study: One key to research success. In P. J. Brink & M. J. Wood (Eds.), *Advanced Design in Nursing Research* (2nd ed.) (pp. 375–384). SAGE Publications, Inc.
- Leal-Rodríguez, A. L., Ariza-Montes, A. J., Morales-Fernández, E., & Albort-Morant, G. (2018). Green innovation, indeed a cornerstone in linking market requests and business performance. Evidence from the Spanish automotive components industry. *Technological Forecasting and Social Change*, 129, 185–193. <https://doi.org/10.1016/j.techfore.2017.07.021>
- Li, J. J., Bonn, M. A., & Ye, H. B. (2019). Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate. *Tourism Management*, 73, 172–181. <https://doi.org/10.1016/j.tourman.2019.02.006>
- Liang, Y., Lee, M. J., & Jung, J. S. (2022). Dynamic capabilities and an ESG strategy for sustainable management performance. *Frontiers in Psychology*, 13, 887776. <https://doi.org/10.3389/fpsyg.2022.887776>
- Lu, Y. (2019). Artificial intelligence: A survey on evolution, models, applications and future trends. *Journal of Management Analytics*, 1-29, 1–29. <https://doi.org/10.1080/23270012.2019.1570365>
- Makridakis, S. (2017). The forthcoming artificial intelligence (AI) revolution: Its impact on society and firms. *Futures*, 90, 46–60. <https://doi.org/10.1016/j.futures.2017.03.006>
- Malmqvist, J., Hellberg, K., Möllas, G., Rose, R., & Shevlin, M. (2019). Conducting the pilot study: A neglected part of the research process? Methodological findings supporting the importance of piloting in qualitative research studies. *International Journal of Qualitative Methods*, 18, 160940691987834. <https://doi.org/10.1177/1609406919878341>
- Mansoor, A., Farrukh, M., Lee, J.-K., & Jahan, S. (2021). Stimulation of employees' green creativity through green transformational leadership and management initiatives. *Sustainability*, 13(14), 7844. <https://doi.org/10.3390/su13147844>
- Manufacturers Association of Nigeria. (2020). *Manufacturers CEO confidence index report*. Retrieved from [www.manufacturersnigeria.org](http://www.manufacturersnigeria.org): <https://www.manufacturersnigeria.org/MCCIRReport#>
- Masri, H. A., & Jaaron, A. A. (2017). Assessing green human resources management practices in Palestinian manufacturing context: An empirical study. *Journal of Cleaner Production*, 143, 474–489. <https://doi.org/10.1016/j.jclepro.2016.12.087>
- Merriman, K. K., & Sen, S. (2012). Incenting managers toward the triple bottom line an agency and social norm perspective. *Human Resource Management*, 51(6), 851–872. <https://doi.org/10.1002/hrm.21491>
- Muisyo, P. K., & Qin, S. (2021). Enhancing the FIRM'S green performance through green HRM: The moderating role of green innovation culture. *Journal of Cleaner Production*, 289, 1–12.
- Mukhty, S., Upadhyay, A., & Rothwell, H. (2022). Strategic sustainable development of Industry 4.0 through the lens of social responsibility:

- The role of human resource practices. *Business Strategy and the Environment*, 31(5), 2068–2081. <https://doi.org/10.1002/bse.3008>
- Naz, F., Agrawal, R., Kumar, A., Gunasekaran, A., Majumdar, A., & Luthra, S. (2022). Reviewing the applications of artificial intelligence in sustainable supply chains: Exploring research propositions for future directions. *Business Strategy and the Environment*, 31(5), 2400–2423. <https://doi.org/10.1002/bse.3034>
- Nejati, M., Rabiei, S., & Jabbour, C. J. (2017). Envisioning the invisible: Understanding the synergy between green human resource management and green supply chain management in manufacturing firms in Iran in light of the moderating effect of employees' resistance to change. *Journal of Cleaner Production*, 168, 163–172. <https://doi.org/10.1016/j.jclepro.2017.08.213>
- Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems*, 116(9), 1849–1864. <https://doi.org/10.1108/IMDS-07-2015-0302>
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5, 14–37.
- Nwosu, B., & Ward, T. (2016). The way forward: Human capital development in the hotel industry in Nigeria. *Worldwide Hospitality and Tourism Themes*, 8(2), 235–240. <https://doi.org/10.1108/WHATT-11-2015-0049>
- Ogbeibu, S., Emelifeonwu, J., Senadjki, A., Gaskin, J., & Kaivo-oja, J. (2020). Technological turbulence and greening of team creativity, product innovation, and human resource management: Implications for sustainability. *Journal of Cleaner Production*, 244(118703), 1, 118703–15. <https://doi.org/10.1016/j.jclepro.2019.118703>
- Ogbeibu, S., Jabbour, C. J., Burgess, J., Gaskin, J., & Renwick, D. W. (2022). Green talent management and turnover intention: The roles of leader STARA competence and digital task interdependence. *Journal of Intellectual Capital*, 23(1), 27–55. <https://doi.org/10.1108/JIC-01-2021-0016>
- Ogbeibu, S., Jabbour, C. J., Gaskin, J., Senadjki, A., & Hughes, M. (2021). Leveraging STARA competencies and green creativity to boost green organisational innovative evidence: A praxis for sustainable development. *Business Strategy and the Environment*, 30(5), 2421–2440. <https://doi.org/10.1002/bse.2754>
- Ogbeibu, S., Senadjki, A., & Gaskin, J. (2018). The moderating effect of benevolence on the impact of organisational culture on employee creativity. *Journal of Business Research*, 90C, 334–346. <https://doi.org/10.1016/j.jbusres.2018.05.032>
- Ojo, A. O., & Fauzi, M. A. (2020). Environmental awareness and leadership commitment as determinants of IT professionals engagement in Green IT practices for environmental performance. *Sustainable Production and Consumption*, 24, 298–307.
- Olaiya, T. O., Olaisebikan, J. S., & Akintunde-Adeyi, J. (2022). Green human resource management practices, employees' behaviour and environmental sustainability of manufacturing companies in Nigeria. *Innovation*, 70, 1343–1354.
- Oosthuizen, R. M. (2019). Smart technology, artificial intelligence, robotics and algorithms (STARA): Employees' perceptions and wellbeing in future workplaces. In I. L. Potgieter, N. Ferreira, & M. Coetzee (Eds.), *Theory, research and dynamics of career wellbeing becoming fit for the future* (pp. 17–40). Springer. [https://doi.org/10.1007/978-3-030-28180-9\\_2](https://doi.org/10.1007/978-3-030-28180-9_2)
- Özbag, G. K. (2013). Resource based view, core competence and innovation: A research on Turkish manufacturing industry. *Scientific Research Journal*, 1, 9–17.
- Park, O., Bae, J., & Hong, W. (2019). High-commitment HRM system, HR capability, and ambidextrous technological innovation. *International Journal of Human Resource Management*, 30, 1526–1548.
- Parker, S., & Grote, G. (2019). Automation, algorithms, and beyond: Why work design matters more than ever in a digital world. *Applied Psychology*, 71, 1171–1204. <https://doi.org/10.1111/apps.12241>
- Peng, J., Yin, K., Hou, N., Zou, Y. C., & Nie, Q. (2020). How to facilitate employee green behavior: The joint role of green transformational leadership and green human resource management practice. *Acta Psychologica Sinica*, 52, 1105–1120.
- Perron, G. M., Côté, R. P., & Duffy, J. F. (2006). Improving environmental awareness training in business. *Journal of Cleaner Production*, 14, 551–562.
- Pham, N. T., Tučková, Z., & Jabbour, C. J. C. (2019). Greening the hospitality industry: How do green human resource management practices influence organizational citizenship behavior in hotels? A mixed-methods study. *Tourism Management*, 72, 386–399.
- Pinheiro, M., Jugend, D., Jabbour, A., Jabbour, C., & Latan, H. (2021). Circular economy-based new products and company performance: The role of stakeholders and Industry 4.0 technologies. *Business Strategy and the Environment*, 31, 483–499. <https://doi.org/10.1002/bse.2905>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, 30(4), 459–467. <https://doi.org/10.1002/nur.20199>
- Ramus, C. A. (2001). Organizational support for employees: Encouraging creative ideas for environmental sustainability. *California Management Review*, 43, 85–105. <https://doi.org/10.2307/41166090>
- Ransbotham, S., Kiron, D., Gerbert, P., & Reeves, M. (2017). Reshaping business with artificial intelligence: Closing the gap between ambition and action. *MIT Sloan Management Review*, 59.
- Rehman, S. U., Kraus, S., Shah, S. A., Khanin, D., & Mahto, R. V. (2021). Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. *Technological Forecasting and Social Change*, 163, 1–6.
- Renwick, D. W., Jabbour, C. J., Muller-Camen, M., Redman, T., & Wilkinson, A. (2016). Contemporary developments in green (environmental) HRM scholarship. *International Journal of Human Resource Management*, 27(1–2), 114–128. <https://doi.org/10.1080/09585192.2015.1105844>
- Renwick, D. W., Redman, T., & Maguire, S. (2013). Green human resource management: A review and research agenda. *International Journal of Management Reviews*, 15, 1–14. <https://doi.org/10.1111/j.1468-2370.2011.00328.x>
- Reyes-Santiago, M. D. R., Sanchez-Medina, P. S., & Díaz-Pichardo, R. (2019). The influence of environmental dynamic capabilities on organizational and environmental performance of hotels: Evidence from Mexico. *Journal of Cleaner Production*, 227, 414–423.
- Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2018). Partial least squares structural equation modeling in HRM research. *The International Journal of Human Resource Management*, 31, 1617–1643. <https://doi.org/10.1080/09585192.2017.1416655>
- Rupa, R. A., & Saif, A. N. M. (2022). Impact of green supply chain management (GSCM) on business performance and environmental sustainability: Case of a developing country. *Business Perspectives and Research*, 10(1), 140–163. <https://doi.org/10.1177/2278533720983089>
- Rusch, M., Schoggi, J.-P., & Baumgartner, R. (2022). Application of digital technologies for sustainable product management in a circular economy: A review. *Business Strategy and the Environment*, 32, 1159–1174. <https://doi.org/10.1002/bse.3099>
- Sahoo, S., Kumar, A., & Upadhyay, A. (2022). How do green knowledge management and green technology innovation impact corporate environmental performance? Understanding the role of green knowledge acquisition. *Business Strategy and the Environment*, 32, 551–569. <https://doi.org/10.1002/bse.3160>
- Salvi, A., Vitolla, F., Rubino, M., Giakoumelou, A., & Raimo, N. (2021). Online information on digitalisation processes and its impact on firm value. *Journal of Business Research*, 124, 437–444.

- Sanni, M. (2018). Drivers of eco-innovation in the manufacturing sector of Nigeria. *Technological Forecasting and Social Change*, 131, 303–314. <https://doi.org/10.1016/j.techfore.2017.11.007>
- Santoro, G., Bresciani, S., & Papa, A. (2021). Collaborative modes with cultural and creative industries and innovation performance: The moderating role of heterogeneous sources of knowledge and absorptive capacity. *Technovation*, 92–93.
- Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J., Ting, H., & Vaithilingam, S. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing*, 53(11), 2322–2347. <https://doi.org/10.1108/EJM-02-2019-0189>
- Shuaib, K. M., He, Z., & Song, L. (2021). Effect of organizational culture and quality management on innovation among Nigerian manufacturing companies: The mediating role of dynamic capabilities. *Quality Management Journal*, 28(4), 223–247. <https://doi.org/10.1080/10686967.2021.1962773>
- Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150(119762), 1, 119762–12. <https://doi.org/10.1016/j.techfore.2019.119762>
- Sobaih, A. E., Hasanein, A., & Elshaer, I. (2020). Influences of green human resources management on environmental performance in small lodging enterprises: The role of green innovation. *Sustainability*, 12(10371), 1, 10371–19. <https://doi.org/10.3390/su122410371>
- Song, W., Yu, H., & Xu, H. (2020). Effects of green human resource management and managerial environmental concern on green innovation. *European Journal of Innovation Management*, 24(3), 951–967. <https://doi.org/10.1108/EJIM-11-2019-0315>
- Sung, S. Y., & Choi, J. N. (2018). Effects of training and development on employee outcomes and firm innovative performance: Moderating roles of voluntary participation and evaluation. *Human Resource Management Journal*, 57(6), 1339–1353. <https://doi.org/10.1002/hrm.21909>
- Tariq, A., Badir, Y., & Chonglertham, S. (2019). Green innovation and performance: moderation analyses from Thailand. *European Journal of Innovation Management*, 22, 446–467.
- Taylor, S., Osland, J., & Egri, C. (2012). Introduction to HRM's role in sustainability: Systems, strategies, and practices. *Human Resource Management*, 51, 789–798.
- Teddlie, C., & Yu, F. (2007). Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research*, 1(1), 77–100. <https://doi.org/10.1177/1558689806292430>
- Tece, D. J. (2007). Explicating dynamic capabilities: The nature and micro-foundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Tece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives*, 28(4), 328–352. <https://doi.org/10.5465/amp.2013.0116>
- Tece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>
- Tece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AIDSMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AIDSMJ882>3.0.CO;2-Z)
- Teeter, P., & Sandberg, J. (2016). Constraining or enabling green capability development? How policy uncertainty affects organizational responses to flexible environmental regulations. *British Journal of Management*, 28, 649–665. <https://doi.org/10.1111/1467-8551.12188>
- Teixeira, A. A., Jabbour, C. J., & de Sousa Jabbour, A. B. (2012). Relationship between green management and environmental training in companies located in Brazil: A theoretical framework and case studies. *International Journal of Production Economics*, 140(1), 318–329. <https://doi.org/10.1016/j.ijpe.2012.01.009>
- Tussyadiah, I., & Miller, G. (2018). Perceived impacts of artificial intelligence and responses to positive behaviour change intervention. In J. Pesonen & J. Neidhardt (Eds.), *Information and communication technologies in tourism* (pp. 359–370). Springer Nature. [https://doi.org/10.1007/978-3-030-05940-8\\_28](https://doi.org/10.1007/978-3-030-05940-8_28)
- Usman, A. B., & Amran, N. A. (2015). Corporate social responsibility practice and corporate financial performance: Evidence from Nigeria companies. *Social Responsibility Journal*, 11(4), 749–763. <https://doi.org/10.1108/SRJ-04-2014-0050>
- Vishwanath, A., Singh, A., Chua, Y. H., Dauwels, J., & Magnenat-Thalman, N. (2019). Humanoid co-workers: How is it like to work with a robot? In *New Delhi, India.: 28th IEEE international conference on robot and human interactive communication (RO-MAN)* (pp. 1–6). Institute of Electrical and Electronics Engineers (IEEE). <https://doi.org/10.1109/RO-MAN46459.2019.8956421>
- Vrontis, D., Christofi, M., Pereira, V., Tarba, S., Makrides, A., & Trichina, E. (2021). Artificial intelligence, robotics, advanced technologies and human resource management: A systematic review. *The International Journal of Human Resource Management*, 33, 1237–1266. <https://doi.org/10.1080/09585192.2020.1871398>
- Wang, J., Xue, Y., Sun, X., & Yang, J. (2020). Green learning orientation, green knowledge acquisition and ambidextrous green innovation. *Journal of Cleaner Production*, 250, 119475.
- Wu, L., Liu, H., & Zhang, J. (2017). Bricolage effects on new-product development speed and creativity: The moderating role of technological turbulence. *Journal of Business Research*, 70, 127–135. <https://doi.org/10.1016/j.jbusres.2016.08.027>
- Xie, X., & Zhu, Q. (2020). Exploring an innovative pivot: How green training can spur corporate sustainability performance. *Business Strategy and the Environment*, 29(6), 2432–2449. <https://doi.org/10.1002/bse.2512>
- Yong, Y. J., Yusliza, M.-Y., Ramayah, T., Jabbour, C. J., Sehnem, S., & Mani, V. (2019). Pathways towards sustainability in manufacturing organisations: Empirical evidence on the role of green human resource management. *Business Strategy and the Environment*, 29, 212, bse.2259–228. <https://doi.org/10.1002/bse.2259>
- Yu, W., Chavez, R., Feng, M., Wong, C. Y., & Fynes, B. (2020). Green human resource management and environmental cooperation: An ability-motivation-opportunity and contingency perspective. *International Journal of Production Economics*, 219, 224–235.
- Yusliza, M. Y., Othman, N. Z., & Jabbour, C. J. (2017). Deciphering the implementation of green human resource management in an emerging economy. *The Journal of Management Development*, 36(10), 1230–1246.
- Yusoff, M. S. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal*, 11(2), 49–54. <https://doi.org/10.21315/eimj2019.11.2.6>
- Zaid, A. A., Jaaron, A. A., & Bon, A. T. (2018). The impact of green human resource management and green supply chain management practices on sustainable performance: An empirical study. *Journal of Cleaner Production*, 204, 965–979. <https://doi.org/10.1016/j.jclepro.2018.09.062>
- Zailani, S., Govindan, K., Iranmanesh, M., Shaharudin, M. R., & Chong, Y. S. (2015). Green innovation adoption in automotive supply chain: The Malaysian. *Journal of Cleaner Production*, 108, 1115–1122. <https://doi.org/10.1016/j.jclepro.2015.06.039>

**How to cite this article:** Ogbaidu, S., Emelifeonwu, J., Pereira, V., Oseghale, R., Gaskin, J., Sivarajah, U., & Gunasekaran, A. (2023). Demystifying the roles of organisational smart technology, artificial intelligence, robotics and algorithms capability: A strategy for green human resource management and environmental sustainability. *Business Strategy and the Environment*, 1–20. <https://doi.org/10.1002/bse.3495>

## APPENDIX A.

### Organisational STARA Capability (OSC)

1. This organisation has the knowledge and ability to apply smart (analysing, reporting and self-monitoring systems) technology during operations.
2. Matters related to machines that share similar qualities (learn, reason, discover and calculate) with the human mind are adequately addressed by this organisation.
3. This organisation is not good at designing or applying algorithms to complete defined tasks (reverse coded).
4. This organisation knows how to design, and or apply robots or mechanical devices during operations.

### Green Performance and Compensation (GPC)

1. Environmental goals and objectives are implemented in this organisation.
2. Assessment of organisational members comprises of their environmental.
3. performance.
4. There is compensation of monetary and or non-monetary incentives or rewards for achieving targeted environmental performance.
5. Flexible compensation payment is given based on environmental performance.

### Green Training, Involvement and Development (GTID)

1. This organisation offers ecological training for employees.
2. This organisation offers ecological training for leaders.
3. Responsibility towards the environment, is part of the job description.

4. Organisational members are involved in matters concerning environmental issues.
5. Organisational members who receive ecological training have the opportunity to implement green knowledge in everyday activities.

### Green Recruitment and Selection (GRS)

1. This organisation is very particular about mainly recruiting and selecting employees with environmental concerns, knowledge, and attitude.
2. This organisation's recruitment process focuses on applicants with environmental insights, attitude, and concern.
3. This organisation is rigorous in identifying, recruiting, assessing, and selecting new employees with environmental concerns, knowledge and attitude.
4. Applicants for positions in this organisation, undergo well designed interviews which includes questions about their environmental attitude, knowledge, concerns.

### Environmental sustainability (EI)

1. During product development implementation phases, this organisation uses the minimum number of materials to develop the product.
2. The product materials this organisation chooses are those that consume the least number of resources and energy for conducting product development or design.
3. During product design or development, the materials of product that create the minimum amount of pollution is preferred by this organisation.
4. At product development or designs stages, this organisation carefully evaluates if the product is easy to recycle, reuse, or decompose.